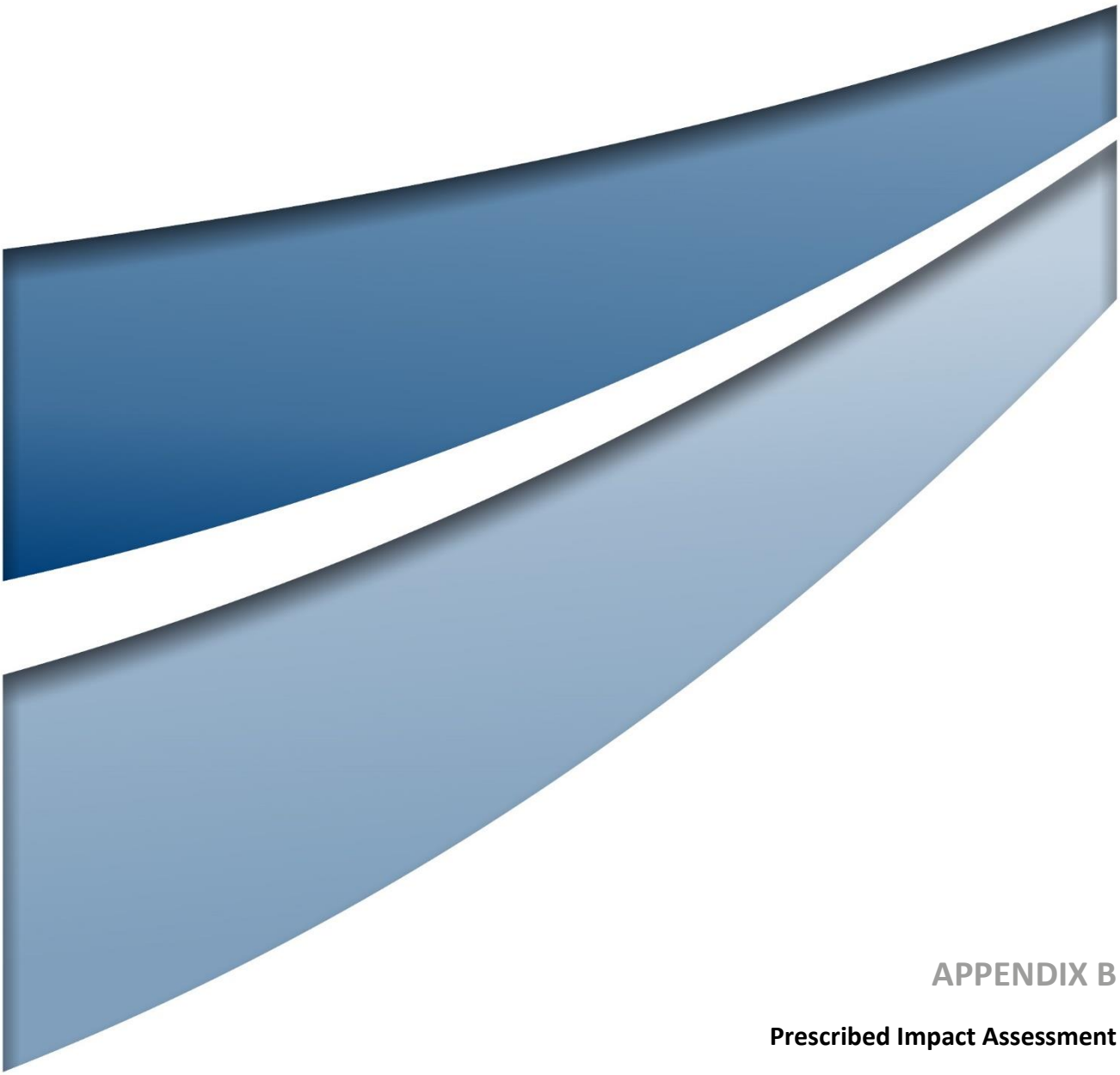
Appendix 6

BIODIVERSITY DEVELOPMENT
ASSESSMENT REPORT



APPENDIX B

Prescribed Impact Assessment

umwelt
Environmental & Social Consultants

SPARK RENEWABLES

MALLEE WIND FARM

Biodiversity Development Assessment Report –
Turbine Strike Prescribed Impact Assessment

FINAL

September 2024

MALLEE WIND FARM

Appendix B – Turbine Strike
Prescribed Impact Assessment

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Spark Renewables Pty Ltd

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Report No. 22494/R10/Appendix B
Date: September 2024

Environmental & Social Consultants

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Ryan Parsons	20 September 2024	Ryan Parsons	20 September 2024

Abbreviations

Abbreviation	Definition
agl	above ground level
BAM	Biodiversity Assessment Method (NSW)
BAM-C	Biodiversity Assessment Method Calculator
BBUS	Bird and Bat Utilisation Survey
BC Act	*Biodiversity Conservation Act 2016* NSW
BCS	NSW Biodiversity and Conservation Science Division in Environment and Heritage Group of NSW Department of Climate Change, Energy, the Environment and Water
BDAR	Biodiversity Development Assessment Report
Commonwealth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEWHA	Department of the Environment, Water, Heritage and the Arts (former Commonwealth department)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (former Commonwealth department)
DPE	NSW Department of Planning and Environment (former NSW department)
DPHI	NSW Department of Planning, Housing and Infrastructure (current)
DPIE	NSW Department of Planning, Industry and Environment (former NSW department)
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* Commonwealth
GW	Gigawatt
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
MNES	Matters of National Environmental Significance
MW	megawatts
NPW Act	*National Parks and Wildlife Act 1974* NSW
NSW	New South Wales
PMST	Protected Matters Search Tool
REZ	Renewable Energy Zone
RSA	Rotor swept area
RtS	Response to Submissions
SAII	Serious And Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
TEC	Threatened Ecological Community
Umwelt	Umwelt (Australia) Pty Limited
VP	Vantage Point

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Appendices

Appendix 1	Vantage Point Surveys Photographs

1.0 Introduction

This document has been prepared to address Section 8.3.5 criterion a-c of the 'assess prescribed biodiversity impacts' section of the Biodiversity Assessment Method (BAM) (DPIE 2020) for the Mallee Wind Farm (the Project).

Of the 166 bird and 16 bat candidate species that were either recorded or are predicted to occur in the vicinity of the Project Area, a total of 147 bird and 16 bat species are examined in this Prescribed Impact Assessment. This includes 15 threatened/migratory bird species and 109 non-threatened bird species that were recorded in the Project Area during the 2022–2024 surveys and an additional 23 threatened/migratory bird species that were not recorded but may occur in the Project Area. A total of four threatened and 12 non-threatened bat species recorded or possibly recorded in the Project Area during the 2022–2024 surveys are assessed.

The bird and bat survey methodology and results are presented in **Section 2.0,** the candidate list of protected species in the Project Area is provided in **Section 3.0,** cumulative impacts are discussed in **Section 7.0** and a qualitative collision risk assessment is detailed in **Section 8.0**.

1.1 The Project

The Project is a proposed wind farm which includes the installation, operation, maintenance and decommissioning of up to 76 wind turbine generators (WTG), battery storage, ancillary infrastructure and temporary facilities associated with construction of the Project.

The Project is located approximately 16 kilometre (km) north-east of Buronga of New South Wales (NSW), close to the NSW-Victorian state border within the Wentworth Shire Local Government Area (LGA). Smaller localities of Mallee, Red Cliffs and Trentham Cliffs are located to the south and south-west of the Project. The Project Area encompasses approximately 57,330.13 hectares (ha) of predominantly cropping and grazing land and adjoins the Mallee Cliffs National Park (Mallee Cliffs NP), which is located directly south and south east.

The Project Area, Development Footprint and proposed WTG locations are shown in **Figure 1.1**.

1.2 WTG Specifications

The assumed WTG specifications used for this prescribed impact assessment for the purpose of interpreting observations and species flight behaviour in relation to collision risk and barotrauma are as follows:

- up to 76 WTG
- maximum blade tip height of 280 metres (m) above ground level (AGL)
- lowermost blade tip height of 50 m AGL[1]

The location of the proposed WTGs are shown in **Figure 1.1.**

[1] The actual turbine dimensions will be confirmed during detailed design. To provide a precautionary assessment this Prescribed Impacts Assessment has assumed a lowermost blade tip height of 50 m AGL.

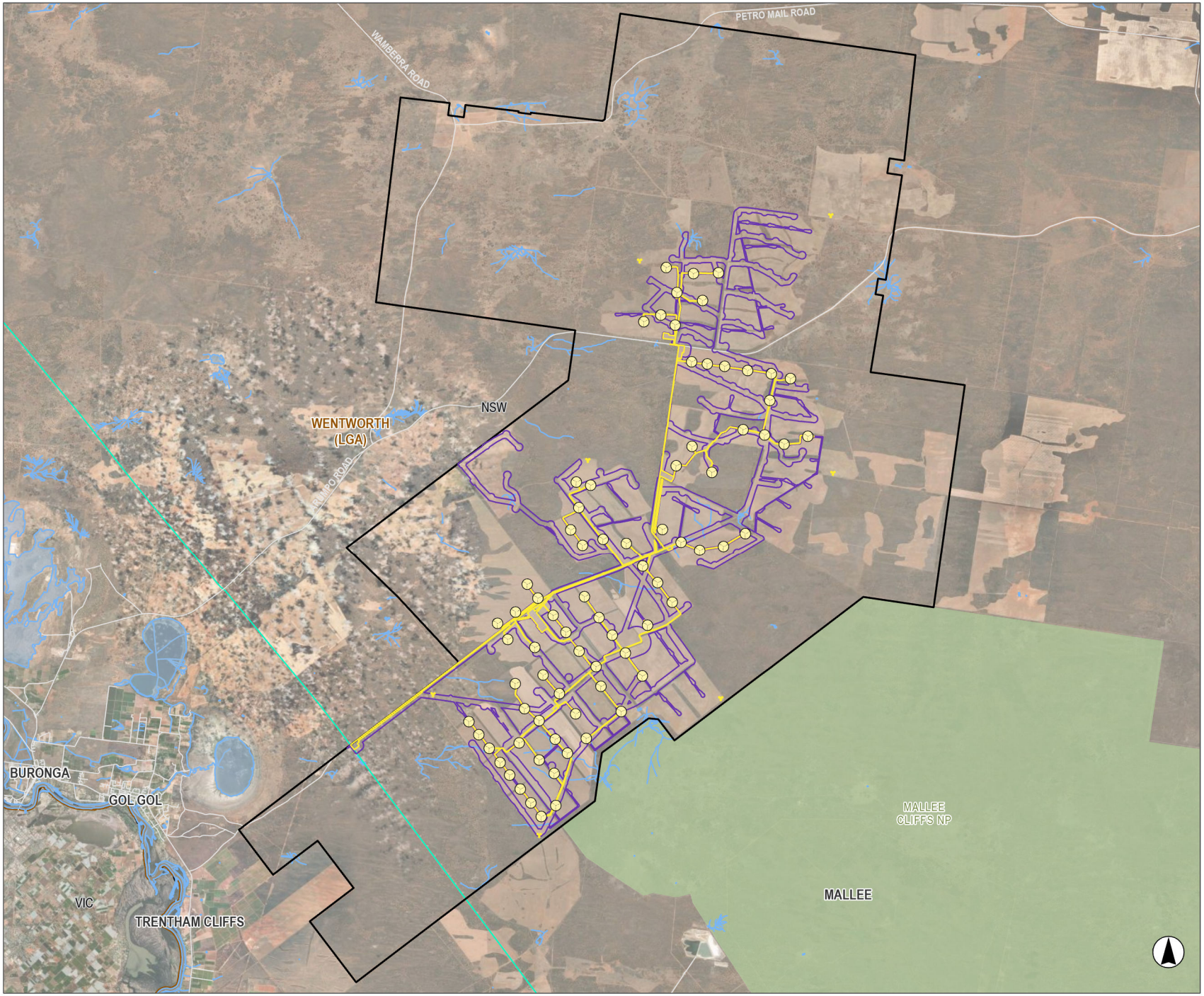


FIGURE 1.1

Proposed Development Footprint and Wind Turbines

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- State Border
- Local Government Area (LGA)
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 5 10
Kilometres

Scale 1:215,000 at A4
GDA2020 MGA Zone 54

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2.0 Bird and Bat Surveys at Mallee Wind Farm

This section describes the methodology and results of the bird and bat surveys that have been undertaken for the Project.

The BAM identifies impacts associated with a wind farm to the flyways and migration routes of bird and bat species as 'prescribed impacts' that require specific assessment in accordance with Section 6.1.5 of the BAM (DPIE 2020). The BDAR is required to consider impacts to species that may use the Project Area as a flyway or migration route, including:

- resident threatened aerial species
- resident raptor species
- nomadic and migratory species that are likely to fly over the Project Area.

To facilitate addressing the requirements of Section 6.1.5 of the BAM (DPIE 2020) Umwelt implemented a comprehensive bird and bat survey program from November 2022–May 2024, comprising two bird and bat survey programs for each season across the two years. The survey program also satisfies the survey requirements of the draft Commonwealth Onshore Wind Farm Guidance document (DCCEEW 2024a). Consultation with BCC during the survey programs also aided in informing adequate survey design.

Surveys were conducted during the following periods:

- Spring
    - November 2022
    - October 2023.
- Summer
    - February 2023
    - February 2024.
- Autumn
    - April/May 2023
    - May 2024.
- Winter
    - July 2023.

A final eighth survey (August 2024) was being completed at the time of writing this Prescribed Impact Assessment, therefore the methodology and associated results have not been included. The associated methods and associated results will be incorporated into the Prescribed Impact Assessment during the post lodgement phase of the Project.

The purpose of the bird and bat surveys was to identify 'at risk' species, being those bird and bat species that may be susceptible to collision-based impacts, through observation of flight behaviour across the Project Area.

2.1 Bird Surveys

2.1.1 Vantage Point Surveys

A total of 491 vantage point surveys were conducted across 15 survey sites in the Project Area from November 2022–May 2024 to assess bird occurrence and flight behaviour across the Project Area (**Table 2.1** and **Figure 2.1**). Surveys were conducted across ten survey sites during the first four survey events (i.e., November 2022, February 2023, April/May 2023 and July 2023). Following consultation with BCC additional sites were established in the Project Area resulting in 12 sites being surveyed in February 2023 and 15 sites being surveyed in February, May and August 2024. The survey results are outlined in **Section 2.1.3.1**. The survey sites were distributed in a manner that maximised spatial coverage of the Project Area. The viewshed across the surrounding landscape, proximity to proposed WTG locations and proximity to different habitat types were the key factors considered in the survey site selection process.

A series of photographs showing the viewshed from the survey sites is presented in **Appendix A**.

Each survey site was surveyed on six occasions during each seasonal survey round with two surveys falling in each of the following periods:

- morning (dawn–9:59 am)
- midday (10.00 am–1:59 pm)
- afternoon (2.00 pm–dusk).

During each survey conducted from November 2022 – July 2023, an ecologist scanned nearby habitat and the surrounding landscape with the naked eye and binoculars for a period of one hour recording all bird species detected visually or aurally.

Following consultation with BCS the duration of each vantage point survey was reduced from one hour to 30 minutes to more closely match the suggested survey duration specified in the draft NSW Wind Farms – turbine strike assessment and adaptive impact management BAM Guide (DCCEEW 2024b).

Hence, during each survey conducted from October 2023 – May 2024, an ecologist scanned nearby habitat and the surrounding landscape with the naked eye and binoculars for a period of 30 minutes recording all bird species detected visually or aurally.

The following information was recorded for each observation during all surveys from November 2022–May 2024:

- Species and abundance (count of individuals).
- Observation type (visual or aural).

- Distance of the bird from the ecologist (to the nearest 10 m within 50 m, to the nearest 20 m between 50–100 m, to the nearest 50 m between 100–250 m, to the nearest 100–200 m between 250–1000 m and to the nearest 200–500 m beyond 1000 m).
- Direction of the bird relative to the ecologist (to the nearest 10° using a compass).
- Estimated flight height when first detected and, where relevant or informative, estimated flight height range (i.e., minimum and maximum height) while the individual was under observation (or perching height). The ecologist estimates height above ground level (AGL):
    - to the nearest 5 m below 30 m AGL
    - to the nearest 10 m between 30–50 m AGL
    - to the nearest 20 m between 50–100 m AGL
    - to the nearest 50 m between 100–300 m AGL
    - to the nearest 100 m between 300–500 m AGL
    - to the nearest 200 m or 500 m above 500 m AGL.
- Direction of flight (to the nearest 5°).
- Flight pattern (i.e., local movement, directional flight, circling, swooping, varied, other).
- Behaviour (i.e., flight, foraging, perching, mating, aggressive interactions, hollow inspection, nesting, on station).

Environmental conditions such as temperature, wind speed, wind direction, cloud cover and precipitation were recorded during each survey.

The information detailed above was also recorded for all incidental observations of threatened birds detected in the Project Area between vantage point or woodland bird surveys or during other ecological surveys.

Table 2.1 Number of Surveys Conducted at each Vantage Point Survey Site (Nov 2022 – May 2024)

Survey Site	Nov 2022	Feb 2023	Apr/May 2023	July 2023	Oct 2023	Feb 2024	May 2024	Total no. of surveys	Total survey hours
Survey length	1 hr	1 hr	1 hr	1 hr	30 mins	30 mins	30 mins		
VP1	6	5	6	5	5	6	6	**39**	**30.5**
VP2	6	6	6	6	6	6	6	**42**	**33**
VP3	6	7	6	6	5	6	6	**42**	**33.5**
VP4	6	7	6	6	6	6	6	**43**	**34**
VP5	6	6	6	6	6	5	6	**41**	**32.5**
VP6	6	7	6	6	6	6	6	**43**	**34**
VP7	6	8	6	7	6	6	6	**45**	**36**
VP8	6	5	6	6	-	6	6	**35**	**29**
VP9	6	6	6	6	6	6	6	**42**	**33**
VP10	6	6	6	6	6	6	6	**42**	**33**
VP11	-	-	-	-	7	6	6	**19**	**9.5**
VP12	-	-	-	-	6	6	6	**18**	**9**
VP13	-	-	-	-	4	6	6	**16**	**8**
VP14	-	-	-	-	-	6	6	**12**	**6**
VP15	-	-	-	-	-	6	6	**12**	**6**
Total no. of surveys	**60**	**63**	**60**	**60**	**69**	**89**	**90**	**491**	**-**
Total survey hours	**60**	**63**	**60**	**60**	**34.5**	**44.5**	**45**	**-**	**367**

Colouring of the survey programs indicates the survey season, as follows:
Orange = Spring,
Red = Summer,
Green = Autumn
Blue = Winter

2.1.2 Woodland Bird Surveys

A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area (**Table 2.2** and **Figure 2.1**). Each woodland bird survey comprised an ecologist recording all species detected across an area of approximately 2 hectares for a minimum of 20 minutes in a manner consistent with the standard 2-hectare bird survey method. Flight behaviour of observed birds was not recorded. Temperature, wind speed, cloud cover and precipitation were recorded during each survey.

Table 2.2 Number of Woodland Bird Surveys Conducted Each Season

Survey Site	Nov 2022	Feb 2023	Apr/May 2023	July 2023	Oct 2023	Feb 2024	May 2024	Total
No. of surveys	20	5	34	15	11	24	25	134

Colouring of the survey programs indicates the survey season, as follows:
Orange = Spring
Red = Summer
Green = Autumn
Blue = Winter

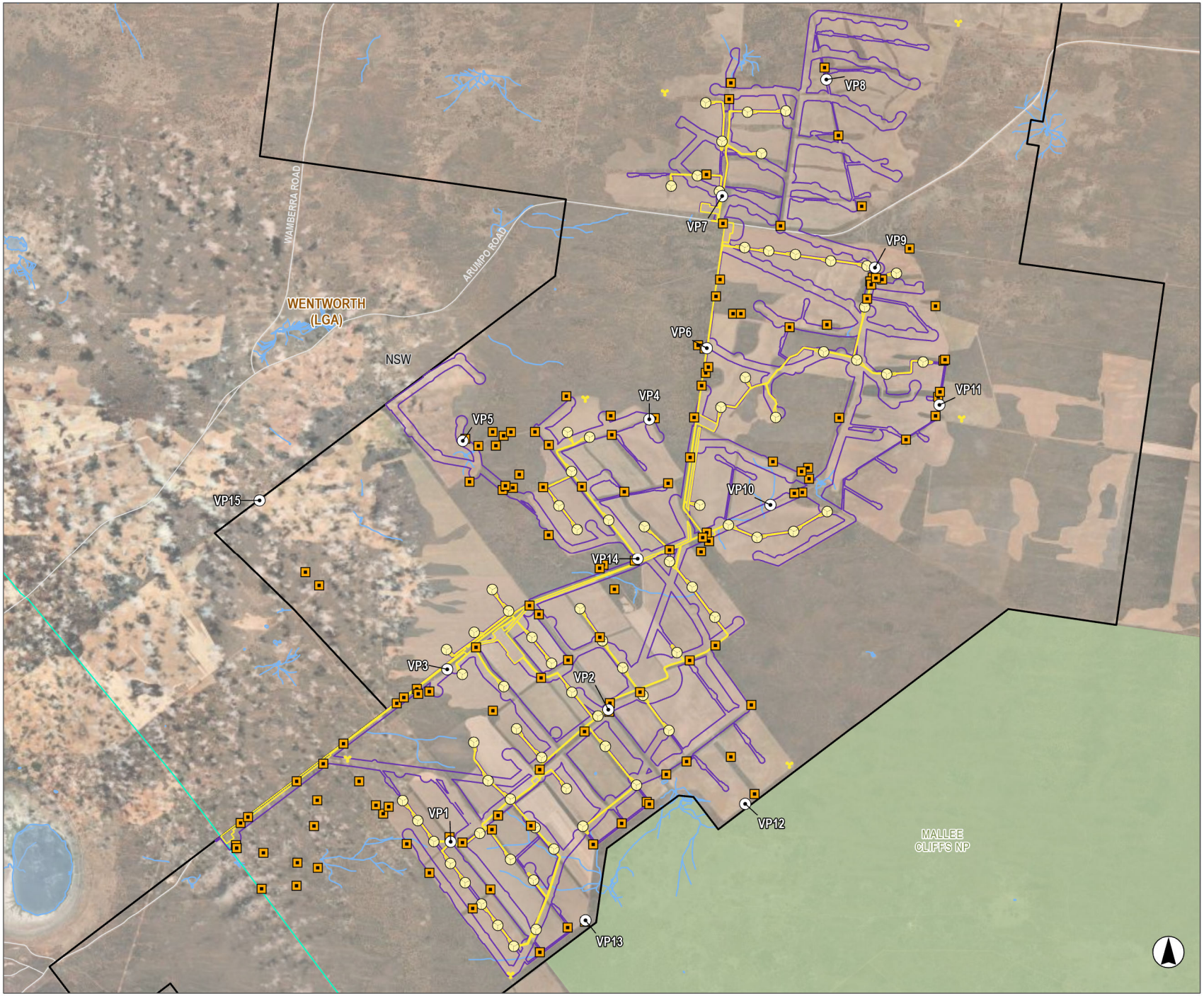


FIGURE 2.1

Location of Bird Survey Sites

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Vantage Point
- Woodland Bird Survey Site
- State Border
- Local Government Area (LGA)
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 2,500 5,000
Metres

Scale 1:140,000 at A4
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2.1.3 Bird Survey Results

A total of 124 bird species were recorded in the Project Area during November 2022 – May 2024 including 14 threatened species listed under the BC Act and/or the EPBC Act.

A total of 491 vantage point surveys were conducted during which 5,532 observations of 106 species were recorded. The results of vantage point surveys are summarised below in **Section 2.1.3.1**. A total of 134 woodland bird surveys were conducted during which 1,586 observations of 92 species were recorded. There were 322 incidental bird observations recorded during the November 2022 – May 2024 survey period. The location of all observations of birds in flight in the Project Area is shown in **Figure 2.2.0 to 2.2.5**.

Threatened species observations are summarised in **Table 2.4** whilst the total list of all species recorded in the Project Area is shown in **Table 3.1**. The majority of observations of threatened species were of hooded robin (*Melanodryas cucullata cucullate*) (55 records), spotted harrier (*Circus assimilis*) (50 records), southern whiteface (*Aphelocephala leucopsis*) (30 records), white-fronted chat (*Epthianura albifrons*) (30 records) and varied sittella (*Daphoensitta chrysoptera*) (19 records). The remaining ten threatened species were recorded on less than ten occasions. Observations of threatened species in the Project Area are examined further in **Section 8.2**.

2.1.3.1 Vantage Point Survey Results

A total of 491 vantage point surveys were conducted in the Project Area from November 2022 – May 2024 during which 5,532 observations of 106 species were recorded. During the 60-minute vantage point surveys conducted in November 2022, February 2023, April/May 2023 and July 2023 across ten vantage point sites (i.e., VP1 – VP10) 3195 observations of 93 species were recorded. During the 30-minute vantage point surveys conducted in October 2023, February 2024 and May 2024, 2,339 observations of 88 species were recorded.

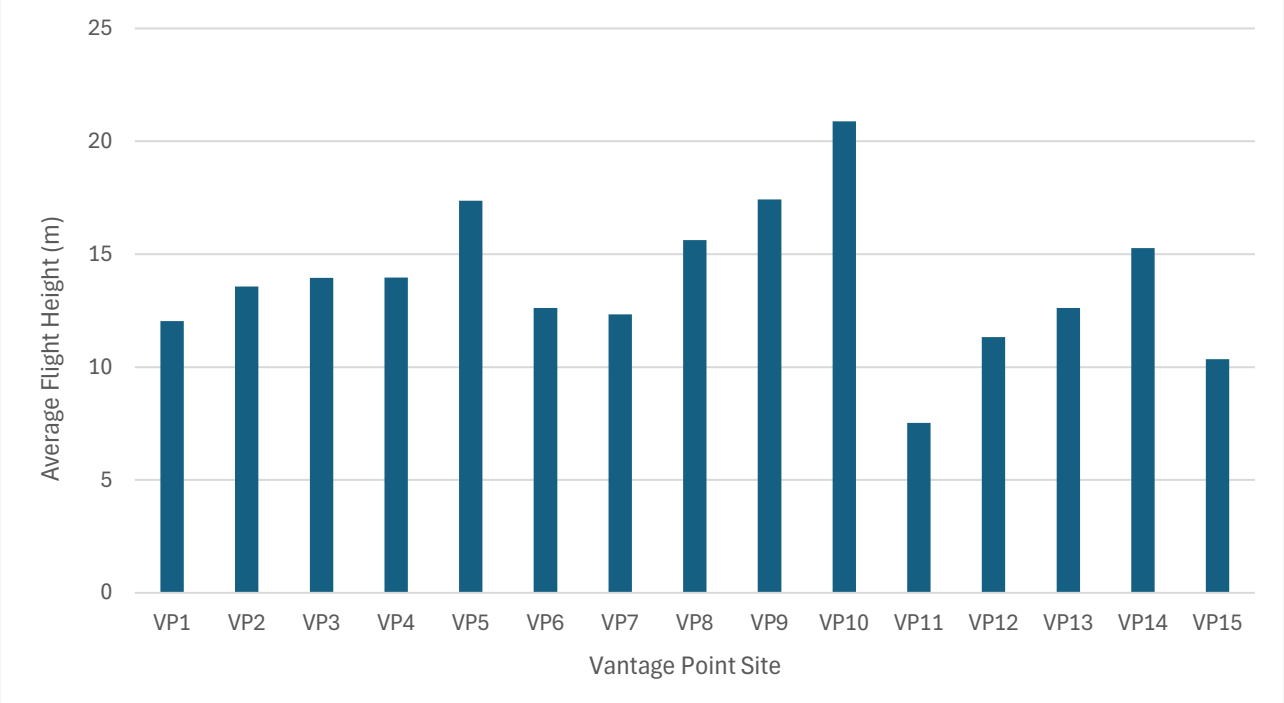
The highest number of species was recorded at VP6 where a total of 70 species were recorded whilst only 27 species were recorded at VP14 (**Table 2.3**). At least one threatened species was recorded at each of the vantage point sites. Four threatened species were detected VP3, VP9, VP10 and VP15 whilst five species were recorded at VP4 and VP6.

Birds were detected flying at rotor swept areas (RSA) height on 252 occasions. At the vantage points surveyed during all seven seasonal survey rounds there were between 17 – 42 observations of birds flying at RSA height at each site (**Table 2.3**). Three or fewer observations were recorded at the vantage point sites that were only surveyed during three seasonal survey rounds (VP11 – VP15) and the observation rate of birds at RSA was on average lower at these locations than at VP1 – VP10. Observation rates at RSA height varied from 0.17 (VP15) to 1.27 (VP10). A total of 26 species were recorded flying at RSA height including four threatened/migratory species and ten raptors. A total of 11 species were observed flying at RSA height at three sites, namely, VP2, VP9 and VP10 whilst only one species was recorded at three of the less frequently surveyed sites (VP11, VP14 andVP15). The average height of observed birds at the moment when they were first detected ranged from 7.5 m AGL at VP11 to 21 m AGL at VP10 (**Graph 2.1**).

Across all vantage point surveys and incidental observations, a total of 27 species were recorded flying at RSA, one was recorded solely above RSA height whilst 118 were recorded solely below RSA height (**Graph 2.2** and **Graph 2.3**). As noted above observations and flight behaviour of threatened species recorded in the Project Area is discussed further in **Section 8.2**.

Table 2.3 Summary of Vantage Point Survey Results

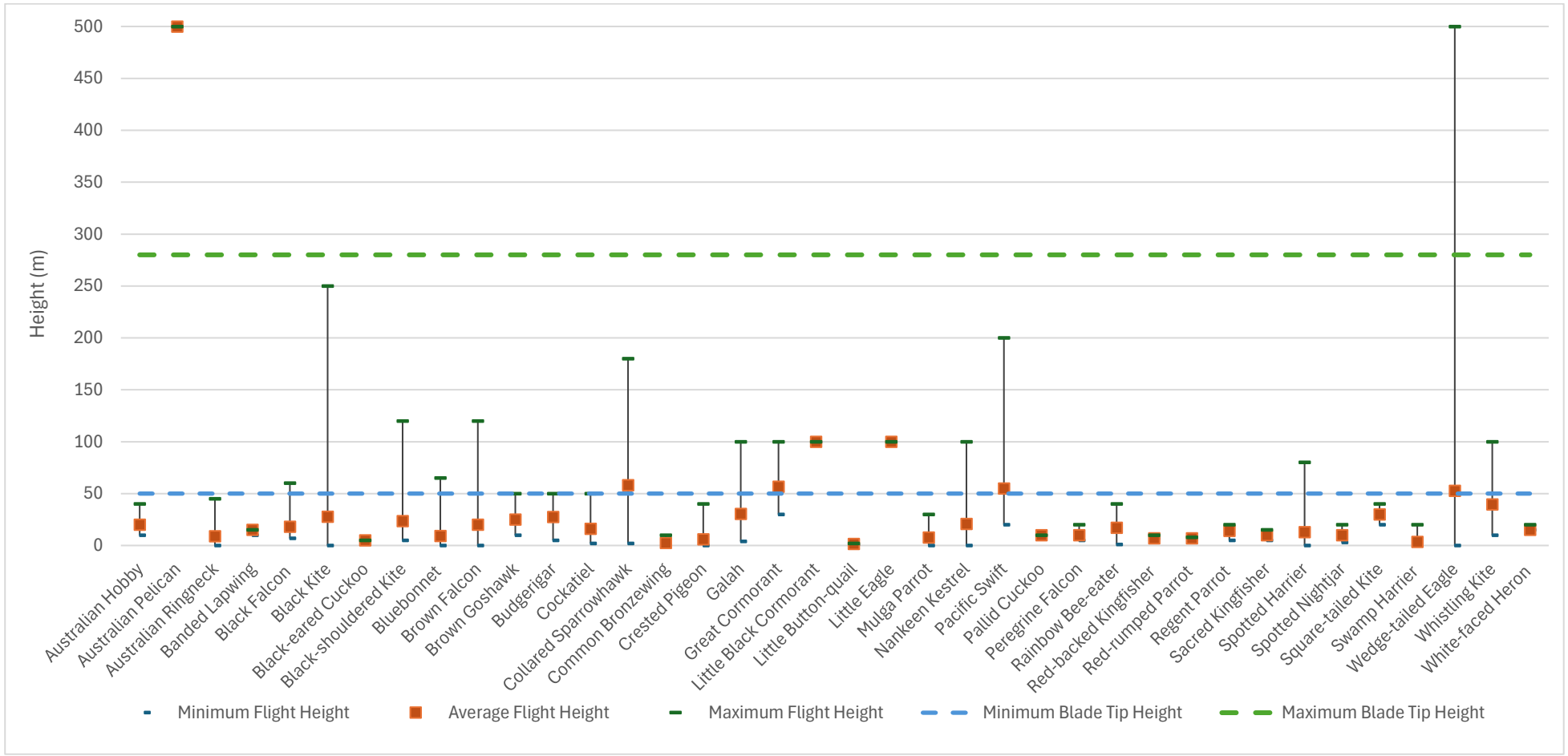
	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11	VP12	VP13	VP14	VP15
Number of species recorded	53	51	68	65	53	70	44	36	57	44	37	40	37	27	33
Number of threatened species recorded	3	3	4	5	3	5	1	1	4	4	3	1	1	1	4
Number of species recorded at RSA height	9	11	10	9	7	8	7	9	11	11	1	3	2	1	1
Total number of observations at RSA height	23	29	24	21	17	17	18	22	28	42	3	3	2	2	1
Observation rate at RSA height (observations/survey hour)	0.75	0.88	0.72	0.62	0.52	0.5	0.5	0.76	0.85	1.27	0.32	0.33	0.25	0.33	0.17



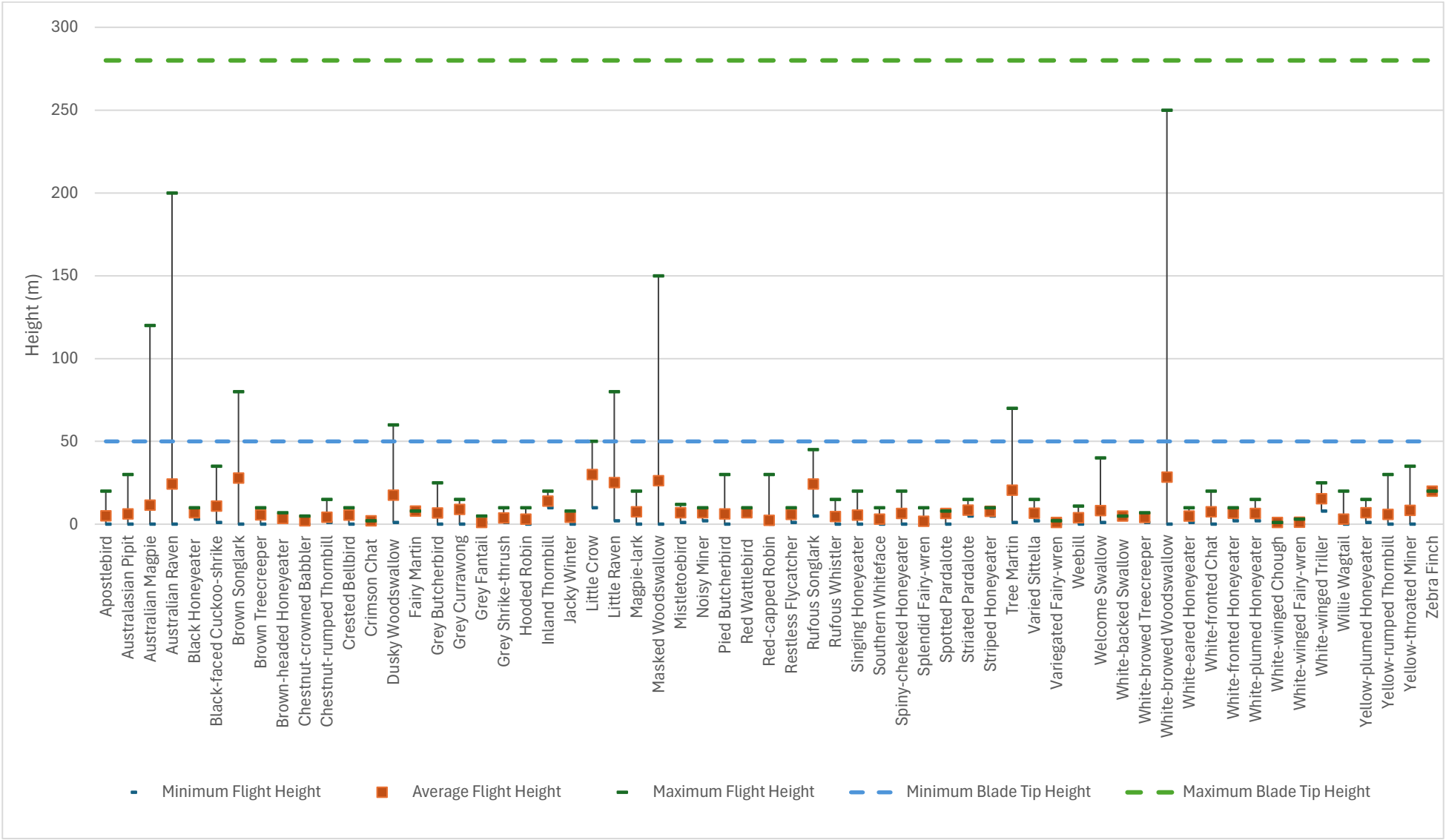
Graph 2.1 Average Flight Height of Birds at the Moment of Initial Detection

Table 2.4 Bird Species Listed under the EPBC Act and/or the BC Act Recorded in the Project Area

Species name	Scientific name	EPBC Act Status	BC Act Status	Number of records in the Project Area			
				Vantage Point Survey	Woodland Bird Survey	Incidental	Total
black falcon	*Falco subniger*	-	Vulnerable	3	0	2	**5**
chestnut quail-thrush	*Cinclosoma castanotum*	-	Vulnerable	0	4	2	**6**
dusky woodswallow	*Artamus cyanopterus cyanopterus*	-	Vulnerable	7	0	0	**7**
Gilbert's whistler	*Pachycephala inornata*	-	Vulnerable	1	3	2	**6**
hooded robin (south-eastern subspecies)	*Melanodryas cucullata cucullata*	Endangered	Endangered	28	15	12	**55**
little eagle	*Hieraaetus morphnoides*	-	Vulnerable	0	1	3	**4**
Pacific swift	*Apus pacificus*	Migratory		2	0	0	**2**
pied honeyeater	*Certhionyx variegatus*	-	Vulnerable	0	4	0	**4**
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	Vulnerable	Endangered	1	0	2	**3**
shy heathwren	*Hylacola cautus*	-	Vulnerable	1	0	0	**1**
southern whiteface	*Aphelocephala leucopsis*	Vulnerable	Vulnerable	9	11	10	**30**
spotted harrier	*Circus assimilis*	-	Vulnerable	32	1	17	**50**
square-tailed kite	*Lophoictinia isura*	-	Vulnerable	0	0	1	**1**
varied sittella	*Daphoensitta chrysoptera*	-	Vulnerable	12	7	0	**19**
white-fronted chat	*Epthianura albifrons*	-	Vulnerable	20	1	9	**30**



Graph 2.2 Minimum, Average and Maximum Flight Height of Non-passerines



Graph 2.3 Minimum, Average and Maximum Flight Height of Passerines

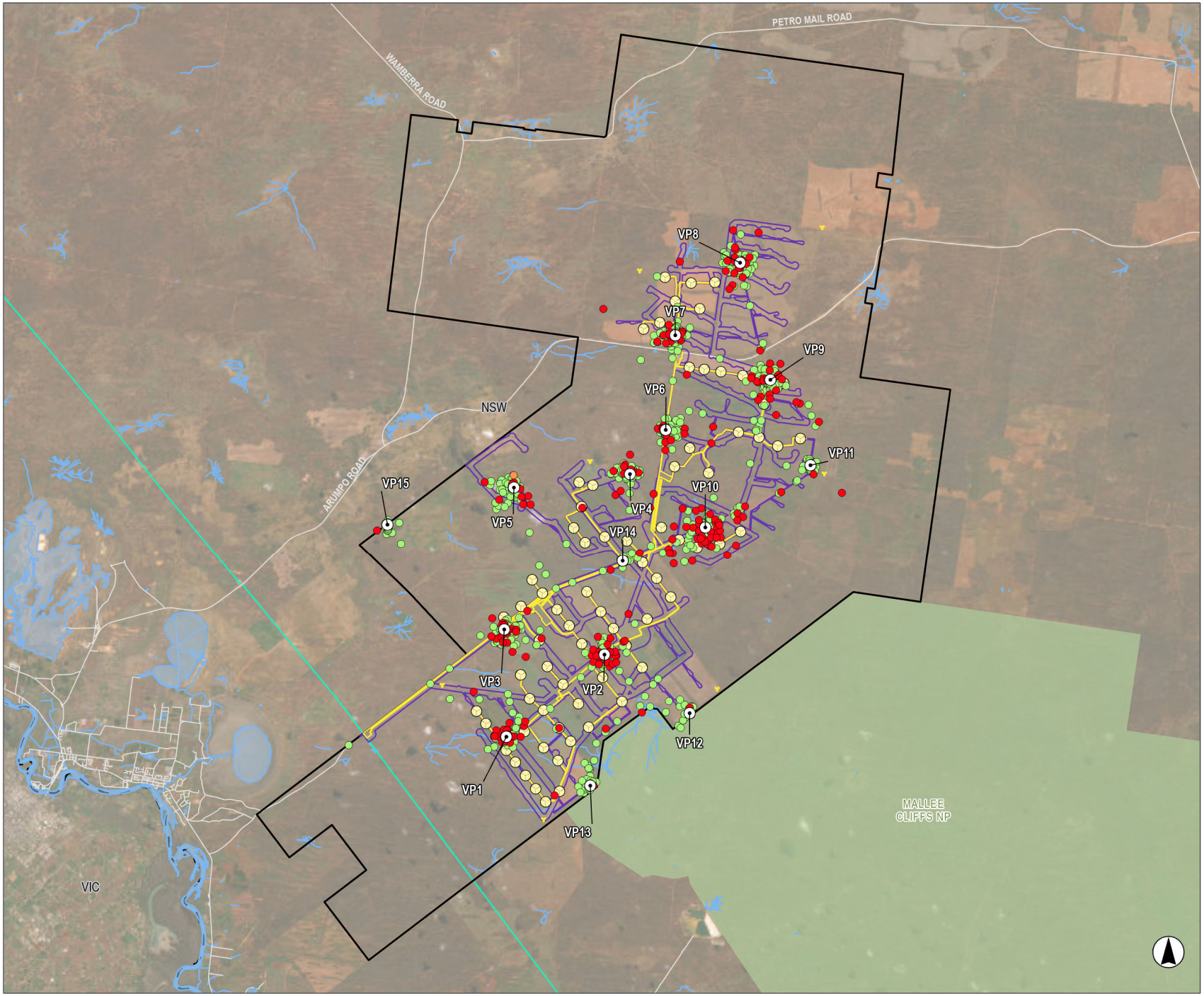


FIGURE 2.2.0

Location of Observed Birds in Flight

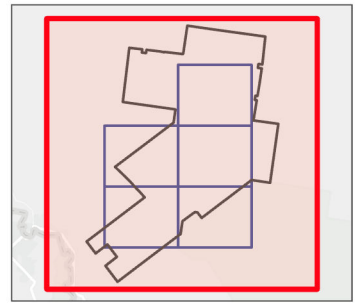
Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Vantage Point

Observed Bird Species

Recorded Flight Height in Relation to RSA

- Within
- Above
- Below
- State Border
- NPWS Estates
- Waterbody
- Watercourse
- Road



0 4 8

Kilometres

Scale 1:225,000 at A4

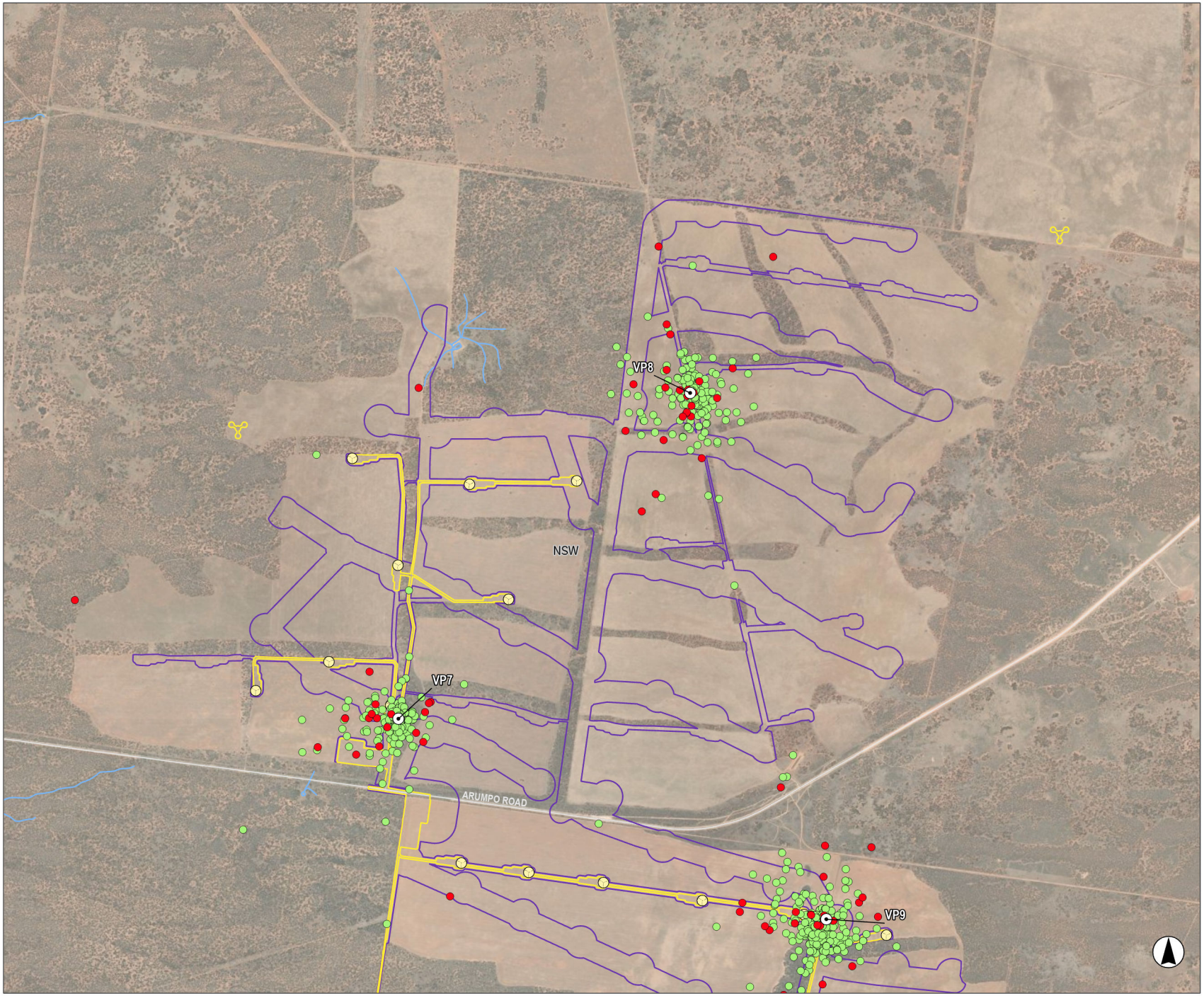
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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024), Umwelt (2024)

FIGURE 2.2.1

Location of Observed Birds in Flight



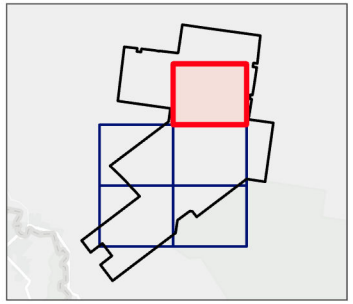
Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point

Observed Bird Species

Recorded Flight Height in Relation to RSA

- Within
- Below
- State Border
- Waterbody
- Watercourse
- Road



0 1 2

Kilometres

Scale 1:50,000 at A4

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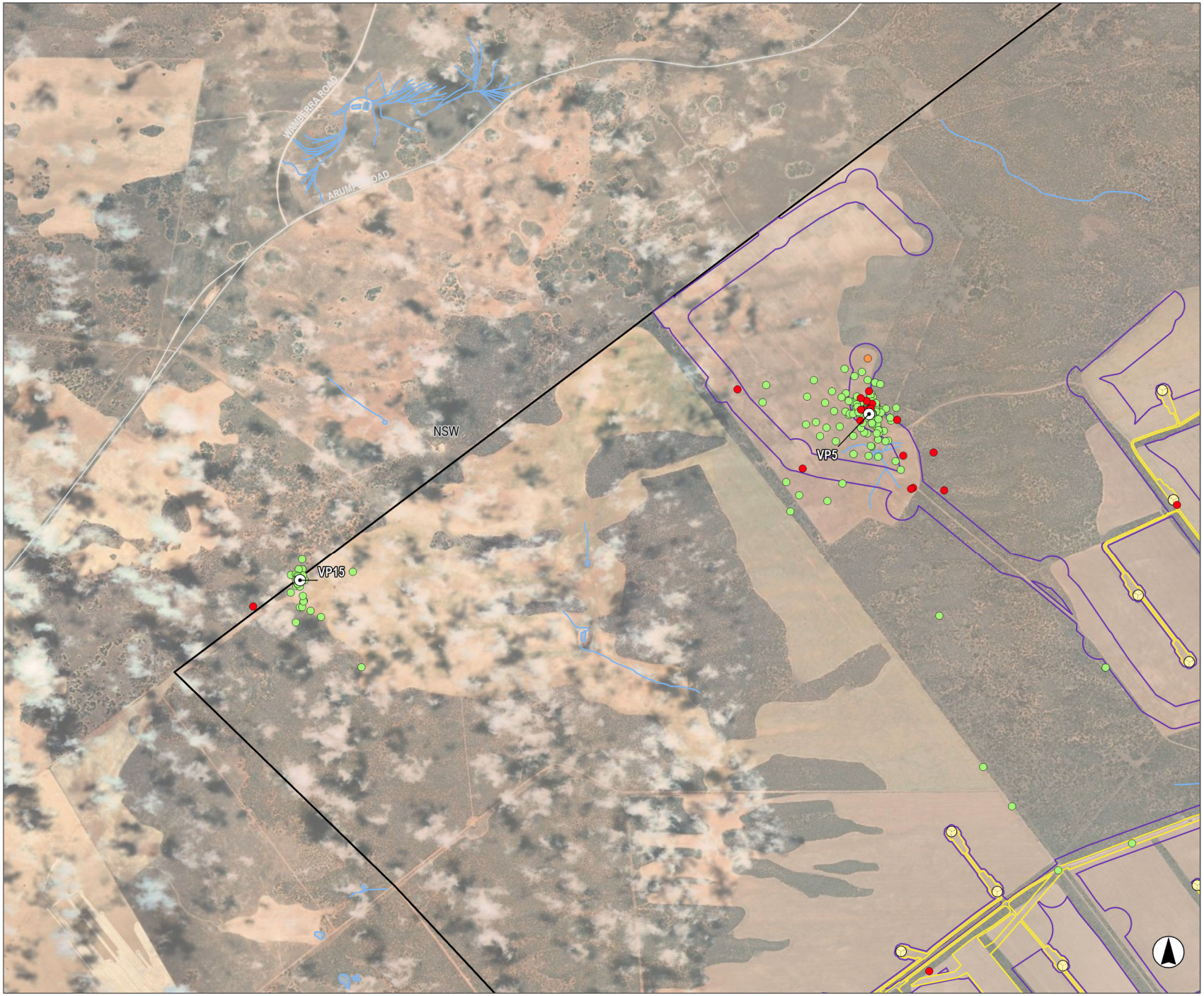


FIGURE 2.2.2

Location of Observed Birds in Flight

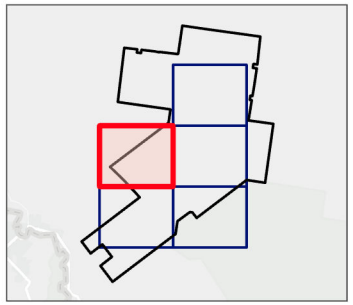
Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point

Observed Bird Species

Recorded Flight Height in Relation to RSA

- Within
- Above
- Below
- State Border
- Waterbody
- Watercourse
- Road



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Kilometres

Scale 1:50,000 at A4

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FIGURE 2.2.3

Location of Observed Birds in Flight



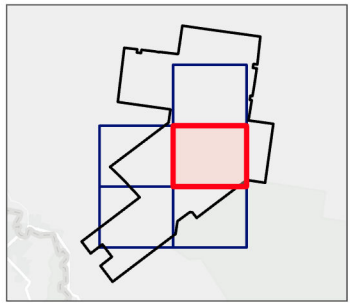
Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point

Observed Bird Species

Recorded Flight Height in Relation to RSA

- Within
- Below
- State Border
- NPWS Estates
- Waterbody
- Watercourse



0 1 2

Kilometres

Scale 1:50,000 at A4

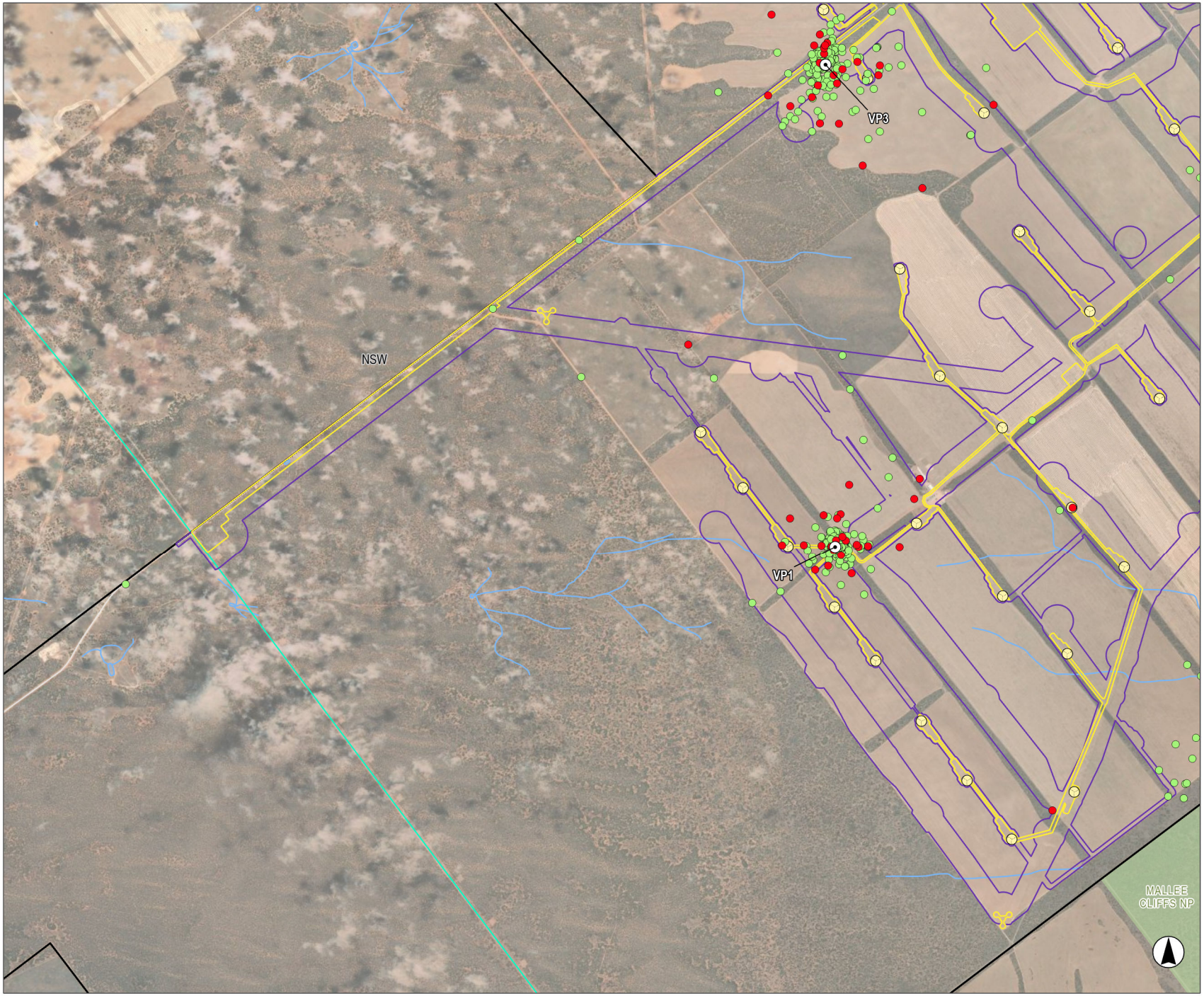
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FIGURE 2.2.4

Location of Observed Birds in Flight



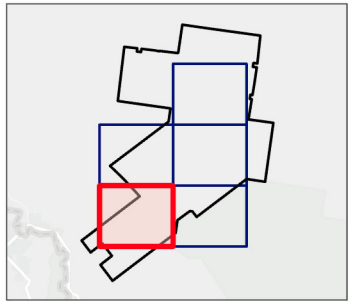
Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Vantage Point

Observed Bird Species

Recorded Flight Height in Relation to RSA

- Within
- Below
- State Border
- NPWS Estates
- Waterbody
- Watercourse
- Road



0 1 2

Kilometres

Scale 1:50,000 at A4

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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024), Umwelt (2024)



FIGURE 2.2.5

Location of Observed Birds in Flight

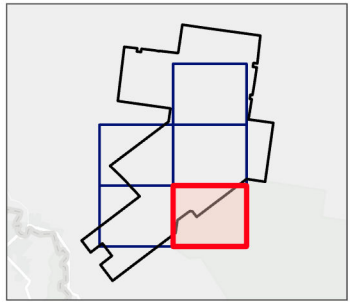
Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point

Observed Bird Species

Recorded Flight Height in Relation to RSA

- Within
- Below
- State Border
- NPWS Estates
- Waterbody
- Watercourse



0 1 2

Kilometres

Scale 1:50,000 at A4

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D:\UMWELT (AUSTRALIA) PTY. LTD\22494 - 03 S&V\02_PROJECTS\22494_R10_BDAR_APPENDIX_B_V3.APRX - 22494_R10_APP_B_FIG02_OBSERVEDBIRDS_DD

Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024), Umwelt (2024)

2.1.4 Overview

A total of 90 ultrasonic call detection surveys were carried out across various locations within the Project Area to assess microbat utilisation. Surveys were completed over seven seasons from spring 2022 to May 2024; an eighth season in winter 2024 has been completed at the time of writing this report.

Surveys from November 2022 to July 2023 were undertaken across ten locations at each vantage point, in addition to two devices installed on a meteorological mast.

Prior to the October 2023 surveys, advice from BCS recommended an additional three locations (VP11, VP12 and VP13) be incorporated into the survey design to account for areas of the Project Area that are proximate to intact vegetation and Mallee Cliffs National Park.

Details are provided in **Table 2.5** and locations are displayed in **Figure 2.3.**

In February 2024, an additional two survey sites (VP14 and VP15) were established to sample potential Project design refinements.

2.1.5 Survey Method

During bat utilisation surveys at each site, bat echolocation recorders were either deployed at or near ground level or using a permanent pulley system installed on a meteorological mast. The bat recorders used on the Project were Anabat Chorus units (Titley Scientific).

All vantage point locations had bat detectors deployed at approximately 1.5 m off the ground on trees. The two bat detectors at the meteorological mast were deployed at heights of 50 m and 75 m, respectively.

Call data was downloaded and sent to EchoEcology and Balance! Environmental for expert identification.

2.1.6 Bat Survey Results

Table 2.5 below provides a summary of the bat utilisation survey effort. It presents the number of survey nights the bat detectors were deployed as well as the number of nights with calls indicating the number of survey nights with recorded bat calls to be analysed.

Table 2.5 Bat Survey Effort

Survey Program and Bat Recorder	Unit	Survey Height	Number of Survey Nights	Number of Nights with Data
Spring – 5 – 11 November 2022				
BBUS1	Chorus 1	~1.5 m	3	3
BBUS3	Chorus 3	~1.5 m	3	3
BBUS4	Chorus 4	~1.5 m	3	3
Met mast	Chorus 5	50 m	6	6
BBUS2	Chorus 6	~1.5 m	3	3
BBUS5	Chorus 7	~1.5 m	3	2
Met mast	Chorus 9	75 m	6	6
BBUS6	Chorus 1	~1.5 m	3	3

Survey Program and Bat Recorder	Unit	Survey Height	Number of Survey Nights	Number of Nights with Data
BBUS10	Chorus 3	~1.5 m	3	3
BBUS7	Chorus 4	~1.5 m	3	3
BBUS9	Chorus 6	~1.5 m	3	3
BBUS8	Chorus 7	~1.5 m	3	3
Subtotal			42	41
Summer – 16-20 February 2023				
BBUS5	Chorus 1	~1.5 m	5	5
Met mast	Chorus 2	75 m	5	5
BBUS1	Chorus 4	~1.5 m	5	5
BBUS2	Chorus 5	~1.5 m	5	5
BBUS7	Chorus 6	~1.5 m	5	5
BBUS6	Chorus 7	~1.5 m	5	5
BBUS10	Chorus 8	~1.5 m	5	5
BBUS9	Chorus 9	~1.5 m	5	5
BBUS8	Chorus 10	~1.5 m	5	5
Met mast	Chorus 11	50 m	5	5
BBUS4	Chorus 12	~1.5 m	5	1
BBUS3	Chorus 15	~1.5 m	5	5
Subtotal			60	56
Autumn – 26 April – 2 May 2023				
BBUS1	Chorus 11	~1.5 m	7	7
BBUS2	Chorus 10	~1.5 m	7	7
BBUS3	Chorus 13	~1.5 m	7	7
BBUS4	Chorus 16	~1.5 m	7	7
BBUS5	Chorus 18	~1.5 m	7	7
BBUS6	Chorus 17	~1.5 m	7	Error*
BBUS7	Chorus 19	~1.5 m	7	7
BBUS8	Chorus 12	~1.5 m	7	7
BBUS9	Chorus 14	~1.5 m	7	7
BBUS10	Chorus 8	~1.5 m	7	7
Met mast	Chorus 15	50 m	7	6
Met mast	Chorus 9	75 m	7	7
Subtotal			84	76
Winter – 3 – 8 July 2023				
BBUS1	Chorus 2	~1.5 m	6	5
BBUS2	Chorus 6	~1.5 m	6	6
BBUS3	Chorus 13	~1.5 m	6	4
BBUS4	Chorus 8	~1.5 m	6	6
BBUS5	Chorus 12	~1.5 m	6	6
BBUS6	Chorus 9	~1.5 m	6	Error*

Survey Program and Bat Recorder	Unit	Survey Height	Number of Survey Nights	Number of Nights with Data
BBUS7	Chorus 4	~1.5 m	6	5
BBUS8	Chorus 7	~1.5 m	6	4
BBUS9	Chorus 3	~1.5 m	6	4
BBUS10	Chorus 10	~1.5 m	6	6
Met mast	Chorus 11	50 m	6	3
Met mast	Chorus 1	75 m	6	Error*
Subtotal			72	49
Spring – 16 – 21 October 2023				
BBUS1	Chorus 6	~1.5 m	5	5
BBUS2	Chorus 9	~1.5 m	5	5
BBUS3	Chorus 8	~1.5 m	5	5
BBUS4	Chorus 5	~1.5 m	5	5
BBUS5	Chorus 1	~1.5 m	5	5
BBUS6	Chorus 3	~1.5 m	5	5
BBUS7	Chorus 13	~1.5 m	5	5
BBUS8	n/a^	n/a^	n/a^	n/a^
BBUS9	Chorus 12	~1.5 m	5	5
BBUS10	Chorus 7	~1.5 m	5	5
BBUS11	Chorus 4	~1.5 m	5	4
BBUS12	Chorus 2	~1.5 m	5	5
BBUS13	Chorus 11	~1.5 m	5	5
Subtotal			60	59
Summer – 23 – 28 February 2024				
BBUS1	Chorus 1	~1.5 m	7	7
BBUS2	Chorus 6	~1.5 m	6	6
BBUS3	Chorus 19	~1.5 m	6	6
BBUS4	Chorus 18	~1.5 m	7	7
BBUS5	Chorus 20	~1.5 m	6	6
BBUS6	Chorus 4	~1.5 m	6	6
BBUS7	Chorus 16	~1.5 m	7	7
BBUS8	Chorus 2	~1.5 m	6	6
BBUS9	Chorus 22	~1.5 m	6	Error*
BBUS10	Chorus 15	~1.5 m	6	6
BBUS11	Chorus 7	~1.5 m	6	6
BBUS12	Chorus 21	~1.5 m	6	6
BBUS13	Chorus 24	~1.5 m	6	6
BBUS14	Chorus 8	~1.5 m	6	6
BBUS15	Chorus 5	~1.5 m	6	
Met mast	Chorus 17	50 m	6	2
Met mast	Chorus 3	75 m	6	6

Survey Program and Bat Recorder	Unit	Survey Height	Number of Survey Nights	Number of Nights with Data
Subtotal			99	89
Autumn – 13 – 19 May 2024				
BBUS1	Chorus 1	~1.5 m	7	6
BBUS2	Chorus 17	~1.5 m	7	7
BBUS3	Chorus 8	~1.5 m	7	6
BBUS4	Chorus 2	~1.5 m	7	6
BBUS5	Chorus 3	~1.5 m	7	6
BBUS6	Chorus 6	~1.5 m	7	6
BBUS7	Chorus 14	~1.5 m	7	6
BBUS8	Chorus 5	~1.5 m	7	6
BBUS9	Chorus 4	~1.5 m	7	2
BBUS10	Chorus 10	~1.5 m	7	6
BBUS11	Chorus 13	~1.5 m	7	7
BBUS12	Chorus 18	~1.5 m	7	7
BBUS13	Chorus 7	~1.5 m	7	6
BBUS14	Chorus 11	~1.5 m	7	6
BBUS15	Chorus 9	~1.5 m	7	6
Met mast	Chorus 16	50 m	7	4
Met mast	Chorus 15	75 m	7	7
Subtotal			119	100
Grand total			**536**	**470**

**Errors have been noted for units that were deployed for survey programs and identified to have had recording issues during deployment, resulting in no data being recorded. Following each occurrence, the particular unit was reviewed by Umwelt, including microphones, and servicing requirements was sought from Titley *(unit manufacturer) where necessary.*

n/a^ unable to be surveyed due to property access constraints.

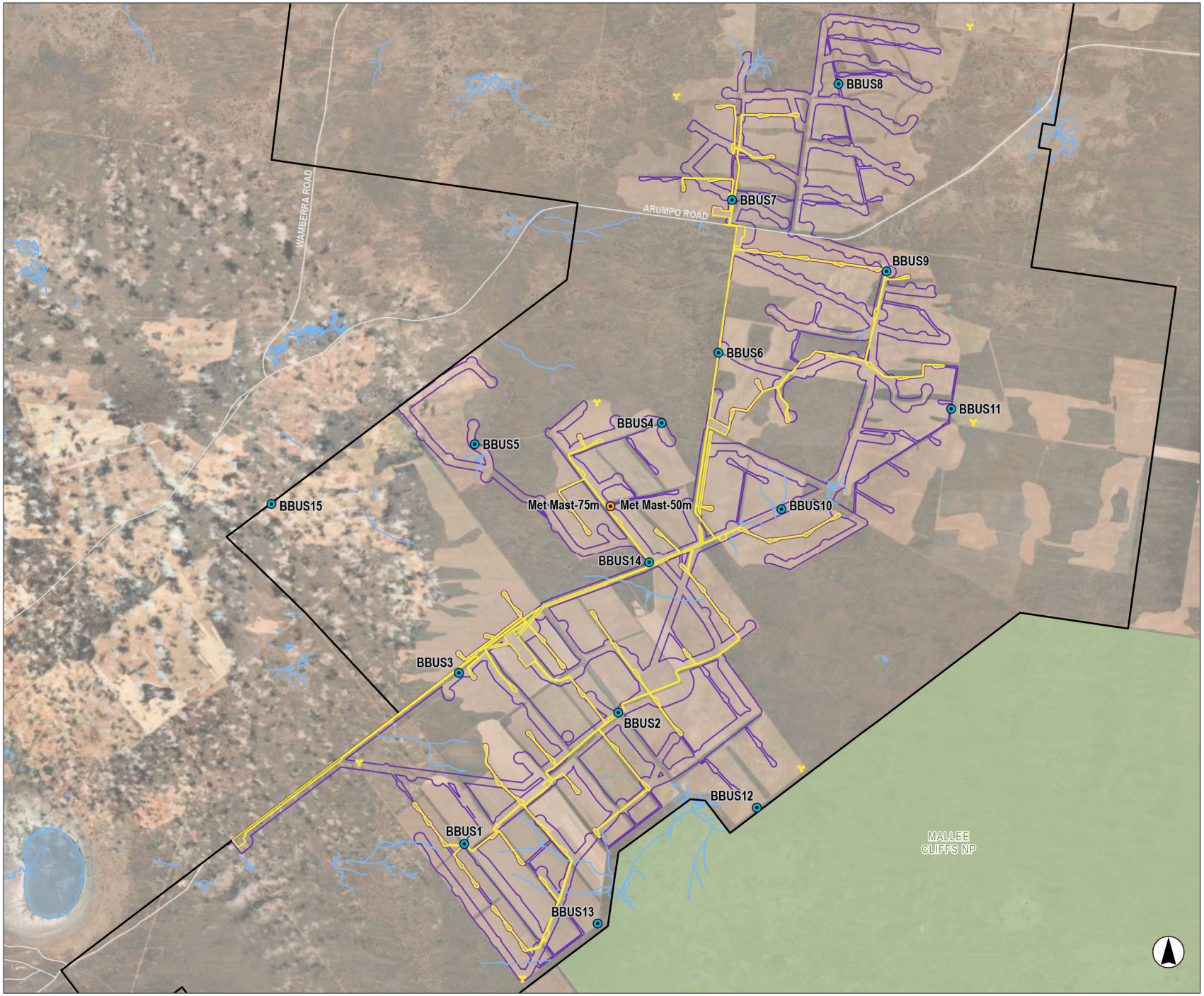


FIGURE 2.3

Bat Survey Sites

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- Anabat Location - Met Mast
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 3 6
Kilometres

Scale 1:140,000 at A4
GDA2020 MGA Zone 54

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3.0 Candidate List of Protected Species Utilising the Project Area

The candidate list of protected bird and bat species that were considered as part of the prescribed impact assessment include:

- resident aerial species
- resident raptor species
- threatened species observed during surveys or that are likely to fly over the Development Footprint
- nomadic and migratory species that are likely to fly over the Development Footprint.

3.1 Species Recorded or Predicted to Occur and Considered in the Assessment

The following data sources were examined to assess which species, in addition to those recorded in the Project Area, may occur in the Project Area:

- Ecosystem credit predicted species database (BAM-C).
- Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (10 km buffer) (MNES) (DCCEEW 2024c). Date last accessed: 12 August 2024.
- BioNet Atlas Threatened Biodiversity Profile Data Collection (20 km buffer) (DCCEEW 2024d). Date last accessed: 12 August 2024.
- Secretary's Environmental Assessment Requirements (SEARs) issued on 17 February 2023 and Supplementary SEARs issued on 7 June 2023.

Candidate bird and bat species lists comprising species that were either recorded or are predicted to occur in the vicinity of the Project Area are provided in **Table 3.1** and **Table 3.2,** respectively. The candidate bird and bat lists comprise 166 and 16 species, respectively, and the *Mallee Bird Community of the Murray Darling Depression Bioregion* EEC.

A total of 147 bird and 16 bat species plus the *Mallee Bird Community of the Murray Darling Depression Bioregion* EEC were considered further in this assessment due to their known presence in the Project Area or their likelihood of occurrence being moderate or high. A summary of the location of the risk assessments for these 163 species and the *Mallee Bird Community of the Murray Darling Depression Bioregion EEC* is provided in **Section 4.0**.

Table 3.1 Candidate Bird Species List

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
apostlebird	*Struthidea cinerea*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australasian bittern	*Botaurus poiciloptilus*	BioNet, PMST	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however Australasian bittern may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Australasian bittern has been recorded at over ten locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area (DCCEEW 2024d, eBird 2024). The nearest record is a historic record from Gol Gol Swamp (2km north-west of the south-west boundary of the Project Area). A single bird was recorded at Etiwanda Wetlands (9 km west of the Project Area) on several occasions from July – October 2023. The species has also been recorded at the Mildura Wastewater Treatment Plant (12 km west of the Project Area) in April 2000 and at Bob Corbould Wetland (12 km west of the Project Area) in March 1994.	**Yes - Table 8.26**
Australasian grebe	*Tachybaptus novaehollandiae*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australasian pipit	*Anthus novaeseelandiae*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian bustard	*Ardeotis australis*	BAM-C	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains marginal habitat however this species is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). The only records within 50 km of the Project Area are from near Coomealla (22 km west of the Project Area) in May 1999 and December 2006.	**No**
Australian hobby	*Falco longipennis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian magpie	*Gymnorhina tibicen*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian owlet-nightjar	*Aegotheles cristatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian painted snipe	*Rostratula australis*	BioNet, PMST, SEARs	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however Australian painted snipe may very rarely disperse through the Project Area. The nearest records are from Lake Gol Gol (7 km west of the Project Area) in July 1984, December 1992 and February 1993 (DCCEEW 2024d,	**Yes - Table 8.26**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
			eBird 2024). The nearest recent contemporary record (i.e., post-2000) is from Merbein Common (18 km west of the Project Area) in December 2011.	
Australian pelican	*Pelecanus conspicillatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian raven	*Corvus coronoides*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian ringneck	*Barnardius zonarius*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian shelduck	*Tadorna tadornoides*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Australian wood duck	*Chenonetta jubata*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
banded lapwing	*Vanellus tricolor*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
bar-tailed godwit	*Limosa lapponica*	BioNet	**Low**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. Bar-tailed godwit has been recorded at less than ten locations within 50 km of the Project Area (DCCEEW 2024d, eBird 2024). The only contemporary records are from Lake Ranfurly in Mildura in 2000 and 2004.	**No**
barn owl	*Tyto alba*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
black falcon	*Falco subniger*	BioNet, BAM-C	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.1**
black honeyeater	*Sugomel nigrum*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
black kite	*Milvus migrans*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
black-breasted buzzard	*Hamirostra melanosternon*	BAM-C	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains marginal habitat however this species is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). The nearest records are historic records from the Mildura/Red Cliffs area. The only contemporary records within 50 km of the Project Area are from the Darling River between Para and Pomona approximately 45 km north-west of the Project Area. This species was recorded in this area in September 2006, September 2008, May 2019, October 2019 and May 2020.	**No**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
black-chinned honeyeater	*Melithreptus gularis gularis*	BioNet	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains marginal habitat however this species is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). A single, black-chinned honeyeater was observed on several occasions from September 2012 – November 2013 at the Australian Inland Botanic Gardens at Mourquong (13 km west of the Project Area). This species has also been recorded at several locations in the central part of Mallee Cliffs National Park (approximately 15 km east of the Project Area) in September 1985 and November 2017.	**No**
black-eared cuckoo	*Chalcites osculans*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
black-eared miner	*Manorina melanotis*	BAM-C, PMST	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains marginal habitat however this species is very rarely recorded near the Project Area (DCCEEW 2024d, eBird 2024). The nearest records are historic records from the 1960s and 1970s approximately 35 – 50 km south and south-west of the Project Area. The nearest contemporary records are from Hattah – Kulkyne National Park and Murray-Sunset National Park.	**No**
black-faced cuckoo-shrike	*Coracina novaehollandiae*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
black-shouldered kite	*Elanus axillaris*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
black-tailed godwit	*Limosa limosa*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however black-tailed godwit may very rarely disperse through the Project Area given the species has been recorded at several locations in the Mildura area (DCCEEW 2024d, eBird 2024). The most recent nearby record is of an individual at Lake Hawthorn (15 km west of the Project Area) in September 2018.	**Yes - Table 8.26**
blue-billed duck	*Oxyura australis*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however blue-billed duck may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. This species has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area (DCCEEW 2024d, eBird 2024). Recent nearby records include observations of 10	**Yes - Table 8.26**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
			birds at Gol Gol Lake in January 2017 (7 km west of the Project Area) and three birds at the Buronga Sewage Farm in June 2024 (7 km west of the Project Area).	
blue-winged parrot	*Neophema chrysostoma*	PMST, SEARs	**Moderate**. Not recorded in the 2022-24 surveys. There is marginal habitat present in the Project Area however blue-winged parrot may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Recent nearby records include observations from Nichols Point Golf Club in August 2022 (5 km west of the Project Area), Kings Billabong Wildlife Reserve in May 2016 (6 km south-west of the Project Area), Etiwanda Wetlands in December 2022 (9 km west of the Project Area) and Mourquong in June 2021 (11 km west of the Project Area) (DCCEEW 2024d, eBird 2024).	**Yes - Table 8.26**
bluebonnet	*Northiella haematogaster*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
brolga	*Grus rubicunda*	BioNet	**Low**. Not recorded in the 2022-24 surveys. There is no suitable habitat present in the Project Area. This species is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). There are a few historic records (primarily from pre-1980) in the Mildura area. The nearest most recent record is from the Iraak area (18 km south of the Project Area) in 1994. This species has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area.	**No**
brown falcon	*Falco berigora*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
brown goshawk	*Accipiter fasciatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
brown quail	*Coturnix ypsilophora*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
brown songlark	*Cincloramphus cruralis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
brown treecreeper	*Climacteris picumnus victoriae / picumnus*	BioNet	Brown treecreeper was recorded in the Project Area during the 2022–24 surveys. However, these observations were of the non-listed subspecies (*Climacteris picumnus picumnus*). The listed subspecies (*Climacteris picumnus victoriae*) does not occur near the Project Area.	**Yes - Table 8.27**
brown-headed honeyeater	*Melithreptus brevirostris*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
budgerigar	*Melopsittacus undulatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
bush stone-curlew	*Burhinus grallarius*	BioNet, BAM-C	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains suitable habitat however this species is very rarely recorded in south-west NSW. There are numerous historic records (primarily from pre-1980) in the Mildura area though only a few records within 50 km of the Project Area from 2000 onwards (DCCEEW 2024d, eBird 2024). The nearest contemporary record appears to be from the Iraak area (18 km south of the Project Area) in 2002 with further records from Murray -Kulkyne Park (40 - 50 km south of the Project Area) in 2005 and 2006.	**No**
Caspian tern	*Hydroprogne caspia*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. This species is regularly observed along the Murray River to the south-west of the Project Area and has been recorded at Lake Gol Gol and Gol Gol Swamp (DCCEEW 2024d, eBird 2024). Although the vast majority of movements by this species in the region are likely to be restricted to the Murray River and adjacent wetlands this species may very occasionally disperse through the Project Area.	**Yes - Table 8.26**
chestnut quail-thrush	*Cinclosoma castanotum*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.2**
chestnut-crowned babbler	*Pomatostomus ruficeps*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
chestnut-rumped thornbill	*Acanthiza uropygialis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
cockatiel	*Nymphicus hollandicus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
collared sparrowhawk	*Accipiter cirrocephalus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
common bronzewing	*Phaps chalcoptera*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
common greenshank	*Tringa nebularia*	BioNet, PMST, SEARs	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however common greenshank may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Common greenshank has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area	**Yes - Table 8.26**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
			(DCCEEW 2024d, eBird 2024). Recent nearby records include observations of a single bird at Mallee Cliffs N.P in November and December 2018 and from Lake Ranfurly in Mildura in March 2022. Common greenshank has been recorded on several occasions at Gol Gol Swamp, Lake Gol Gol and in the Mourquong area.	
common myna*	*Acridotheres tristis*	-	**Recorded** in the 2022–24 surveys	**No**
common sandpiper	*Actitis hypoleucos*	PMST	**Low**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. Common sandpiper has been recorded at approximately 10 locations within 50 km of the Project Area although there is only one contemporary record - from Cowanna Billabong in December 2001 (30 km west of the Project Area) (DCCEEW 2024d, eBird 2024). The nearest records are historic records from Buronga (1962) and Merbein (1983).	**No**
crested bellbird	*Oreoica gutturalis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
crested pigeon	*Ocyphaps lophotes*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
crimson chat	*Epthianura tricolor*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
curlew sandpiper	*Calidris ferruginea*	BioNet, PMST, SEARs	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however curlew sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. Curlew sandpiper has been recorded at approximately 15 locations within 50 km of the Project Area (DCCEEW 2024d, eBird 2024). Recent proximate records include an observation of five birds at Morquong Saltworks (13 km west of the Project Area) in February 2017 and observations from Lake Ranfurly in Mildura in September 2018 and October 2023. Curlew sandpiper has been recorded on several occasions at Gol Gol Swamp, Lake Gol Gol and in the Mourquong area.	**Yes - Table 8.26**
diamond dove	*Geopelia cuneata*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
diamond firetail	*Stagonopleura guttata*	PMST	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains marginal habitat however this species has been very rarely recorded near the Project Area in the past three decades (DCCEEW 2024d, eBird 2024). The majority of records in the Mildura area are from the 1950s-1970s. The nearest records are two from 1977 that	**No**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
			may potentially be from the Project Area. These records have a spatial uncertainty of 9 km so the precise location of these records is unknown.	
dusky woodswallow	*Artamus cyanopterus*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.3**
emu	*Dromaius novaehollandiae*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
fairy martin	*Petrochelidon ariel*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
fan-tailed cuckoo	*Cacomantis flabelliformis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
flame robin	*Petroica phoenicea*	BioNet	**Low**. Not recorded in the 2022-24 surveys. The Project Area contains marginal habitat however this species is very rarely recorded within 50 km of the Project Area (DCCEEW 2024d, eBird 2024). The nearest records are from Merbein in 1964 and Mallee Cliffs N.P in 1985. The nearest contemporary records are from Hattah-Kulkyne N.P 50 km south of the Project Area.	**No**
freckled duck	*Stictonetta naevosa*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however freckled duck may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. This species has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area (DCCEEW 2024d, eBird 2024). Recent nearby records include observations from Lake Gol Gol in January 2017 (7 km west of the Project Area), Kings Billabong Wildlife Reserve in April 2019 and October 2023 (6 km south-west of the Project Area) and up to 208 birds at Mildura Wastewater Treatment Plant (12 km west of the Project Area) in September 2018, December 2019, March and December 2021, October 2023 and March 2024.	**Yes - Table 8.26**
galah	*Eolophus roseicapilla*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Gilbert's whistler	*Pachycephala inornata*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.4**
golden whistler	*Pachycephala pectoralis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
great cormorant	*Phalacrocorax carbo*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
grey butcherbird	*Cracticus torquatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
grey currawong	*Strepera versicolor*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
grey falcon	*Falco hypoleucos*	BioNet, PMST, SEARs	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area contains suitable habitat however this species is rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). Grey falcon may very rarely disperse through the Project Area. There are several historic records within 50 km of the Project Area, with the majority being from the 1960s – 1980s. The nearest recent record is of three birds on Arumpo Rd 42 km north-east of the Project Area in April 2014.	**Yes - Table 8.26**
grey fantail	*Rhipidura fuliginosa*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
grey shrike-thrush	*Colluricincla harmonica*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
grey teal	*Anas gracilis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
gull-billed tern	*Gelochelidon nilotica*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however gull-billed tern may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. This species has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records along the Murray River (DCCEEW 2024d, eBird 2024). Recent nearby records include observations from Kings Billabong Wildlife Reserve in November 2015 and October 2023 (6 km south-west of the Project Area) and two locations at Nichols Point in September 2019 and August 2023 (4 km and 7 km west of the Project Area respectively).	**Yes - Table 8.26**
hooded robin (south-eastern subspecies)	*Melanodryas cucullata cucullata*	BioNet, PMST, SEARs	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.5**
Horsfield's bronze-cuckoo	*Chalcites basalis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
inland thornbill	*Acanthiza apicalis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Jacky winter	*Microeca fascinans*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
Latham's snipe	*Gallinago hardwickii*	BioNet, PMST	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however Latham's snipe may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Latham's snipe has been recorded at over ten locations within 50 km of the Project Area, with a particularly high number of records within 5 km of the Murray River (DCCEEW 2024d, eBird 2024). The nearest record is from Gol Gol Swamp (2km from the Project Area) in January 2017. The next closest record is from Etiwanda Wetlands (9 km west of the Project Area) in November 2008.	**Yes - Table 8.26**
little black cormorant	*Phalacrocorax sulcirostris*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
little button-quail	*Turnix velox*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
little crow	*Corvus bennetti*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
little eagle	*Hieraaetus morphnoides*	BioNet, BAM-C	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.6**
little raven	*Corvus mellori*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
magpie-lark	*Grallina cyanoleuca*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
malleefowl	*Leipoa ocellata*	BioNet, PMST, SEARs	**High**. Not recorded in the 2022-24 surveys. There is suitable habitat in the Project Area. This species is very likely to occasionally occur in the Project Area given it has been recorded on two occasions in the Project Area by others and is known to occur immediately adjacent the site at Mallee Cliffs N.P (DCCEEW 2024d, eBird 2024). There is a record from the north-west boundary of the south-western portion of the Project Area from October 2001. There is also a record from the southern boundary of the south-west portion from September 2003. The nearest recent record is from Mallee Cliffs N.P in March 2024.	**Yes - Table 8.26**
marsh sandpiper	*Tringa stagnatilis*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however marsh sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. The most recent nearby record is of two birds at Lake Hawthorn in November 2015 (15 km west of the Project Area) (DCCEEW 2024d, eBird 2024). Marsh sandpiper has been	**Yes - Table 8.26**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
			recorded on several occasions at Gol Gol Swamp, Lake Gol Gol and in the Mourquong area.	
masked woodswallow	*Artamus personatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
mistletoebird	*Dicaeum hirundinaceum*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
mulga parrot	*Psephotellus varius*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
nankeen kestrel	*Falco cenchroides*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
noisy miner	*Manorina melanocephala*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Pacific swift	*Apus pacificus*	PMST, SEARs	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.7**
pacific golden plover	*Pluvialis fulva*	BioNet	**Low**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. Pacific golden plover is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). This species has not been recorded within 50 km of the Project Area since 1987.	**No**
painted button-quail	*Turnix varius*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
painted honeyeater	*Grantiella picta*	PMST	**Moderate**. Not recorded in the 2022-24 surveys. There is marginal habitat in the Project Area. This species may very occasionally disperse through the Project Area. Contemporary nearby records include a single bird adjacent the Murray River in Mildura in January 2017 (10 km west of the Project Area) and records from Merbein Common in 2005 and 2006 (18 km west of the Project Area).	**Yes - Table 8.26**
pallid cuckoo	*Cacomantis pallidus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
pectoral sandpiper	*Calidris melanotos*	BioNet, PMST	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however pectoral sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. The most recent nearby record is of an individual adjacent Mildura Airport in February 2019 (17 km west of the Project Area) (eBird 2024). The nearest records are from Gol Gol Swamp in 1986 and 1983.	**Yes - Table 8.26**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
peregrine falcon	*Falco peregrinus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
pied butcherbird	*Cracticus nigrogularis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
pied honeyeater	*Certhionyx variegatus*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.8**
pink cockatoo	*Lophochroa leadbeateri*	BioNet, BAM-C, PMST, SEARs	**High**. Not recorded in the 2022-24 surveys. There is suitable habitat in the Project Area. Pink cockatoo was recorded in the south-west portion of the Project Area in 1980. Pink cockatoo are regularly recorded in the Mildura area (DCCEEW 2024d, eBird 2024). In the past few years pink cockatoo has been recorded adjacent the Project Area on Arumpo Road in October 2023 (1km west of the Project Area), in Mallee Cliffs N.P in 2022 and at Gol Gol Swamp in 2024.	**Yes - Table 8.26**
plains-wanderer	*Pedionomus torquatus*	BioNet, PMST	**Low**. The Project Area does not contain any suitable habitat. There are three records within 50 km of the Project Area. The first is from the Historical Bird Atlas centred on Iraak, Victoria. The second is a record of a skin in the Online Zoological Collections of Australian Museum database from Mildura. The third is a BioNet record from October 2022 centred on Mourquong with a spatial uncertainty figure of 10 km.	**No**
purple-crowned lorikeet	*Glossopsitta porphyrocephala*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. There is marginal habitat in the Project Area. Although this species is very rarely recorded north of the Murray River west of Deniliquin it has recently been recorded at a few locations in Buronga and Gol Gol (5 – 6km west of the Project Area), and at Nichols Point, Kings Billabong Wildlife Reserve and Red Cliffs (5 – 10 km south-west of the Project Area) during June – August 2024 (DCCEEW 2024d, eBird 2024). Purple-crowned lorikeet may very rarely disperse through the Project Area.	**Yes - Table 8.26**
purple-gaped honeyeater	*Lichenostomus cratitius*	BioNet	**Low**. Not recorded in the 2022-24 surveys. Whilst there is suitable habitat in the Project Area this species is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). The nearest population is at Hattah-Kulkyne NP approximately 45 km south of the Project Area. The nearest records are from Mallee Cliffs in 1985 where this species has been recorded on one occasion and from a location 13 km north of the Project Area near in 2006. The only other contemporary record from within 30 km of the Project Area is from Carwarp West Bushland Reserve in 2022 (30 km south of the Project Area).	**No**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
rainbow bee-eater	*Merops ornatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
red wattlebird	*Anthochaera carunculata*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
red-backed kingfisher	*Todiramphus pyrrhopygius*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
red-capped robin	*Petroica goodenovii*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
red-lored whistler	*Pachycephala rufogularis*	BAM-C	**Low**. Not recorded in the 2022-24 surveys. Whilst there is suitable habitat in the Project Area this species is very rarely recorded in south-west NSW aside from the extreme western edge of the state (i.e., in the Scotia area) (DCCEEW 2024d, eBird 2024). Despite considerable survey effort it has not been recorded at Mallee Cliffs N.P. The nearest known population is at Hattah-Kulkyne N.P 50 km south of the Project Area.	**No**
red-necked stint	*Calidris ruficollis*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however red-necked stint may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Red-necked stint has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area (DCCEEW 2024d, eBird 2024). Recent records include an observation of approximately 240 birds at Mourquong Saltworks (13 km west of the Project Area) in March 2024. A flock of approximately 200 birds was also recorded at this site in February 2017. Large numbers (up to 500 birds) were recorded at Lake Ranfurly in Mildura in 2023. This species has also been recorded at Gol Gol Swamp, Lake Hawthorn, Kings Billabong Wildlife Reserve and at the Mildura Wastewater Treatment Plant.	**Yes - Table 8.26**
red-rumped parrot	*Psephotus haematonotus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	BioNet, BAM-C, PMST, SEARs	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.9**
restless flycatcher	*Myiagra inquieta*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
ruddy turnstone	*Arenaria interpris*	BioNet	**Low**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. Ruddy turnstone is very rarely recorded in south-west NSW	**No**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
			(DCCEEW 2024d, eBird 2024). It has been recorded at approximately 10 locations within 50 km of the Project Area although there is only one contemporary record.	
rufous songlark	*Cincloramphus mathewsi*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
rufous whistler	*Pachycephala rufiventris*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
sacred kingfisher	*Todiramphus sanctus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
sharp-tailed sandpiper	*Calidris acuminata*	BioNet, PMST, SEARs	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however sharp-tailed sandpiper may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Sharp-tailed sandpiper has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area (DCCEEW 2024d, eBird 2024). Recent records include an observation of approximately 300 birds at Gol Gol Swamp in March 2017 following records of 25 and 33 birds at this location in January 2017 and December 2016 respectively. This species has also been recorded at Lakes Ranfurly and Hawthorn in Mildura, Kings Billabong Wildlife Reserve and at the Mildura Wastewater Treatment Plant.	**Yes - Table 8.26**
shy heathwren	*Polytelis anthopeplus monarchoides*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.10**
singing honeyeater	*Gavicalis virescens*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
southern scrub-robin	*Drymodes brunneopygia*	BioNet	**High**. Not recorded in the 2022-24 surveys. There is suitable habitat in the Project Area. This species is very likely to occasionally occur in the Project Area given its status at Mallee Cliffs N.P (DCCEEW 2024d). Southern scrub-robin was recorded at two locations within 500 m of the south-eastern boundary of the Project Area in August 2020.	**Yes - Table 8.26**
southern whiteface	*Aphelocephala leucopsis*	BioNet, PMST, SEARs	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.11**
spiny-cheeked honeyeater	*Acanthagenys rufogularis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
splendid fairy-wren	*Malurus splendens*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
spotted harrier	*Circus assimilis*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.12**
spotted nightjar	*Eurostopodus argus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
spotted pardalote	*Pardalotus punctatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
square-tailed kite	*Lophoictinia isura*	BioNet, BAM-C	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.13**
striated grasswren	*Amytornis striatus howei*	PMST	**Low**. Not recorded in the 2022-24 surveys. There is marginal habitat in the Project Area. This species is very rarely recorded in south-west NSW aside from the extreme western edge of the state (i.e., in the Scotia area) (DCCEEW 2024d, eBird 2024). Despite considerable survey effort it has not been recorded at Mallee Cliffs N.P. The nearest known population is at Hattah-Kulkyne N.P 45 km south of the Project Area.	**No**
striated pardalote	*Pardalotus striatus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
striped honeyeater	*Plectorhyncha lanceolata*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
stubble quail	*Coturnix pectoralis*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
sulphur-crested cockatoo	*Cacatua galerita*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
superb fairy-wren	*Malurus cyaneus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
swamp harrier	*Circus approximans*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
swift parrot	*Lathamus discolor*	PMST	**Low**. Not recorded in the 2022-24 surveys. There is no suitable habitat in the Project Area. There are historic records within 50 km of the Project Area however the nearest record post-2000 is from 100 km south of the Project Area in the Mittyack area (DCCEEW 2024d).	**No**
tawny frogmouth	*Podargus strigoides*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
tree martin	*Petrochelidon nigricans*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
varied sittella	*Daphoenositta chrysoptera*	BioNet	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.14**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
variegated fairy-wren	*Malurus lamberti*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
wedge-tailed eagle	*Aquila audax*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27, Section 8.3.1**
weebill	*Smicrornis brevirostris*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
welcome swallow	*Hirundo neoxena*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
western gerygone	*Gerygone fusca*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
whistling kite	*Haliastur sphenurus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-backed swallow	*Cheramoeca leucosterna*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-bellied sea-eagle	*Haliaeetus leucogaster*	BioNet, BAM-C	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. This species is occasionally observed along the Murray River to the south-west of the Project Area (DCCEEW 2024d, eBird 2024). The nearest recent record is from Kings Billabong Wildlife Reserve in 2023 approximately 6 km south-west of the Project Area. Although the vast majority of movements by this species in the region are likely to be restricted to the Murray River and adjacent wetlands this species may very occasionally disperse through the Project Area.	**Yes - Table 8.26**
white-browed babbler	*Pomatostomus superciliosus*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-browed treecreeper	*Climacteris affinis*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-browed woodswallow	*Artamus superciliosus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-eared honeyeater	*Nesoptilotis leucotis*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-faced heron	*Egretta novaehollandiae*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
white-fronted chat	*Epthianura albifrons*	BioNet, BAM-C	**Recorded** in the 2022–24 surveys	**Yes - Section 8.2.15**
white-necked heron	*Ardea pacifica*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-plumed honeyeater	*Ptilotula penicillata*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-winged black tern	*Chlidonias leucopterus*	BioNet	**Low**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat. White-winged black tern is very rarely recorded in south-west NSW (DCCEEW 2024d, eBird 2024). This species has only been recorded within 50 km of the Project Area on three occasions the most recent being in 2011 at Merbein South (25 km west of the Project Area).	**No**
white-winged chough	*Corcorax melanorhamphos*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-winged fairy-wren	*Malurus leucopterus*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
white-winged triller	*Lalage tricolor*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
willie wagtail	*Rhipidura leucophrys*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
wood sandpiper	*Tringa glareola*	BioNet	**Moderate**. Not recorded in the 2022-24 surveys. The Project Area does not contain any suitable habitat however wood sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. The most recent nearby records are from the Mildura Wastewater Treatment Plant in December 2019 (12 km west of the Project Area) and the Australian Inland Botanic Gardens at Mourquong in September 2019 (13 km west of the Project Area) (DCCEEW 2024d, eBird 2024).	**Yes - Table 8.26**
yellow thornbill	*Acanthiza nana*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
yellow wagtail	*Motacilla tschutschensis*	PMST	**Low**. Not recorded in the 2022-24 surveys. There is no suitable habitat in the Project Area. This species has not been recorded within 50 km of the Project Area (DCCEEW 2024d, eBird 2024).	**No**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Species' Risk Assessment (Y/N) and Location
yellow-plumed honeyeater	*Ptilotula ornata*		**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
yellow-rumped thornbill	*Acanthiza chrysorrhoa*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
yellow-throated miner	*Manorina flavigula*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
zebra finch	*Taeniopygia guttata*	-	**Recorded** in the 2022–24 surveys	**Yes - Table 8.27**
Mallee Bird Community of the Murray Darling Depression Bioregion Endangered Ecological Community		PMST, SEARs	The *Mallee Bird Community of the Murray Darling Depression* EEC is present in the Project Area given: a. The Project Area is located in the Murray Darling Depression b. There is a patch of native vegetation at least 10 ha in size present in the Project Area. c. There is a patch of native vegetation dominated by mallee that is greater than 5 ha in size in the Project Area, and d. There are at least three bird species belonging to the EEC present in the Project Area A total of ten bird species belonging to this EEC, namely chestnut quail-thrush, crested bellbird, Jacky winter, regent parrot, shy heathwren, splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater and yellow-plumed honeyeater, were recorded in the Project Area during the 2022 – 2024 surveys.	**Yes – Section 8.2.16**

Table 3.2 Candidate Bat Species List

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Location of Species' Risk Assessment
Definitive Identification				
chocolate wattled bat	*Chalinolobus morio*	-	Recorded in the Project Area	**Section 8.5.1**

Common Name	Scientific Name	Data source (BAM-C, PMST, BioNet, SEARs)	Likelihood of occurrence in the Project Area	Location of Species' Risk Assessment
Gould's wattle bat	*Chalinolobus gouldii*	-	Recorded in the Project Area	**Section 8.5.3**
inland forest bat	*Vespadelus baverstocki*	BAM-C, BioNet	Recorded in the Project Area	**Section 8.4.2**
inland broad-nosed bat	*Scotorepens balstoni*	-	Recorded in the Project Area	**Section 8.5.4**
inland free-tailed bat	*Ozimops petersi*	-	Recorded in the Project Area	**Section 8.5.5**
little broad-nosed bat	*Scotorepens greyii*	-	Recorded in the Project Area	**Section 8.5.7**
little forest bat	*Vespadelus vulturnus*	-	Recorded in the Project Area	**Section 8.5.8**
little pied bat	*Chalinolobus picatus*	BAM-C, BioNet	Recorded in the Project Area	**Section 8.4.3**
ride's free-tailed bat	*Ozimops ridei*	-	Recorded in the Project Area	**Section 8.5.9**
southern forest bat	*Vespadelus regulus*	-	Recorded in the Project Area	**Section 8.5.10**
southern free-tailed bat	*Ozimops planiceps*	-	Recorded in the Project Area	**Section 8.5.11**
white-striped free-tailed bat	*Austronomus australis*	-	Recorded in the Project Area	**Section 8.5.12**
Possible or Species Group Identification				
Corben's long-eared bat	*Nyctophilus corbeni*	PMST, SEARs	Species Group	**Section 8.4.1**
Gould's long-eared bat	*Nyctophilus gouldi*	-	Species Group	**Section 8.5.2**
lesser long-eared bat	*Nyctophilus geoffroyi*	-	Species Group	**Section 8.5.6**
yellow-tailed sheath-tailed bat	*Saccolaimus flaviventris*	BAM-C, BioNet	Species Group	**Section 8.4.4**

4.0 Wind Turbine Strike Impact Assessment

Criterion a (i): Predict the impact on species living in, or likely to fly over, the proposed development site, including bat or bird strike and barotrauma

To assess the likelihood and consequence of impacts on aerial species, a qualitative risk-based assessment based on an assessment methodology developed by the Arthur Rylah Institute (Lumsden *et al.* 2019) has been conducted (**Section 8.0**). The assessment approach comprises consideration of the likelihood of blade strike based on a species' recorded flight behaviour and status in the Project Area, as well as consideration of existing turbine strike data from Australia (**Section 8.1.1**). The relative consequence of potential collisions and/or barotrauma is assessed with consideration of a species' total population size and degree of concentration in certain areas, conservation status and demographic resilience (**Section 8.1.1**).
The results of the risk assessment are provided in **Section 8.2** to **Section 8.5** as follows:

- The risk of blade strike for the 15 threatened and/or migratory bird species that were recorded in the Project Area is examined in **Section 8.2.1** to **Section 8.2.15**.
- The risk of blade strike for the ten bird species included in the *Mallee Bird Community of the Murray Darling Depression Bioregion EEC* that were recorded in the Project Area is examined in **Section 8.2.16**.
- Risk ratings for 23 threatened and/or migratory bird species that were not recorded in the Project Area during the 2022–2024 surveys which may occasionally occur in the Project Area are provided in **Section 8.2.17**.
- Risk ratings for the 109 non-threatened bird species that were recorded in the Project Area are provided in **Section 8.3**.
- The risk of blade strike for the four threatened bats recorded or possibly recorded in the Project Area is examined in **Section 8.4**.
- The risk of blade strike for the 12 non-threatened bat species recorded or possibly recorded in the Project Area is examined in **Section 8.5**.

Table 4.1 below highlights the results of the detailed risk assessments conducted for:

- the 15 threatened/migratory bird species recorded in the Project Area
- the *Mallee Bird Community of the Murray Darling Depression Bioregion EEC*
- wedge-tailed eagle
- the four threatened bat species that were recorded or possibly recorded in the Project Area
- the 12 non-threatened bat species that were recorded or possibly recorded in the Project Area.

Table 4.1 Risk Assessment Summary

Common Name	Species Name	Likelihood	Consequence	Risk Rating
Threatened/migratory Birds				
black falcon	*Falco subniger*	High	Moderate	High
chestnut quail-thrush	*Cinclosoma castanotum*	Low	Low	Negligible
dusky woodswallow	*Artamus cyanopterus cyanopterus*	Moderate	Low	Minor
Gilbert's whistler	*Pachycephala inornata*	Low	Low	Negligible
hooded robin (south-eastern subspecies)	*Melanodryas cucullata cucllata*	Low	Low	Negligible
little eagle	*Hieraaetus morphnoides*	High	Moderate	High
Pacific swift	*Apus pacificus*	High	Low	Moderate
pied honeyeater	*Certhionyx variegatus*	Low	Low	Negligible
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	Moderate	Moderate	Moderate
shy heathwren	*Hylacola cautus*	Low	Low	Negligible
southern whiteface	*Aphelocephala leucopsis*	Low	Low	Negligible
spotted harrier	*Circus assimilis*	High	Moderate	High
square-tailed kite	*Lophoictinia isura*	Moderate	Moderate	Moderate
varied sittella	*Daphoensitta chrysoptera*	Low	Low	Negligible
white-fronted chat	*Epthianura albifrons*	Low	Low	Negligible
Mallee Bird Community EEC: regent parrot		Moderate	Moderate	Moderate
Mallee Bird Community EEC: chestnut quail-thrush, crested bellbird, Jacky winter, shy heathwren, splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater and yellow-plumed honeyeater		Low	Low	Negligible
Non-listed birds				
wedge-tailed eagle	*Aquila audax*	High	Low	Moderate
Threatened bats				
Corben's long-eared bat	*Nyctophilus corbeni*	Low	Moderate	Minor
inland forest bat	*Vespadelus baverstocki*	Moderate	Moderate	Moderate
little pied bat	*Chalinolobus picatus*	Moderate	Moderate	Moderate
yellow-bellied sheathtail bat	*Saccolaimus flaviventris*	Moderate	Moderate	Moderate
Non-listed bats				
chocolate wattled bat	*Chalinolobus morio*	Moderate	Low	Minor
Gould's long-eared bat	*Nyctophilus gouldi*	Moderate	Low	Minor
Gould's wattle bat	*Chalinolobus gouldii*	High	Low	Moderate

Common Name	Species Name	Likelihood	Consequence	Risk Rating
inland broad-nosed bat	*Scotorepens balstoni*	High	Low	Moderate
inland free-tailed bat	*Ozimops petersi*	High	Moderate	High
lesser long-eared bat	*Nyctophilus geoffroyi*	Moderate	Low	Minor
little broad-nosed bat	*Scotorepens greyii*	Moderate	Low	Minor
little forest bat	*Vespadelus vulturnus*	High	Low	Moderate
ride's free-tailed bat	*Ozimops ridei*	High	Moderate	High
southern forest bat	*Vespadelus regulus*	Moderate	Low	Minor
southern free-tailed bat	*Ozimops planiceps*	Moderate	Moderate	Moderate
white-striped freetail-bat	*Austronomus australis*	High	Low	Moderate

5.0 Rate of Impact

Criterion a (ii) Predict the rate and timing of impact per turbine per year for species likely to be affected

The results of a risk-based assessment pertaining to potential impacts are included within the response in **Section 8.0.**

Where available, mortality estimates from other Australian wind farms have been considered within the responses below for estimating relative risk. Mortality estimates include data from two of 15 Victorian wind farms at which mortality monitoring has been undertaken and mortality rates for particular species determined (Moloney *et al.* 2019).

It is noted that mortality rates are likely to vary considerably among wind farms, depending on a range of variables such as their proximity to key habitat features (e.g. important cave roosts), turbine size, landscape position and the inherent spatial variability in species abundance and utilisation of airspace (Richardson 2000, Drewitt and Langston 2006, Krijgsveld *et al.* 2009). For this reason, it is not advisable to extrapolate or predict mortality estimates provided in Moloney *et al.* (2019) for other wind farms though consideration of such data when estimating relative risk is considered appropriate.

6.0 Consequences of Impacts

Criterion a (iii) Predict the consequences of impacts for the persistence of populations

The consequences of impacts for the persistence of the assessed species depends on a range of poorly understood or unknown factors including:

- the relative importance of the Project Area for the long-term persistence of the greater population in the bioregion
- the degree of connectivity regarding the movement of individuals between the Project Area and surrounding areas
- whether likely mortality rates from blade strike in the Project Area would exceed the rate of replacement of individuals either in situ or through dispersal from elsewhere.

Given the lack of data with which to predict estimates and the inherent high uncertainty associated with predictions if attempted, the precise consequence of impacts for the persistence of bioregional populations is not predicted here. Instead, the relative consequence of impacts for each of the assessed bird and bat species is estimated within the risk assessment (**Section 8.0**).

7.0 Cumulative Impacts

Criterion a (iv) Predict the cumulative impacts of the proposed development alongside existing wind farms on species mortality, movement pattern and use of adjacent habitat

In order to predict the cumulative impacts of a proposed wind farm alongside existing wind farms with an adequate degree of confidence, it is necessary for the impacts in question of all other wind farms, at whichever spatial scale the assessment is being undertaken, to be monitored and quantified in a robust, consistent manner (Croll *et al.* 2022, Schippers *et al.* 2020). Given the general paucity of knowledge of impacts of wind farms on species mortality rates, movement patterns and use of adjacent habitat at the single-site scale in Australia and importantly, the impact of these factors on bird and bat populations at various spatial scales, there is little information with which to derive adequate predictions of cumulative impacts of such factors from.

Given this, and the fact that there are no operational wind farms within 200 km of the Project at present, the cumulative impacts of the Project and existing wind farms on species mortality, movement patterns and use of adjacent habitat are not predicted here.

Instead, a summary of basic information relating to proposed wind farms in the South West REZ alongside an outline of which threatened species have been recorded at each of the project sites during pre-construction surveys is provided below in an effort to identify particular species recorded in the Project that may be at the greatest risk of cumulative impacts of the factors in question. It is noted that this is limited to publicly available information relating to the projects, and is only accurate at the time of writing this assessment.

7.1 Wind Farms in the South West REZ

At present there are a total of 16 proposed wind farms and one approved wind farm in the South West REZ (**Table 7.1**). There is also one proposed wind farm, Lake Victoria Wind Farm, that is located 65 km west of the Project that is situated outside of the South West REZ (though adjacent the Project EnergyConnect Corridor). In the western third of the South West REZ (i.e., the area west of Balranald) there are up to 459 WTGs proposed across four projects, namely the Project, Gol Gol Energy Hub, Euston Wind Farm and Koorakee Energy Park. Not including the Project, there are a total of approximately 264 proposed WTG across three projects within 50 km of the Project, 586 proposed WTG across four projects within 100 km of the Project and 1,257 proposed WTG across nine projects within 200 km of the Project.

The final composition of renewable energy development in the South West REZ will largely be determined by the NSW Government allocation of access rights to the limited transmission infrastructure present. The intended capacity of the South West REZ is 2.5 gigawatts (GW) with registered interest well in excess of this. It is therefore expected that there will be more proposed projects than the intended capacity and cumulative impacts required to build the South West REZ to its maximum capacity will potentially be less than that predicted for the full extent of all projects currently proposed.

7.2 Threatened Species Recorded at Wind Farms in the South West REZ

A total of 28 threatened/migratory bird species and five threatened bat species have been recorded at the ten projects for which survey data is publicly available (**Table 7.2**).

It is possible that populations of particular species susceptible to blade strike will be impacted at the local and regional scale through cumulative impacts. Of the 15 threatened/migratory species recorded in the Project Area it is likely that threatened raptors such as black falcon, little eagle and spotted harrier are most vulnerable to cumulative impacts given their flight behaviour and occurrence at the majority of proposed Project sites (**Table 7.2**). Black falcon have been recorded at eight of the ten Projects for which there is data, whilst little eagle and spotted harrier have been recorded at five and nine of these Projects to date, respectively. Given their distribution in the South West REZ and habitat preferences it is highly likely that these species occur at least 15 if not all of the 17 Projects.

Threatened mallee specialists recorded in the Project Area such as chestnut quail-thrush, Gilbert's whistler and shy heathwren are unlikely to be vulnerable to cumulative impacts relating to blade strike given they don't occur at many Projects in the South West REZ (**Table 7.2**) and they typically fly below 15 m AGL.

Other threatened passerines recorded in the Project Area such as hooded robin, pied honeyeater, southern whiteface and varied sittella are also unlikely to be at risk of cumulative impacts given their flight behaviour combined with their population sizes. For passerine species that are known to either occasionally or regularly fly between 40 – 100 m AGL such as white-fronted chat and dusky woodswallow the degree of risk of cumulative impacts will likely depend on which models of turbines are installed at projects in the South West REZ. Both these species have large total population sizes but may be susceptible to impacts at several sites.

Relatively little is known about the occurrence of threatened bat species, and the range of heights at which they fly, at projects in the South West REZ. The occurrence of Corben's long-eared bat and yellow-bellied sheathtail-bat is hard to ascertain through ultrasonic call sampling due to difficulties differentiating their calls from the calls of other species. The inland forest bat and little pied bat (which can be readily identified through ultrasonic detection) appear to have only been recorded at two projects in the South West REZ to date however this may not reflect true occupancy rates at such sites (**Table 7.2**).

It is noted that particular non-threatened bird and bat species such as wedge-tailed eagle and white-striped freetail-bat are likely to be susceptible to cumulative impacts in the South West REZ given the frequency of instances of blade strike in south-east Australia.

Table 7.1 Proposed and Approved Renewable Projects in the South West REZ

Project	Project Abbreviation	Distance between projects	Number of proposed/approved WTG
Gol Gol Wind Farm (Prepare EIS Stage)	GGWF	Nearest proposed WTG is approximately 3 km west	Up to 120
Gol Gol Solar Farm (Prepare EIS Stage)	GGSF	Same Project Boundaries to the western side of the Project Area	N/A

Project	Project Abbreviation	Distance between projects	Number of proposed/approved WTG
		3.3 km to the north west to the nearest piece of Project Infrastructure	
Gol Gol BESS (Prepare EIS Stage)	GGB	9 km to the north west between turbine to BESS substation	N/A
Euston Wind Farm (Prepare EIS Stage)	EWF	Nearest proposed WTG is approximately 30 km south-east	Up to 96
Koorakee Energy Park (Prepare EIS Stage)	KEP	Nearest proposed WTG is approximately 45 km away	Up to 167
Lake Victoria Wind Farm [1] (Prepare EIS Stage)	LVWF	Nearest proposed WTG is 65 km west	Up to 203
Junction Rivers Wind Farm (Response to Submissions stage)	JRWF	Nearest proposed WTG is approximately 120 km away	Up to 96
Wilan Energy Park (Prepare EIS stage)	WEP	Nearest proposed WTG is approximately 140 km away	Up to 138
Keri Keri Renewable Energy Project (EIS submitted)	KKREP	Nearest proposed WTG is approximately 150 km away	Up to 155
Baldon Wind Farm (Prepare EIS stage)	BaWF)	Nearest proposed WTG is approximately 160 km away	Up to 162
Tchelery Wind Farm (Prepare EIS Stage)	TWF	Nearest proposed WTG is approximately 170 km away	Up to 120
The Plains Wind Farm (RtS stage)	TPWF	Nearest proposed WTG is approximately 210 km away	Up to 188
Booroorban Wind Farm (Prepare EIS stage)	BoWF	Nearest proposed WTG is approximately 230 km away	Up to 70
Pottinger Wind Farm (Exhibition Stage)	PWF	Nearest proposed WTG is approximately 235 km away	Up to 247
Bullawah Wind Farm (EIS submitted)	BuWF	Nearest proposed WTG is approximately 250 km away	Up to 143
Dinawan Wind Farm (Prepare EIS stage)	DWF	Nearest proposed WTG is approximately 280 km away	Up to 200
Conargo Wind Farm (Prepare EIS stage)	CWF	Nearest proposed WTG is approximately 285 km away	Up to 53
Yanco Delta Wind Farm (Approved)	YDWF	Nearest proposed WTG is approximately 290 km away	Up to 208
Argoon Wind Farm (Prepare EIS Stage)	AWF	Nearest proposed WTG is approximately 300 km away	Up to 106

Included despite not being located in the South West REZ due to its proximity to the Project.

Table 7.2 Threatened/Migratory Bird and Bat Species Recorded at Proposed/Approved Wind Farms in the South West REZ

Project	MWF	GGEH[1]	EWF[2]	KEP[1]	LVWF[1]	JRWF	WEP[1]	KKREP	BaWF[1]	TWF[2]	TPWF	BoWF[1]	PWF	Buwf	DWF	CWF[1]	YDWF	AWF[1]	Total
Birds																			
barking owl														X					**1**
black falcon	X					X		X			X		X	X	X		X		**8**
blue-winged parrot								X						X					**2**
chestnut quail-thrush	X		X																**2**
curlew sandpiper										X									**1**
diamond firetail														X			X		**2**
dusky woodswallow	X												X				X		**3**
flame robin														X			X		**2**
Gilbert's whistler	X																		**1**
grey-crowned babbler													X	X	X		X		**4**
hooded robin	X		X																**2**
little eagle	X		X					X						X			X		**5**
Pacific swift	X							X											**2**
painted honeyeater															X				**1**
pied honeyeater	X														X				**2**
pink cockatoo			X			X		X					X						**4**
plains-wanderer								X					X	X					**3**
redthroat															X				**1**
red-necked stint										X									**1**
regent parrot	X					X													**2**
shy heathwren	X																		**1**
sharp-tailed sandpiper										X	X		X						**3**
southern whiteface	X										X		X	X	X				**4**
spotted harrier	X		X			X		X		X			X	X	X		X		**9**
square-tailed kite	X																X		**2**

Project	MWF	GGEH[1]	EWF[2]	KEP[1]	LVWF[1]	JRWF	WEP[1]	KKREP	BaWF[1]	TWF[2]	TPWF	BoWF[1]	PWF	Buwf	DWF	CWF[1]	YDWF	AWF[1]	Total
superb parrot															X		X		**2**
varied sittella	X																X		**2**
white-fronted chat	X		X			X		X		X	X		X	X	X		X		**10**
Total	**15**		**6**			**5**		**8**		**5**	**4**		**9**	**11**	**9**		**11**		
Bats																			
Corben's long-eared bat	X										X		X	X					**3**
inland forest bat	X												X						**1**
little pied bat	X												X						**1**
southern myotis											X		X				AP[3]		**3**
yellow-bellied sheathtail bat	X							X			X		X	X	X		AP[3]		**6**
Total	**4**					**0**		**1**		**0**	**3**		**5**	**2**	**1**		**2**		
Grand Total	**19**					**5**		**9**		**5**	**7**		**14**	**13**	**10**		**13**		

No survey data available at the time of writing

Based on preliminary or partially completed bird and bat surveys

AP = assumed present

8.0 Likelihood and Nature of Impacts

Criterion a (v) likelihood and nature of impacts on aerial species living in, or likely to fly over, the proposed development site, including barriers to migratory pathways, and breeding, feeding and resting resources

8.1 Comparison to Operating Wind Farms

In the absence of operating wind farms in the South West REZ, data has been sourced from wind farms in south-eastern and central-western NSW, Victoria and north-west Tasmania where mortality monitoring has taken place. The following risk assessment considers published and unpublished mortality data from these regions, as well as behavioural factors, to assess turbine blade strike risk, risks relating to barotrauma, and the impact of the proposed development on migratory pathways.

8.1.1 Risk Assessment Method

The relative risk of blade strike for the 149 bird and 16 bat species assessed here was estimated using two criteria to ascribe likelihood of risk and four criteria to ascribe consequence of risk (**Table 8.1** and **Table 8.2**). These six criteria were employed in a study conducted with the aim of developing a science-based approach to aid decision-making regarding turbine collision risk for birds and bats in Victoria (Lumsden *et al*. 2019). The criteria used by Lumsden *et al.* (2019) to determine the relative risk for 'species of interest' were:

- Criterion A – Flight Height.
- Criterion B – Status in Project Area.
- Criterion C – Geographic Population Concentration.
- Criterion D – Demographic Resilience.
- Criterion E – Population Size.
- Criterion F – Listed Conservation Status.

Each criterion was either adopted unchanged or was adjusted for the purposes of this current assessment as appropriate to ensure the particulars of each criterion were relevant to specific aspects of the Project such as geographic location. For the purposes of this assessment, Criterion A, C and F were slightly altered, Criterion B was substantially altered and the thresholds and spatial scale for Criterion E were adjusted.

Table 8.1 Criteria Used to Ascribe Likelihood of Risk

Criterion A – flight height	Criterion B – status in Project Area
Known or likely frequency of flights within RSA height	Status or frequency of occurrence in the Project Area

Table 8.2 Criteria Used to Ascribe Consequence of Risk

Criterion C – geographic population concentration	Criterion D – demographic resilience	Criterion E – population size	Criterion F – conservation status
Highly localised or concentrated population (for whole or part of lifecycle), such that siting of wind farm could have significant consequence to regional, national or international population	Impact on population relative to demographic capacity to replace fatalities (i.e., generalised combination of dispersal capacity of potential replacements, fecundity and generation time)	Known or estimated size of national or global population	Listed conservation status under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the BC Act

Each of the species was ranked either Low, Moderate or High for each criterion depending on which is most appropriate in consideration of the assessed species' ecology and observed or predicted utilisation of the Project Area. Descriptions for each ranking are outlined in **Table 8.3**.

Criterion A (flight height) was assessed by identifying the frequency of flights observed between **50 m** (being the assumed lowermost blade tip height) and **280 m** (being maximum blade tip height) in the Project Area and assessing this with consideration of observed and reported flight behaviour from elsewhere in Australia. Given that flight height data for bird and bat species in Australia is scant and observation data from pre-construction surveys at wind farms areas is largely unavailable, estimates of flight height require an adequate number of observations from the assessed site coupled with consideration of expert opinion on known flight behaviour for each species assessed. This Criterion is important as flight height is the primary variable through which a relative estimate of collision risk can be reached.

Criterion B (status in Project Area) was assessed by determining the status or estimating the frequency of occurrence in the Project Area. This Criterion is included as it is an essential component for estimating overall blade strike risk. Data from field surveys conducted by Umwelt in 2022, 2023 and 2024 were primarily used to establish the ranking for this criterion. In the absence of species observations, likelihood of occurrence was predicted based on historical and local observations, known ranges and/or presence of suitable foraging or nesting habitat.

Criterion C (geographic population concentration) was assessed by estimating the degree to which a species' population may be concentrated due to site related factors such as geographic location, habitat type, proximity to important habitat or roost locations (i.e., significant wetlands, roost caves) and how this relates to the specific landscape in which the Project Area is located. Lumsden *et al*. (2019) noted that this criterion is intended to account for situations where the degree to which a taxon is geographically concentrated may influence the risk posed by the particular location of a wind farm. Where large flocks or aggregations are involved the concentration of individuals may be for short seasonal periods but may nonetheless substantially heighten risk to a large portion of a species' total population. This is particularly important if a large proportion of a species' population passes through a localised area, such as a migratory corridor, over the course of each seasonal passage.

Criterion D (demographic resilience) was assessed through consideration of known aspects of each assessed species breeding biology and, most specifically, the nature of species' life-history traits. This criterion is included in the risk assessment as it is necessary to estimate the capacity to which a species may replace individuals lost to mortality resulting from blade strike.

Criterion E (population size) is included to account for the variation in the significance of mortality of a given number of individuals between species as a result of the large variation in assessed species' national or global populations. This, when assessed in combination with Criterion D provides a measure through which the relative vulnerability of a species to loss of individuals can be estimated.

Criterion F (listed conservation status) refers to the status of bird and bat species listed under the EPBC Act or the BC Act. In instances where a species listing differs between Acts, for example one that is listed vulnerable under the EPBC Act and endangered under the BC Act the most threatened listing category is selected for the purposes of this assessment – the order being critically endangered, endangered and vulnerable. Species listed as migratory and/or marine under the EPBC Act are not assigned a rank for this criterion.

Table 8.3 Descriptions of Each Score for Criterion A–F

Likelihood/ Consequence Score	Criterion A (Flight Height)	Criterion B (Status in Project Area)	Criterion C (Geographic Population Concentration)	Criterion D (Demographic Resilience)	Criterion E (Population Size)	Criterion F (Listed Conservation Status)
Low	Species that do not or rarely fly at RSA height.	Species that rarely occur in the Project Area.	Species that are widely distributed within areas of suitable habitat and the habitat itself is relatively widely dispersed.	Species that form breeding territories and that have a reasonable proportion of the population as nonbreeding 'floaters' that can rapidly replace breeding territorial adults if lost; species that may or may not form breeding territories and that are short-lived and have high fecundity; species that have capacity for long range or widespread juvenile or sub-adult dispersal.	Total population (i.e., whether that corresponds to the national population of Australian endemics or a migrant's global population) is estimated to number more than 20,000 individuals.	Species not listed or listed as near threatened or data deficient under the EPBC Act or the BC Act.
Moderate	Species which regularly fly below RSA height and occasionally fly at RSA height.	Species that occasionally occur in, or occasionally move through the Project Area.	Species that may be more widespread or have greater flexibility in the range of suitable habitat availability, but where a high proportion of their population is likely to be concentrated at sites where they do occur.	Species with life-history characteristics that sit between the low and high descriptions here.	Total population is estimated to number between 5,000 and 20,000 individuals.	Species listed as vulnerable under the EPBC Act or the BC Act.
High	Species in which a high proportion of flight activity is at RSA height.	Species that regularly occur in, or regularly move through the Project Area.	Bat species that have major aggregations at a few caves, or bird or bat species that have either very restricted distributions or those where a substantial proportion of a population may move through certain areas (i.e., migratory pathways).	Species that form breeding territories but where there is limited capacity for a lost breeding adult to be readily replaced; species that do not form breeding territories and that are long-lived and/or have low fecundity; species that may have short-distance juvenile or sub-adult dispersal capacity only.	Total population is estimated to number less than 5,000 individuals.	Species listed as endangered or critically endangered under the EPBC Act or the BC Act.

8.1.2 Estimating Overall Risk

Estimates of overall risk for each assessed species were determined by following an approach similar to that employed by Lumsden *et al*. (2019) with the most notable exception being the difference in spatial scale for which resulting estimates of risk are intended to be relevant to (i.e., state-wide vs site-specific). Elements of the likelihood and consequence of collision were combined to form an overall qualitative risk rating (Low/Moderate/High) specific to the Project for the likelihood of collision and the consequence of collision. Likelihood of collision questions (Criterion A and B) and consequence of collision questions (Criterion C to F) were combined in a generally additive process to determine whether the overall likelihood and consequence of collisions was Low, Moderate or High.

The following describes how the **likelihood of collision** scores were determined:

- **High**: Either criteria A or B is High and neither can be Low.
- **Moderate**: All other combinations not described in High or Low.
- **Low**: Both Criteria A and B are Low, or in cases where Criterion A is Low because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and/or observations from the Project Area.

The following describes how the **consequence of collision** scores were determined:

- **High:** The majority of Criteria C, D, E and F are High, or the risk associated with Criterion C for localised concentration is High. It was considered that the consequences of high mortality due to wind turbine collisions for species that have a limited distribution and/or have the capacity to be highly concentrated is sufficiently large such that, if a species' risk associated with this element was High, the consequences of collision should also be set to High, irrespective of the risks of the other criteria.
- **Moderate**: The majority of Criteria C, D, E and F were Moderate.
- **Low**: The majority of Criteria C, D, E and F were Low.

In cases where risk achieved two of two criteria, the higher risk rating was designated, e.g., two Moderate and two High criteria would result in a high rating.

Once the overall scores for the likelihood and consequence of collision specific to the Project had been assigned for a species, the results were then placed into a risk matrix to determine the overall risk rating and level of concern (**Table 8.4**). Five overall risk ratings were used, namely Negligible, Minor, Moderate, High, and Very High, based on the combination of the scores for likelihood and consequence.

Table 8.4 Risk Matrix

		Consequence of Collisions		
		Low	**Moderate**	**High**
Likelihood of collisions	**Low**	Negligible	Minor	Moderate
	Moderate	Minor	Moderate	High
	High	Moderate	High	**Very High**

8.2 Assessment of Likelihood and Consequence of Impact – Threatened and Migratory Bird Species

8.2.1 Black Falcon (*Falco subniger*)

8.2.1.1 Information on Black Falcon from Wind Farms in Australia

Black falcon are known to be susceptible to collisions with infrastructure such as powerlines and fences (Debus 2014). There are two published records of blade strike in south-east Australia. A review of mortality monitoring conducted at 15 wind farms in Victoria from 2003 - 2018 found one record of blade strike (Moloney *et al*. 2019). This case was of a carcass detected at a wind farm in south-western Victoria during a monitoring program conducted from March 2013 to February 2015 (Wood 2015). No black falcon had been recorded at the site during pre- or post-construction bird surveys (Wood 2015). The second record of blade strike is from a wind farm on the Central Tablelands of NSW in 2019 where the species had previously been recorded on one occasion during bird surveys at the site (Nature Advisory 2020).

8.2.1.2 Status and Flight Behaviour in the Project Area

The black falcon is a widespread though uncommon breeding resident/nomad across the Murray Darling Depression Bioregion. Black falcon were recorded on five occasions in the Project Area during the 2022 – 2024 surveys, including three times during vantage point surveys and twice incidentally. The location of observations of black falcon in the Project Area is shown in **Figure 8.10 to 8.1.5**.

A summary of black falcon observations in the Project Area is presented below:

- 19 March 2023: one individual was observed flying at 8m AGL near VP1 in the south-western part of the Project Area
- 18 October 2023: one individual was observed flying between 10-20 m AGL during a midday survey at VP9
- 21 October 2023: two individuals were observed flying between 15-20 m AGL during a morning survey at VP9
- 21 October 2023: two individuals were observed flying between 7-15 m AGL near VP2 in the south-western part of the Project Area
- 18 May 2024: one individual was observed flying at 50-60 m AGL during a morning survey at VP10.

The overall reporting rate across all vantage point surveys was 0.6% (3/491).

8.2.1.3 Likelihood and Consequence of Impacts

The overall risk rating for black falcon is high, based on a high likelihood and a Moderate consequence of collisions (**Table 8.5**). The rationale for responses to each criterion is as follows:

a. The black falcon is a highly aerial species that is known to fly below and at typical RSA height. Although it was recorded flying at RSA height on only one of the five occasions it was observed in the Project Area it is known to regularly fly at RSA height. A High ranking is assigned to Criterion A.

b. Black falcon were occasionally recorded in the Project Area during the 2022–2024 surveys. Hence, Criterion B is assigned Moderate.

c. The black falcon is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the black falcon overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Marchant and Higgins 1993). Hence, Criterion D is assigned Moderate.

e. The population is estimated to number 1,000–10,000 individuals, roughly equating to 670–6,700 mature individuals (BirdLife International 2024).

f. Black falcon is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.5 Black Falcon Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			
Moderate		X		X	X	X
High	X					
Risk Rating						
Likelihood	High					
Consequence	Moderate					
Risk Rating	High					

8.2.2 Chestnut Quail-thrush (*Cinclosoma castanotum*)

8.2.2.1 Information on Chestnut Quail-thrush from Wind Farms in Australia

There are no records of blade strike of chestnut quail-thrush in the available literature. There are currently no wind farms in the chestnut quail-thrush's range.

8.2.2.2 Status and Flight Behaviour in the Project Area

The chestnut quail-thrush is an uncommon, localised breeding resident that is generally restricted to larger tracts of mallee, in the north-western, central and extreme eastern parts of the Murray Darling Depression Bioregion. Chestnut quail-thrush were recorded on six occasions during the 2022–2024 surveys, including four times during woodland bird surveys and twice incidentally. The location of observations of chestnut quail-thrush including one located just west of the Project Area is shown in **Figure 8.1.0 to 8.1.5**. All six observations of chestnut quail-thrush were of birds on the ground in areas of mallee. A summary of chestnut quail-thrush observations in and adjacent the Project Area is presented below:

- November 2022: one individual was incidentally observed in the large patch of mallee in the central-eastern part of the Project Area adjacent Mallee Cliffs N.P
- 11 November 2022: one individual was observed during a woodland bird survey 1.5 km south-west of VP3 in the large patch of mallee in the south-western part of the Project Area

- February 2023: two individuals were incidentally observed 800 m south-east of VP5 in the large patch of mallee in the central-western part of the Project Area
- 29 April 2023: one individual was observed during a woodland bird survey 1.4 km north-east of VP10 in a patch of mallee in the centre of the Project Area
- 9 July 2023: one individual was observed 1.8 km south-east of VP5 in the large patch of mallee in the central-western part of the Project Area
- 29 February 2024: two individuals were observed during a woodland bird survey west of the Project Area.

8.2.2.3 Likelihood and Consequence of Impacts

The overall risk rating for chestnut quail-thrush is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.6**). Note that despite a High rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The chestnut quail-thrush is highly unlikely to fly at RSA height. Hence, Criterion A is assigned low.

b. Although chestnut quail-thrush were only recorded on six occasions this species is likely either resident, or regularly moves through the Project Area. Hence, Criterion B is assigned High.

c. The chestnut quail-thrush is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the chestnut quail-thrush align with the Low rating for Criterion D (Higgins and Peter 2002).

a. The chestnut quail-thrush population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Hence, Criterion E is assigned Low.

e. Chestnut quail-thrush is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.6 Chestnut Quail-thrush Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						X
High		X				
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

8.2.3 Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)

8.2.3.1 Information on Dusky Woodswallow from Wind Farms in Australia

Moloney *et al.* (2019) reported one record of blade strike of dusky woodswallow at Victorian wind farms from post-construction mortality monitoring from 2003 to 2018.

8.2.3.2 Status and Flight Behaviour in the Project Area

The dusky woodswallow is a widespread though uncommon partial nomad / migrant in the Murray Darling Depression Bioregion. Dusky woodswallow were recorded on seven occasions in the Project Area during the 2022–2024 surveys. All seven observations were recorded during vantage point surveys. The location of observations of dusky woodswallow in the Project Area is shown in **Figure 8.1.0 to 8.1.5**. A summary of dusky woodswallow observations in the Project Area is presented below:

- 17 October 2023: four individuals were observed flying below 5 m AGL during an afternoon survey at VP6
- 18 October 2023: four individuals were observed flying at 60 m AGL during a midday survey at VP3
- 24 February 2024: one individual was observed flying between 7-15 m AGL during a midday survey at VP6
- 24 February 2024: one individual was observed flying between 10-25 m AGL during a midday survey at VP6
- 26 February 2024: seven individuals were observed flying between 2-20 m AGL during a morning survey at VP6
- 25 February 2024: three individuals were observed flying between 1-40 m AGL during an afternoon survey at VP6
- 18 May 2024: two individuals were observed flying between 3-8 m AGL during a midday survey at VP4.

The overall reporting rate across all vantage point surveys was 1.2% (6/491).

8.2.3.3 Likelihood and Consequence of Impacts

The overall risk rating for dusky woodswallow is Low, based on a Moderate likelihood and Low consequence of collisions (**Table 8.7**). The rationale for responses to each criterion is as follows:

a. The dusky woodswallow occasionally flies at RSA height. Hence, Criterion A is assigned Moderate.

b. The dusky woodswallow is known to occur in the Project Area. As it is likely that it is an occasional visitor to the Project Area, Criterion B is assigned Moderate.

c. The dusky woodswallow is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the dusky woodswallow align with the Low rating for Criterion D (Higgins *et al.* 2006).

b. The dusky woodswallow population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Hence, Criterion E is assigned Low.

e. The dusky woodswallow is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.7 Dusky Woodswallow Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X	X	X	
Moderate	X	X				X
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Low					
Risk Rating	Minor					

8.2.4 Gilbert's Whistler (*Pachycephala inornata*)

8.2.4.1 Information on Gilbert's Whistler from Wind Farms in Australia

There are no records of blade strike of Gilbert's whistler in the available literature.

8.2.4.2 Status and Flight Behaviour in the Project Area

The Gilbert's whistler is an uncommon, localised breeding resident / nomad that is increasingly restricted to larger tracts of native vegetation, particularly mallee, in the southern, north-western, central and extreme eastern parts of the Murray Darling Depression Bioregion. Gilbert's whistler were recorded on six occasions in the Project Area during the 2022 – 2024 surveys, including once during vantage point surveys, three times during woodland bird surveys and twice incidentally. The location of observations of Gilbert's whistler in the Project Area is shown in **Figure 8.1.0 to 8.1.5**. A summary of Gilbert's whistler observations in the Project Area is presented below:

- November 2022: one individual was heard calling in a small patch of mallee 2.7 km south of VP9 in the central-eastern part of the Project Area
- 12 July 2023: one individual was observed during a woodland bird survey 2.2 km west of VP1 on the edge of the large patch of mallee in the south-western part of the Project Area
- 20 October 2023: one individual was observed during a woodland bird survey in a wind break 1.1 km south-west of VP2 in the central-southern part of the Project Area
- 20 October 2023: four individuals were observed during a morning survey at VP6 on the edge of the large patch of mallee in the central-western part of the Project Area
- 15 May 2024: one individual was incidentally observed at the extreme south-east corner of the large patch of mallee in the central-western part of the Project Area

- 16 May 2024: one individual was observed during a woodland bird survey 1 km south-west of VP1 on the edge of the large patch of mallee in the south-western part of the Project Area.

8.2.4.3 Likelihood and Consequence of Impacts

The overall risk rating for Gilbert's whistler is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.8**). Note that despite a High rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The Gilbert's whistler is highly unlikely to fly at RSA height. Hence, Criterion A is assigned Low.

b. The Gilbert's whistler is either resident, or regularly moves through the Project Area. Hence, Criterion B is assigned High.

c. The Gilbert's whistler is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the Gilbert's whistler align with the Low rating for Criterion D (Higgins and Peter 2002).

c. The Gilbert's whistler population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Hence, Criterion E is assigned Low.

e. The Gilbert's whistler is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.8 Gilbert's Whistler Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						X
High		X				
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

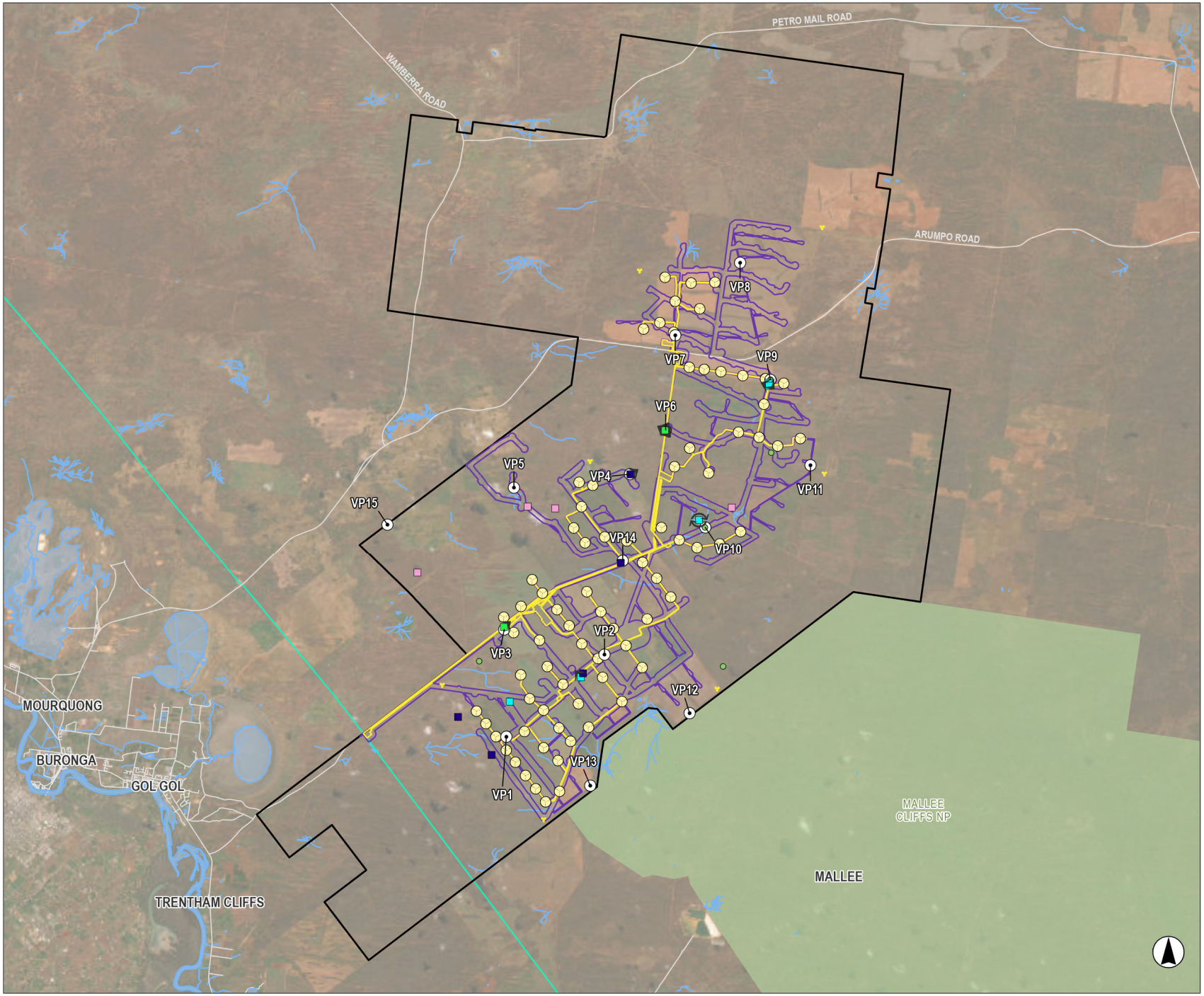


FIGURE 8.1.0

Location of Black Falcon, Chestnut Quail-thrush, Dusky Woodswallow and Gilbert's Whistler Records in the Project Area (2022–2024 Surveys)

Legend

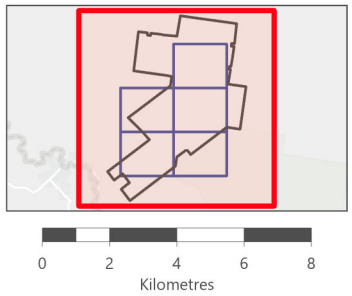
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Black Falcon
- Chestnut Quail-thrush
- Dusky Woodswallow
- Gilbert's Whistler
- NPWS Estates
- Road
- Watercourse
- Waterbody



Scale 1:225,000 at A4
GDA2020 MGA Zone 54

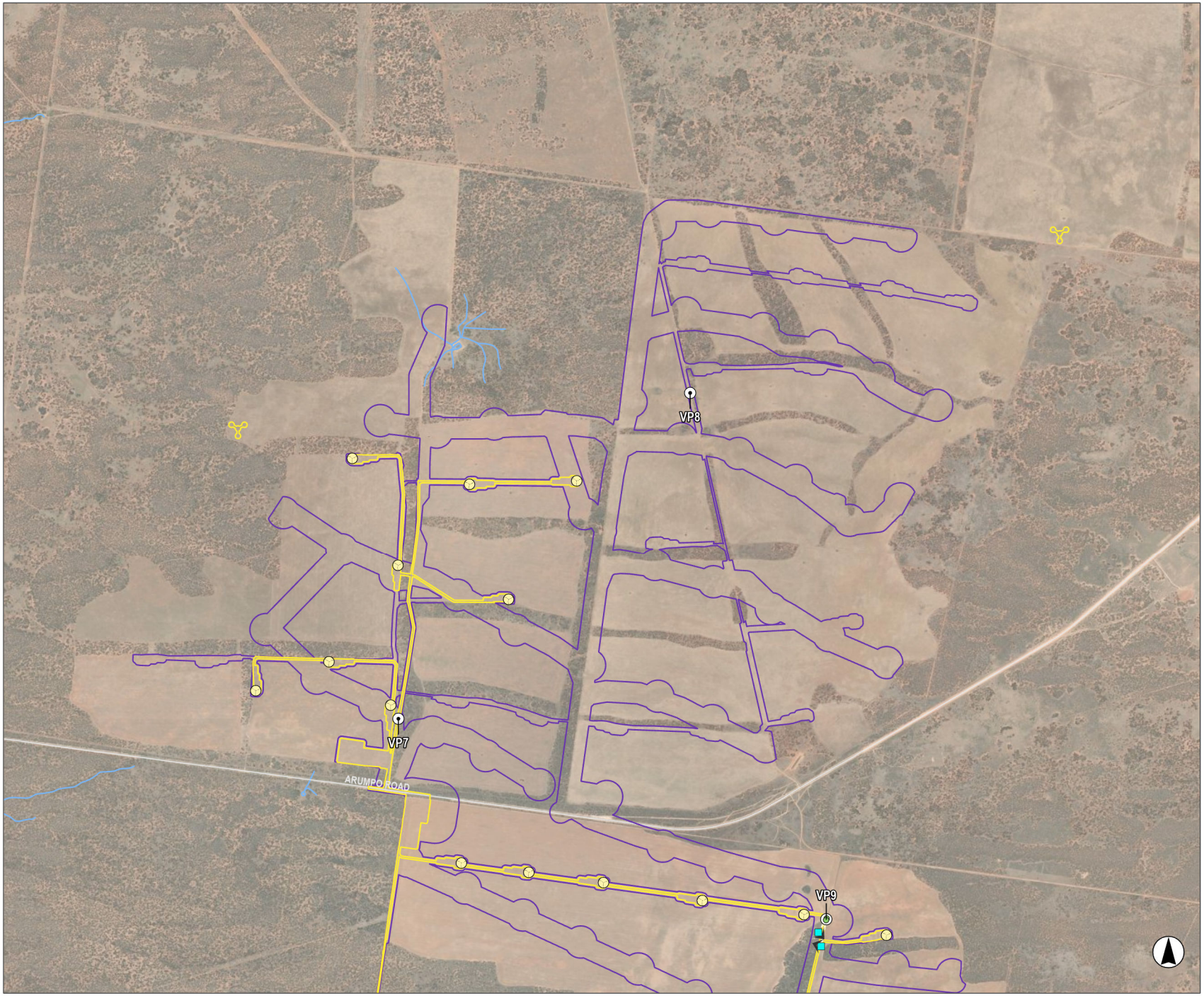
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FIGURE 8.1.1

Location of Black Falcon, Chestnut Quail-thrush, Dusky Woodswallow and Gilbert's Whistler Records in the Project Area (2022–2024 Surveys)



Legend

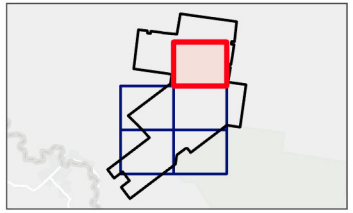
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Black Falcon
- Road
- Watercourse
- Waterbody



0 2

Kilometres

Scale 1:50,000 at A4

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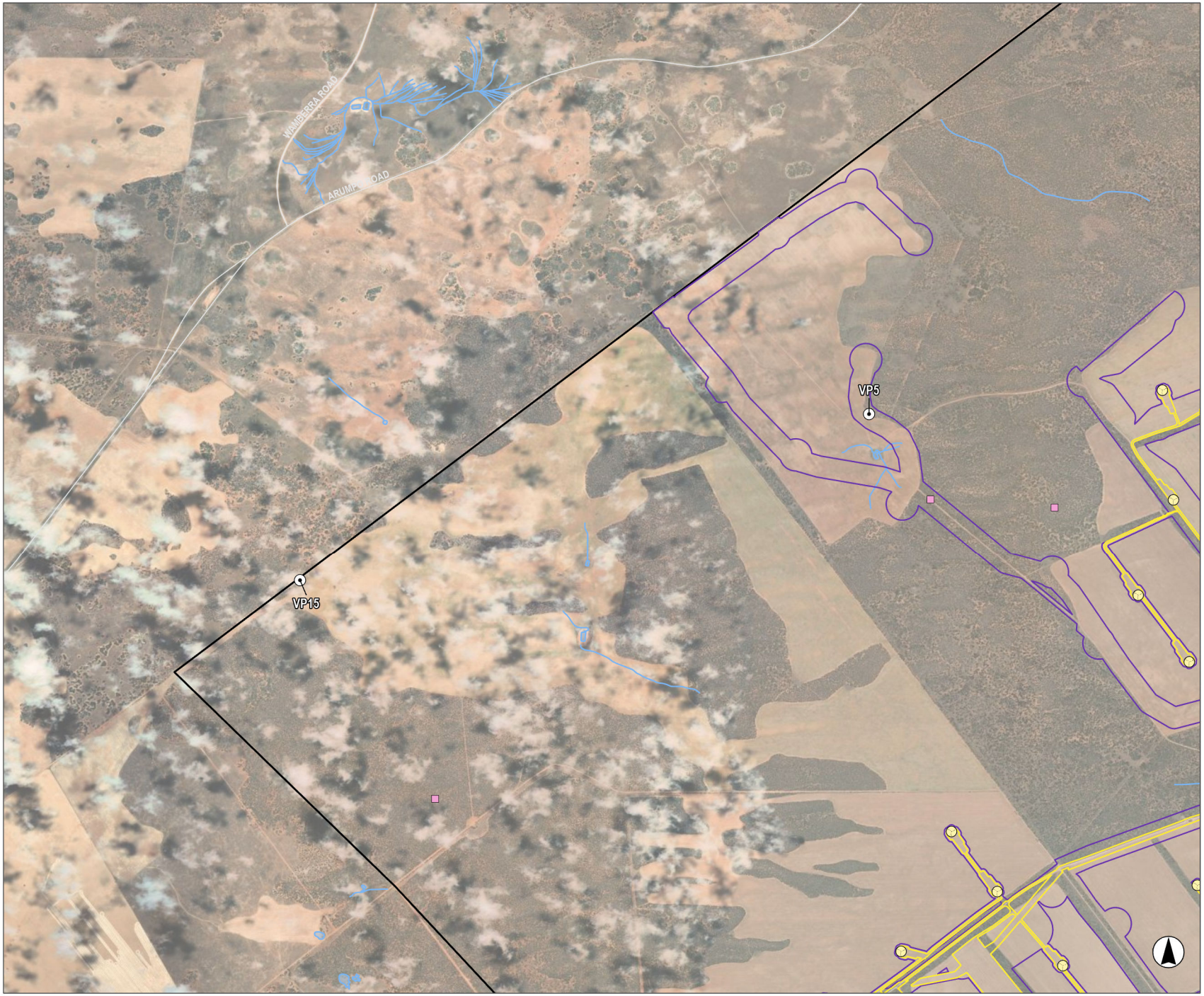


FIGURE 8.1.2

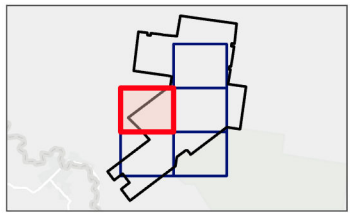
Location of Black Falcon, Chestnut Quail-thrush, Dusky Woodswallow and Gilbert's Whistler Records in the Project Area (2022–2024 Surveys)

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point
- Observation Location

Species Common Name

- Chestnut Quail-thrush
- Road
- Watercourse
- Waterbody



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FIGURE 8.1.3

Location of Black Falcon, Chestnut Quail-thrush, Dusky Woodswallow and Gilbert's Whistler Records in the Project Area (2022–2024 Surveys)

Legend

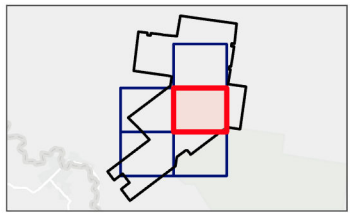
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Black Falcon
- Chestnut Quail-thrush
- Dusky Woodswallow
- Gilbert's Whistler
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

Scale 1:50,000 at A4

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FIGURE 8.1.4

Location of Black Falcon, Chestnut Quail-thrush, Dusky Woodswallow and Gilbert's Whistler Records in the Project Area (2022–2024 Surveys)

Legend

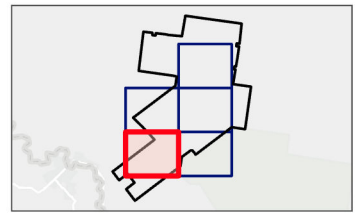
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Black Falcon
- Dusky Woodswallow
- Gilbert's Whistler
- NPWS Estates
- Road
- Watercourse
- Waterbody



0 2

Kilometres

Scale 1:50,000 at A4

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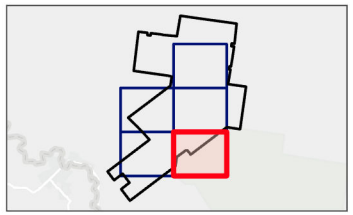


FIGURE 8.1.5

Location of Black Falcon, Chestnut Quail-thrush, Dusky Woodswallow and Gilbert's Whistler Records in the Project Area (2022–2024 Surveys)

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point
- Observation Location
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

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8.2.5 Hooded Robin (south-eastern subspecies) (*Melanodryas cucullata cucullata*)

8.2.5.1 Information on Hooded Robin from Wind Farms in Australia

There are no records of blade strike of hooded robin in the available literature.

8.2.5.2 Status and Flight Behaviour in the Project Area

The hooded robin is a widespread though generally uncommon resident that occurs in shrublands and woodlands across much of the Murray Darling Depression Bioregion. Hooded robin were regularly recorded in the Project Area during the 2022–2024 bird surveys especially in the central and the south-west parts of the site. Hooded robin were recorded on 55 occasions, including 28 times during vantage point surveys, 15 times during woodland bird surveys and 12 times incidentally across all seven seasonal surveys.
The location of observations of hooded robin in the Project Area is shown in **Figure 8.2.0 to 8.2.5**.

Hooded robin were recorded at five of the 15 vantage point sites (**Table 8.9**). The overall reporting rate across all vantage point surveys was 5.0% (25/491). Hooded robin were recorded in flight on 21 occasions. All observations were of birds flying below 10 m AGL.

Table 8.9 Number of Hooded Robin Observations at Each Vantage Point Site

	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11	VP12	VP13	VP14	VP15
Number of obs.	8	1	4	0	0	14	0	0	0	1	0	0	0	0	0
Proportion of surveys recorded	7/39 (18%)	1/42 (2%)	2/42 (5%)	0/43	0/41	14/43 (33%)	0/45	0/35	0/42	1/42 (2%)	0/19	0/18	0/16	0/12	0/12

8.2.5.3 Likelihood and Consequence of Impacts

The overall risk rating for the hooded robin is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.10**). Note that despite a High rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The hooded robin is highly unlikely to fly at RSA height. Hence, Criterion A is assigned Low.

b. The hooded robin is resident in the Project Area. Hence, Criterion B is assigned High.

c. The hooded robin is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the hooded robin align with the Low rating for Criterion D (Higgins and Peter 2002).

e. The hooded robin population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Criterion E is assigned Low.

f. The south-eastern hooded robin subspecies (*M. c. cucullata*) is listed as Endangered under the EPBC Act and the BC Act.

Table 8.10 Hooded Robin Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						
High		X				X
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

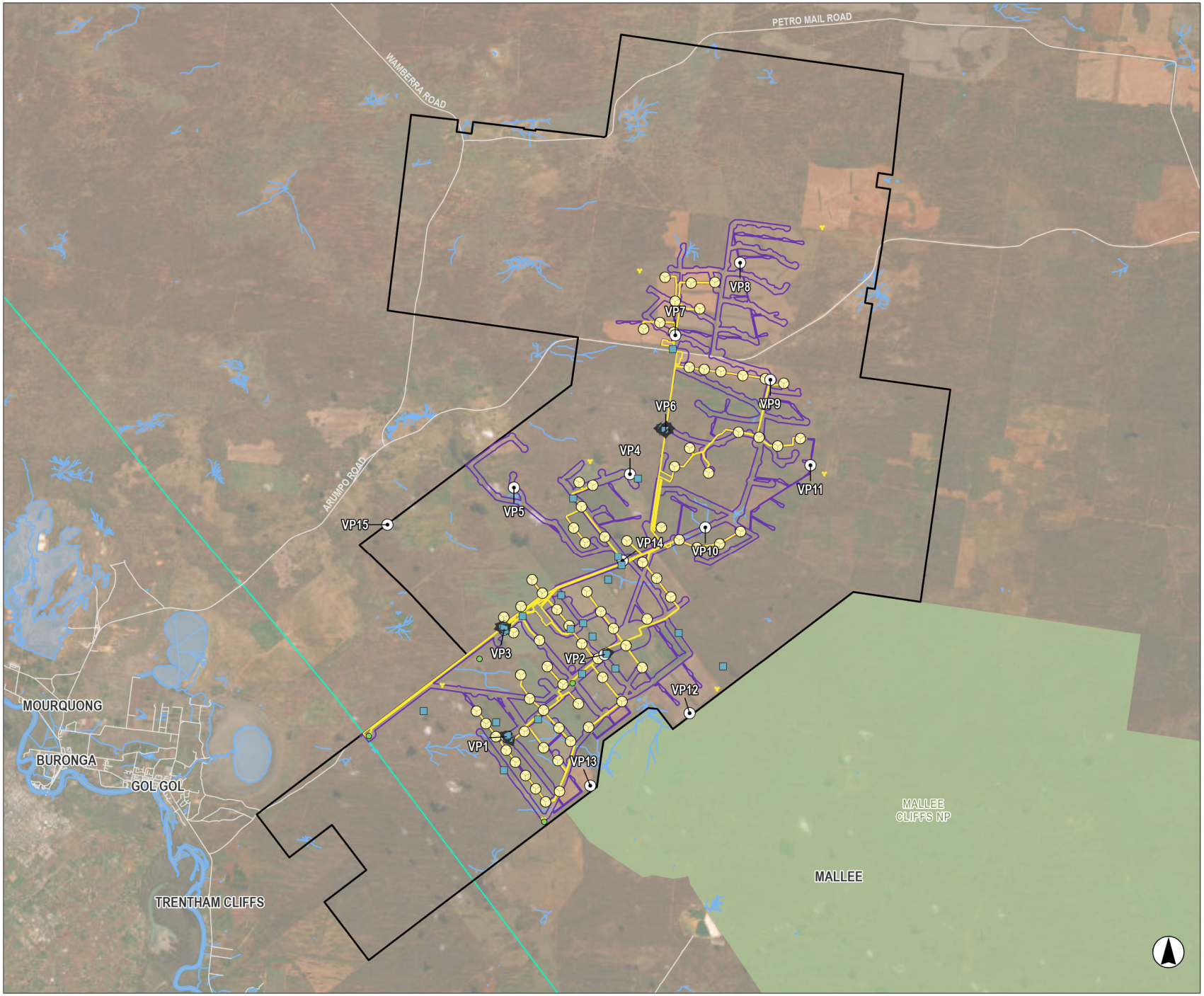


FIGURE 8.2.0

Location of Hooded Robin Records in the Project Area (2022–2024 Surveys)

Legend

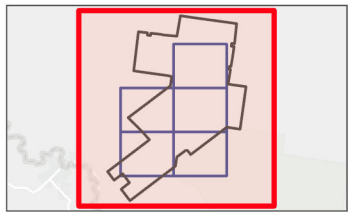
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Hooded Robin
- NPWS Estates
- Road
- Watercourse
- Waterbody



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GDA2020 MGA Zone 54

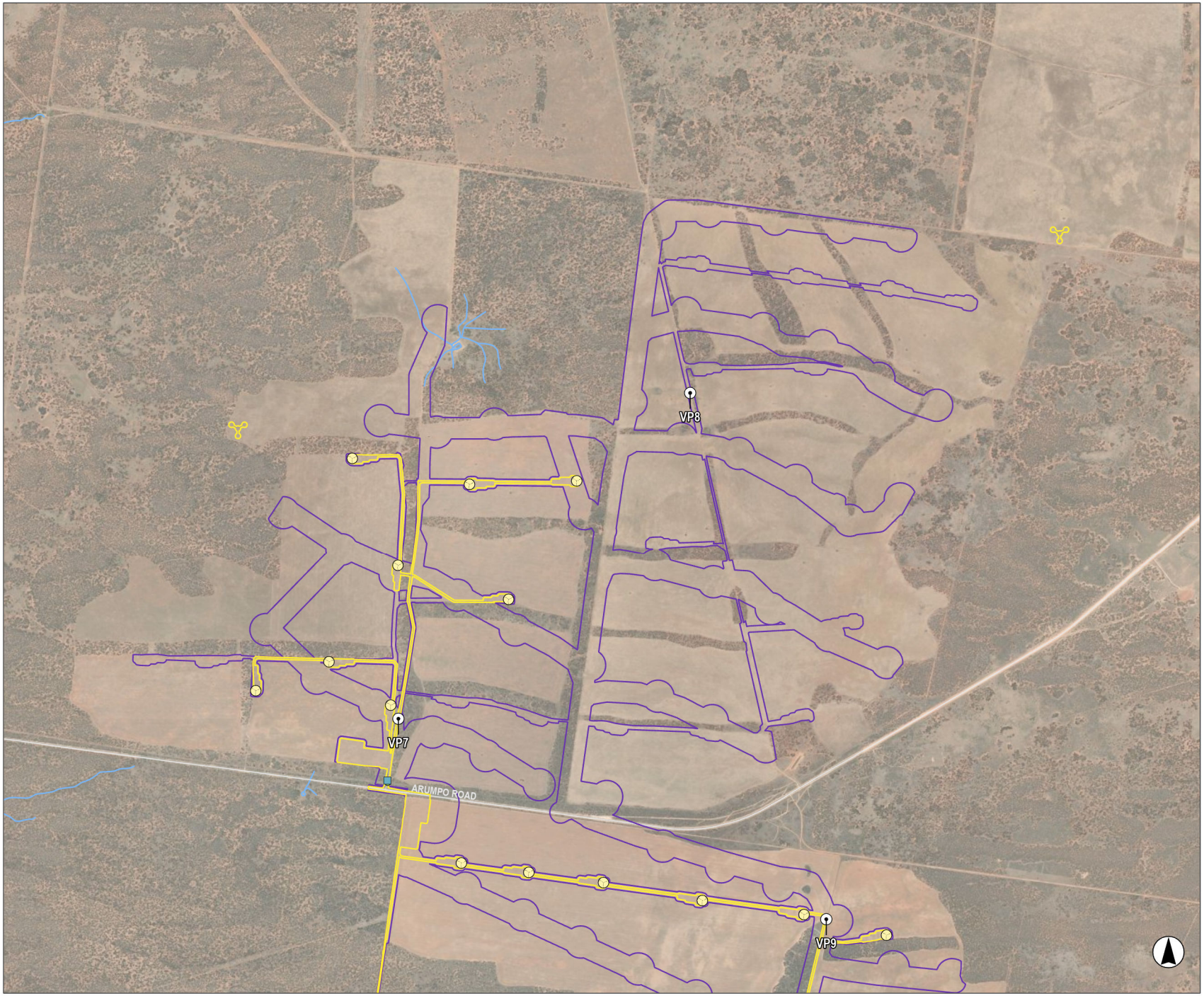
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FIGURE 8.2.1

Location of Hooded Robin Records in the Project Area (2022–2024 Surveys)

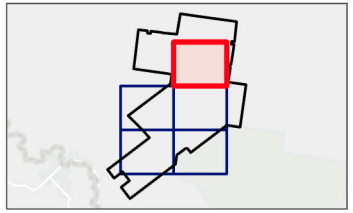


Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Species Common Name

- Hooded Robin
- Road
- Watercourse
- Waterbody



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GDA2020 MGA Zone 54

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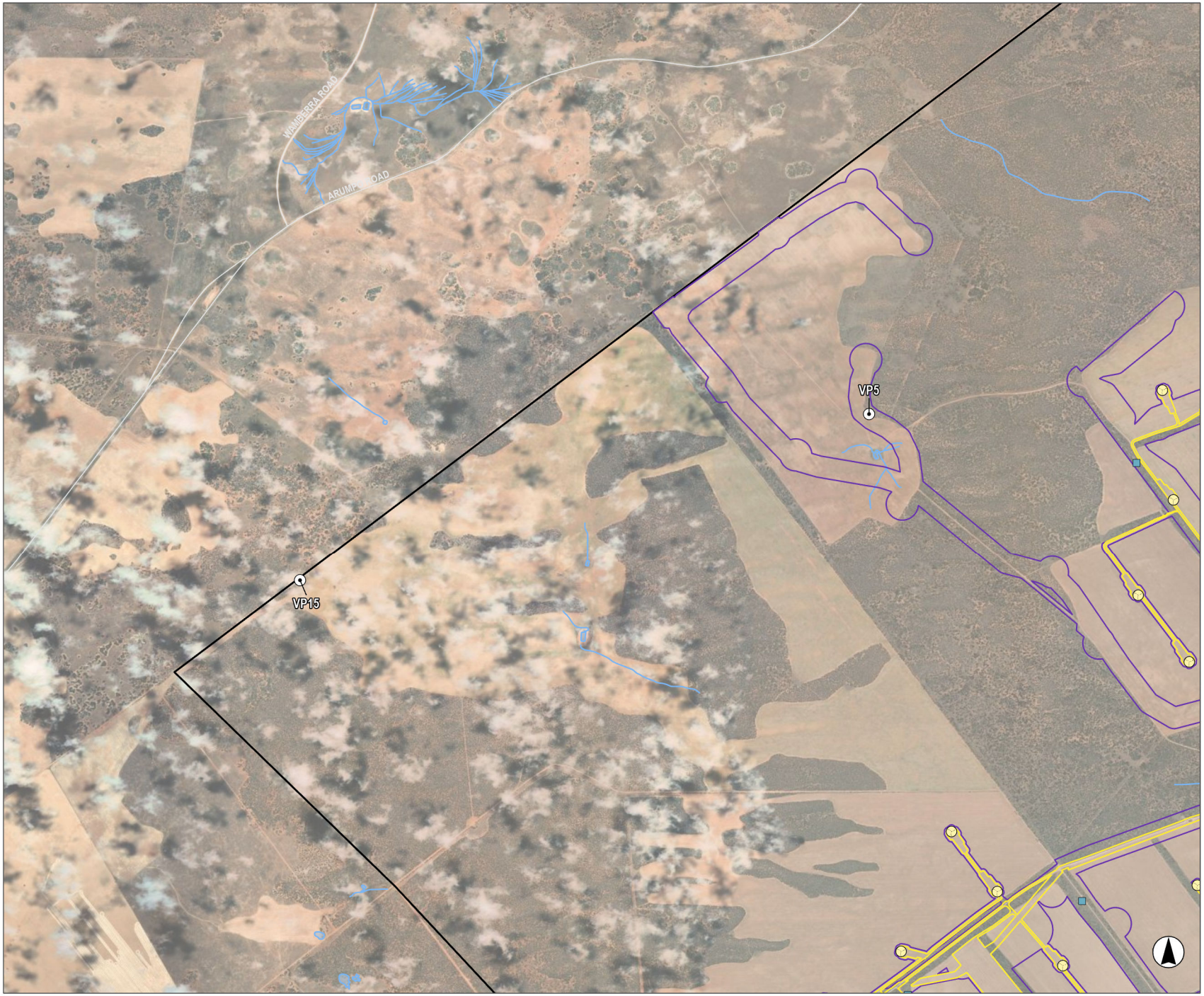


FIGURE 8.2.2

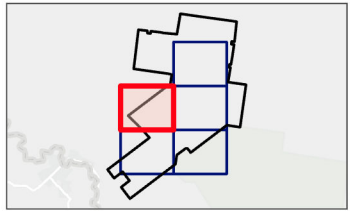
Location of Hooded Robin Records in the Project Area (2022–2024 Surveys)

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point
- Observation Location

Species Common Name

- Hooded Robin
- Road
- Watercourse
- Waterbody



Scale 1:50,000 at A4
GDA2020 MGA Zone 54

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FIGURE 8.2.3

Location of Hooded Robin Records in the Project Area (2022–2024 Surveys)



Legend

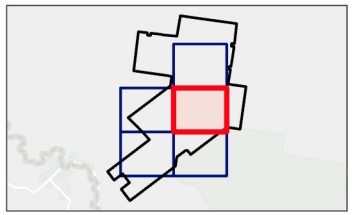
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Hooded Robin
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

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FIGURE 8.2.4

Location of Hooded Robin Records in the Project Area (2022–2024 Surveys)

Legend

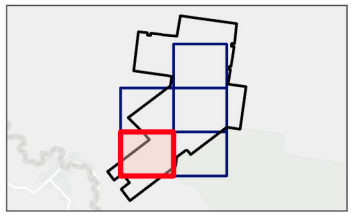
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Hooded Robin
- NPWS Estates
- Road
- Watercourse
- Waterbody



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FIGURE 8.2.5

Location of Hooded Robin Records in the Project Area (2022–2024 Surveys)



Legend

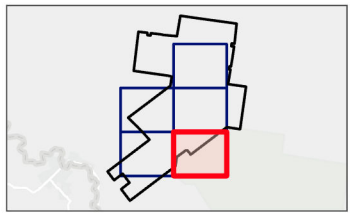
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Hooded Robin
- NPWS Estates
- Watercourse
- Waterbody



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8.2.6 Little Eagle (*Hieraaetus morphnoides*)

8.2.6.1 Information on Little Eagle from Wind Farms in Australia

Moloney *et al.* (2019) reported one record of blade strike of little eagle from post-construction mortality monitoring of 15 wind farms in Victoria from 2003 to 2018. Smales (2014) reported two records of blade strike of little eagle from eight wind farms in south-eastern Australia (i.e., Victoria and South Australia). It is likely that these reports are referring to the same record of blade strike in Victoria.

8.2.6.2 Status and Flight Behaviour in the Project Area

The little eagle is a widespread though uncommon breeding resident / nomad / migrant across the Murray Darling Depression Bioregion. Little eagle were recorded on four occasions in the Project Area during the 2022–2024 surveys, including once during woodland bird surveys and three times incidentally. The location of observations of little eagle in the Project Area is shown in **Figure 8.3.0 to 8.3.5**. A summary of little eagle observations in the Project Area is presented below:

- November 2022: one individual was incidentally observed 3 km south-west of VP3 in the south-western part of the Project Area. No flight details were recorded.
- 7 September 2022: two individuals were incidentally observed circling at 100 m AGL 2.3 km north-west of VP1 in the south-western part of the Project Area
- 7 February 2023: one individual was incidentally observed 700 m south-west of VP3 in the south-western part of the Project Area. No flight details were recorded.
- 28 March 2023: one individual was observed during a woodland bird survey 900 m east of VP5 in the central-western part of the Project Area. No flight details were recorded.

8.2.6.3 Likelihood and Consequence of Impacts

The overall risk rating for little eagle is High, based on a High likelihood and Moderate consequence of collisions (**Table 8.11**). The rationale for responses to each criterion is as follows:

a. The little eagle regularly flies at RSA height. Hence, Criterion A is conservatively assigned High.

b. The little eagle is an uncommon visitor to the Project Area. Hence, Criterion B is assigned Moderate.

c. The little eagle is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the little eagle overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Marchant and Higgins 1993). Hence, Criterion D is assigned Moderate.

e. In 2009, the population of little eagle was estimated to number 10,000 to 100,000 individuals, based upon an estimate made by Ferguson and Christie (2001), although the data quality is listed as poor (Birdlife International 2024). Given the uncertainty of this estimate and the decline of little eagle in NSW (Barrett *et al*. 2007) and the ACT (Olsen and Fuentes 2005). Criterion E is conservatively assigned Moderate (based on the lower population estimate).

f. Little eagle is listed as Vulnerable under the BC Act.

Table 8.11 Little Eagle Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			
Moderate		X		X	X	X
High	X					
Risk Rating						
Likelihood	High					
Consequence	Moderate					
Risk Rating	High					

8.2.7 Pacific Swift (*Apus pacificus*)

8.2.7.1 Information on Pacific Swift from Wind Farms in Australia

Moloney *et al*. (2019) reported one record of blade strike of Pacific swift from post-construction mortality monitoring of 15 wind farms in Victoria from 2003 to 2018. There are no records of blade strike from any wind farms in NSW.

8.2.7.2 Status and Flight Behaviour in the Project Area

The Pacific swift is an uncommon migrant that may be detected overhead anywhere in the Murray Darling Depression Bioregion between October - April. Pacific swift were recorded on two occasions in the Project Area during the 2022–2024 surveys. Both observations were recorded during vantage point surveys. The first observation was of one individual flying at 20 m AGL during a morning survey at VP1 on 8 November 2022. The second observation was of a flock of 20 birds flying at approximately 90 m AGL during a midday survey at VP6 on 16 February 2023. The location of observations of Pacific swift in the Project Area is shown in **Figure 8.3.0 to 8.3.5**.

8.2.7.3 Likelihood and Consequence of Impacts

The overall risk rating for Pacific swift is Moderate, based on a High likelihood and Low consequence of collisions (**Table 8.11**). The rationale for responses to each criterion is as follows:

a. The Pacific swift regularly flies at RSA height. Hence, Criterion A is assigned High.

b. The Pacific swift is an uncommon visitor to the Project Area. Hence, Criterion B is assigned Moderate.

d. The Pacific swift is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low (Higgins 1999).

e. The life-history characteristics of the align with the Moderate rating for Criterion D (Higgins et al. 2001).

c. The Pacific swift population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Criterion E is assigned Low.

d. Pacific swift is listed as Migratory under the EPBC Act.

Table 8.12 Pacific Swift Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X		X	X
Moderate		X		X		
High	X					
Risk Rating						
Likelihood	High					
Consequence	Low					
Risk Rating	Moderate					

8.2.8 Pied Honeyeater (*Certhionyx variegatus*)

8.2.8.1 Information on Pied Honeyeater from Wind Farms in Australia

There are no records of blade strike of pied honeyeater in the available literature.

8.2.8.2 Status and Flight Behaviour in the Project Area

The pied honeyeater is an uncommon - rare nomadic visitor to the Murray Darling Depression Bioregion. Pied honeyeater were recorded on four occasions in the Project Area during the 2022–2024 surveys. Each of the four observations were of single birds recorded during woodland bird surveys on 11 November 2022. Three of the observations were from the south-western part of the Project Area and one was from 800 m south of VP 6 in the central-western part of the Project Area. No flight details were recorded. The location of observations of pied honeyeater in the Project Area is shown in **Figure 8.3.0 to 8.3.5**.

8.2.8.3 Likelihood and Consequence of Impacts

The overall risk rating for pied honeyeater is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.13**). The rationale for responses to each criterion is as follows:

a. The pied honeyeater may very rarely fly at RSA height. Hence, Criterion A is assigned Low.

b. The pied honeyeater is likely a rare visitor to the Project Area. Hence, Criterion B is assigned Low.

c. The pied honeyeater is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the align with the Low rating for Criterion D (Higgins *et al.* 2001).

e. The pied honeyeater population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Criterion E is assigned Low.

f. Pied honeyeater is listed as Vulnerable under the BC Act.

Table 8.13 Pied Honeyeater Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X	X	X	X	X	
Moderate						X
High						
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

8.2.9 Regent Parrot (eastern subspecies) (*Polytelis anthopeplus monarchoides*)

8.2.9.1 Information on Regent Parrot from Wind Farms in Australia

There are no records of blade strike of regent parrot in the available literature. There are currently no wind farms in the regent parrot's range.

8.2.9.2 Status and Flight Behaviour in the Project Area

The regent parrot is an uncommon breeding resident that occurs in river red gum (*Eucalyptus camaldulensis*) forest and woodland and mallee in the central and north-western parts of the Murray Darling Depression Bioregion between Morgan, S.A in the west, Wentworth, NSW in the north, Balranald, NSW in the east and Jeparit, Vic in the south. Regent parrot were recorded on three occasions on the south-eastern boundary of the Project Area during the 2022 – 2024 surveys, including once during vantage point surveys and twice incidentally. The location of observations of regent parrot in the Project Area is shown in **Figure 8.3.0 to 8.3.5**. A summary of regent parrot observations in the Project Area is presented below:

- 14 May 2024: a flock of 16 birds was incidentally observed at 8:55 am at VP13 in the southern part of the Project Area. These birds were flying south at heights of between 5-15 m AGL.
- 17 May 2024: a flock of 12 birds was observed flying east between 5-10 m AGL during a morning survey at VP13
- 17 May 2024: a flock of 14 birds was incidentally observed at 8:45 am flying north between 15-20 m AGL 1.7 km west of VP12 in the south-eastern part of the Project Area.

8.2.9.3 Likelihood and Consequence of Impacts

The overall risk rating for regent parrot is Moderate, based on a Moderate likelihood and Moderate consequence of collisions (**Table 8.15**). The rationale for responses to each criterion is as follows:

a. The regent parrot is likely to only rarely fly at RSA height. Hence, Criterion A is assigned Low

b. The regent parrot likely occasionally flies through or forages in the Project Area. Hence, Criterion B is assigned Moderate.

c. The regent parrot has a large range at the species level however a relatively high proportion of the eastern subspecies' population is concentrated along the Murray River and its tributaries. Given the Project Area's location relative to the Murray River and the findings of the bird surveys conducted at the Project to date it is unlikely that a high proportion of this species' population regularly flies through the Project Area. Criterion C is assigned Moderate.

d. The life-history characteristics of the regent parrot overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Higgins 1999). Hence, Criterion D is assigned Moderate.

e. The population of regent parrot is estimated to be 21,500 individuals (Garnett and Crowley 2000). However, it is noted that the total adult breeding population of the eastern subspecies that occurs in the Project Area is estimated at 1,500 pairs, with 600 in NSW (Sluiter *et al*. 2006), 500 in Victoria (Sluiter *et al*. 2006) and 400 in South Australia (Smith 2001). Hence, Criterion E is assigned as Moderate.

f. Regent parrot is listed as Vulnerable under the EPBC Act and Endangered under the BC Act.

Table 8.14 Regent Parrot Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X					
Moderate		X	X	X	X	
High						X
Risk Rating						
Likelihood	Moderate					
Consequence	Moderate					
Risk Rating	Moderate					

8.2.10 Shy Heathwren (*Hylacola cautus*)

8.2.10.1 Information on Shy Heathwren from Wind Farms in Australia

There are no records of blade strike of shy heathwren in the available literature.

8.2.10.2 Status and Flight Behaviour in the Project Area

The shy heathwren is an uncommon, localised breeding resident that is generally restricted to larger tracts of native vegetation, particularly mallee, in the western half and the extreme eastern section of the Murray Darling Depression Bioregion. Shy heathwren was recorded on one occasion in the Project Area during the 2022-2024 surveys. A group of four birds was observed on 18 October 2023 in the understory at VP11 in the central-eastern part of the Project Area (**Figure 8.3.0 to 8.3.5**).

8.2.10.3 Likelihood and Consequence of Impacts

The overall risk rating for shy heathwren is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.15**). Note that despite a Moderate rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The shy heathwren is highly unlikely to fly at RSA height. Hence, Criterion A is assigned Low.

b. The shy heathwren is likely either a resident that occurs in a restricted part of the Project Area or a species that rarely or occasionally disperses through the Project Area. Criterion B is assigned Moderate.

c. The shy heathwren is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the shy heathwren align with the Low rating for Criterion D (Higgins and Peter 2002).

e. The shy heathwren population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Criterion E is assigned Low.

f. Shy heathwren is listed as Vulnerable under the BC Act.

Table 8.15 Shy Heathwren Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate		X				X
High						
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

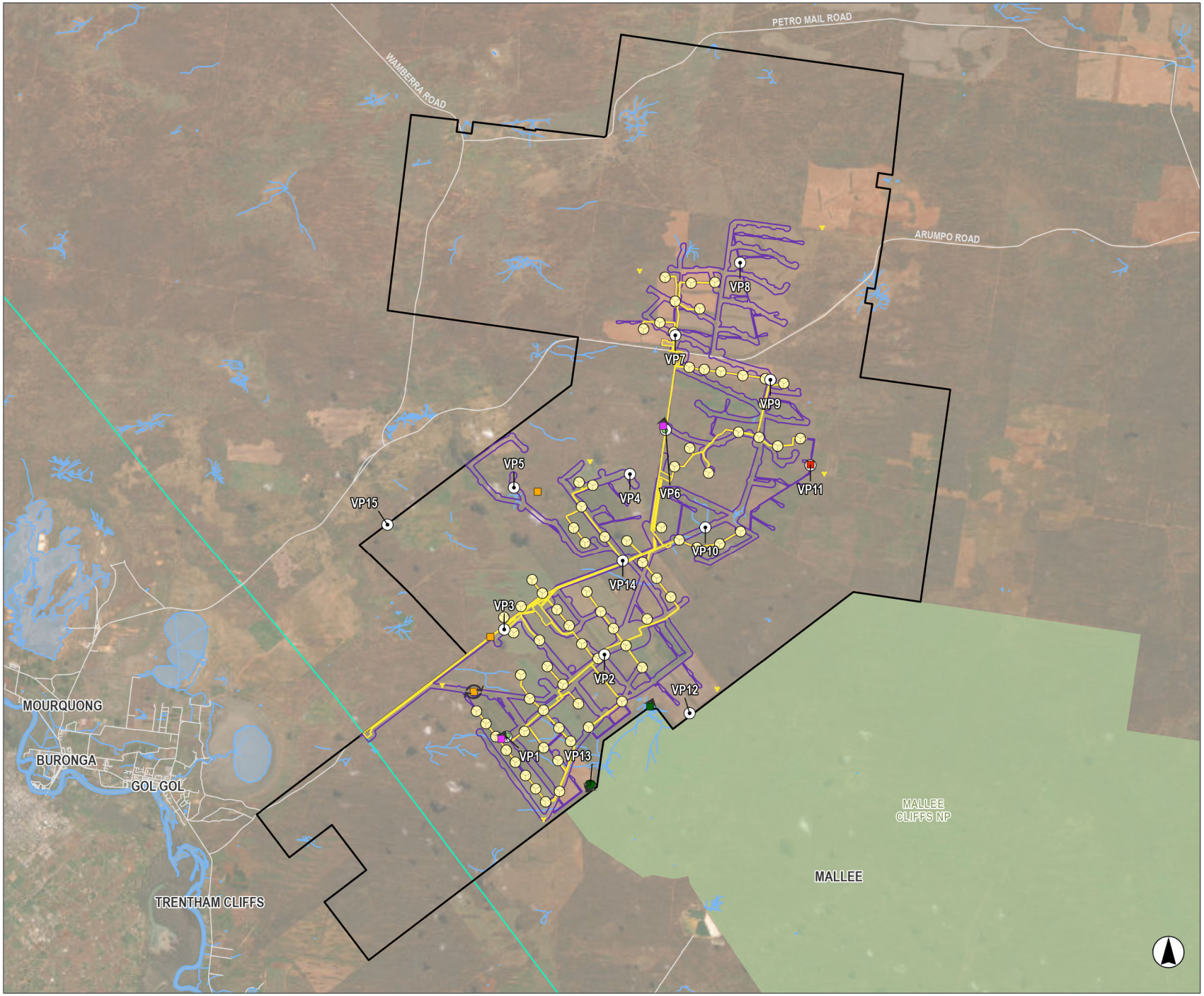


FIGURE 8.3.0

Location of Little Eagle, Pacific Swift, Pied Honeyeater, Regent Parrot and Shy Heathwren Records in the Project Area (2022–2024 Surveys)

Legend

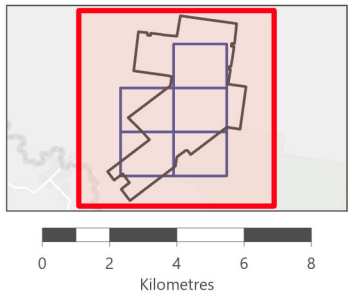
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Little Eagle
- Pacific Swift
- Regent Parrot
- Shy Heathwren
- NPWS Estates
- Road
- Watercourse
- Waterbody



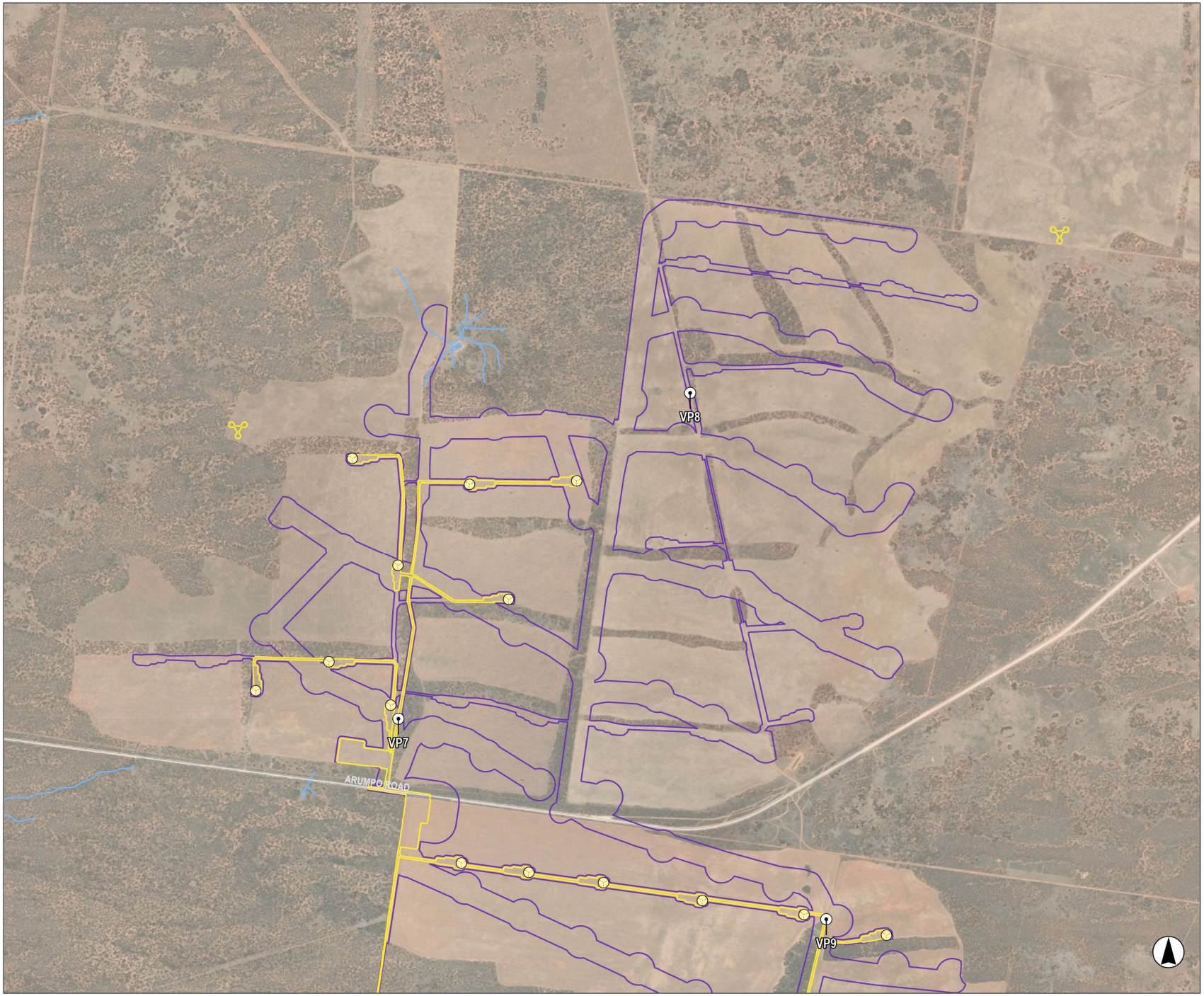
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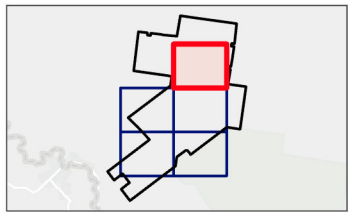
FIGURE 8.3.1

Location of Little Eagle, Pacific Swift, Pied Honeyeater, Regent Parrot and Shy Heathwren Records in the Project Area (2022–2024 Surveys)



Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point
- Road
- Watercourse
- Waterbody



0 2

Kilometres

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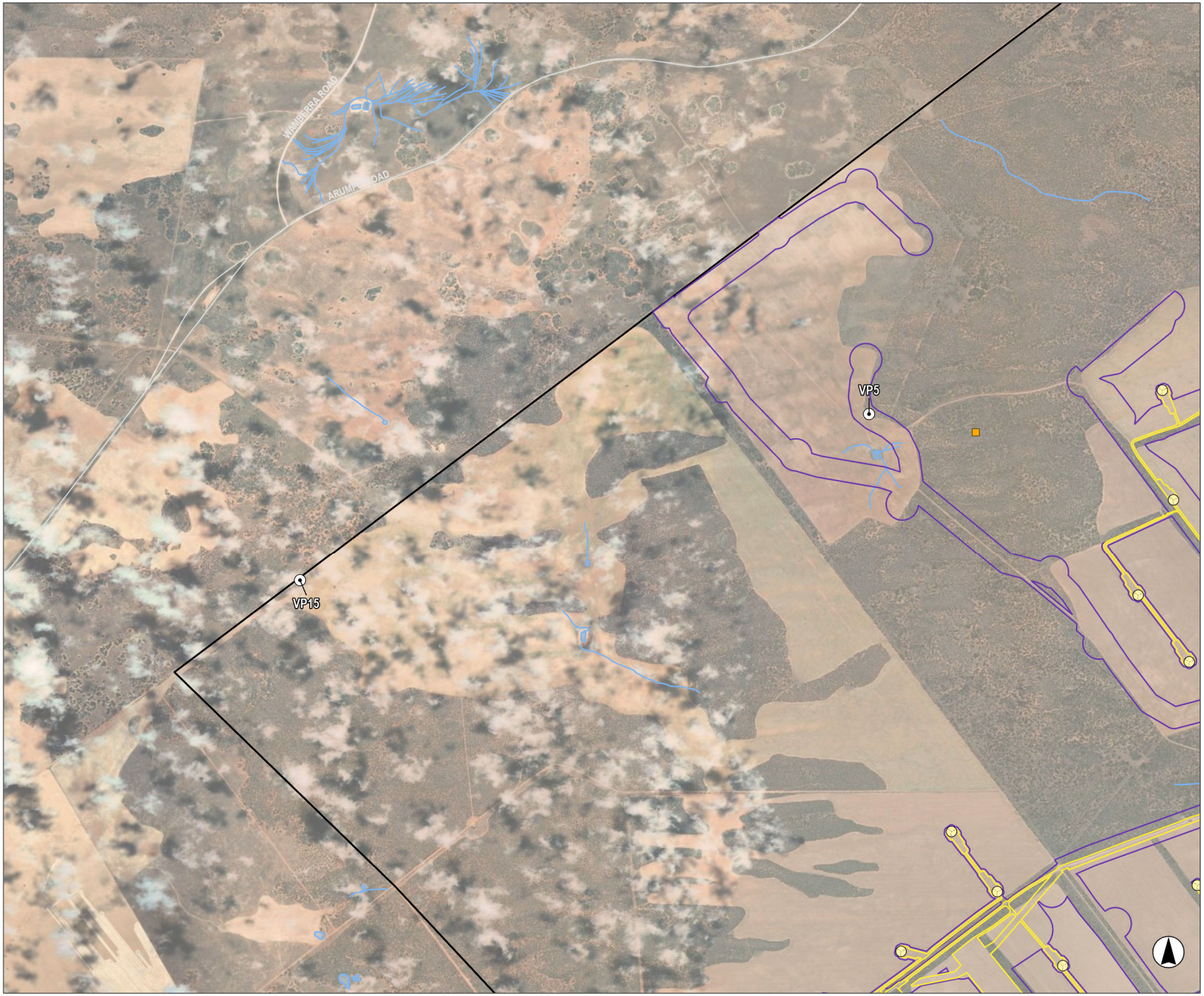


FIGURE 8.3.2

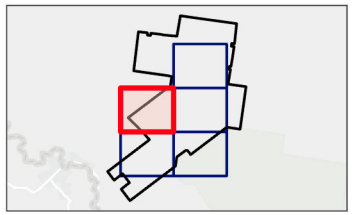
Location of Little Eagle, Pacific Swift, Pied Honeyeater, Regent Parrot and Shy Heathwren Records in the Project Area (2022–2024 Surveys)

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point
- Observation Location

Species Common Name

- Little Eagle
- Road
- Watercourse
- Waterbody



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FIGURE 8.3.3

Location of Little Eagle, Pacific Swift, Pied Honeyeater, Regent Parrot and Shy Heathwren Records in the Project Area (2022–2024 Surveys)



Legend

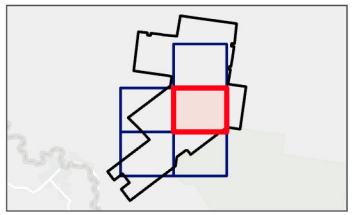
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Pacific Swift
- Shy Heathwren
- NPWS Estates
- Watercourse
- Waterbody



0 2

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FIGURE 8.3.4

Location of Little Eagle, Pacific Swift, Pied Honeyeater, Regent Parrot and Shy Heathwren Records in the Project Area (2022–2024 Surveys)

Legend

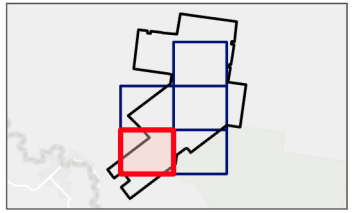
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Little Eagle
- Pacific Swift
- NPWS Estates
- Road
- Watercourse
- Waterbody



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FIGURE 8.3.5

Location of Little Eagle, Pacific Swift, Pied Honeyeater, Regent Parrot and Shy Heathwren Records in the Project Area (2022–2024 Surveys)

Legend

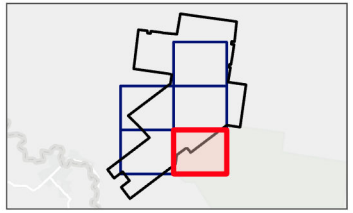
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Regent Parrot
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

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8.2.11 Southern Whiteface (*Aphelocephala leucopsis*)

8.2.11.1 Information on Southern Whiteface from Wind Farms in Australia

There are no records of blade strike of southern whiteface in the available literature.

8.2.11.2 Status and Flight Behaviour in the Project Area

The southern whiteface is a widespread common - uncommon breeding resident across the Murray Darling Depression Bioregion. Southern whiteface were regularly recorded in the Project Area during the 2022–2024 bird surveys having been recorded during each of the seven seasonal surveys. Southern whiteface were recorded on 30 occasions, including nine times during vantage point surveys, 11 times during woodland bird surveys and 10 times incidentally. The location of observations of southern whiteface in the Project Area is shown in (**Figure 8.4.0 to 8.4.5**).

Southern whiteface were recorded at six of the 15 vantage point sites (**Table 8.16**). The overall reporting rate across all vantage point surveys was 1.8% (9/491). Across all incidental sightings and surveys southern whiteface were recorded in flight on 10 occasions. All observed flights were at or below 10 m AGL.

Table 8.16 Number of Southern Whiteface Observations at Each Survey Site

	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP 10	VP 11	VP 12	VP 13	VP 14	VP 15
Number of obs.	0	0	1	0	1	4	0	0	1	0	1	0	0	0	1
Proportion of surveys recorded	0/39	0/42	1/42 (2%)	0/43	1/41 (2%)	4/43 (9%)	0/45	0/35	1/42 (2%)	0/42	1/19 (5%)	0/18	0/16	0/12	1/12 (8%)

8.2.11.3 Likelihood and Consequence of Impacts

The overall risk rating for the southern whiteface is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.17**). Note that despite a High rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The southern whiteface is highly unlikely to fly at RSA height. Hence, Criterion A is assigned Low.

b. Southern whiteface were regularly recorded in the Project Area during the 2022–2024 surveys. The species was recorded on 69 occasions. Hence, Criterion B is assigned High.

c. The southern whiteface is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the southern whiteface align with the Low rating for Criterion D (Higgins and Peter 2002).

e. There are currently estimated to be 477,000 (range 236,000–954,000) mature individuals in the wild (S Garnett pers. comm. 9 Nov 2021) with a declining trend (Ehmke *et al*. 2021).

f. Southern whiteface is listed as vulnerable under the BC Act and vulnerable under the EPBC Act.

Table 8.17 Southern Whiteface Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						X
High		X				
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

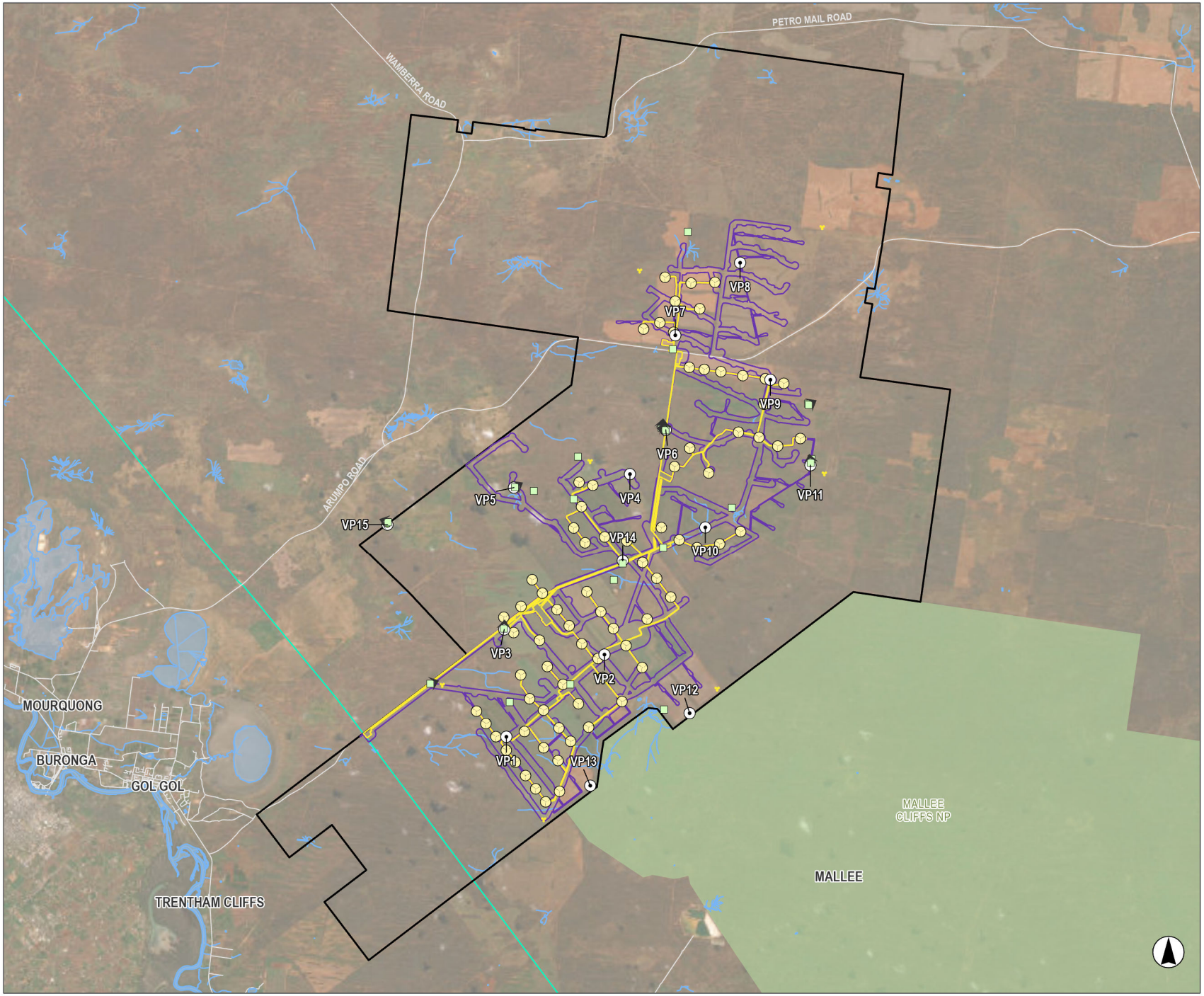


FIGURE 8.4.0

Location of Southern Whiteface Records in the Project Area (2022–2024 Surveys)

Legend

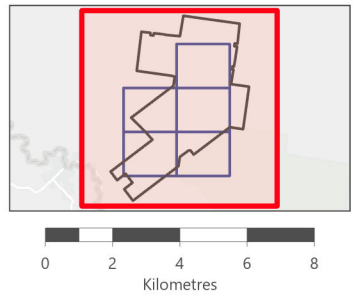
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Southern Whiteface
- NPWS Estates
- Road
- Watercourse
- Waterbody



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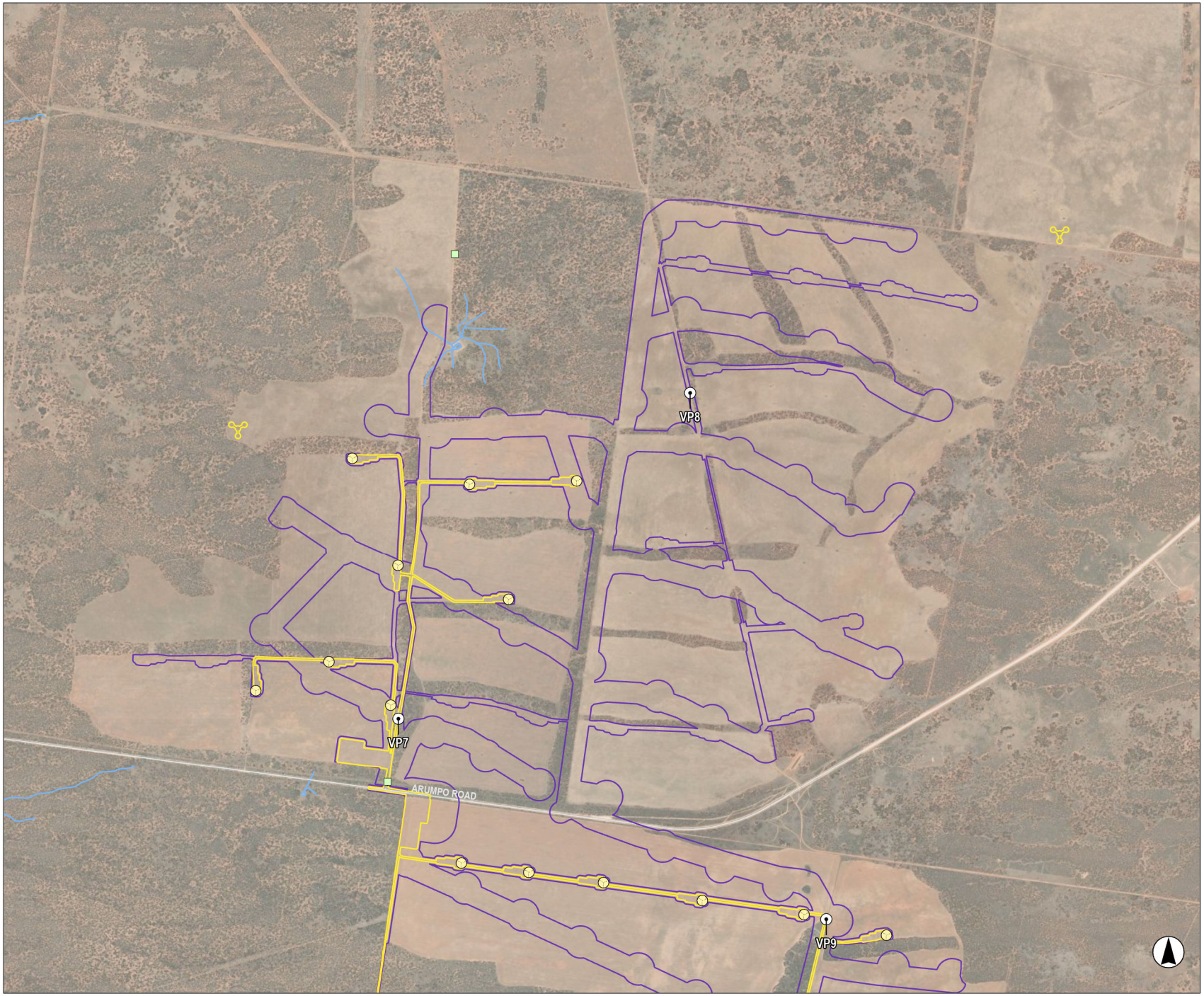


FIGURE 8.4.1

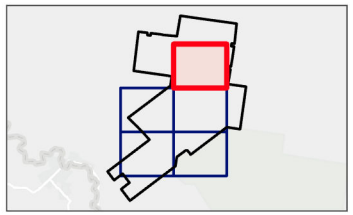
Location of Southern Whiteface Records in the Project Area (2022–2024 Surveys)

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Species Common Name

- Southern Whiteface
- Road
- Watercourse
- Waterbody



0 2

Kilometres

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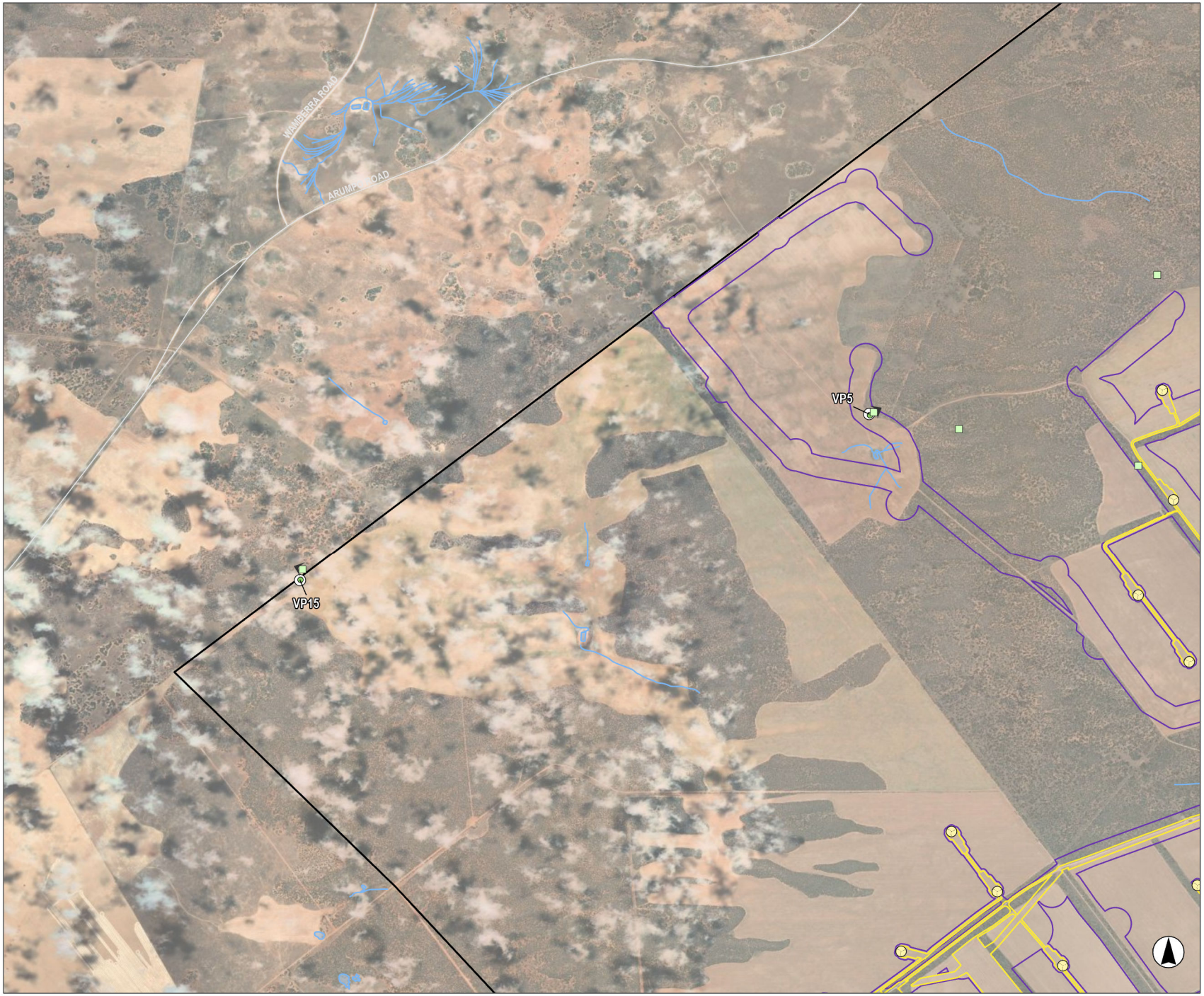


FIGURE 8.4.2

Location of Southern Whiteface Records in the Project Area (2022–2024 Surveys)

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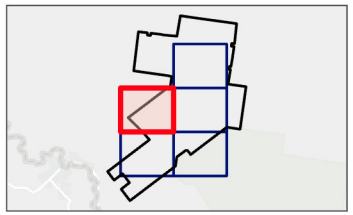
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Southern Whiteface
- Road
- Watercourse
- Waterbody



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FIGURE 8.4.3

Location of Southern Whiteface Records in the Project Area (2022–2024 Surveys)

Legend

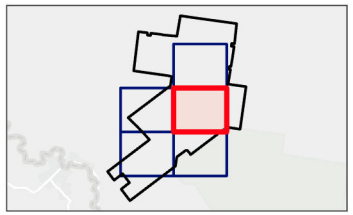
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Southern Whiteface
- NPWS Estates
- Watercourse
- Waterbody



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FIGURE 8.4.4

Location of Southern Whiteface Records in the Project Area (2022–2024 Surveys)

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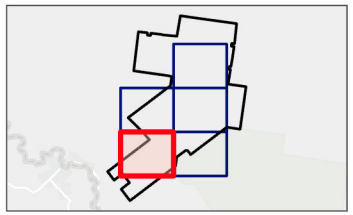
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Southern Whiteface
- NPWS Estates
- Road
- Watercourse
- Waterbody



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FIGURE 8.4.5

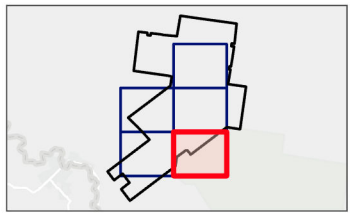
Location of Southern Whiteface Records in the Project Area (2022–2024 Surveys)

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Species Common Name

- Southern Whiteface
- NPWS Estates
- Watercourse
- Waterbody



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8.2.12 Spotted Harrier (*Circus assimilis*)

8.2.12.1 Information on Spotted Harrier from Wind Farms in Australia

One deceased spotted harrier was reported during monitoring from 2003 to 2018 across 15 wind farms in Victoria (Moloney *et al*. 2019).

8.2.12.2 Status and Flight Behaviour in the Project Area

The spotted harrier is a widespread though uncommon resident / nomad / partial migrant in the Murray Darling Depression Bioregion. Some birds are resident whereas others are thought to be dispersive or migratory. In south-west NSW, spotted harrier may overwinter only in good seasons, more usually dispersing or migrating in autumn and returning in spring (Marchant and Higgins 1993).

Spotted harrier was regularly recorded across the Project Area during the 2022–2024 bird surveys. It was recorded on 50 occasions, including 32 times during vantage point surveys, once during woodland bird surveys and 17 times incidentally. The location of observations of spotted harrier in the Project Area is shown in **Figure 8.5.0 to 8.5.5**.

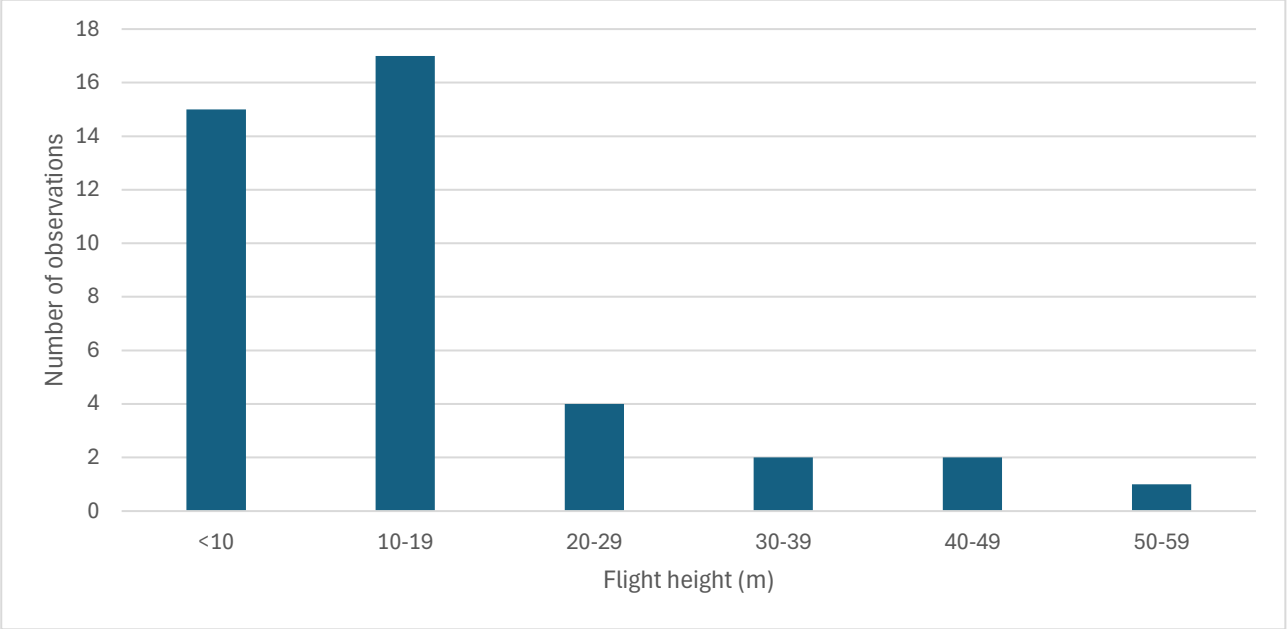
Spotted harrier were recorded at eight of the 15 vantage survey sites (**Table 8.18**). Spotted harrier were recorded during six of the seven seasonal survey events. The overall reporting rate across all vantage point surveys was 5.9% (29/491).

A summary of spotted harrier observations in the Project Area is presented below:

- 92% (46/50) of observations were of individuals, whilst 8% (4/50) were of two birds.
- Spotted harrier were recorded in flight on 41 occasions. Behaviour was not recorded for the remaining nine observations. The height of observed birds at the moment when first detected during each observation is shown in **Graph 8.1**. Spotted harrier was only observed flying at RSA height on one occasion. During 78% (32/42) of observations of spotted harrier in flight the observed bird was first detected at a height of <20 m.
- Maximum flight height recorded for spotted harrier was 80 metres.

Table 8.18 Number of Spotted Harrier Observations at Each Survey Site

	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11	VP12	VP13	VP14	VP15
Number of obs.	2	9	0	2	3	1	1	0	11	3	0	0	0	0	0
Proportion of surveys recorded	2/39 (5%)	6/42 (14%)	0/42	2/43 (5%)	3/41 (7%)	1/43 (2%)	1/45 (2%)	0/35	11/42 (26%)	3/42 (7%)	0/19	0/18	0/16	0/12	0/12



Graph 8.1 Number of observations of spotted harrier (at moment of initial detection) in each height class

8.2.12.3 Likelihood and Consequence of Impacts

The overall risk rating for spotted harrier is High, based on a High likelihood and Moderate consequence of collisions (**Table 8.19**). The rationale for responses to each criterion is as follows:

a. Flight data from observations in the Project Area showed that spotted harriers were mostly recorded at <20 m AGL. Maximum flight height recorded however, was 80 metres which is within RSA height. Dispersing birds or pairs searching for new territories have been documented flying between woodland patches using thermals and flying at 500 m (Higgins *et al*. 2006). Hence, Criterion A has been assigned Moderate.

b. Spotted harriers were recorded on 50 occasions in the Project Area during the 2022–2024 surveys. Hence, Criterion B is assigned High.

c. The spotted harrier is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the spotted harrier overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Marchant and Higgins 1993). Hence, Criterion D is assigned Moderate.

e. The spotted harrier population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Hence, Criterion E is assigned Low.

f. Spotted harrier is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.19 Spotted Harrier Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X		X	
Moderate	X			X		X
High		X				
Risk Rating						
Likelihood	High					
Consequence	Moderate					
Risk Rating	High					

8.2.13 Square-tailed Kite (*Lophoictinia isura*)

8.2.13.1 Information on Square-tailed Kite from Wind Farms in Australia

There are no records of blade strike of square-tailed kite in the available literature.

8.2.13.2 Status and Flight Behaviour in the Project Area

The square-tailed kite is an uncommon - rare nomad / partial migrant in the Murray Darling Depression Bioregion that is typically most frequently recorded within 20 km of the Murray River in this region. Square-tailed kite was recorded on one occasion incidentally in the Project Area during the 2022-2024 surveys (**Figure 8.5.0 to 8.5.5**). A single bird was observed on 18 March 2023 approximately 1.5 km north-east of VP10 in the central part of the Project Area flying at a maximum height of 40 m AGL.

8.2.13.3 Likelihood and Consequence of Impacts

The overall risk rating for square-tailed kite is Moderate, based on a Moderate likelihood and Moderate consequence of collisions (**Table 8.20**). The rationale for responses to each criterion is as follows:

a. The square-tailed kite occasionally flies at RSA height. Flight data from a single observed square-tailed kite within the Project Area was recorded flying between 20 to 40 m AGL, which is close to RSA height. Hence, Criterion A has been assigned as Moderate.

b. Square-tailed kite was recorded on one occasions in the Project Area during the 2022–2024 surveys. Hence, Criterion B is assigned Low.

c. The square-tailed kite is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the square-tailed kite overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Marchant and Higgins 1993). Hence, Criterion D is assigned Moderate.

e. The total population has been estimated to be between 1,000 and 10,000 birds (Ferguson-Lees & Christie 2001), or approximately 7,000 breeding birds (Garnett & Crowley 2000). Hence, Criterion E has been assigned Moderate.

f. Square-tailed kite is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.20 Square-tailed Kite Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low		X	X			
Moderate	X			X	X	X
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Moderate					
Risk Rating	Moderate					

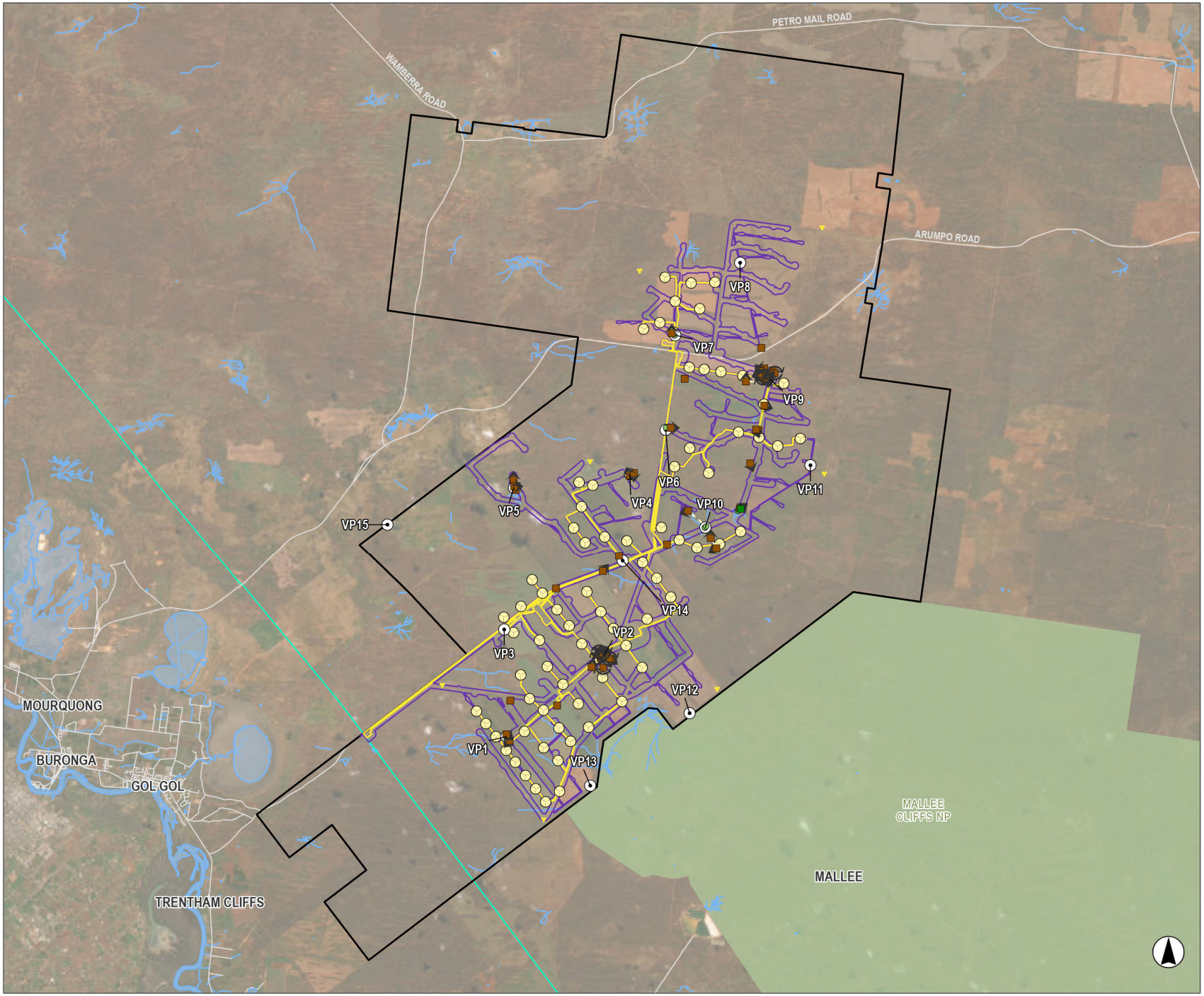


FIGURE 8.5.0

Location of Spotted Harrier and Square-tailed Kite Records in the Project Area (2022–2024 Surveys)

Legend

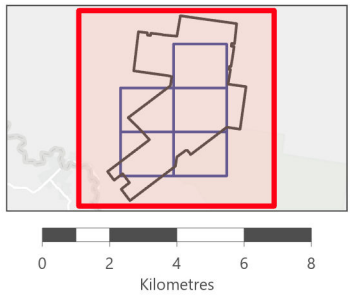
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Spotted Harrier
- Square-tailed Kite
- NPWS Estates
- Road
- Watercourse
- Waterbody



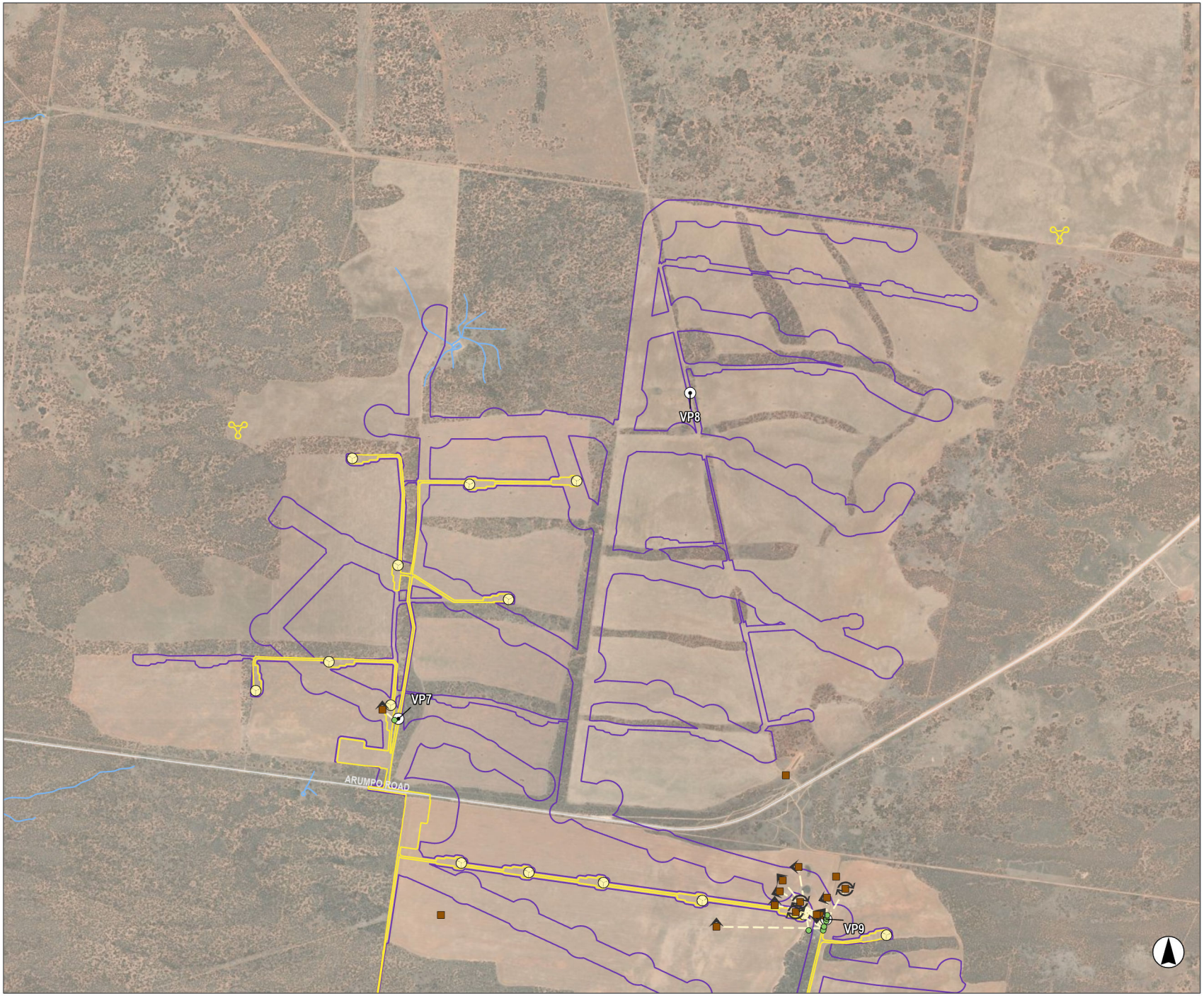
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FIGURE 8.5.1

Location of Spotted Harrier and Square-tailed Kite Records in the Project Area (2022–2024 Surveys)



Legend

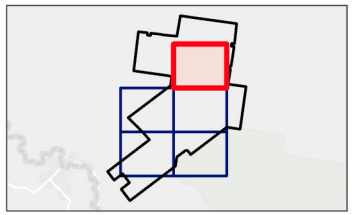
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- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Spotted Harrier
- Road
- Watercourse
- Waterbody



0 2

Kilometres

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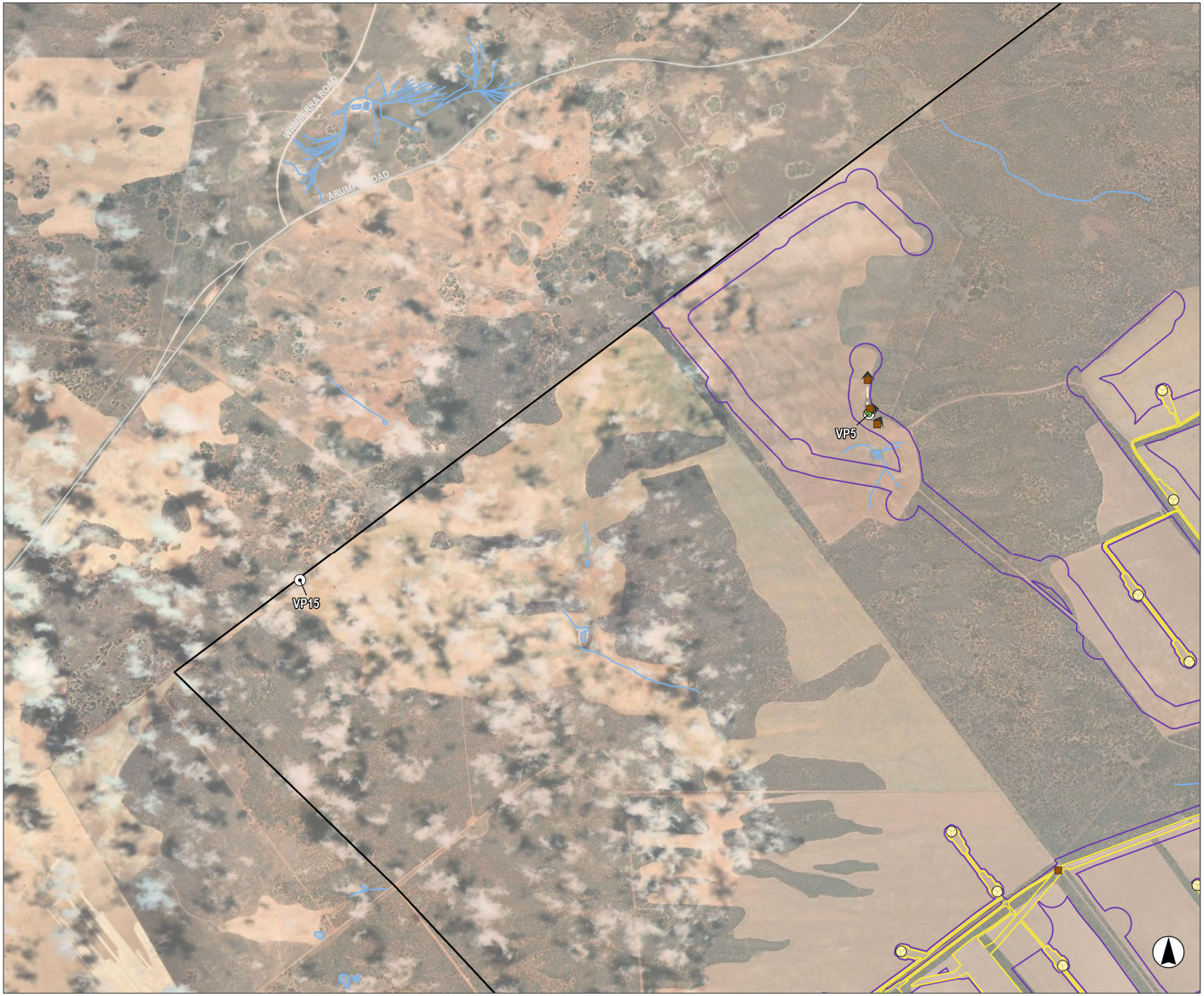


FIGURE 8.5.2

Location of Spotted Harrier and Square-tailed Kite Records in the Project Area (2022–2024 Surveys)

Legend

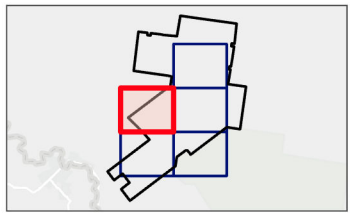
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- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Spotted Harrier
- Road
- Watercourse
- Waterbody



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FIGURE 8.5.3

Location of Spotted Harrier and Square-tailed Kite Records in the Project Area (2022–2024 Surveys)



Legend

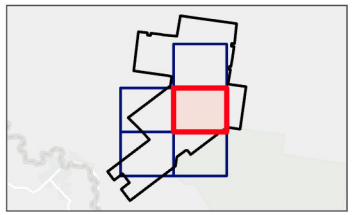
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- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Spotted Harrier
- Square-tailed Kite
- NPWS Estates
- Watercourse
- Waterbody



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FIGURE 8.5.4

Location of Spotted Harrier and Square-tailed Kite Records in the Project Area (2022–2024 Surveys)

Legend

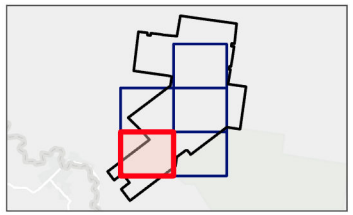
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Flight Behaviour

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Species Common Name

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FIGURE 8.5.5

Location of Spotted Harrier and Square-tailed Kite Records in the Project Area (2022–2024 Surveys)

Legend

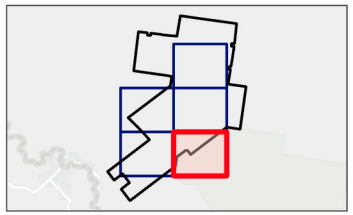
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Spotted Harrier
- NPWS Estates
- Watercourse
- Waterbody



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8.2.14 Varied Sittella (*Daphoenositta chrysoptera*)

8.2.14.1 Information on Varied Sittella from Wind Farms in Australia

There are no records of blade strike of varied sittella in the available literature.

8.2.14.2 Status and Flight Behaviour in the Project Area

The varied sittella is a widespread though uncommon breeding resident that occurs in woodlands throughout much of the Murray Darling Depression Bioregion. Varied sittella were recorded on 19 occasions in the Project Area during the 2022-2024 surveys, including 12 times during vantage point surveys and 7 times during woodland bird surveys. The location of observations of varied sittella in the Project Area is shown in **Figure 8.6.0** to **Figure 8.6.5**.

Varied sittella were recorded at three of the 15 vantage points (**Table 8.21**), during six of the seven seasonal survey events. The overall reporting rate across all vantage point surveys was 2% (11/491).

A summary of varied sittella observations in the Project Area is presented below:

- The majority of observations were of groups of at least four birds. There were two observations of a single bird. Groups of six birds were recorded on four occasions. Groups of two, four, eight, ten and 12 birds were recorded on one occasion each.
- Varied sittella were recorded in flight on seven occasions and whilst perched on four occasions. Behaviour was not recorded for the remaining eight observations.
- All observations of flight were of birds flying no higher than 15 m AGL.

Table 8.21 Number of Varied Sittella Observations at Each Survey Site

	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11	VP12	VP13	VP14	VP15
Number of obs.	0	0	2	9	0	0	0	0	0	0	0	0	0	1	0
Proportion of surveys recorded	0/39	0/42	2/42 (5%)	8/43 (19%)	0/41	0/43	0/45	0/35	0/42	0/42	0/19	0/18	0/16	1/12 (8%)	0/12

8.2.14.3 Likelihood and Consequence of Impacts

The overall risk rating for varied sittella is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.20**). Note that despite a High rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The varied sittella is unlikely to fly at RSA height. Hence, Criterion A is assigned Low.

b. Varied sittellas were recorded on 19 occasions in the Project Area during the 2022–2024 surveys. Hence, Criterion B is assigned High.

c. The varied sittella is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the varied sittella align with the Low rating for Criterion D (Higgins and Peter 2002).

e. The varied sittella population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Criterion E is assigned Low.

f. Varied sittella is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.22 Varied Sittella Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						X
High		X				
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

8.2.15 White-fronted Chat (*Epthianura albifrons*)

8.2.15.1 Information on White-fronted Chat from Wind Farms in Australia

There are no published records of blade strike of white-fronted chat in the available literature in Victoria (Moloney *et al*. 2019), south-east NSW (BCS unpublished data) or in north-west Tasmania (Hull *et al*. 2013). This is despite having a wide distribution in southern Australia, a preference for open landscapes in which the majority of wind farms are situated and a tendency to occasionally fly above 50 m AGL. Given the survey effort of post-construction monitoring to date, scavenger rates in open landscapes and the small size of this species amongst other factors it is plausible that instances of blade strike have gone undetected at Australian wind farms.

A review of literature identified that the species may actively avoid turbines, with an observation of turbine avoidance from Codrington Wind Farm in south-western Victoria. Meredith *et al*. (2002) reported a 100% turbine avoidance rate for the species at this location. However, given that the context of the situation in which this observation was made is unknown (i.e. the survey effort, number of observed flights, habitat type and all other relevant factors are unspecified) little can be drawn from this observation other than the conclusion that white-fronted chat do indeed avoid turbines (though the question of the rate at which they do remains unanswered).

8.2.15.2 Status and Flight Behaviour in the Project Area

The white-fronted chat is a widespread, common - uncommon breeding resident in open country across the Murray Darling Depression Bioregion. White-fronted chat were fairly regularly recorded in the Project Area during the 2022–2024 bird surveys. White-fronted chat were recorded on 30 occasions, including 20 times during vantage point surveys, once during woodland bird surveys and nine times incidentally. The location of observations of white-fronted chat in the Project Area is shown in **Figure 8.6.0 to 8.6.5**.

White-fronted chat were recorded at nine of the 15 vantage survey points (**Table 8.23**), and during all seven seasonal survey events. The overall reporting rate across all vantage point surveys was 3% (17/491).

A summary of white-fronted chat observations in the Project Area is presented below:

- The majority of observations were of groups of fewer than five birds however groups of six, 11, 14, 16, 28 and 40 birds were recorded on one occasion each.
- White-fronted chat were recorded in flight on 16 occasions and perched on eight occasions. Behaviour was not recorded for the remaining six observations.
- There were two observations of birds flying up to 20 m AGL and one of birds flying up to 15 m AGL. The remaining 14 observations of flight comprised birds flying at or below 10 m AGL.

Table 8.23 Number of White-fronted Chat Observations at Each Survey Site

	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11	VP12	VP13	VP14	VP15
Number of obs.	1	7	0	1	2	1	0	1	5	1	1	0	0	0	0
Proportion of surveys recorded	1/39 (3%)	5/42 (12%)	0/42	1/43 (2%)	2/41 (5%)	1/43 (2%)	0/45	1/35 (3%)	4/42 (10%)	1/42 (2%)	1/19 (5%)	0/18	0/16	0/12	0/12

8.2.15.3 Likelihood and Consequence of Impacts

The overall risk rating for white-fronted chat is Negligible, based on a Low likelihood and Low consequence of collisions (**Table 8.24**). Note that despite a High rating being assigned for Criterion B, the overall rating for consequence is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. The white-fronted chat is unlikely to fly at RSA height. Hence, Criterion A is assigned Low.

b. White-fronted chats were regularly recorded in the Project Area during the 2022–2024 surveys. The species was recorded on 30 occasions. Hence, Criterion B is assigned High.

c. The white-fronted chat is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Hence, Criterion C is assigned Low.

d. The life-history characteristics of the white-fronted chat align with the Low rating for Criterion D (Higgins *et al*. 2001).

e. The white-fronted chat population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024). Criterion E is assigned Low.

f. The white-fronted chat is listed as Vulnerable under the BC Act. It is not listed under the EPBC Act.

Table 8.24 White-fronted Chat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						X
High		X				
Risk Rating						
Likelihood	Low					
Consequence	Low					
Risk Rating	Negligible					

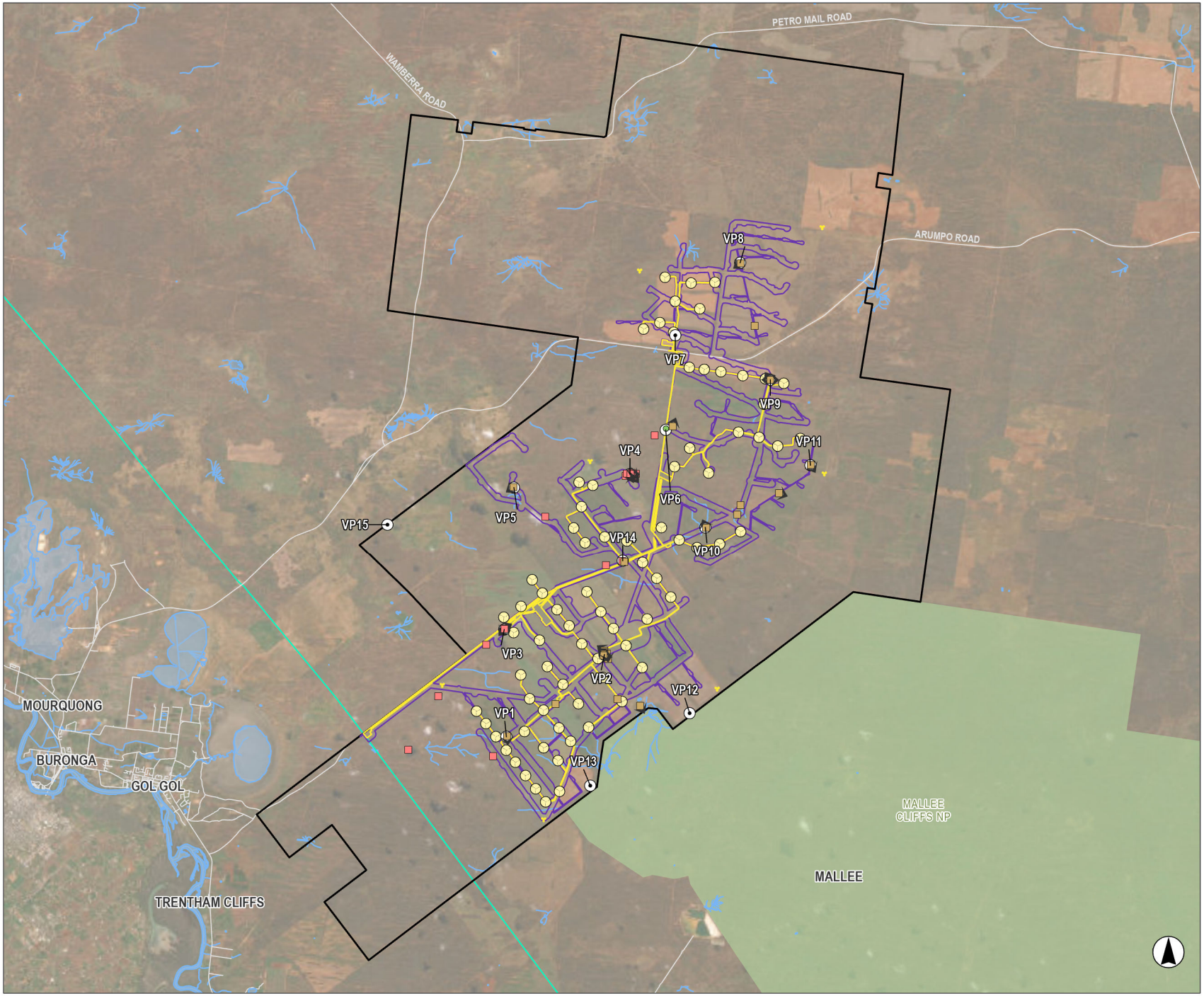


FIGURE 8.6.0

Location of Varied Sittella and White-fronted Chat Records in the Project Area (2022–2024 surveys)

Legend

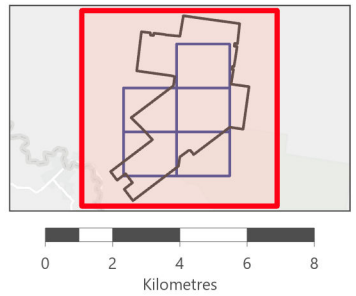
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Varied Sittella
- White-fronted Chat
- NPWS Estates
- Road
- Watercourse
- Waterbody



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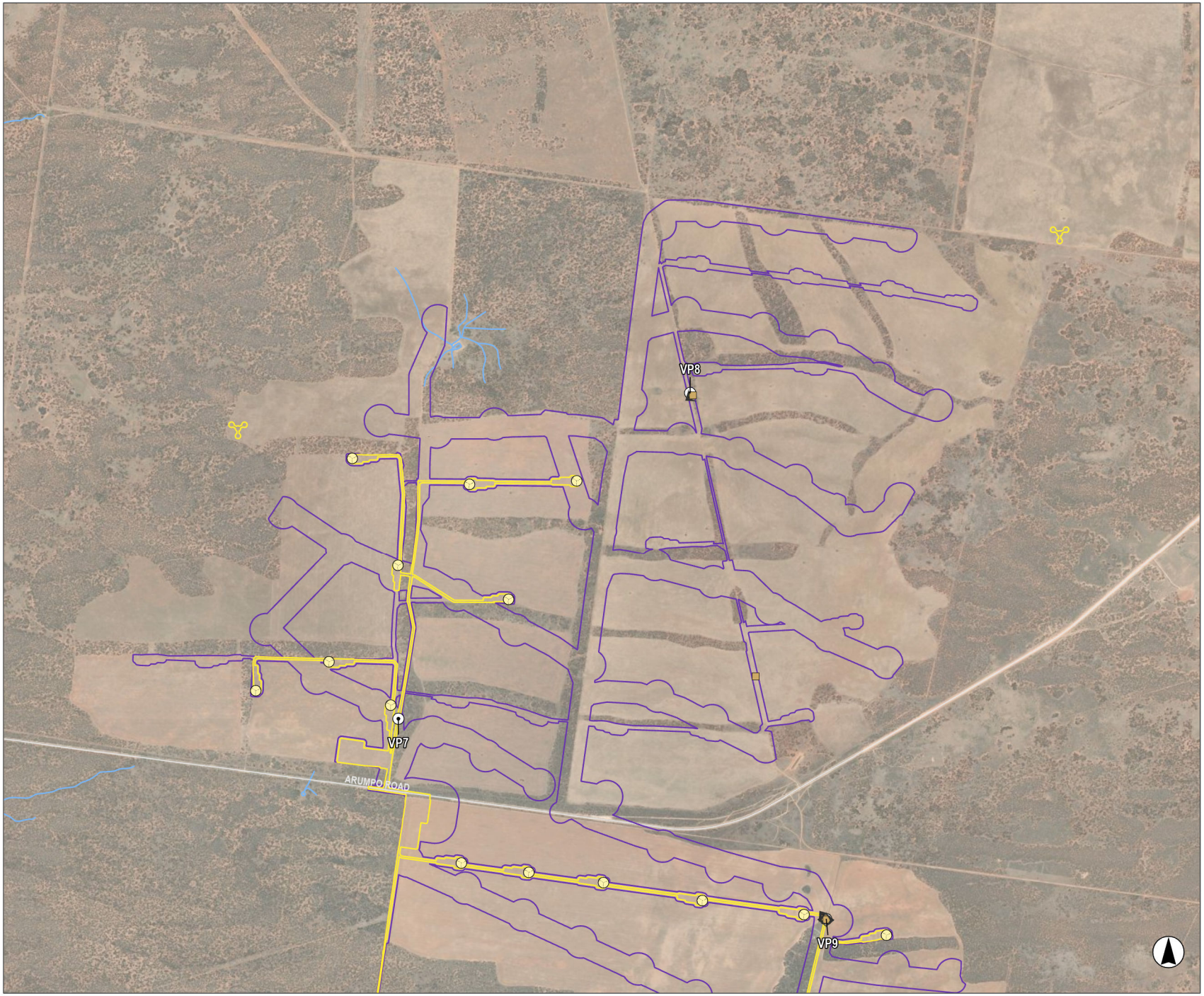


FIGURE 8.6.1

Location of Varied Sittella and White-fronted Chat Records in the Project Area (2022–2024 surveys)

Legend

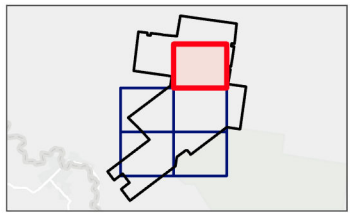
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- White-fronted Chat
- Road
- Watercourse
- Waterbody



0 2

Kilometres

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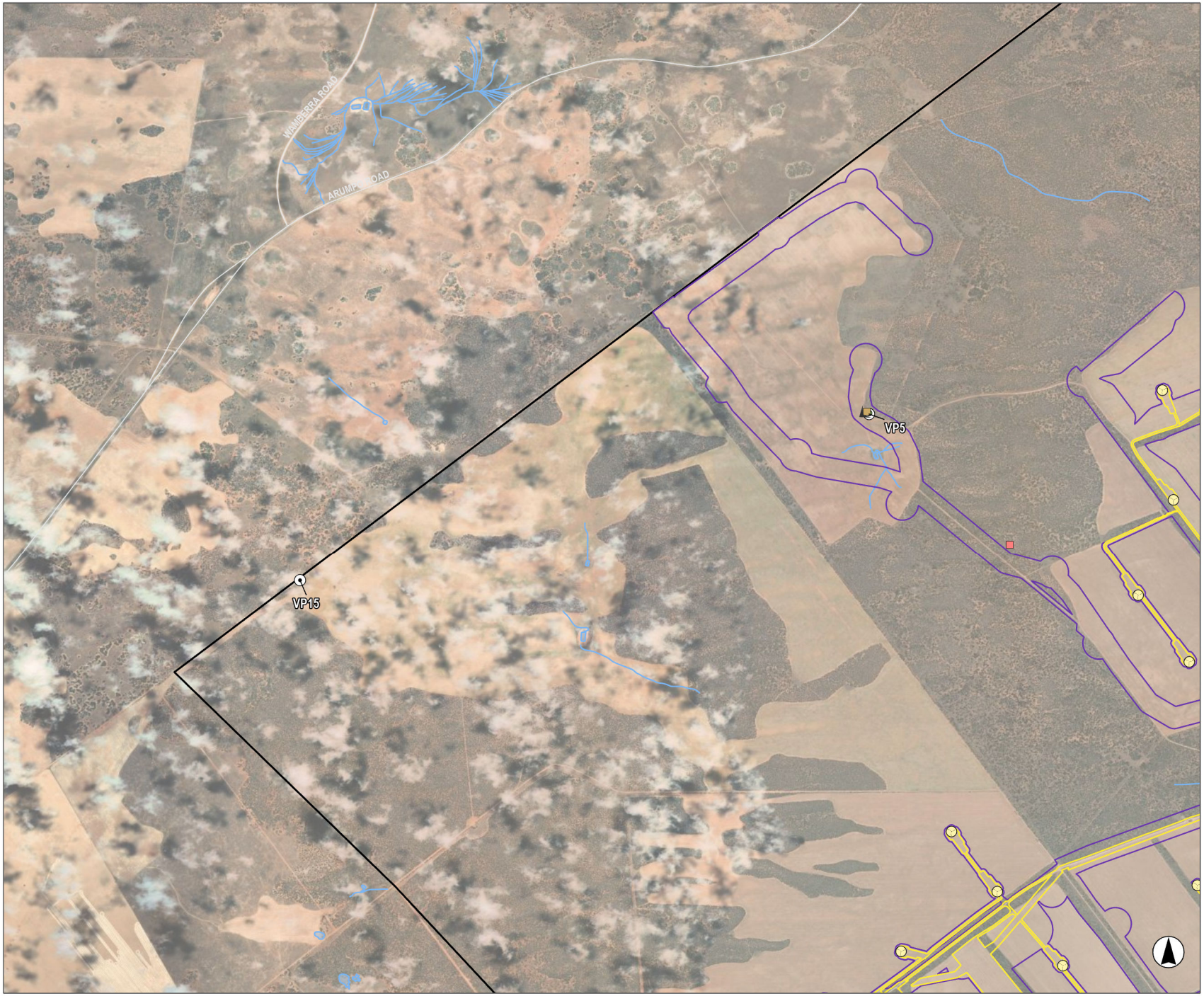


FIGURE 8.6.2

Location of Varied Sittella and White-fronted Chat Records in the Project Area (2022–2024 surveys)

Legend

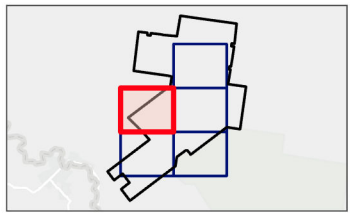
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Varied Sittella
- White-fronted Chat
- Road
- Watercourse
- Waterbody



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FIGURE 8.6.3

Location of Varied Sittella and White-fronted Chat Records in the Project Area (2022–2024 surveys)



Legend

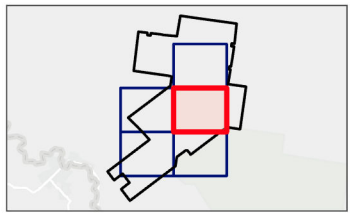
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Varied Sittella
- White-fronted Chat
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

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FIGURE 8.6.4

Location of Varied Sittella and White-fronted Chat Records in the Project Area (2022–2024 surveys)

Legend

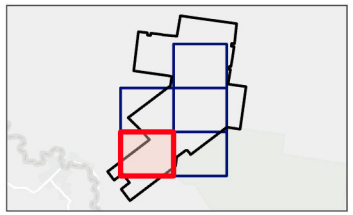
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Varied Sittella
- White-fronted Chat
- NPWS Estates
- Road
- Watercourse
- Waterbody



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FIGURE 8.6.5

Location of Varied Sittella and White-fronted Chat Records in the Project Area (2022–2024 surveys)

Legend

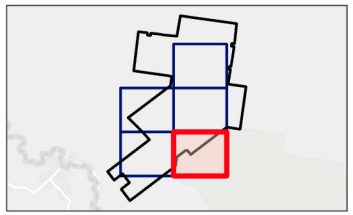
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- White-fronted Chat
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

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8.2.16 Mallee Bird Community of the Murray Darling Depression Bioregion EEC

The *Mallee Bird Community of the Murray Darling Depression Bioregion* EEC is an assemblage of 20 bird species that rely on mallee habitats. Within the assemblage two broad groups of species are recognised: mallee specialists and mallee dependents. Mallee specialists are found almost exclusively in mallee habitats and include black-eared miner, chestnut quail-thrush, mallee emu-wren, malleefowl, red-lored whistler, scarlet-chested parrot, striated grasswren and mallee western whipbird. Mallee dependents are bird species dependent on mallee where it is present, but that also utilise non-mallee woodland or shrubland habitat that intergrades with mallee vegetation. Mallee dependents include crested bellbird, grey-fronted honeyeater, Jacky winter, purple-gaped honeyeater, regent parrot, shy heathwren, southern scrub-robin , splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater and yellow-plumed honeyeater.

A total of ten species belonging to this EEC, namely chestnut quail-thrush, crested bellbird, Jacky winter, regent parrot, shy heathwren, splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater and yellow-plumed honeyeater were recorded in the Project Area during the 2022 – 2024 surveys. The location of observations of these species in the Project Area is shown in **Figure 8.7.0 to 8.7.5**. A further three species belonging to this EEC, namely malleefowl, grey-fronted honeyeater and southern scrub-robin may occasionally occur or disperse through the Project Area.

8.2.16.1 Information on blade strike from Wind Farms in Australia

Of the ten species belonging to the EEC that were recorded in the Project Area there is one record of blade strike of one species in NSW, being the spotted pardalote.

8.2.16.2 Status and Flight Behaviour in the Project Area

The assemblage of species belonging to this EEC that have been recorded in the Project Area range from common residents, such as crested bellbird and white-eared honeyeater, to occasional visitors or rare residents such as regent parrot and shy heathwren. A summary of the number of records of each of the ten species recorded in the Project Area and their maximum observed flight height during the 2022 – 2024 surveys is provided below:

- chestnut quail-thrush (6 records, not recorded in flight)
- crested bellbird (136 records, maximum flight height of 10 m)
- Jacky winter (19 records, maximum flight height of 8 m)
- regent parrot (6 records, maximum flight height of 20 m)
- shy heathwren (1 records, not recorded in flight)
- splendid fairy-wren (38 records, maximum flight height of 2 m)
- spotted pardalote (62 records, maximum flight height of 8 m)
- white-eared honeyeater (144 records, maximum flight height of 10 m)
- white-fronted honeyeater (35 records, maximum flight height of 10 m)

- yellow-plumed honeyeater (31 records, maximum flight height of 15 m).

8.2.16.3 Likelihood and Consequence of Impacts

The overall risk rating for these ten species ranges from Negligible (for the nine passerines) – Minor (regent parrot), based on a Low (for the nine passerines) – Moderate (regent parrot) likelihood and Low (for the nine passerines) – Moderate (regent parrot) consequence of collisions (**Table 8.25**). Note that despite a High rating being assigned for eight of these species for Criterion B, the overall rating for likelihood is deemed to be Low. This is because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of these species' flight behaviour and observations from the Project Area. The rationale for responses to each criterion is as follows:

a. Eight of the ten assessed species are highly unlikely to fly at RSA height whilst two species, spotted pardalote and regent parrot, may rarely fly at RSA height. The majority of species in the *Mallee Bird Community of the Murray Darling Depression Bioregion* EEC occur in mallee or other low vegetation types with a canopy height of <10 m and rarely fly above this height. Criterion A is assigned Low.

b. The ten assessed species range from common residents to occasional visitors. Criterion B is assigned Moderate for regent parrot and shy heathwren and High for the remaining eight species.

c. Nine of the assessed species are widely distributed within areas of suitable habitat across their range and the habitat itself is relatively widely dispersed. Regent parrot is assigned a Moderate rating for Criterion D.

d. The life-history characteristics of nine of the assessed species align with the Low rating for Criterion D. Regent parrot is assigned a Moderate rating.

e. The population sizes of the ten assessed species , excluding the regent parrot with an estimated population size of 21,500 individuals, are highly likely to exceed 20,000 individuals. Criterion E is assigned Low for nine of the assessed species and Moderate for regent parrot.

The ten assessed species included seven non-listed species, two species listed as Vulnerable under the BC Act (chestnut quail-thrush and shy heathwren) and one species (regent parrot) listed as Vulnerable under the EPBC Act and endangered under the BC Act. Table 8.25 Mallee Bird EEC Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	CQT, CB, JW, RP, SH, SP, SFW, WEHE, WFHE, YPHE[1]		CQT, CB, JW, SH, SP, SFW, WEHE, WFHE, YPHE	CQT, CB, JW, SH, SP, SFW, WEHE, WFHE, YPHE	CQT, CB, JW, SH, SP, SFW, WEHE, WFHE, YPHE	CB, JW, SP, SFW, WEHE, WFHE, YPHE
Moderate		RP, SH	RP	RP	RP	CQT, SH
High		CQT, CB, JW, SH, SFW, WEHE, WFHE, YPHE				RP
Risk Rating						
Likelihood	Low: CQT, CB, JW, SH, SP, SFW, WEHE, WFHE, YPHE					
	Moderate: Regent Parrot					

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Consequence	Low: CQT, CB, JW, SH, SP, SFW, WEHE, WFHE, YPHE					
	Moderate: Regent Parrot					
Risk Rating	Negligible: CQT, CB, JW, SH, SP, SFW, WEHE, WFHE, YPHE					
	Moderate: Regent Parrot					

1. CQT = chestnut quail-thrush, CB = crested bellbird, JW = jacky winter, RP = regent parrot, SH = shy heathwren, SFW = splendid fairy-wren, SP = spotted pardalote, WEHE = white-eared honeyeater, WFHE = white-fronted honeyeater, YPHE = yellow-plumed honeyeater.

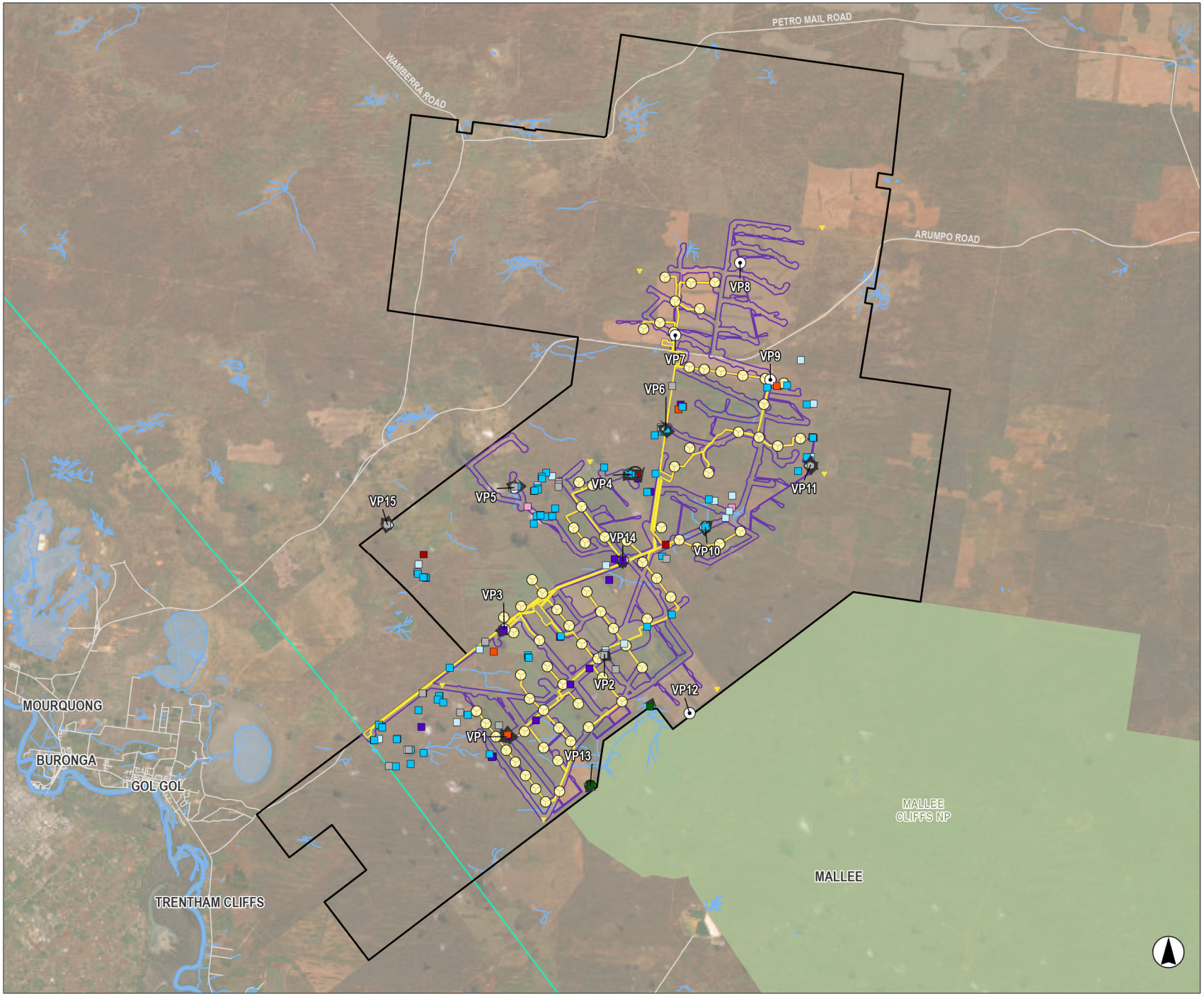


FIGURE 8.7.0

Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species Records

Legend

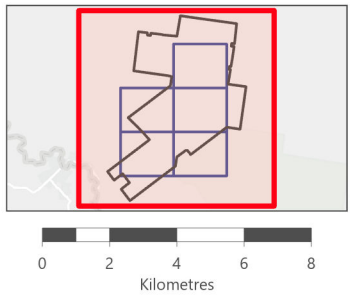
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Chestnut Quail-thrush
- Crested Bellbird
- Jacky Winter
- Regent Parrot
- Shy Heathwren
- Splendid Fairy-wren
- Spotted Pardalote
- White-eared Honeyeater
- White-fronted Honeyeater
- NPWS Estates
- Road
- Watercourse
- Waterbody



Scale 1:225,000 at A4
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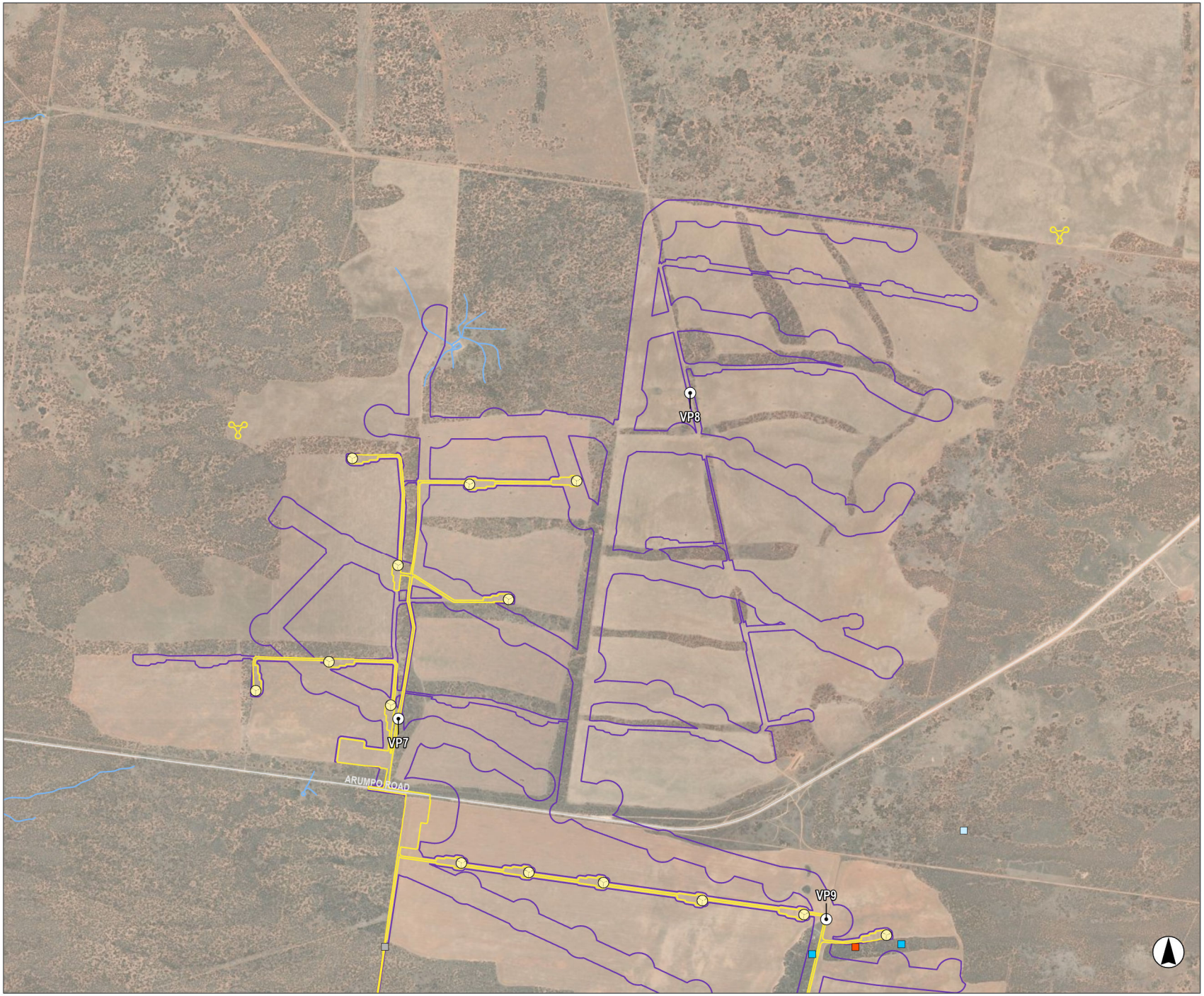


FIGURE 8.7.1

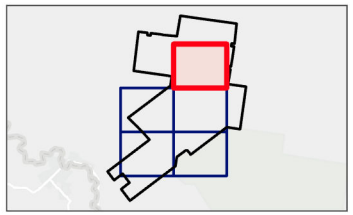
Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species Records

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Vantage Point
- Observation Location

Species Common Name

- Jacky Winter
- Splendid Fairy-wren
- White-eared Honeyeater
- White-fronted Honeyeater
- Road
- Watercourse
- Waterbody



0 2

Kilometres

Scale 1:50,000 at A4

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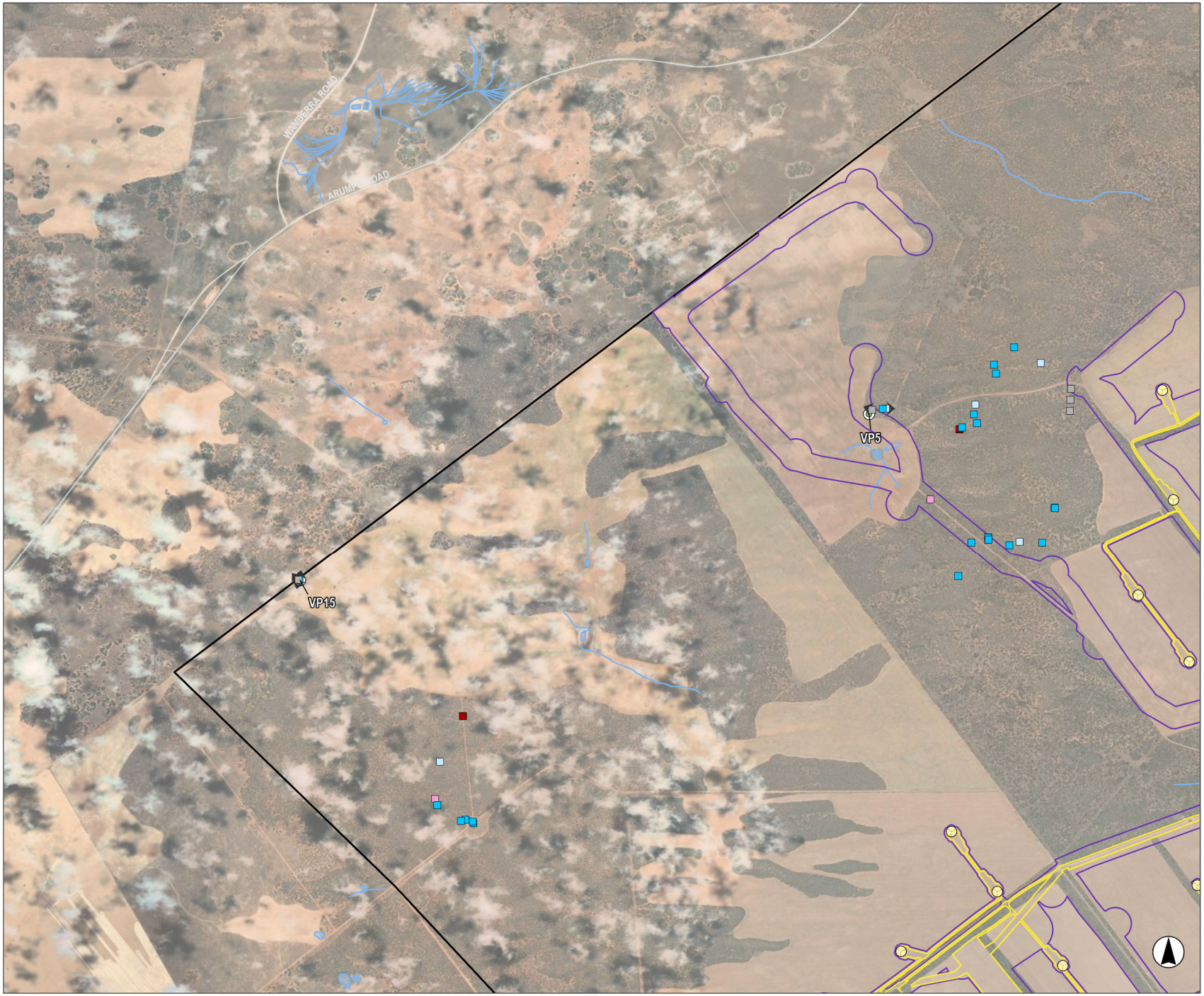


FIGURE 8.7.2

Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species Records

Legend

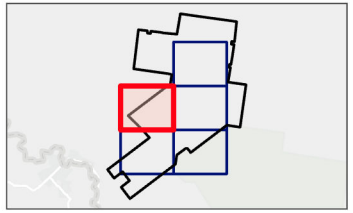
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Chestnut Quail-thrush
- Crested Bellbird
- Jacky Winter
- Splendid Fairy-wren
- Spotted Pardalote
- White-eared Honeyeater
- White-fronted Honeyeater
- Road
- Watercourse
- Waterbody



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FIGURE 8.7.3

Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species Records

Legend

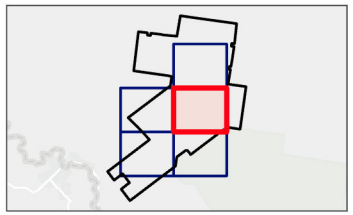
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Chestnut Quail-thrush
- Crested Bellbird
- Jacky Winter
- Shy Heathwren
- Splendid Fairy-wren
- Spotted Pardalote
- White-eared Honeyeater
- White-fronted Honeyeater
- NPWS Estates
- Watercourse
- Waterbody



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Kilometres

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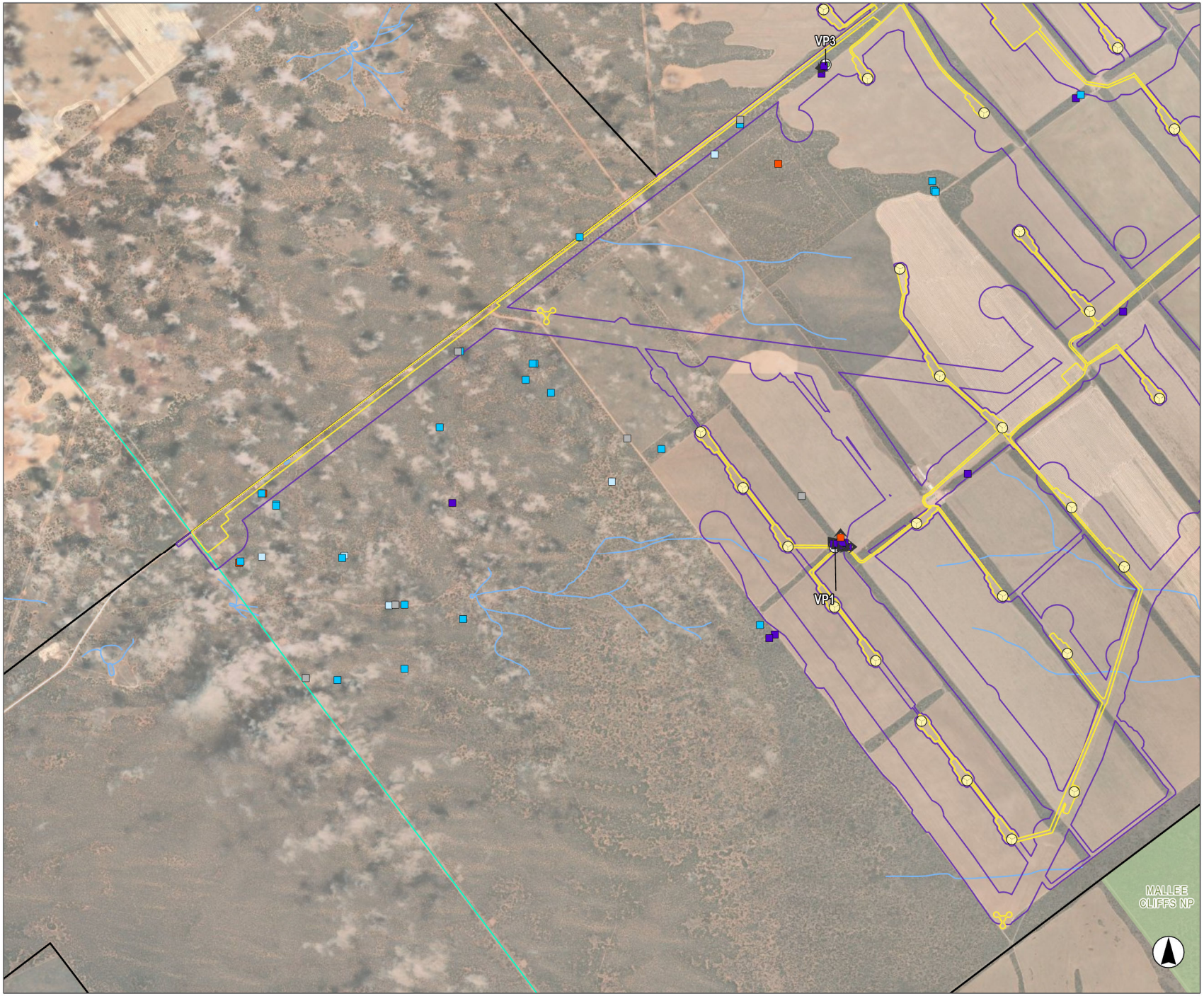


FIGURE 8.7.4

Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species Records

Legend

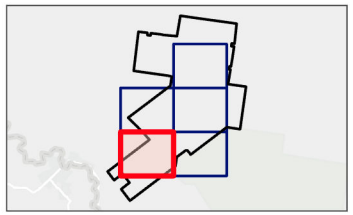
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Crested Bellbird
- Jacky Winter
- Splendid Fairy-wren
- White-eared Honeyeater
- White-fronted Honeyeater
- NPWS Estates
- Road
- Watercourse
- Waterbody



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FIGURE 8.7.5

Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species Records

Legend

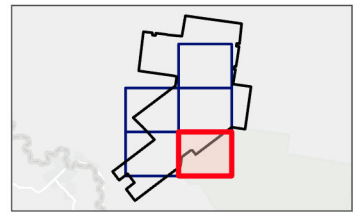
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Crested Bellbird
- Regent Parrot
- Splendid Fairy-wren
- White-eared Honeyeater
- White-fronted Honeyeater
- NPWS Estates
- Watercourse
- Waterbody



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Kilometres

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Figure 8.7.5 Location of Mallee Bird Community of the Murray Darling Depression Bioregion EEC Species RecordsThreatened and Migratory Bird Species Not recorded in the Project Area

The estimated relative risk of blade strike for 23 threatened and/or migratory bird species listed under the BC Act and/or the EPBC Act that were not recorded in the Project Area but may rarely or occasionally occur in the Project Area are shown in **Table 8.26**. Three species were assigned a Moderate risk rating, 14 were assigned a Minor risk rating and six were assigned a Negligible rating.

Table 8.26 Unrecorded Threatened and Migratory Bird Species Risk Assessment

Common Name	Scientific Name	EPBC Act Status	BC Act Status	Likelihood	Consequence	Risk Rating
Australasian bittern	*Botaurus poiciloptilus*	Endangered	Endangered	Low	High	Moderate
Australian painted snipe	*Rostratula australis*	Endangered	Endangered	Low	High	Moderate
black-tailed godwit	*Limosa limosa*	Endangered	Vulnerable	Low	Moderate	Minor
blue-billed duck	*Oxyura australis*	-	Vulnerable	Low	Moderate	Minor
blue-winged parrot	*Neophema chrysostoma*	Vulnerable	Vulnerable	Low	Moderate	Minor
Caspian tern	*Hydroprogne caspia*	Migratory	-	Low	Low	Negligible
common greenshank	*Tringa nebularia*	Endangered, migratory	-	Low	Moderate	Minor
curlew sandpiper	*Calidris ferruginea*	Critically Endangered, migratory	Endangered	Low	Moderate	Minor
freckled duck	*Stictonetta naevosa*	-	Vulnerable	Low	Moderate	Minor
gull-billed tern	*Gelochelidon nilotica*	Migratory	-	Low	Low	Negligible
grey falcon	*Falco hypoleucos*	Vulnerable	Vulnerable	Low	Moderate	Minor
Latham's snipe	*Gallinago hardwickii*	Vulnerable, migratory	-	Low	Moderate	Minor
malleefowl	*Leipoa ocellata*	Vulnerable	Endangered	Low	Moderate	Minor
marsh sandpiper	*Tringa stagnatilis*	Migratory	-	Low	Low	Negligible
purple-crowned lorikeet	*Glossopsitta porphyrocephala*	-	Vulnerable	Low	Low	Negligible
painted honeyeater	*Grantiella picta*	Vulnerable	Vulnerable	Low	Moderate	Minor
pectoral sandpiper	*Calidris melanotos*	Migratory	-	Low	Moderate	Minor
pink cockatoo	*Lophochroa leadbeateri*	Endangered	Vulnerable	Moderate	Moderate	Moderate

Common Name	Scientific Name	EPBC Act Status	BC Act Status	Likelihood	Consequence	Risk Rating
red-necked stint	*Calidris ruficollis*	Migratory	-	Low	Moderate	Minor
sharp-tailed sandpiper	*Calidris acuminata*	Vulnerable, migratory	-	Low	Moderate	Minor
southern scrub-robin	*Drymodes brunneopygia*	-	Vulnerable	Low	Low	Negligible
white-bellied sea-eagle	*Haliaeetus leucogaster*	-	Vulnerable	Low	Moderate	Minor
wood sandpiper	*Tringa glareola*	Migratory	-	Low	Low	Negligible

8.3 Assessment of Likelihood and Consequence of Impact – Non-threatened Bird Species

The results of the blade strike risk assessment for all 109 non-threatened bird species recorded in the Project Area during the 2022–2024 surveys is presented in **Table 8.27**. A total of 14 non-threatened bird species were recorded flying at RSA height on at least one occasion during the 2022–2024 surveys in the Project Area. A total of five species were assigned a Moderate risk rating, 19 were assigned a Minor risk rating and the remaining 85 were assigned a Negligible risk rating. Due to its status in the Project Area and its known susceptibility to blade strike, the wedge-tailed eagle is more closely examined than the other non-threatened bird species recorded in the Project Area (**Section 8.3.1**). Table 8.27 Non-threatened Bird Species Risk Assessment

Common Name	Scientific Name	No. of records in the Project Area	Recorded at RSA height in the Project Area (Yes/No)	Likelihood	Consequence	Risk Rating
apostlebird	*Struthidea cinerea*	47	No	Low	Low	Negligible
Australasian grebe	*Tachybaptus novaehollandiae*	4	No	Low	Low	Negligible
Australasian pipit	*Anthus novaeseelandiae*	67	No	Low	Low	Negligible
Australian hobby	*Falco longipennis*	4	No	Moderate	Low	Minor
Australian magpie	*Gymnorhina tibicen*	528	**Yes**	Moderate	Low	Minor
Australian owlet-nightjar	*Aegotheles cristatus*	7	No	Low	Low	Negligible
Australian pelican	*Pelecanus conspicillatus*	1	**Recorded above RSA height**	Moderate	Low	Minor
Australian raven	*Corvus coronoides*	566	**Yes**	Moderate	Low	Minor

Common Name	Scientific Name	No. of records in the Project Area	Recorded at RSA height in the Project Area (Yes/No)	Likelihood	Consequence	Risk Rating
Australian ringneck	*Barnardius zonarius*	209	No	Low	Low	Negligible
Australian shelduck	*Tadorna tadornoides*	1	No	Low	Low	Negligible
Australian wood duck	*Chenonetta jubata*	7	No	Low	Low	Negligible
banded lapwing	*Vanellus tricolor*	7	No	Low	Low	Negligible
barn owl	*Tyto alba*	1	No	Low	Low	Negligible
black honeyeater	*Sugomel nigrum*	2	No	Low	Low	Negligible
black kite	*Milvus migrans*	52	**Yes**	High	Low	Moderate
black-eared cuckoo	*Chalcites osculans*	3	No	Low	Low	Negligible
black-faced cuckoo-shrike	*Coracina novaehollandiae*	63	No	Moderate	Low	Minor
black-shouldered kite	*Elanus axillaris*	168	**Yes**	High	Low	Moderate
bluebonnet	*Northiella haematogaster*	287	No	Low	Low	Negligible
brown falcon	*Falco berigora*	35	**Yes**	High	Low	Moderate
brown goshawk	*Accipiter fasciatus*	8	No	Moderate	Low	Minor
brown quail	*Coturnix ypsilophora*	1	No	Low	Low	Negligible
brown songlark	*Cincloramphus cruralis*	103	No	Low	Low	Negligible
brown treecreeper	*Climacteris picumnus*	42	No	Low	Low	Negligible
brown-headed honeyeater	*Melithreptus brevirostris*	20	No	Low	Low	Negligible
budgerigar	*Melopsittacus undulatus*	4	No	Low	Low	Negligible
chestnut-crowned babbler	*Pomatostomus ruficeps*	23	No	Low	Low	Negligible
chestnut-rumped thornbill	*Acanthiza uropygialis*	108	No	Low	Low	Negligible
cockatiel	*Nymphicus hollandicus*	89	No	Low	Low	Negligible
collared sparrowhawk	*Accipiter cirrocephalus*	7	**Yes**	Moderate	Low	Minor
common bronzewing	*Phaps chalcoptera*	66	No	Low	Low	Negligible

Common Name	Scientific Name	No. of records in the Project Area	Recorded at RSA height in the Project Area (Yes/No)	Likelihood	Consequence	Risk Rating
common myna	*Acridotheres tristis*	2	No	Low	Low	Negligible
crested bellbird	*Oreoica gutturalis*	136	No	Low	Low	Negligible
crested pigeon	*Ocyphaps lophotes*	243	No	Low	Low	Negligible
crimson chat	*Epthianura tricolor*	4	No	Low	Low	Negligible
diamond dove	*Geopelia cuneata*	2	No	Low	Low	Negligible
emu	*Dromaius novaehollandiae*	23	No	Low	Low	Negligible
fairy martin	*Petrochelidon ariel*	1	No	Low	Low	Negligible
fan-tailed cuckoo	*Cacomantis flabelliformis*	2	No	Low	Low	Negligible
galah	*Eolophus roseicapilla*	63	**Yes**	Moderate	Low	Minor
golden whistler	*Pachycephala pectoralis*	3	No	Low	Low	Negligible
great cormorant	*Phalacrocorax carbo*	3	**Yes**	Moderate	Low	Minor
grey butcherbird	*Cracticus torquatus*	236	No	Low	Low	Negligible
grey currawong	*Strepera versicolor*	19	No	Low	Low	Negligible
grey fantail	*Rhipidura fuliginosa*	8	No	Low	Low	Negligible
grey shrike-thrush	*Colluricincla harmonica*	80	No	Low	Low	Negligible
grey teal	*Anas gracilis*	3	No	Low	Low	Negligible
Horsfield's bronze-cuckoo	*Chalcites basalis*	4	No	Low	Low	Negligible
inland thornbill	*Acanthiza apicalis*	24	No	Low	Low	Negligible
Jacky winter	*Microeca fascinans*	19	No	Low	Low	Negligible
little black cormorant	*Phalacrocorax sulcirostris*	2	**Yes**	Moderate	Low	Minor
little button-quail	*Turnix velox*	2	No	Low	Low	Negligible
little crow	*Corvus bennetti*	22	No	Moderate	Low	Minor
little raven	*Corvus mellori*	38	No	Moderate	Low	Minor

Common Name	Scientific Name	No. of records in the Project Area	Recorded at RSA height in the Project Area (Yes/No)	Likelihood	Consequence	Risk Rating
magpie-lark	*Grallina cyanoleuca*	53	No	Low	Low	Negligible
masked woodswallow	*Artamus personatus*	57	**Yes**	Moderate	Low	Minor
mistletoebird	*Dicaeum hirundinaceum*	4	No	Low	Low	Negligible
mulga parrot	*Psephotellus varius*	198	No	Low	Low	Negligible
nankeen kestrel	*Falco cenchroides*	255	**Yes**	High	Low	Moderate
noisy miner	*Manorina melanocephala*	19	No	Low	Low	Negligible
painted button-quail	*Turnix varius*	2	No	Low	Low	Negligible
pallid cuckoo	*Cacomantis pallidus*	3	No	Low	Low	Negligible
peregrine falcon	*Falco peregrinus*	4	No	Moderate	Low	Minor
pied butcherbird	*Cracticus nigrogularis*	150	No	Low	Low	Negligible
rainbow bee-eater	*Merops ornatus*	57	No	Moderate	Low	Minor
red wattlebird	*Anthochaera carunculata*	9	No	Low	Low	Negligible
red-backed kingfisher	*Todiramphus pyrrhopygius*	6	No	Low	Low	Negligible
red-capped robin	*Petroica goodenovii*	96	No	Low	Low	Negligible
red-rumped parrot	*Psephotus haematonotus*	2	No	Low	Low	Negligible
restless flycatcher	*Myiagra inquieta*	6	No	Low	Low	Negligible
rufous songlark	*Cincloramphus mathewsi*	33	No	Low	Low	Negligible
rufous whistler	*Pachycephala rufiventris*	113	No	Low	Low	Negligible
sacred kingfisher	*Todiramphus sanctus*	5	No	Low	Low	Negligible
singing honeyeater	*Gavicalis virescens*	473	No	Low	Low	Negligible
spiny-cheeked honeyeater	*Acanthagenys rufogularis*	375	No	Low	Low	Negligible
splendid fairy-wren	*Malurus splendens*	38	No	Low	Low	Negligible
spotted nightjar	*Eurostopodus argus*	1	No	Low	Low	Negligible

Common Name	Scientific Name	No. of records in the Project Area	Recorded at RSA height in the Project Area (Yes/No)	Likelihood	Consequence	Risk Rating
spotted pardalote	*Pardalotus punctatus*	62	No	Low	Low	Negligible
striated pardalote	*Pardalotus striatus*	144	No	Low	Low	Negligible
striped honeyeater	*Plectorhyncha lanceolata*	111	No	Low	Low	Negligible
stubble quail	*Coturnix pectoralis*	1	No	Low	Low	Negligible
sulphur-crested cockatoo	*Cacatua galerita*	1	No	Low	Low	Negligible
swamp harrier	*Circus approximans*	2	No	Low	Low	Negligible
tawny frogmouth	*Podargus strigoides*	1	No	Low	Low	Negligible
tree martin	*Petrochelidon nigricans*	11	No	Moderate	Low	Minor
variegated fairy-wren	*Malurus lamberti*	23	No	Low	Low	Negligible
wedge-tailed eagle	*Aquila audax*	120	**Yes**	High	Low	Moderate
weebill	*Smicrornis brevirostris*	282	No	Low	Low	Negligible
welcome swallow	*Hirundo neoxena*	35	No	Moderate	Low	Minor
western gerygone	*Gerygone fusca*	3	No	Low	Low	Negligible
whistling kite	*Haliastur sphenurus*	14	**Yes**	Moderate	Low	Minor
white-backed swallow	*Cheramoeca leucosterna*	2	No	Low	Low	Negligible
white-browed babbler	*Pomatostomus superciliosus*	8	No	Low	Low	Negligible
white-browed treecreeper	*Climacteris affinis*	15	No	Low	Low	Negligible
white-browed woodswallow	*Artamus superciliosus*	58	**Yes**	Moderate	Low	Minor
white-eared honeyeater	*Nesoptilotis leucotis*	144	No	Low	Low	Negligible
white-faced heron	*Egretta novaehollandiae*	1	No	Low	Low	Negligible
white-fronted honeyeater	*Purnella albifrons*	35	No	Low	Low	Negligible
white-necked heron	*Ardea pacifica*	1	No	Low	Low	Negligible
white-plumed honeyeater	*Ptilotula penicillata*	7	No	Low	Low	Negligible

Common Name	Scientific Name	No. of records in the Project Area	Recorded at RSA height in the Project Area (Yes/No)	Likelihood	Consequence	Risk Rating
white-winged chough	*Corcorax melanorhamphos*	9	No	Low	Low	Negligible
white-winged fairy-wren	*Malurus leucopterus*	27	No	Low	Low	Negligible
white-winged triller	*Lalage tricolor*	17	No	Low	Low	Negligible
willie wagtail	*Rhipidura leucophrys*	205	No	Low	Low	Negligible
yellow thornbill	*Acanthiza nana*	9	No	Low	Low	Negligible
yellow-plumed honeyeater	*Ptilotula ornata*	31	No	Low	Low	Negligible
yellow-rumped thornbill	*Acanthiza chrysorrhoa*	48	No	Low	Low	Negligible
yellow-throated miner	*Manorina flavigula*	360	No	Low	Low	Negligible
zebra finch	*Taeniopygia guttata*	2	No	Low	Low	Negligible

8.3.1 Wedge-tailed eagle

8.3.1.1 Information on wedge-tailed eagle from Australian Wind Farms

Wedge-tailed eagle are commonly reported during mortality monitoring events at wind farms in Australia. Moloney *et al.* (2019) report wedge-tailed eagle as the second-most frequently recorded bird species found deceased during monitoring from 2003 to 2018 across 15 wind farms in Victoria, with 58 carcasses detected and equating to 10% of all birds found. Using this data, Moloney *et al.* (2019) calculated mortality estimates of 0.06 (95% CI: 0.02–0.41) and 0.1 (95% CI: 0–0.2) individuals per turbine per year at two Victorian wind farms.

At two wind farms in north-western Tasmania, a total of 18 wedge-tailed eagle carcasses were recorded during monitoring conducted for three and six years at Bluff Point Wind Farm and Studland Bay Wind Farm respectively (Hull *et al.* 2013). This particular monitoring program modelled a mortality estimate of 1.5 and 1.1 collisions per annum at Bluff Point (37 turbines) and Studland Bay (25 turbines). A 95% turbine avoidance rate closely approximated the observed mean annual mortality rate of 1.6 and 1.1 individuals per annum at each wind farm respectively (Smales *et al.* 2013).

Wedge-tailed eagles are known to collide with turbines at wind farms in NSW, however the total number of fatalities detected in the state is not publicly available. Reported collisions include one at Biala Wind Farm (Nature Advisory 2024), three at Boco Rock Wind Farm (NGH 2022), eight at Bodangora Wind Farm (Nature Advisory 2021), 12 at Crudine Ridge Wind Farm (EcoLogical Australia 2023), 12 at Gullen Range Wind Farm (BLA 2017), nine at Sapphire Wind Farm (Nature Advisory 2023), two at Silverton Wind Farm (Elmoby Ecology 2022) and nine at White Rock Wind Farm (BLA 2019).

8.3.1.2 Status and Flight Behaviour in the Project Area

The wedge-tailed eagle is a common breeding resident in the Murray Darling Depression Bioregion. Wedge-tailed eagle were regularly recorded in the Project Area during the 2022–2024 surveys. The species was recorded on 120 occasions, including 87 times during vantage point surveys, four times during woodland bird surveys and 29 times incidentally. The location of observations of wedge-tailed eagle in the Project Area is shown in **Figure 8.8.0 to 8.8.5**.

Wedge-tailed eagle were recorded at 14 of the 15 vantage survey points (**Table 8.28**), during six of the seven seasonal survey events. The overall reporting rate across all vantage point surveys was 13.8% (68/491).

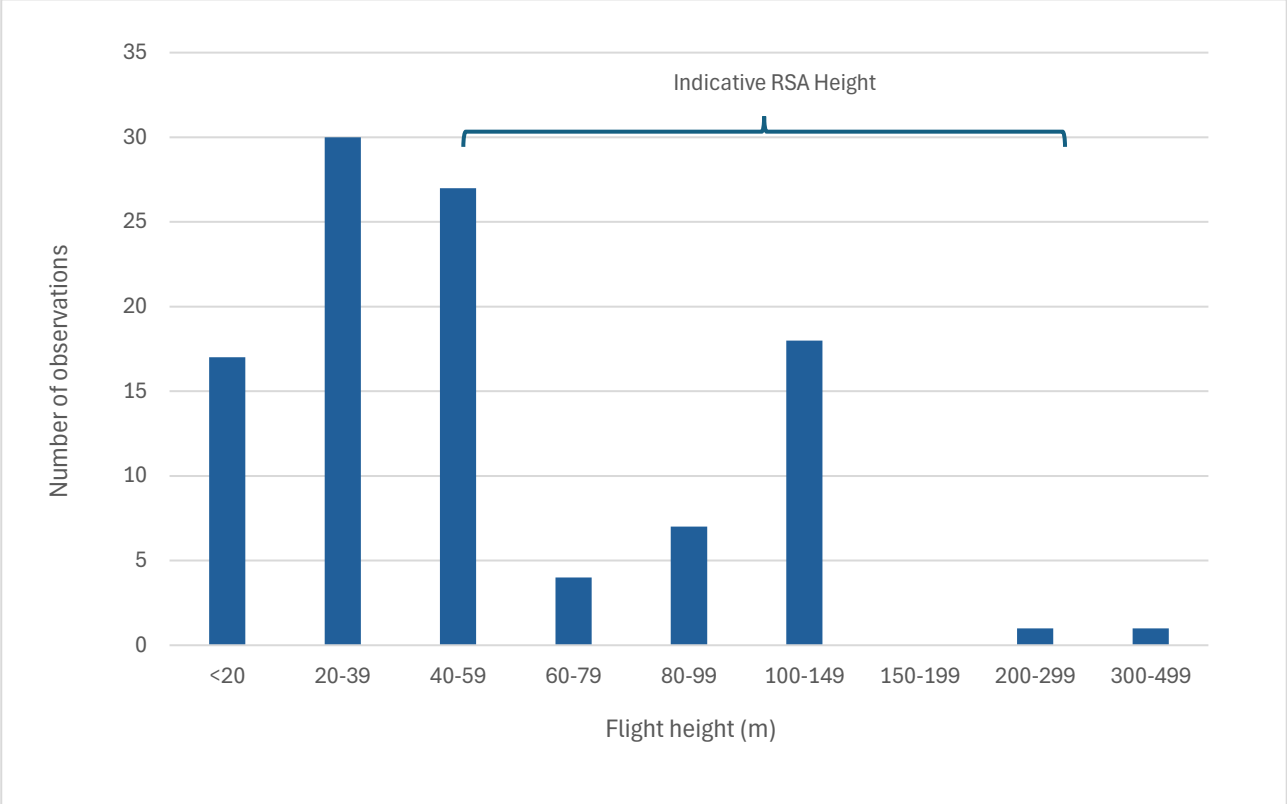
A summary of wedge-tailed eagle observations in the Project Area is presented below:

- 80% (96/120) of observations were of one bird, 14% (17/120) of observations were of pairs, 3% (4/120) of observations were of three birds, two observations were of four birds and there was one observation was of five birds.
- Wedge-tailed eagle were recorded in flight on 106 occasions and whilst perched on eight occasions. Behaviour was not recorded for the remaining six observations. The height of observed birds at the moment when first detected during each observation is shown in **Graph 8.2**. Of the flight observations:
    - 49% (52/106) comprised observation of birds between 50 – 280 m at the moment of detection. 50% (53/106) comprised observation of birds below 50 m at the moment of detection and one above 280 m at the point of detection.
    - 73% (77/106) comprised observation of birds between 100–300 m at any point during the observation.

Table 8.28 Number of Wedge-tailed Eagle Observations at Each Survey Site

	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11	VP12	VP13	VP14	VP15
Number of obs.	1	8	6	6	11	6	5	4	7	24	3	2	0	3	1
Proportion of surveys recorded	1/39 (3%)	7/42 (17%)	5/42 (12%)	6/43 (14%)	6/41 (15%)	6/43 (14%)	4/45 (9%)	4/35 (11%)	6/42 (14%)	15/42 (36%)	2/19 (11%)	2/18 (11%)	0/16	3/12 (25%)	1/12 (8%)

Graph 8.2 Number of observations of wedge-tailed eagle (at moment of initial detection) in each height class



8.3.1.3 Likelihood and Consequence of Impacts

The overall risk rating for wedge-tailed eagle is Moderate, based on a High likelihood and Low consequence of collisions (**Table 8.29**). The rationale for responses to each criterion is as follows:

a. the wedge-tailed eagle regularly flies at RSA height.

b. wedge-tailed eagle is a common resident in the Project Area.

c. wedge-tailed eagle is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The life-history characteristics of the wedge-tailed eagle overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D, however overall, they average out between the two and hence Criterion D is assigned Moderate (Marchant and Higgins 1993).

e. The total population of wedge-tailed eagle is described as very large by Birdlife International (2024) and given this species' very large distribution (c. 10.6 million km^2) the total population is likely to exceed 20,000 individuals.

f. The subspecies of wedge-tailed eagle that occurs in the Project Area is not listed as threatened under the EPBC Act or the BC Act.

The wedge-tailed eagle's risk rating of Moderate reflects the low consequence that a potentially high frequency of blade strike in the Project Area is likely to have on this species' total population.

Table 8.29 Wedge-tailed eagle Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X		X	X
Moderate				X		
High	X	X				
Risk Rating						
Likelihood	High					
Consequence	Low					
Risk Rating	Moderate					

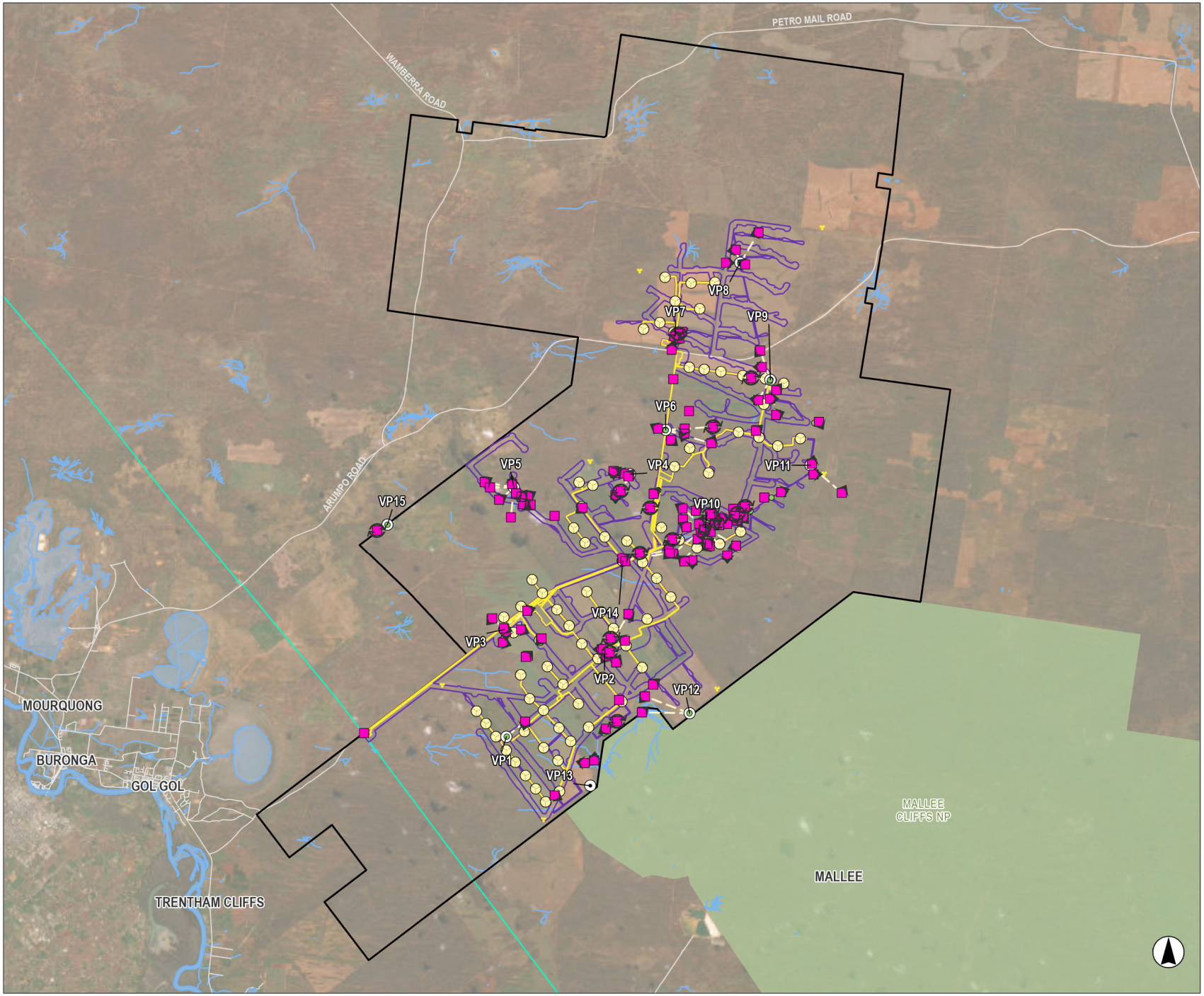


FIGURE 8.8.0

Location of Wedge-tailed Eagle Records in the Project Area (2022–2024 Surveys)

Legend

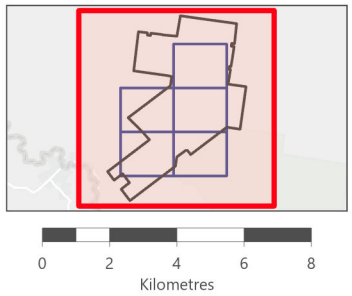
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Wedge-tailed Eagle
- NPWS Estates
- Road
- Watercourse
- Waterbody



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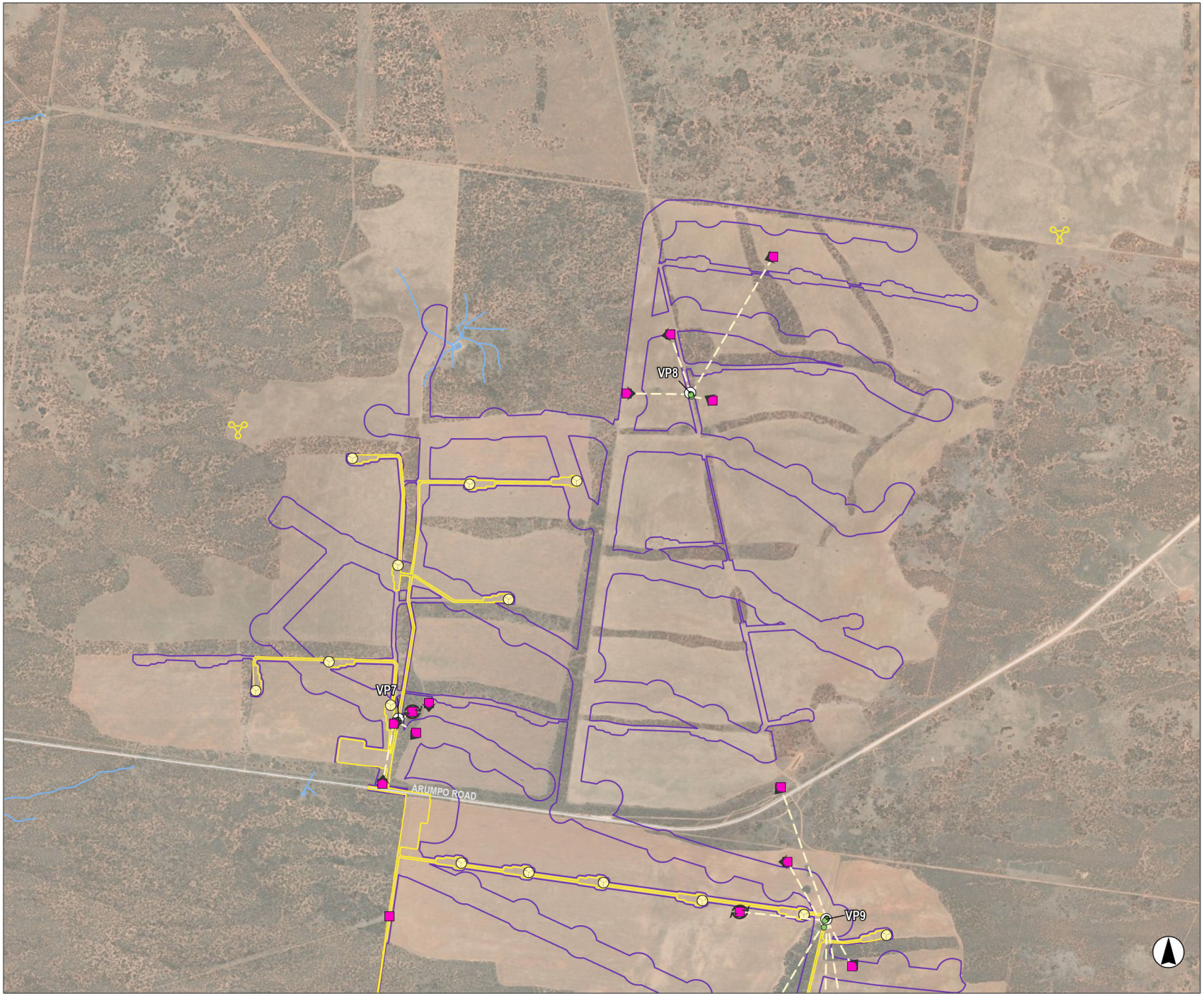


FIGURE 8.8.1

Location of Wedge-tailed Eagle Records in the Project Area (2022–2024 Surveys)

Legend

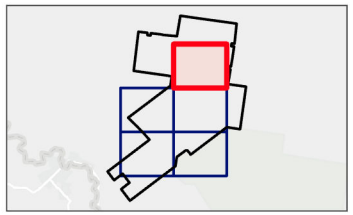
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Wedge-tailed Eagle
- Road
- Watercourse
- Waterbody



0 2

Kilometres

Scale 1:50,000 at A4

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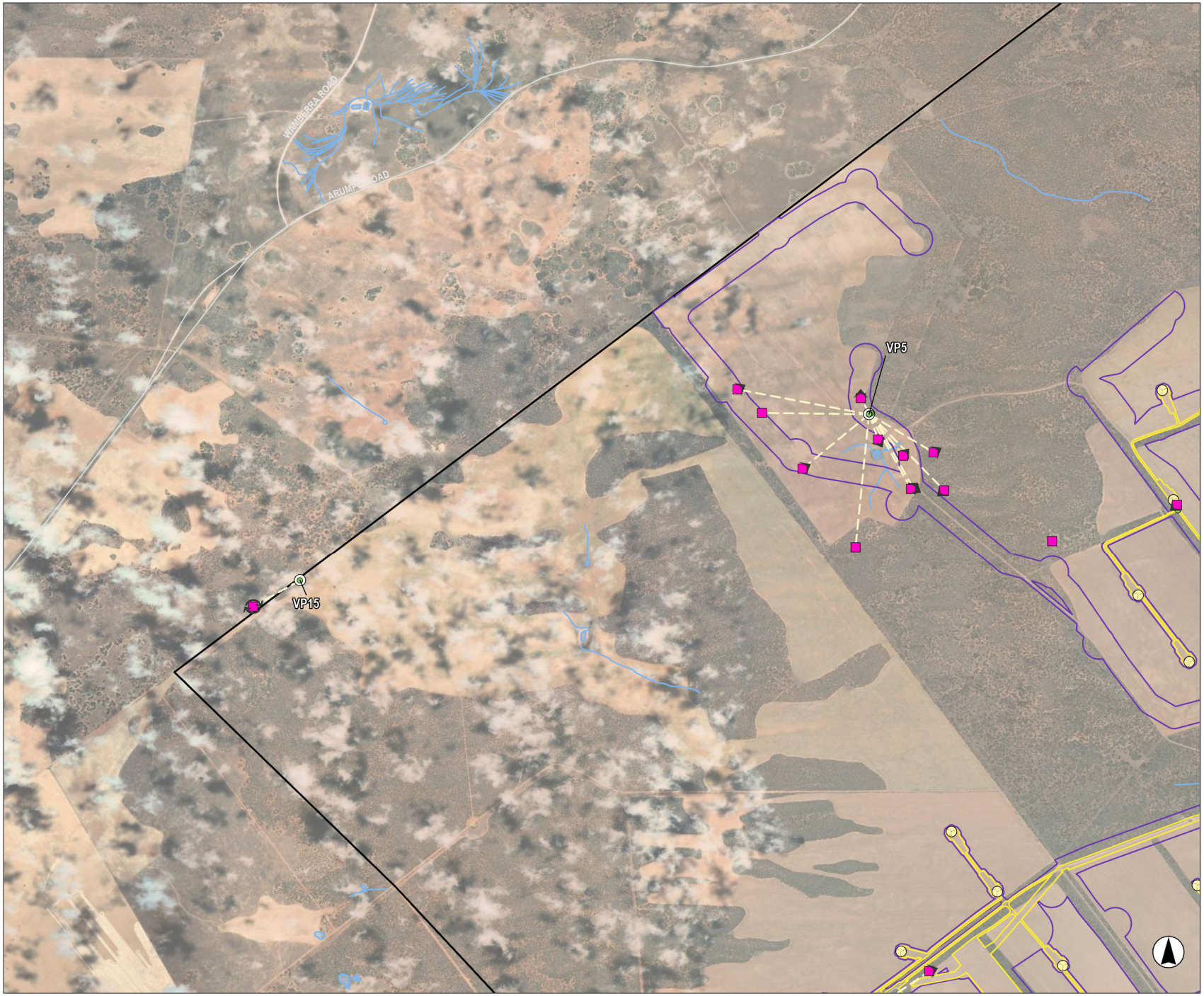


FIGURE 8.8.2

Location of Wedge-tailed Eagle Records in the Project Area (2022–2024 Surveys)

Legend

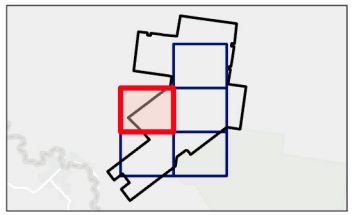
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Wedge-tailed Eagle
- Road
- Watercourse
- Waterbody



0 2

Kilometres

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FIGURE 8.8.3

Location of Wedge-tailed Eagle Records in the Project Area (2022–2024 Surveys)

Legend

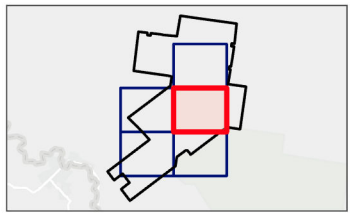
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Wedge-tailed Eagle
- NPWS Estates
- Watercourse
- Waterbody



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Kilometres

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FIGURE 8.8.4

Location of Wedge-tailed Eagle Records in the Project Area (2022–2024 Surveys)

Legend

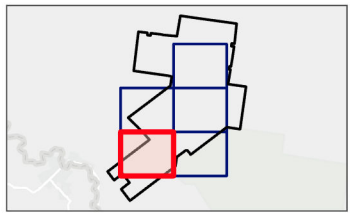
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Project EnergyConnect
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Directional Flight

Species Common Name

- Wedge-tailed Eagle
- NPWS Estates
- Road
- Watercourse
- Waterbody



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FIGURE 8.8.5

Location of Wedge-tailed Eagle Records in the Project Area (2022–2024 Surveys)



Legend

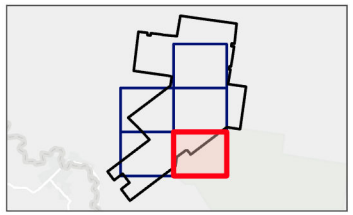
- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wind Turbine Generators
- Observation Direction and Distance
- Vantage Point
- Observation Location

Flight Behaviour

- Circling
- Directional Flight

Species Common Name

- Wedge-tailed Eagle
- NPWS Estates
- Watercourse
- Waterbody



0 2

Kilometres

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8.4 Assessment of Likelihood and Consequence – Threatened Bat Species

8.4.1 Corben's long-eared bat (*Nyctophilus corbeni*)

8.4.1.1 Information on Corben's long-eared bat from Australian Wind Farms

There are no published records of blade strike of Corben's long-eared bats in the available literature in Victoria (Moloney *et al*. 2019), south-east NSW (BCS unpublished data) or NSW more broadly (Jacobs 2022). The majority of wind farms monitored to date in Victoria are located outside of this species' distribution. There are published records of blade strike of the closely related lesser long-eared bat (six strikes) and Gould's long-eared bat (one strike) in Victoria (Moloney *et al*. 2019) and five strikes of the lesser long-eared bat in NSW (Jacobs 2022). A mortality model for the lesser long-eared bat generated a mortality rate estimate of 0.1 individuals per turbine per year (95% CI 0–0.5) for one particular wind farm (Moloney *et al*. 2019). Thus, it is possible that Corben's long-eared bat would be similarly vulnerable to turbine strike.

8.4.1.2 Status and Flight Behaviour in the Project Area

Corben's long-eared bat was recorded in the Project Area as part of a species complex consisting of large-footed myotis/Corben's long-eared bat/lesser long-eared bat/Gould's long-eared bat and as *Nyctophilus* sp. on a combined total of 1,082 occasions in all seven survey periods. The number of passes per survey ranged from 18 (November 2022) to 285 (February 2023). The calls are unlikely to be attributable to the large-footed myotis as the Project Area is outside of this species' range, suggesting that the species complex records are most likely to represent one or more *Nyctophilus* species. *Nyctophilus* spp. were not recorded on the detectors on the meteorological mast and hence were not recorded at RSA height.

Umwelt have reviewed existing records of Corben's long-eared bat from the NSW BioNet Atlas (DCCEEW 2024d). The species occurs inland of the Great Dividing Range from southern Queensland, through NSW and northern Victoria to the far east of South Australia. This species has been recorded at Mallee Cliffs N.P. It is possible that Corben's long-eared bat occurs in the Project Area.

8.4.1.3 Likelihood and Consequence of Impacts

The overall risk rating for Corben's long-eared bat is Minor, based on a Low likelihood and Moderate consequence of collisions (**Table 8.30**). The rationale for responses to each criterion is as follows:

a. Based on available data on related species, Corben's long-eared bat may rarely fly at RSA height. No records of the large-footed myotis/Corben's long-eared bat/lesser long-eared bat/Gould's long-eared bat species group were recorded at either of the bat detectors deployed on the meteorological mast.

b. A species complex containing a *Nyctophilus* species was recorded and the site is within the known range of the species, suggesting it may possibly occur. Criterion B is assigned Low.

c. Corben's long-eared bat have a wide but sparse distribution and are highly concentrated in suitable habitat (Law *et al.* 2016).

d. The life-history characteristics of the Corben's long-eared bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Churchill 2009).

e. The population of Corben's long-eared bats is not fully quantified but is likely to be between 5,000 and 20,000 individuals (Pennay *et al*. 2011).

f. Corben's long-eared bat is listed as Vulnerable under both the EPBC Act and BC Act.

Table 8.30 Corben's Long-eared Bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X	X				
Moderate			X	X	X	X
High						
Risk Rating						
Likelihood	Low					
Consequence	Moderate					
Risk Rating	Minor					

8.4.2 Inland forest bat (*Vespadelus baverstocki*)

8.4.2.1 Information on the inland forest bat from Australian Wind Farms

There are no published records of blade strike of the inland forest bat in the available literature in Victoria (Moloney *et al*. 2019) or NSW (Jacobs 2022). The majority of wind farms monitored to date are located outside of this species' distribution. There are published records of blade strike of the related southern forest bat (21 strikes), large forest bat (20 strikes), little forest bat (15 strikes) and an unidentified vesper bat (nine strikes) in NSW (Jacobs 2022). In Victoria, turbine strike has been recorded for southern forest bat (two strikes), large forest bat (16 strikes) and little forest bat (nine strikes) (Moloney *et al.* 2019).

8.4.2.2 Status and Flight Behaviour in the Project Area

The inland forest bat was recorded in the Project Area 2,513 times. It was also recorded a total of 7,315 times as part of various species complexes across the seven survey periods. The inland forest bat was not recorded on the meteorological mast detectors, including as part of a species complex.

Umwelt have reviewed existing records of the inland forest bat from the NSW BioNet Atlas (DCCEEW 2024d). The species occurs inland of the Great Dividing Range from central Queensland, through NSW, north-east Victoria to South Australia and southern Northern Territory, with an outlying population in western Australia. There are two records of the inland forest bat in the project locality (DCCEEW 2024d).

8.4.2.3 Likelihood and Consequence of Impacts

The overall risk rating for the inland forest bat is Moderate, based on a Moderate likelihood and Moderate consequence of collisions **Table 8.31**. The rationale for responses to each criterion is as follows:

a. Based on available data on related species, the inland forest bat may rarely fly at RSA height but there is no evidence of this in the Project Area despite sampling bat activity at height.

b. The inland forest bat was detected in the Project Area on 2,513 occasions.

c. The inland forest bat has a wide but sparse distribution and are highly concentrated in suitable habitat.

d. The life-history characteristics of the inland forest bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Churchill 2009).

e. The population of the inland forest bat is not fully quantified but is likely to be between 5,000 and 20,000 individuals (Pennay *et al*. 2011).

f. The inland forest bat is listed as Vulnerable under the BC Act.

Table 8.31 Inland Forest Bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X					
Moderate			X	X	X	X
High		X				
Risk Rating						
Likelihood	Moderate					
Consequence	Moderate					
Risk Rating	Moderate					

8.4.3 Little pied bat (*Chalinolobus picatus*)

8.4.3.1 Information on the little pied bat from Australian Wind Farms

There are no published records of blade strike of the little pied bat in the available literature in Victoria (Moloney *et al*. 2019) or NSW (Jacobs 2022). The majority of wind farms monitored to date are located outside of this species' distribution. There are published records of blade strike of the related Gould's wattled bat (59 strikes) and chocolate wattled bat (nine strikes) in NSW (Jacobs 2022). In Victoria, turbine strike has been recorded for Gould's wattled bat (49 strikes) and the chocolate wattled bat (five strikes) (Moloney *et al*. 2019). It is possible that the little pied bat would also be at risk of turbine strike.

8.4.3.2 Status and Flight Behaviour in the Project Area

The little pied bat was definitely or probably recorded in the Project Area a total of 1,472 times across all survey periods. It was also recorded as part of various species complexes a further 3,378 times. It was not recorded on the meteorological mast detectors.

The little pied bat occurs in inland NSW and Queensland. There are two records of the inland forest bat in the project locality (DCCEEW 2024d).

8.4.3.3 Likelihood and Consequence of Impacts

The overall risk rating for the little pied bat is Moderate, based on a Moderate likelihood and Moderate consequence of collisions **Table 8.32**. The rationale for responses to each criterion is as follows:

- Based on available data on related species, the little pied bat may rarely fly at RSA height but there is no evidence of this in the Project Area despite sampling bat activity at height.
- The little pied bat was detected in the Project Area on 1,472 occasions.
- The little pied bat has a wide but sparse distribution.

- The life-history characteristics of the little pied bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Churchill 2009).
- The population of the little pied bat is not fully quantified but is likely to be between 5,000 and 20,000 individuals (Pennay *et al*. 2011).
- The little pied bat is listed as Vulnerable under the BC Act.

Table 8.32 Little Pied Bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X					
Moderate			X	X	X	X
High		X				
Risk Rating						
Likelihood	Moderate					
Consequence	Moderate					
Risk Rating	Moderate					

8.4.4 Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)

8.4.4.1 Information on yellow-bellied sheathtail-bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across six operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding only four yellow-bellied sheathtail-bat carcasses out of 229 total carcasses of 11 bat species. However, four of the five wind farms examined had a minimum blade tip height of 30 m (the remaining turbine was 74 m minimum and no yellow-bellied sheathtail-bats were recorded). Moloney *et al*. (2019) examined 11 wind farms in Victoria and found no yellow-bellied sheathtail-bats within 446 total bat carcasses. This suggests that the yellow-bellied sheathtail-bat occasionally flies at (lower) turbine heights and represents a Moderate overall collision risk.

8.4.4.2 Status and Flight Behaviour in the Project Area

Four possible yellow-bellied sheathtail-bat calls were recorded in February 2023. These calls may also be attributable to the white-striped freetail bat, which was recorded 5,384 times across five survey periods. None of these possible records were obtained from the bat detectors at the meteorological mast, therefore are not associated with at height flight. While it is possible that the yellow-bellied sheathtail-bat is not present, it is a Vulnerable species under the BC Act and, accordingly, it is conservatively treated as present here.

The species is widely recorded across much of eastern and northern Australia. This species has been recorded in Mallee Cliffs N.P and in Mildura (DCCEEW 2024d).

8.4.4.3 Likelihood and Consequence of Impacts

The overall risk rating for yellow-bellied sheathtail-bat is Moderate, based on a Moderate likelihood and Moderate consequence of collisions (**Table 8.33**). The rationale for responses to each criterion is as follows:

a. Yellow-bellied sheathtail-bat are likely to regularly fly below RSA height and occasionally fly at RSA height.

b. Yellow-bellied sheathtail-bat was possibly recorded in the Project Area.

c. Yellow-bellied sheathtail-bat are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The life-history characteristics of yellow-bellied sheathtail-bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D.

e. Very little is known about the ecology of yellow-bellied sheathtail-bat though given its very large distribution (Churchill 2009) its population is likely to exceed 5,000 individuals and may possibly be over 20,000. Given the migratory nature of individuals that occur in south-eastern Australia coupled with the lack of any population estimates Criterion E is conservatively assigned Moderate.

f. The yellow-bellied sheathtail-bat is listed as Vulnerable in NSW under the BC Act.

Table 8.33 Yellow-bellied Sheathtail-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low		X				
Moderate	X		X	X	X	X
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Moderate					
Risk Rating	Moderate					

8.5 Assessment of Likelihood and Consequence – Non-threatened Bat Species

8.5.1 Chocolate wattled bat (*Chalinolobus morio*)

8.5.1.1 Information on Chocolate wattled bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding nine chocolate wattle-bat carcasses at three sites out of 229 total carcasses of 11 bat species across all sites. This included one record at Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found five chocolate wattle-bats within 446 total bat carcasses.

8.5.1.2 Status and Flight Behaviour in the Project Area

The chocolate wattle-bat was definitively recorded in the Project Area 68 times. A total of 1,656 detections across various species complexes were also recorded. None of these detections were recorded by bat detectors on the meteorological mast.

8.5.1.3 Likelihood and Consequence of Impacts

The overall risk rating for chocolate wattle-bat is Minor, based on a Moderate likelihood and Low consequence of collisions (**Table 8.34**). The rationale for responses to each criterion is as follows:

a. Chocolate wattle-bats are likely to regularly fly below RSA height and rarely fly at RSA height.

b. The chocolate wattle-bat was definitively recorded in the Project Area on 68 occasions.

c. Chocolate wattle-bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The life-history characteristics of the chocolate wattle-bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D.

e. The population of the chocolate wattle-bat is likely to be well over 20,000 individuals.

f. The chocolate wattle-bat is not listed under the BC Act or the EPBC Act.

Table 8.34 Chocolate Wattle-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X		X	X
Moderate		X		X		
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Low					
Risk Rating	Minor					

8.5.2 Gould's long-eared bat (*Nyctophilus gouldi*)

8.5.2.1 Information on Gould's long-eared bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora). No Gould's long-eared bats were found, but the five carcasses of the related lesser long-eared bat were recorded at two sites out of 229 total carcasses of 11 bat species across all sites. These turbines had a minimum height of 20–30 m. There were no records from Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found one Gould's long-eared bat within 446 total bat carcasses.

8.5.2.2 Status and Flight Behaviour in the Project Area

Gould's long-eared bat was recorded in the Project Area as part of a species complex consisting of large-footed myotis/Corben's long-eared bat/lesser long-eared bat/Gould's long-eared bat and as *Nyctophilus* sp. on a combined total of 1,082 occasions in all four survey periods. The number of passes per survey ranged from 18 (November 2022) to 285 (February 2023). The calls are unlikely to be attributable to the large-footed myotis as this species is not known to occur in the Locality, suggesting that the species complex records are most likely to represent one or more *Nyctophilus* species. *Nyctophilus* spp. were not recorded on the meteorological mast detectors.

8.5.2.3 Likelihood and Consequence of Impacts

The overall risk rating for Gould's long-eared bat is Minor, based on a Moderate likelihood and Low consequence of collisions (**Table 8.35**). The rationale for responses to each criterion is as follows:

a. Gould's long-eared bats are likely to regularly fly below RSA height and rarely fly at RSA height.

b. The Gould's long-eared bat has not been definitively recorded in the Project Area, but it is a common and widespread and there are 1,082 onsite records of a species complex that includes this species.

c. Gould's long-eared bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The Gould's long-eared bat is a common and widespread species that would have high demographic resilience.

e. The population of the Gould's long-eared bat covers most of Victoria, the eastern half of NSW and much of Queensland, although most records are clustered in the south-east corner of that State, therefore, it is likely to be very large and exceed 20,000 individuals.

f. The Gould's long-eared bat is not listed under the BC Act or the EPBC Act.

Table 8.35 Gould's Long-eared bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	X
Moderate		X				
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Low					
Risk Rating	Minor					

8.5.3 Gould's wattled bat (*Chalinolobus gouldii*)

8.5.3.1 Information on Gould's wattled bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding 59 Gould's wattle-bat carcasses at four sites out of 229 total carcasses of 11 bat species across all sites. All four turbines had a minimum height of 20–30 m. There were no records from Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found 49 Gould's wattle-bats within 446 total bat carcasses. This suggests that Gould's wattle-bat is likely to fly at heights exceeding the minimum turbine height at those locations.

8.5.3.2 Status and Flight Behaviour in the Project Area

Gould's wattle-bat was definitively or probably recorded in the Project Area on 10,460 times across all survey periods except November 2022. The number of passes per survey ranged from 57 (February 2023) to 8,764 (Autumn 2023). A further 31,537 records were made as part of various species complexes. Gould's wattle-bat was also detected a total of 26 times at both detector heights on the meteorological mast, demonstrating that it flies at turbine height in the Project Area.

8.5.3.3 Likelihood and Consequence of Impacts

The overall risk rating Gould's wattle-bat is Moderate, based on a High likelihood and Low consequence of collisions (**Table 8.36**). The rationale for responses to each criterion is as follows:

a. Gould's wattle-bats are likely to regularly fly below RSA height and occasionally fly at RSA height.

b. Gould's wattle-bat has been definitively recorded on the Project Area on 10,460 occasions.

c. Gould's wattle-bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. Gould's wattle-bat is a common and widespread species is likely to have high demographic resilience.

e. The population of the Gould's wattle-bat extends to all of Australia and would, therefore, be very large.

f. Gould's wattle-bat is not listed under the BC Act or the EPBC Act.

Table 8.36 Gould's Wattle-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X	X	X	X
Moderate	X					
High		X				
Risk Rating						
Likelihood	High					
Consequence	Low					
Risk Rating	Moderate					

8.5.4 Inland broad-nosed bat (*Scotorepens balstoni*)

8.5.4.1 Information on Inland broad-nosed bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding no inland broad-nosed bat carcasses Moloney *et al*. (2019) examined 11 wind farms in Victoria and also found no inland broad-nosed bats within 446 total bat carcasses. The broad distribution range of the inland broad-nosed bat suggests that it would occur in areas occupied by commissioned wind farms. Similarly, there are no turbine strikes from other related and widely distributed broad-nosed bat species. This suggests that the inland broad-nosed bat is at a low risk of turbine strike.

8.5.4.2 Status and Flight Behaviour in the Project Area

The inland broad-nosed bat was definitively recorded in the Project Area on 567 occasions. It was also recorded as part of various species complexes on 19,368 occasions. Species records were obtained in all survey periods. The inland broad-nosed bat was recorded on three occasions on the meteorological mast, including twice at 70 m. The inland broad-nosed bat was also recorded as part of a species complex with Gould's wattled bat and Ride's freetail bat 149 times. Both the latter species were recorded definitely flying at turbine height more frequently than the inland broad-nosed bat.

8.5.4.3 Likelihood and Consequence of Impacts

The overall risk rating for inland broad-nosed bat is Moderate, based on a High likelihood and Low consequence of collisions (**Table 8.37**). The rationale for responses to each criterion is as follows:

a. Inland broad-nosed bats are likely to regularly fly below RSA height and occasionally fly at RSA height.

b. The inland broad-nosed bat has been definitively recorded in the Project Area on 567 occasions.

c. Inland broad-nosed bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The inland broad-nosed bat is a common and widespread species that is likely to have high demographic resilience.

e. The population of the inland broad-nosed bat is likely to be well over 20,000 individuals.

f. The inland broad-nosed bat is not listed under the BC Act or the EPBC Act.

Table 8.37 Inland Broad-nosed bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X	X	X	X
Moderate	X					
High		X				
Risk Rating						
Likelihood	High					
Consequence	Low					
Risk Rating	Moderate					

8.5.5 Inland freetail-bat (*Ozimops petersi*)

8.5.5.1 Information on Inland freetail-bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding only one inland freetail-bat carcass out of 229 total carcasses of 11 bat species. The wind farm where the carcass was detected has a minimum RSA height of 30 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found no inland freetail-bats within 446 total bat carcasses. However, the inland freetail-bat only occurs in Victoria in the far north-west of the State and it is unlikely to occur in the locations of any of the wind farms examined. This suggests that the inland freetail-bat occasionally flies at (lower) turbine heights but represents a low overall collision risk.

8.5.5.2 Status and Flight Behaviour in the Project Area

The inland freetail-bat was definitively recorded by ground-based detectors on the Project Area on 1,726 occasions. It was also recorded as part of species complexes a further 107 times. It was detected in all survey periods. There were 52 definite detections of the inland freetail-bat on the meteorological mast detectors at both 50 m and 75 m AGL demonstrating that it flies at turbine height on the Project Area.

8.5.5.3 Likelihood and Consequence of Impacts

The overall risk rating for the inland freetail-bat is Moderate, based on a Moderate likelihood and Moderate consequence of collisions (**Table 8.38**). The rationale for responses to each criterion is as follows:

a. Inland freetail-bats are likely to regularly fly below RSA height and occasionally fly at RSA height.

b. The inland freetail-bats was recorded in the Project Area on 1,726 occasions.

c. Inland freetail-bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The life-history characteristics of the inland freetail-bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D.

e. Very little is known about the ecology of inland freetail-bat though given its very large distribution (Churchill 2009) its population is likely to exceed 5,000 individuals and may possibly be over 20,000.

f. The inland freetail bat is not listed under the BC Act or the EPBC Act.

Table 8.38 Inland Freetail-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			X
Moderate	X			X	X	
High		X				
Risk Rating						
Likelihood	High					
Consequence	Moderate					
Risk Rating	High					

8.5.6 Lesser long-eared bat (*Nyctophilus geoffroyi*)

8.5.6.1 Information on Lesser long-eared bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding five lesser long-eared bat carcasses at two sites out of 229 total carcasses of 11 bat species across all sites. These turbines had a minimum height of 20–30 m. There were no records from Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et al.* (2019) examined 11 wind farms in Victoria and found six lesser long-eared bats within 446 total bat carcasses.

8.5.6.2 Status and Flight Behaviour in the Project Area

The lesser long-eared bat was recorded on the Project Area as part of a species complex consisting of large-footed myotis/Corben's long-eared bat/lesser long-eared bat/Gould's long-eared bat and as *Nyctophilus* sp. on a combined total of 1,082 occasions in all survey periods. The number of passes per survey ranged from 18 (November 2022) to 285 (February 2023). The calls are unlikely to be attributable to the large-footed myotis as this species is not known to occur near the Project Area, suggesting that the species complex records are most likely to represent one or more *Nyctophilus* species. *Nyctophilus* spp. were not recorded on the meteorological mast detectors.

8.5.6.3 Likelihood and Consequence of Impacts

The overall risk rating for lesser long-eared bat is Minor, based on a Moderate likelihood and Low consequence of collisions (**Table 8.39**). The rationale for responses to each criterion is as follows:

- Lesser long-eared bats are likely to regularly fly below RSA height and may rarely fly at RSA height.
- The lesser long-eared bat has not been definitively recorded on the Project Area, but it is a common and widespread species and there are 1,082 onsite records of a species complex that includes this species.
- Lesser long-eared bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.
- The lesser long-eared bat is a common and widespread species that would have high demographic resilience.
- The population of the lesser long-eared bat covers the entire continent and would, therefore, be very large and exceed 20,000 individuals.
- The lesser long-eared bat is not listed under the BC Act or the EPBC Act.

Table 8.39 Lesser Long-eared bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	X
Moderate		X				
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Low					
Risk Rating	Minor					

8.5.7 Little broad-nosed bat (*Scotorepens greyii*)

8.5.7.1 Information on Little broad-nosed bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding no little broad-nosed bat carcasses Moloney *et al*. (2019) examined 11 wind farms in Victoria and also found no little broad-nosed bats within 446 total bat carcasses. The broad distribution range of the little broad-nosed bat suggests that it would occur in areas occupied by commissioned wind farms. Similarly, there are no turbine strikes from other related and widely distributed broad-nosed bat species. This suggests that the little broad-nosed bat is at a low risk of turbine strike.

8.5.7.2 Status and Flight Behaviour in the Project Area

The little broad-nosed bat was definitely or probably recorded in the Project Area on 193 occasions in five survey periods. The little broad-nosed bat was not recorded on the meteorological mast detectors.

8.5.7.3 Likelihood and Consequence of Impacts

The overall risk rating for little broad-nosed bat is Minor, based on a Moderate likelihood and Low consequence of collisions (**Table 8.40**). The rationale for responses to each criterion is as follows:

a. Little broad-nosed bats are likely to regularly fly below RSA height and rarely at RSA height.

b. The little broad-nosed bat has been definitively recorded on the Project Area on 193 occasions.

c. Little broad-nosed bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The little broad-nosed bat is a common and widespread species that would have high demographic resilience.

e. The population of the little broad-nosed bat is likely to be well over 20,000 individuals.

f. The little broad-nosed bat is not listed under the BC Act or the EPBC Act.

Table 8.40 Inland Broad-nosed Bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	X
Moderate		X				
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Low					
Risk Rating	Minor					

8.5.8 Little forest bat (*Vespadelus vulturnus*)

8.5.8.1 Information on Little forest bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding 15 little forest bat carcasses at two sites out of 229 total carcasses of 11 bat species across all sites. These turbines had a minimum height of 20–30 m. There were no records from Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et a*l. (2019) examined 11 wind farms in Victoria and found nine little forest bats within 446 total bat carcasses. This suggests that the little forest bat may fly at heights exceeding the minimum turbine height at least occasionally.

8.5.8.2 Status and Flight Behaviour in the Project Area

The little forest bat was recorded on the Project Area on 552 occasions across all survey periods. It was also potentially recorded 6,301 times as part of various species complexes. The little forest bat was not detected on the meteorological mast detectors, including as a species complex.

8.5.8.3 Likelihood and Consequence of Impacts

The overall risk rating for little forest bat is Moderate, based on a High likelihood and Low consequence of collisions (**Table 8.41**). The rationale for responses to each criterion is as follows:

a. Little forest bats are likely to regularly fly below RSA height and rarely fly at RSA height.

b. The little forest bat has been definitively recorded on the Project Area on 552 occasions.

c. Little forest bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The little forest bat is a common and widespread species that would have high demographic resilience.

e. The little forest bat has a large range and is it likely that its population exceeds 20,000 individuals.

f. The little forest bat is not listed under the BC Act or the EPBC Act.

Table 8.41 Little Forest Bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X	X	X	X
Moderate	X					
High		X				
Risk Rating						
Likelihood	High					
Consequence	Low					
Risk Rating	Moderate					

8.5.9 Ride's freetail-bat (*Ozimops ridei*)

8.5.9.1 Information on Ride's freetail-bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora) but did not report Ride's freetail-bat out of 229 total carcasses of 11 bat species. Four of the five wind farms had minimum turbine heights of 20–30 m, with the remaining one 74 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and also reported no Ride's freetail-bats within 446 total bat carcasses. This suggests that the Ride's freetail-bat usually flies below turbine heights even when they are not particularly high. Thus, Ride's freetail-bat has a low overall collision risk.

8.5.9.2 Status and Flight Behaviour in the Project Area

Ride's freetail-bat was definitively recorded in the Project Area 1,143 times. A further 2,477 detections were made as part of various species complexes. Species records were obtained in all survey periods. There were 18 definitive calls attributed to Ride's freetail-bat both sampled heights at the meteorological mast. A further 149 calls were recorded as part of a species complex. Ride's freetail-bat flies at turbine height in the Project Area.

8.5.9.3 Likelihood and Consequence of Impacts

The overall risk rating for the Ride's freetail-bat is High, based on a High likelihood and Moderate consequence of collisions (**Table 8.42**). The rationale for responses to each criterion is as follows:

a. Ride's freetail-bats are likely to regularly fly below RSA height and occasionally fly at RSA height.

b. Ride's freetail-bat was definitively recorded on the Project Area on 1,143 occasions.

c. Ride's freetail-bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The life-history characteristics of Ride's freetail-bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D.

e. Very little is known about the ecology of Ride's freetail-bat though given its very large distribution (Churchill 2009) its population is likely to exceed 5,000 individuals and may possibly be over 20,000.

f. Ride's freetail bat is not listed under the BC Act or the EPBC Act.

Table 8.42 Ride's Freetail-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			X
Moderate	X			X	X	
High		X				
Risk Rating						
Likelihood	High					
Consequence	Moderate					
Risk Rating	High					

8.5.10 Southern forest bat (*Vespadelus regulus*)

8.5.10.1 Information on Southern forest bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding 21 southern forest bat carcasses at two sites out of 229 total carcasses of 11 bat species across all sites. These turbines had a minimum height of 20–30 m. There were no records from Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found two southern forest bats within 446 total bat carcasses.

8.5.10.2 Status and Flight Behaviour in the Project Area

The southern forest bat was probably or possibly recorded in the Project Area on six occasions. The southern forest bat was also described from various species complexes 643 times. These records were made in all survey periods. The southern forest bat was not recorded by the detectors on the meteorological mast, suggesting that it is unlikely to regularly fly at turbine height on the Project Area.

8.5.10.3 Likelihood and Consequence of Impacts

The overall risk rating for southern forest bat is Minor, based on a Moderate likelihood and Low consequence of collisions (**Table 8.43**). The rationale for responses to each criterion is as follows:

a. Southern forest bats are likely to regularly fly below RSA height and rarely fly at RSA height.

b. The southern forest bat was recorded in the Project Area on six occasions.

c. Southern forest bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The southern forest bat is a common and widespread species that is likely to have high demographic resilience.

e. The population of the southern forest bat extends to a large swath of southern Australia and would, therefore, be very large and exceed 20,000 individuals.

f. The southern forest bat is not listed under the BC Act or the EPBC Act.

Table 8.43 Southern Forest Bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low		X	X	X	X	X
Moderate	X					
High						
Risk Rating						
Likelihood	Moderate					
Consequence	Low					
Risk Rating	Minor					

8.5.11 Southern freetail-bat (*Ozimops planiceps*)

8.5.11.1 Information on Southern freetail-bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding 17 southern freetail-bat carcasses out of 229 total carcasses of 11 bat species. It was recorded at only one wind farm (Bodangora; 102 total bat carcasses), which has a minimum turbine height of 20 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found nine southern freetail-bats within 446 total bat carcasses. This suggests that the southern freetail-bat occasionally flies at (lower) turbine heights but represents a low-moderate overall collision risk.

8.5.11.2 Status and Flight Behaviour in the Project Area

The southern freetail-bat was recorded in the Project Area on 334 occasions. There were a further 2,727 passes as part of various species complexes. The southern freetail-bat was recorded in all survey periods except Winter 2023. The southern freetail-bat was also detected at both the 50 m and 75 m heights on the meteorological mast (totalling of 16 definite detections and 149 detections as part of a species complex) demonstrating that it flies at turbine height in the Project Area.

8.5.11.3 Likelihood and Consequence of Impacts

The overall risk rating for the southern freetail-bat is Moderate, based on a Moderate likelihood and Moderate consequence of collisions (**Table 8.44**). The rationale for responses to each criterion is as follows:

a. Southern freetail-bats are likely to regularly fly below RSA height and occasionally fly at RSA height.

b. The southern freetail-bat has been definitively recorded on the Project Area on 334 occasions.

c. Southern freetail-bats are widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d. The life-history characteristics of the southern freetail-bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D.

e. Very little is known about the ecology of southern freetail-bat though given its very large distribution (Churchill 2009) its population is likely to exceed 5,000 individuals and may possibly be over 20,000.

f. The southern freetail bat is not listed under the BC Act or the EPBC Act.

Table 8.44 Southern Freetail-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			X
Moderate	X	X		X	X	
High		X				
Risk Rating						
Likelihood	Moderate					
Consequence	Moderate					
Risk Rating	Moderate					

8.5.12 White-striped freetail-bat (*Austronomus australis*)

8.5.12.1 Information on white-striped freetail-bat from Australian Wind Farms

Jacobs (2022) reviewed bat mortality data across five operational wind farms in NSW (Silverton, Gullen Range, White Rock, Sapphire, Bodangora), finding 69 white-striped freetail-bat carcasses at four of the five sites out of 229 total carcasses of 11 bat species across all sites. These four wind farms had a minimum height of 20–30 m. There were no records from Sapphire Wind Farm, which has a minimum turbine height of 74 m. Moloney *et al*. (2019) examined 11 wind farms in Victoria and found 296 white-striped freetail-bats within 446 total bat carcasses. White-striped freetail-bats have been frequently reported to be killed in moderate numbers as a result of blade strike or barotrauma through Bird and Bat Adaptive Management Plans (BBAMPs) for wind farms in the south-east NSW (BCS unpublished data).

8.5.12.2 Status and Flight Behaviour in the Project Area

A total of 5,384 white-striped freetail-bat calls were recorded in the Project Area in five survey periods, ranging from two passes in Summer 2024 to 5,158 passes in Autumn 2023. The white-striped freetail-bat was also detected a total of 178 times at the bat detectors deployed at 50 m and 75 m AGL on the meteorological mast demonstrating that it regularly flies at RSA height in the Project Area.

8.5.12.3 Likelihood and Consequence of Impacts

The overall risk rating for White-striped freetail-bat is Moderate, based on a High likelihood and Low consequence of collisions (**Table 8.45**). The rationale for responses to each criterion is as follows:

a. White-striped freetail-bat are likely to regularly fly below RSA height and within RSA height given their instances of being struck by wind turbines as well as the results of our at height bat utilisation surveys.

b. The white-striped freetail-bat has been definitively recorded on the Project Area on 5,384 occasions.

c. White-striped freetail-bats are widespread and have greater flexibility in the range of suitable habitat availability (including roosting in hollows of trees) of which the habitat is also relatively widespread (Richards 1995, Hoye 2002, Churchill 2009).

d. The life-history characteristics of white-striped freetail-bat overlap with certain aspects of both the descriptions for a Low and High rating for Criterion D (Churchill 2009).

e. The white-striped freetail-bat is a common species found across the continent with 10,844 records in NSW alone, hence its population is likely to exceed 20,000 individuals (DPIE 2024).

f. The white-striped freetail-bat is not a threatened species.

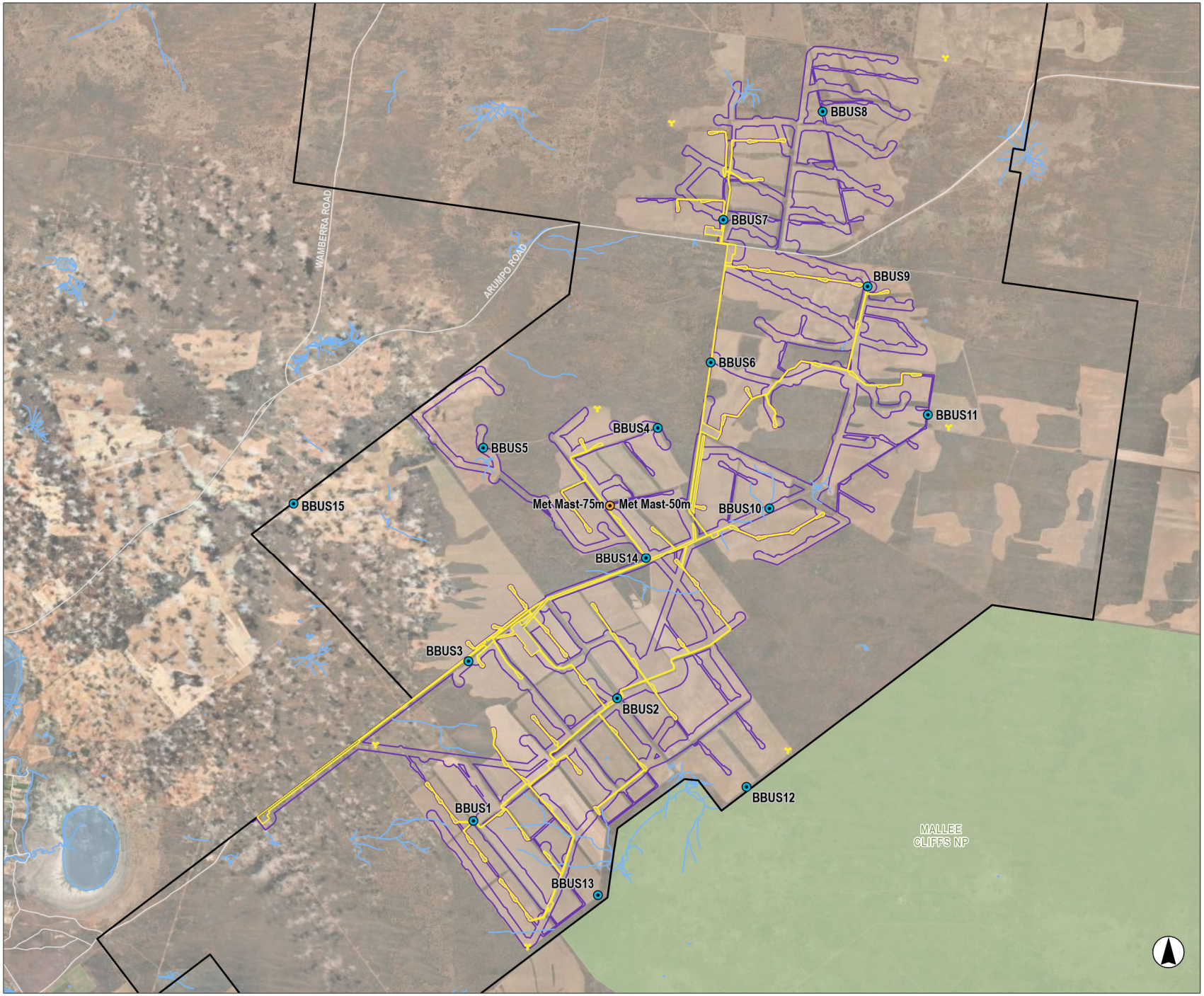
Table 8.45 White-striped Freetail-bat Risk Assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X		X	X
Moderate				X		
High	X	X				
Risk Rating						
Likelihood	High					

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Consequence	Low					
Risk Rating	Moderate					

FIGURE 8.9.0

Location of Microbat Records



Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- Anabat Location - Met Mast
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 3 6
Kilometres

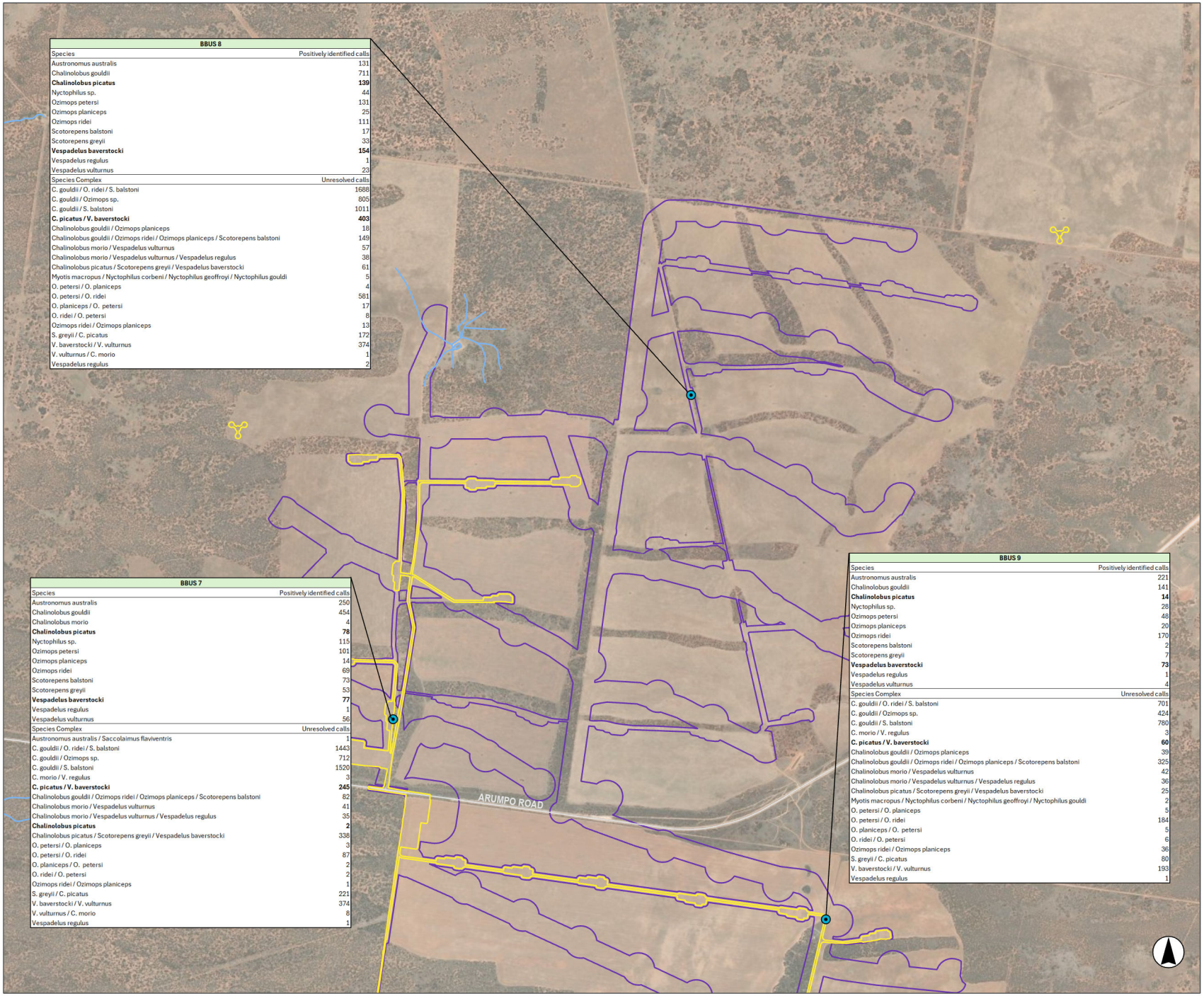
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BBUS 8

Species	Positively identified calls
Austronomus australis	131
Chalinolobus gouldii	711
Chalinolobus picatus	**139**
Nyctophilus sp.	44
Ozimops petersi	131
Ozimops planiceps	25
Ozimops ridei	111
Scotorepens balstoni	17
Scotorepens greyii	33
Vespadelus baverstocki	**154**
Vespadelus regulus	1
Vespadelus vulturnus	23
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	1688
C. gouldii / Ozimops sp.	805
C. gouldii / S. balstoni	1011
C. picatus / V. baverstocki	**403**
Chalinolobus gouldii / Ozimops planiceps	18
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	149
Chalinolobus morio / Vespadelus vulturnus	57
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	38
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	61
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	5
O. petersi / O. planiceps	4
O. petersi / O. ridei	581
O. planiceps / O. petersi	17
O. ridei / O. petersi	8
Ozimops ridei / Ozimops planiceps	13
S. greyii / C. picatus	172
V. baverstocki / V. vulturnus	374
V. vulturnus / C. morio	1
Vespadelus regulus	2

BBUS 7

Species	Positively identified calls
Austronomus australis	250
Chalinolobus gouldii	454
Chalinolobus morio	4
Chalinolobus picatus	**78**
Nyctophilus sp.	115
Ozimops petersi	101
Ozimops planiceps	14
Ozimops ridei	69
Scotorepens balstoni	73
Scotorepens greyii	53
Vespadelus baverstocki	**77**
Vespadelus regulus	1
Vespadelus vulturnus	56
Species Complex	**Unresolved calls**
Austronomus australis / Saccolaimus flaviventris	1
C. gouldii / O. ridei / S. balstoni	1443
C. gouldii / Ozimops sp.	712
C. gouldii / S. balstoni	1520
C. morio / V. regulus	3
C. picatus / V. baverstocki	**245**
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	82
Chalinolobus morio / Vespadelus vulturnus	41
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	35
Chalinolobus picatus	**2**
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	338
O. petersi / O. planiceps	3
O. petersi / O. ridei	87
O. planiceps / O. petersi	2
O. ridei / O. petersi	2
Ozimops ridei / Ozimops planiceps	1
S. greyii / C. picatus	221
V. baverstocki / V. vulturnus	374
V. vulturnus / C. morio	8
Vespadelus regulus	1

BBUS 9

Species	Positively identified calls
Austronomus australis	221
Chalinolobus gouldii	141
Chalinolobus picatus	**14**
Nyctophilus sp.	28
Ozimops petersi	48
Ozimops planiceps	20
Ozimops ridei	170
Scotorepens balstoni	2
Scotorepens greyii	7
Vespadelus baverstocki	**73**
Vespadelus regulus	1
Vespadelus vulturnus	4
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	701
C. gouldii / Ozimops sp.	424
C. gouldii / S. balstoni	780
C. morio / V. regulus	3
C. picatus / V. baverstocki	**60**
Chalinolobus gouldii / Ozimops planiceps	39
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	325
Chalinolobus morio / Vespadelus vulturnus	42
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	36
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	25
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	2
O. petersi / O. planiceps	5
O. petersi / O. ridei	184
O. planiceps / O. petersi	5
O. ridei / O. petersi	6
Ozimops ridei / Ozimops planiceps	36
S. greyii / C. picatus	80
V. baverstocki / V. vulturnus	193
Vespadelus regulus	1

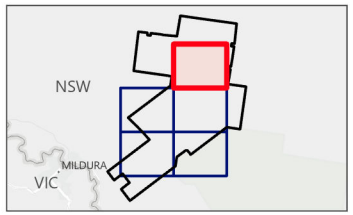
FIGURE 8.9.1

Location of Microbat Records

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- Road
- Watercourse
- Waterbody

Note: Species in **bold** are threatened



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Kilometres

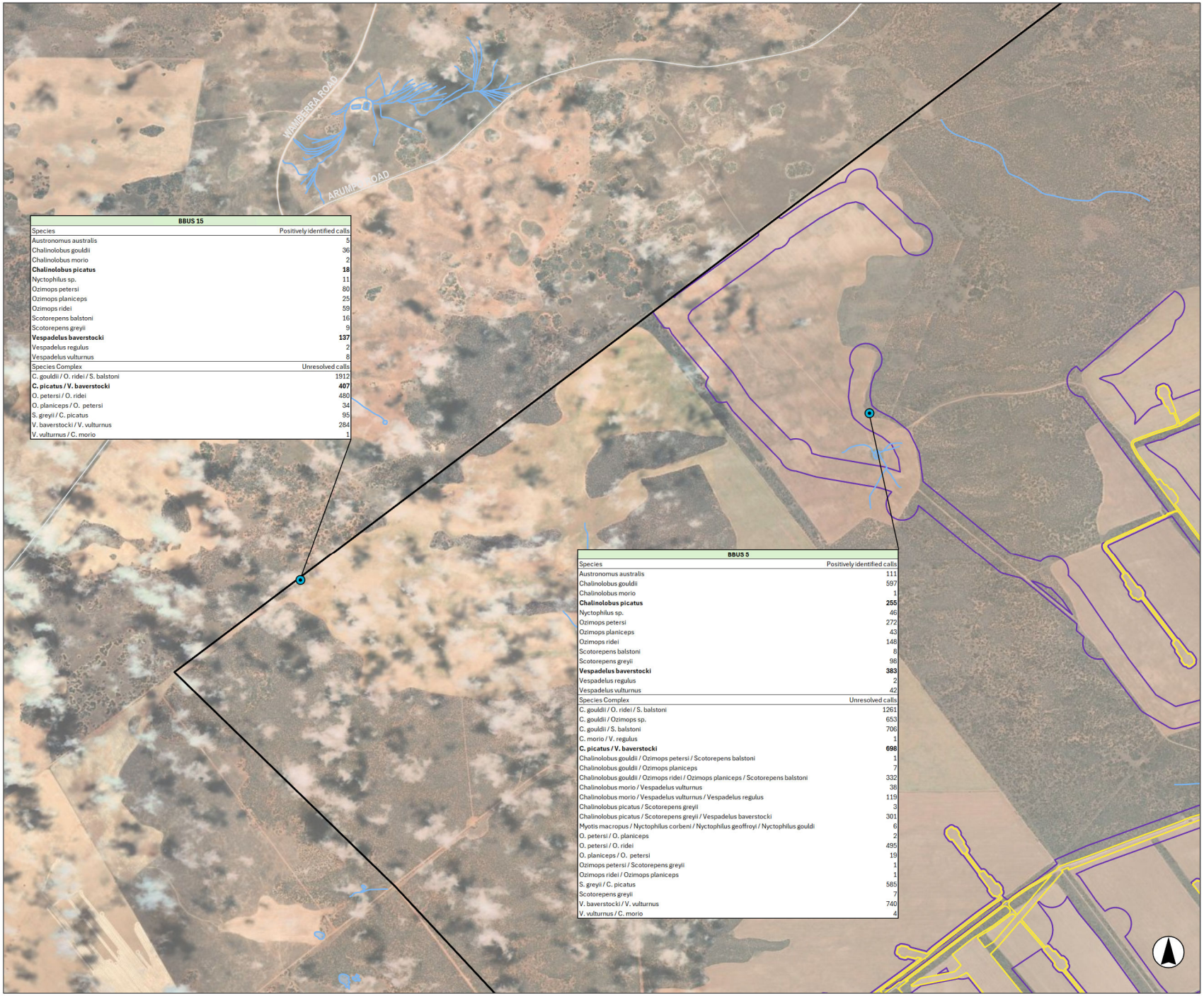
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BBUS 15

Species	Positively identified calls
Austronomus australis	5
Chalinolobus gouldii	36
Chalinolobus morio	2
Chalinolobus picatus	**18**
Nyctophilus sp.	11
Ozimops petersi	80
Ozimops planiceps	25
Ozimops ridei	59
Scotorepens balstoni	16
Scotorepens greyii	9
Vespadelus baverstocki	**137**
Vespadelus regulus	2
Vespadelus vulturnus	8
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	1912
C. picatus / V. baverstocki	**407**
O. petersi / O. ridei	480
O. planiceps / O. petersi	34
S. greyii / C. picatus	95
V. baverstocki / V. vulturnus	284
V. vulturnus / C. morio	1

BBUS 5

Species	Positively identified calls
Austronomus australis	111
Chalinolobus gouldii	597
Chalinolobus morio	1
Chalinolobus picatus	**255**
Nyctophilus sp.	46
Ozimops petersi	272
Ozimops planiceps	43
Ozimops ridei	148
Scotorepens balstoni	8
Scotorepens greyii	98
Vespadelus baverstocki	**383**
Vespadelus regulus	2
Vespadelus vulturnus	42
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	1261
C. gouldii / Ozimops sp.	653
C. gouldii / S. balstoni	706
C. morio / V. regulus	1
C. picatus / V. baverstocki	**698**
Chalinolobus gouldii / Ozimops petersi / Scotorepens balstoni	1
Chalinolobus gouldii / Ozimops planiceps	7
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	332
Chalinolobus morio / Vespadelus vulturnus	38
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	119
Chalinolobus picatus / Scotorepens greyii	3
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	301
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	6
O. petersi / O. planiceps	2
O. petersi / O. ridei	495
O. planiceps / O. petersi	19
Ozimops petersi / Scotorepens greyii	1
Ozimops ridei / Ozimops planiceps	1
S. greyii / C. picatus	585
Scotorepens greyii	7
V. baverstocki / V. vulturnus	740
V. vulturnus / C. morio	4

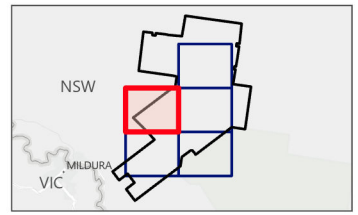
FIGURE 8.9.2

Location of Microbat Records

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- Road
- Watercourse
- Waterbody

Note: Species in **bold** are threatened



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Kilometres

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BBUS 4

Species	Positively identified calls
Austronomus australis	1554
Chalinolobus gouldii	1328
Chalinolobus morio	3
Chalinolobus picatus	**123**
Nyctophilus sp.	155
Ozimops petersi	120
Ozimops planiceps	34
Ozimops ridei	95
Scotorepens balstoni	114
Scotorepens greyii	12
Vespadelus baverstocki	**268**
Vespadelus regulus	1
Vespadelus vulturnus	120
Species Complex	**Unresolved calls**
C. gouldii / Ozimops sp.	1184
C. gouldii / S. balstoni	534
C. morio / V. regulus	2
C. picatus / V. baverstocki	**244**
Chalinolobus gouldii / Ozimops planiceps	3
Chalinolobus morio / Vespadelus vulturnus	13
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	6
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	69
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	7
O. planiceps / O. petersi	13
O. ridei / O. petersi	3
Ozimops ridei / Ozimops planiceps	1
S. greyii / C. picatus	166
Scotorepens greyii	1
V. baverstocki / V. vulturnus	453
Vespadelus regulus	3

BBUS 6

Species	Positively identified calls
Austronomus australis	2
Chalinolobus gouldii	164
Chalinolobus morio	18
Chalinolobus picatus	**17**
Nyctophilus sp.	23
Ozimops petersi	74
Ozimops planiceps	2
Ozimops ridei	53
Scotorepens balstoni	56
Scotorepens greyii	13
Vespadelus baverstocki	**40**
Species Complex	**Unresolved calls**
Austronomus australis / Saccolaimus flaviventris	2
C. gouldii / O. ridei / S. balstoni	2783
C. gouldii / S. balstoni	807
C. picatus / V. baverstocki	**235**
Chalinolobus gouldii / Ozimops planiceps	2
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	42
Chalinolobus morio / Vespadelus vulturnus	64
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	32
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	74
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	2
O. petersi / O. ridei	572
O. planiceps / O. petersi	18
Ozimops ridei / Ozimops planiceps	1
S. greyii / C. picatus	108
Scotorepens greyii	2
V. baverstocki / V. vulturnus	314
V. vulturnus / C. morio	1

BBUS 11

Species	Positively identified calls
Chalinolobus gouldii	16
Chalinolobus picatus	**26**
Nyctophilus sp.	5
Ozimops petersi	26
Ozimops planiceps	1
Ozimops ridei	19
Scotorepens balstoni	50
Scotorepens greyii	2
Vespadelus baverstocki	**151**
Vespadelus vulturnus	5
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	947
C. picatus / V. baverstocki	**384**
O. petersi / O. ridei	289
O. planiceps / O. petersi	9
S. greyii / C. picatus	220
V. baverstocki / V. vulturnus	339
V. vulturnus / C. morio	2

Met Mast

Species	(50 m) Positively identified calls	(75 m) Positively identified calls
Austronomus australis	40	201
Chalinolobus gouldii	14	13
Chalinolobus picatus	**-**	**1**
Ozimops petersi	30	27
Ozimops planiceps	5	11
Ozimops ridei	12	6
Scotorepens balstoni	-	2
Species Complex	**Unresolved calls**	
C. gouldii / O. ridei / S. balstoni	112	127
C. gouldii / Ozimops sp.	-	6
C. gouldii / S. balstoni	98	115
C. picatus / V. baverstocki	**-**	**1**
Chalinolobus gouldii / Ozimops planiceps	3	6
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	3	19
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	1	
O. petersi / O. planiceps	-	5
O. petersi / O. ridei	68	81
O. planiceps / O. petersi	7	6
Ozimops ridei / Ozimops planiceps	2	-

BBUS 10

Species	Positively identified calls
Austronomus australis	227
Chalinolobus gouldii	607
Chalinolobus picatus	**409**
Nyctophilus sp.	43
Ozimops petersi	115
Ozimops planiceps	26
Ozimops ridei	93
Scotorepens balstoni	42
Scotorepens greyii	64
Vespadelus baverstocki	**778**
Vespadelus regulus	1
Vespadelus vulturnus	122
Species Complex	**Unresolved calls**
Austronomus australis / Saccolaimus flaviventris	1
C. gouldii / O. ridei / S. balstoni	2260
C. gouldii / Ozimops sp.	838
C. gouldii / S. balstoni	3441
C. morio / V. regulus	5
C. picatus / V. baverstocki	**651**
Chalinolobus gouldii / Ozimops planiceps	56
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	535
Chalinolobus morio / Vespadelus vulturnus	616
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	243
Chalinolobus picatus	**1**
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	437
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	16
O. petersi / O. planiceps	6
O. petersi / O. ridei	666
O. planiceps / O. petersi	35
O. ridei / O. petersi	4
Ozimops petersi / Scotorepens greyii	5
Ozimops ridei / Ozimops planiceps	22
S. greyii / C. picatus	542
Scotorepens greyii	5
V. baverstocki / V. vulturnus	2354
V. vulturnus / C. morio	3
Vespadelus regulus	2

BBUS 14

Species	Positively identified calls
Austronomus australis	34
Chalinolobus gouldii	168
Chalinolobus morio	2
Chalinolobus picatus	**11**
Nyctophilus sp.	29
Ozimops petersi	144
Ozimops planiceps	10
Ozimops ridei	18
Scotorepens balstoni	11
Scotorepens greyii	2
Vespadelus baverstocki	**171**
Vespadelus regulus	0
Vespadelus vulturnus	5
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	964
C. gouldii / S. balstoni	161
C. picatus / V. baverstocki	**155**
Chalinolobus gouldii / Ozimops planiceps	9
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	9
O. petersi / O. ridei	418
O. planiceps / O. petersi	12
Ozimops ridei / Ozimops planiceps	1
S. greyii / C. picatus	62
V. baverstocki / V. vulturnus	164
V. vulturnus / C. morio	2

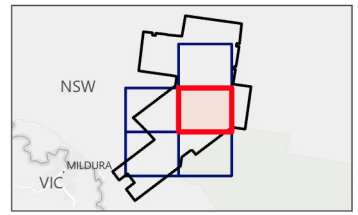
FIGURE 8.9.3

Location of Microbat Records

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- Anabat Location - Met Mast
- NPWS Estates
- Watercourse
- Waterbody

Note: Species in **bold** are threatened



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Kilometres

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BBUS 3

Species	Positively identified calls
Austronomus australis	528
Chalinolobus gouldii	1930
Chalinolobus morio	6
Chalinolobus picatus	**77**
Nyctophilus sp.	136
Ozimops petersi	166
Ozimops planiceps	47
Ozimops ridei	95
Scotorepens balstoni	60
Scotorepens greyii	17
Vespadelus baverstocki	**27**
Vespadelus regulus	1
Vespadelus vulturnus	95
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	1987
C. gouldii / Ozimops sp.	1627
C. gouldii / S. balstoni	2211
C. morio / V. regulus	4
C. picatus / V. baverstocki	**326**
Chalinolobus gouldii / Ozimops petersi / Scotorepens balstoni	1
Chalinolobus gouldii / Ozimops planiceps	17
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	141
Chalinolobus morio / Vespadelus vulturnus	11
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	8
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	153
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	1
O. petersi / O. planiceps	5
O. petersi / O. ridei	563
O. planiceps / O. petersi	26
O. ridei / O. petersi	4
Ozimops ridei / Ozimops planiceps	4
S. greyii / C. picatus	105
Scotorepens greyii	1
V. baverstocki / V. vulturnus	191
V. vulturnus / C. morio	1

BBUS 1

Species	Positively identified calls
Austronomus australis	1482
Chalinolobus gouldii	2764
Chalinolobus morio	7
Chalinolobus picatus	**101**
Nyctophilus sp.	42
Ozimops petersi	154
Ozimops planiceps	42
Ozimops ridei	65
Scotorepens balstoni	25
Scotorepens greyii	19
Vespadelus baverstocki	**51**
Vespadelus regulus	2
Vespadelus vulturnus	21
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	5026
C. gouldii / Ozimops sp.	2889
C. gouldii / S. balstoni	5462
C. morio / V. regulus	11
C. picatus / V. baverstocki	**148**
Chalinolobus gouldii / Ozimops planiceps	21
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	302
Chalinolobus morio / Vespadelus vulturnus	49
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	19
Chalinolobus picatus / Scotorepens greyii	1
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	202
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	237
O. petersi / O. planiceps	7
O. petersi / O. ridei	1265
O. planiceps / O. petersi	56
O. ridei / O. petersi	6
Ozimops petersi / Scotorepens greyii	2
Ozimops ridei / Ozimops planiceps	5
S. greyii / C. picatus	102
Scotorepens greyii	2
V. baverstocki / V. vulturnus	285
V. vulturnus / C. morio	2

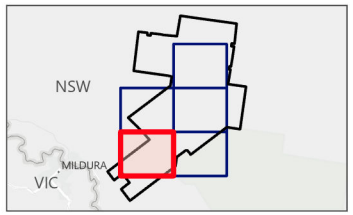
FIGURE 8.9.4

Location of Microbat Records

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- NPWS Estates
- Road
- Watercourse
- Waterbody

Note: Species in **bold** are threatened



0 2

Kilometres

Scale 1:50,000 at A4

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BBUS 2

Species	Positively identified calls
Austronomus australis	599
Chalinolobus gouldii	1237
Chalinolobus morio	2
Chalinolobus picatus	**158**
Nyctophilus sp.	25
Ozimops petersi	151
Ozimops planiceps	27
Ozimops ridei	83
Scotorepens balstoni	21
Scotorepens greyii	33
Vespadelus baverstocki	**108**
Vespadelus vulturnus	52
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	1507
C. gouldii / Ozimops sp.	479
C. gouldii / S. balstoni	2452
C. morio / V. regulus	10
C. picatus / V. baverstocki	**133**
Chalinolobus gouldii / Ozimops petersi / Scotorepens balstoni	4
Chalinolobus gouldii / Ozimops planiceps	39
Chalinolobus gouldii / Ozimops ridei / Ozimops planiceps / Scotorepens balstoni	341
Chalinolobus morio / Vespadelus vulturnus	45
Chalinolobus morio / Vespadelus vulturnus / Vespadelus regulus	41
Chalinolobus picatus	**7**
Chalinolobus picatus / Scotorepens greyii	2
Chalinolobus picatus / Scotorepens greyii / Vespadelus baverstocki	595
Myotis macropus / Nyctophilus corbeni / Nyctophilus geoffroyi / Nyctophilus gouldi	14
O. petersi / O. planiceps	4
O. petersi / O. ridei	695
O. planiceps / O. petersi	33
O. ridei / O. petersi	7
Ozimops ridei / Ozimops planiceps	32
S. greyii / C. picatus	63
Scotorepens greyii	2
V. baverstocki / V. vulturnus	683
V. vulturnus / C. morio	1

BBUS 12

Species	Positively identified calls
Austronomus australis	1
Chalinolobus gouldii	56
Chalinolobus morio	3
Chalinolobus picatus	**5**
Nyctophilus sp.	63
Ozimops petersi	14
Ozimops planiceps	1
Ozimops ridei	15
Scotorepens balstoni	48
Scotorepens greyii	1
Vespadelus baverstocki	**25**
Vespadelus vulturnus	2
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	1386
C. picatus / V. baverstocki	**300**
O. petersi / O. ridei	154
O. planiceps / O. petersi	10
S. greyii / C. picatus	93
V. baverstocki / V. vulturnus	72

BBUS 13

Species	Positively identified calls
Austronomus australis	2
Chalinolobus gouldii	364
Chalinolobus morio	20
Chalinolobus picatus	**56**
Nyctophilus sp.	14
Ozimops petersi	74
Ozimops planiceps	8
Ozimops ridei	32
Scotorepens balstoni	22
Scotorepens greyii	1
Vespadelus baverstocki	**70**
Vespadelus vulturnus	2
Species Complex	**Unresolved calls**
C. gouldii / O. ridei / S. balstoni	2214
C. picatus / V. baverstocki	**92**
O. petersi / O. ridei	535
O. planiceps / O. petersi	33
S. greyii / C. picatus	37
V. baverstocki / V. vulturnus	57

FIGURE 8.9.5

Location of Microbat Records

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Anabat Location
- NPWS Estates
- Watercourse
- Waterbody

Note: Species in **bold** are threatened



0 2

Kilometres

Scale 1:50,000 at A4

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9.0 Impact Avoidance Behaviour

Criterion a (vi) predict the impact of avoidance behaviour for migratory species relative to migration distances, and the availability of suitable habitat for breeding, feeding and resting over the migration route

Avoidance behaviour is considered to be a behavioural change by a particular species whereby either specific habitat, a locality or a wider region is avoided. The potential influence that indirect impacts associated with such avoidance behaviour may have on migratory or partly migratory species is difficult to predict given the lack of relevant information available in Australia. Assessment against such criterion will be only possible through the preparation (i.e., completion of baseline monitoring) and subsequent implementation (i.e., ongoing monitoring) of the Bird and Bat Adaptative Management Plan for the Project.

10.0 Justification of Likelihood and Nature of Impact Predictions

Criterion b: Justify predictions with reference to data, collision risk modelling (if available), relevant literature or other published sources including any publications by the Department

Refer to **Section 8.0**.

11.0 Disturbance Zones

Criterion c: Map the disturbance zone around wind turbines, and the significant landscape and habitat features within that zone, for species likely to be affected, e.g., hollow bearing trees and important habitat for migratory species.

The disturbance zones around the wind turbines in relation to significant landscape and habitat features is shown on **Figure 11.1**.

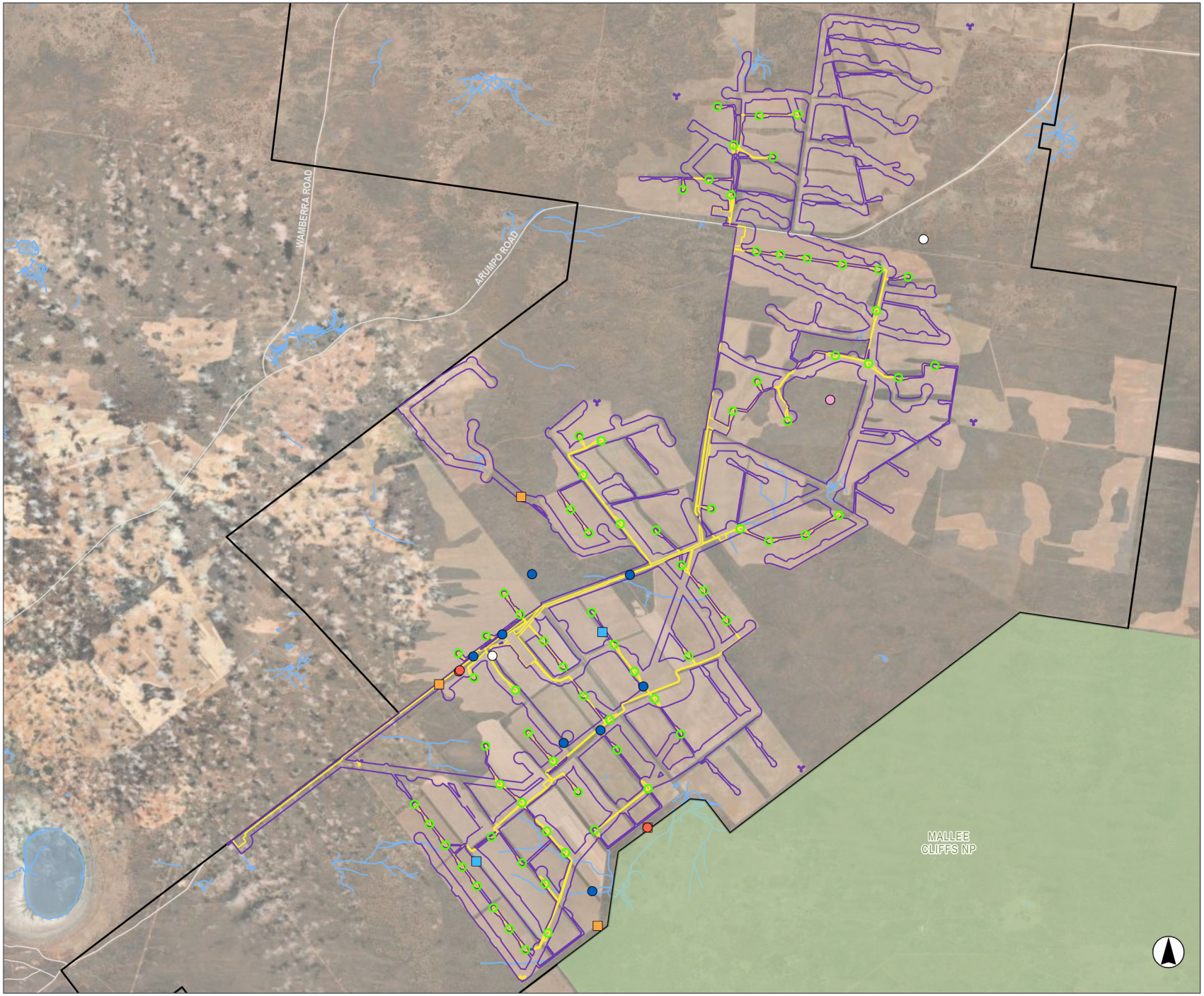


FIGURE 11.1

Turbine Disturbance Areas

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Turbine Disturbance Areas

Habitat Features

- Burrow - inactive
- Hollow Bearing Tree
- Stick Nest (likely raptor) - unoccupied
- Stick Nest (likely raven) - unoccupied
- Wedge-tailed Eagle Stick Nest - active until spring 2024 (tree fallen over)
- Stick Nest - unoccupied
- NPWS Estates
- Road
- Watercourse
- Waterbody

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12.0 Conclusion

A total of 124 bird species were recorded in the Project Area during November 2022 – May 2024 including 14 threatened species listed under the BC Act and/or the EPBC Act. A total of 16 bat species were recorded including four threatened species listed under the BC Act and/or the EPBC Act

Of the 15 assessed threatened/migratory bird species that were recorded in the Project Area a total of three were assigned a High risk rating, three were assigned a Moderate risk rating, one was assigned a Minor risk rating and the remaining eight were assigned a Negligible risk rating (**Table 12.1**).

Of the 23 threatened bird species that were not recorded during the 2022–2024 surveys but are likely to occasionally occur in the Project Area three species were assigned a Moderate risk rating, 14 were assigned a Minor risk rating and six were assigned a Negligible rating.

Of the 109 non-threatened bird species that were recorded in the Project Area five species were assigned a Moderate risk rating, 19 were assigned a Minor risk rating and the remaining 85 were assigned a Negligible risk rating.

Of the four threatened bat species that were recorded in the Project Area three were assigned a Moderate risk rating and one was assigned a Minor risk rating. Of the 12 non-threatened bat species, two were assigned a High risk rating, five were assigned a Moderate risk rating and five were assigned a Minor risk rating.

Table 12.1 Risk Assessment Results

Common Name	Species Name	Likelihood	Consequence	Risk Rating
Threatened/migratory Birds				
black falcon	*Falco subniger*	High	Moderate	High
chestnut quail-thrush	*Cinclosoma castanotum*	Low	Low	Negligible
dusky woodswallow	*Artamus cyanopterus cyanopterus*	Moderate	Low	Minor
Gilbert's whistler	*Pachycephala inornata*	Low	Low	Negligible
hooded robin (south-eastern subspecies)	*Melanodryas cucullata cucllata*	Low	Low	Negligible
little eagle	*Hieraaetus morphnoides*	High	Moderate	High
Pacific swift	*Apus pacificus*	High	Low	Moderate
pied honeyeater	*Certhionyx variegatus*	Low	Low	Negligible
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	Moderate	Moderate	Moderate
shy heathwren	*Hylacola cautus*	Low	Low	Negligible
southern whiteface	*Aphelocephala leucopsis*	Low	Low	Negligible
spotted harrier	*Circus assimilis*	High	Moderate	High
square-tailed kite	*Lophoictinia isura*	Moderate	Moderate	Moderate
varied sittella	*Daphoensitta chrysoptera*	Low	Low	Negligible
white-fronted chat	*Epthianura albifrons*	Low	Low	Negligible
Mallee Bird Community EEC: regent parrot		Moderate	Moderate	Moderate

Common Name	Species Name	Likelihood	Consequence	Risk Rating
Mallee Bird Community EEC: chestnut quail-thrush, crested bellbird, Jacky winter, shy heathwren, splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater and yellow-plumed honeyeater		Low	Low	Negligible
Non-listed birds				
wedge-tailed eagle	*Aquila audax*	High	Low	Moderate
Bats				
Corben's long-eared bat	*Nyctophilus corbeni*	Low	Moderate	Minor
inland forest bat	*Vespadelus baverstocki*	Moderate	Moderate	Moderate
little pied bat	*Chalinolobus picatus*	Moderate	Moderate	Moderate
yellow-bellied sheathtail bat	*Saccolaimus flaviventris*	Moderate	Moderate	Moderate
Non-listed bats				
chocolate wattled bat	*Chalinolobus morio*	Moderate	Low	Minor
Gould's long-eared bat	*Nyctophilus gouldi*	Moderate	Low	Minor
Gould's wattle bat	*Chalinolobus gouldii*	High	Low	Moderate
inland broad-nosed bat	*Scotorepens balstoni*	High	Low	Moderate
inland free-tailed bat	*Ozimops petersi*	High	Moderate	High
lesser long-eared bat	*Nyctophilus geoffroyi*	Moderate	Low	Minor
little broad-nosed bat	*Scotorepens greyii*	Moderate	Low	Minor
little forest bat	*Vespadelus vulturnus*	High	Low	Moderate
ride's free-tailed bat	*Ozimops ridei*	High	Moderate	High
southern forest bat	*Vespadelus regulus*	Moderate	Low	Minor
southern free-tailed bat	*Ozimops planiceps*	Moderate	Moderate	Moderate
white-striped freetail-bat	*Austronomus australis*	High	Low	Moderate

13.0 References

Barrett, G., Silcocks, A., Cunningham, R., Oliver, D., Weston, M., Baker, J. 2007. Comparison of atlas data to determine the conservation status of bird species in New South Wales, with an emphasis on woodland-dependent species. Australian Zoologist 34, 37–77.

BirdLife International (2024) IUCN Red List for birds. Downloaded from https://datazone.birdlife.org on 10/08/2024.

Brett Lane and Associates (BLA) 2017. Gullen Range Wind Farm – Annual Report Mar 2016 – Feb 2017

Brett Lane and Associates (BLA) 2019. White Rock Wind Farm – First Annual Report March 2018 – March 2019

Churchill, S. 2009. Australian Bats (2nd edition). Allen and Unwin. Sydney, NSW.

Croll, D.A., Ellis, A.A., Adams, J., Cook, A.S., Garthe, S., Goodale, M.W., Hall, C.S., Hazen, E., Keitt, B.S., Kelsey, E.C. and Leirness, J.B., 2022. Framework for assessing and mitigating the impacts of offshore wind energy development on marine birds. Biological Conservation, 276, p.109795.

Debus, S. (2014). Black Falcons and collisions. Boobook 32: 15.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024a. Onshore wind farm guidance - best practice approaches when seeking approval under Australia's national environment law, Department of Climate Change, Energy, the Environment and Water, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024b. NSW Wind Farms – turbine strike assessment and adaptive impact management. Biodiversity Assessment Method Guide. February 2024.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024c. Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (10 km buffer). (MNES) https://www.awe.gov.au/environment/epbc/protected-matters-search-tool (DCCEEW 2024c). Date last accessed: 12 August 2024

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024d. BioNet Atlas Threatened Biodiversity Profile Data Collection (20km buffer). https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet. Date last accessed: 12 August 2024

Department of Planning, Industry and Environment (DPIE) (2020a). Biodiversity Assessment Method 2020.

Department of Planning, Industry and Environment (DPIE) (2024) BioNet Atlas of NSW Wildlife. Last accessed August 2024.

Drewitt, A. and Langston, R. 2006. Assessing the impacts of wind farms on birds. Ibis, 148: 29–42.

eBird. 2024. eBird: An online database of bird distribution and abundance. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: http://www.ebird.org. Date last accessed: 12 August 2024

Eco Logical Australia 2023. Crudine Ridge Wind Farm Bird and Bat Adaptive Management Plan Implementation Report – Year Two. Prepared for Squadron Energy

Ehmke G, Antos MJ, Bennett AF, Ford HA, Barnes MD, Tulloch AIT, Loyn RH & Garnett ST (2021) South-west Southern Whiteface Aphelocephala leucopsis castaneiventris and South-east Southern Whiteface A. l. leucopsis. In The Action Plan for Australian Birds 2020. (Eds ST Garnett and GB Baker). CSIRO Publishing, Melbourne.

Elmoby Ecology 2022. Year 2 Bird and Bat Mortality Monitoring Survey, Silverton Wind Farm, NSW. Report for GE Renewable Energy Australia Pty Ltd. Bennett, E. Elmoby Ecology, Clunes Vic. Project No. 238

Ferguson-Lees, J. and Christie, D.A. 2001. Raptors of the world. Christopher Helm, London.

Garnett S, Crowley G (Eds) (2000) 'The Action Plan for Australian Birds 2000.' (Environment Australia: Canberra)

Higgins, P., Peter, J., and Cowling, S (eds) 2006. Handbook of Australian, New Zealand and Antarctic Birds. Volume 7: Boatbill to Starlings. Oxford University Press, Melbourne.

Higgins, P.J. (ed) 1999. Handbook of Australian, New Zealand and Antarctic Birds. Volume 4: Parrots to Dollarbird. Oxford University Press, Melbourne. ISBN 0-19-553071-3.

Higgins, P.J., J.M. Peter & W.K. Steele (eds) 2001. Handbook of Australian, New Zealand and Antarctic Birds. Volume 5: Tyrant-flycatchers to Chats. Oxford University Press, Melbourne.

Higgins, P.J. & J.M. Peter (eds) 2002. Handbook of Australian, New Zealand and Antarctic Birds. Volume 6: Pardalotes to Shrike-thrushes. Oxford University Press, Melbourne.

Hoye, G. 2002. Baseline Survey for Microchiropteran bats of the Sydney Olympic Parklands, Homebush Bay, New South Wales. Fly By Night Bat Surveys Ptd Ltd, NSW.

Hull, C., Stark, E., Peruzzo, S., and Sims, C. 2013. Avian collisions at two wind farms in Tasmania, Australia: taxonomic and ecological characteristics of colliders versus noncolliders, New Zealand Journal of Zoology, 40:1, 47–62.

Jacobs (2022) Yanco Delta Wind Farm Jerilderie NSW: Biodiversity Development Assessment Report. Prepared on behalf of Virya Energy Pty Ltd.

Krijgsveld, K., Akershock, K., Schenk, F., Djik. F., and Dirksen, S. 2009. Collision risk of birds with modern large wind turbines. Ardea 97:357–366.

Law, B., Gonsalves, L., Chidel, M. and Brassil, T. 2016. Subtle use of a disturbance mosaic by the south-Eastern long-Fared bat (*Nyctophilus corbeni*): an extinction-prone, narrow-space bat. Wildlife Research, 43, 153–168.

Lumsden, L., Moloney, P., and Smales, I. 2019. Developing a science-based approach to defining key species of birds and bats of concern for wind farm developments in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series No. 301. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Marchant, S., & P.J. Higgins (eds) 1993. Handbook of Australian, New Zealand and Antarctic Birds. Volume 2: Raptors to Lapwings. Oxford University Press, Melbourne.

Meredith, C., Venosta, M., and Ressom, R. 2002. Codrington Wind Farm Avian Avoidance Behaviour Report. Biosis Research report.

Moloney, P., Lumsden L., and Smales, I. 2019. Investigation of existing post-construction mortality monitoring at Victorian wind farms to assess its utility in estimating mortality rates. Arthur Rylah Institute for Environmental Research Technical Report Series No. 302. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Nature Advisory (2020), Annual Report on the Implementation of the Bird and Bat Adaptive Management Plan, Prepared for Bodangora Wild Farm Pty Ltd. Report No. 15124 (20.0).

Nature Advisory 2021. Bodangora Wind Farm Bird and Bat Adaptive Management Plan – Second Annual Report. Prepared for Infigen Pty Ltd

Nature Advisory 2023. Sapphire Wind Farm Fourth Year Annual Report on the Implementation of the Bird and Bat Adaptive Management Plan. Prepared for Sapphire Wind Farm 1 Operations Pty Ltd

Nature Advisory 2024. Second Annual Report on the Implementation of the Bird and Bat Adaptive Management Program, Biala Wind Farm. Prepared for Newtricity Developments Biala Pty Ltd

NGH 2022. Boco Rock Wind Farm Bird and Bat Monitoring Annual Report 2021 Year 7.

Olsen, J., and Fuentes, E. 2005. Collapse in numbers of breeding Little Eagles in the Australian Capital Territory. Canberra Bird Notes 30, 141–145.

Pennay, M., Law, B., and Lumney, D. 2011. Review of the distribution and status of the bat fauna of New South Wales and the Australian Capital Territory, in The Biology and Conservation of Australian Bats. January 2011, 226–256.

Richards, G. C. 1995. White-striped Freetail-bat Nyctinomus australis (Gray, 1838). Pages 487–488 in R. Strahan, editor. The Mammals of Australia, 2nd edition. Reed Books, Chatswood, NSW.

Richardson, W.J. 2000. Bird Migration and Wind Turbines: Migration Timing, Flight Behaviour, and Collision Risk. Proceedings of National Avian-Wind Power Planning Meeting II, 132–140.

Schippers, P., Buij, R., Schotman, A., Verboom, J., van der Jeugd, H. and Jongejans, E., 2020. Mortality limits used in wind energy impact assessment underestimate impacts of wind farms on bird populations. Ecology and Evolution, 10(13), pp.6274-6287.

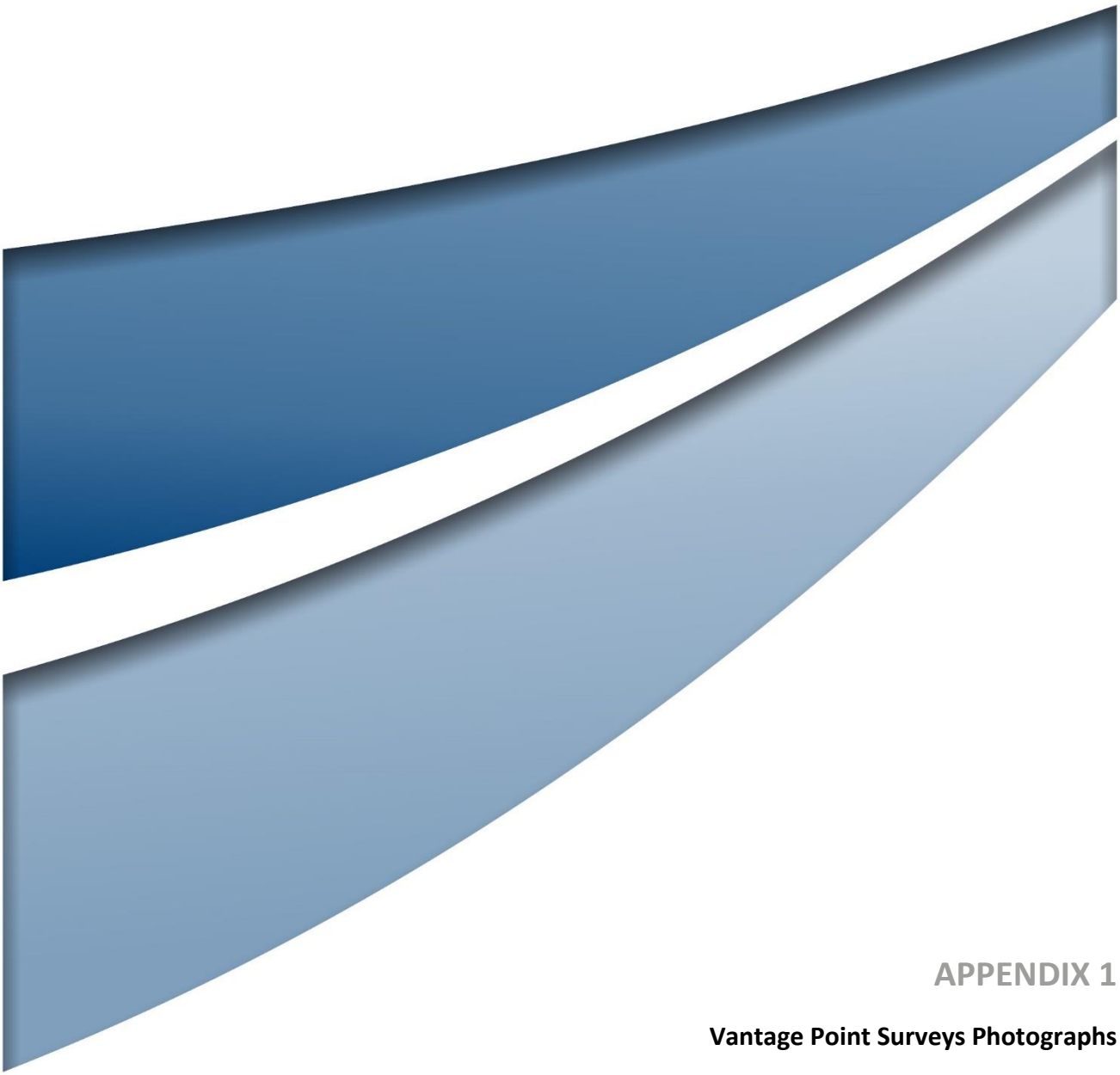
Sluiter, I.R.K., Robertson, P. and Webster. R. 2006. Victim impact statement – threatened wildlife damage – The Regent Parrot (eastern sub-species) population at Yungera, north western Victoria – November 2006. Report produced for the Department of Sustainability and Environment. Ogyris Pty. Ltd., Merbein.

Smales I. 2014. Fauna Collisions with Wind Turbines: Effects and Impacts, Individuals and Populations. What Are We Trying to Assess?. In: Hull C., Bennett E., Stark E., Smales I., Lau J., Venosta M. (eds) Wind and Wildlife. Springer, Dordrecht.

Smales, I., Muir, S., Meredith, C., and Baird, R. 2013. A description of the Biosis model to assess risk of bird collisions with wind turbines, Wildlife Society Bulletin, Vol. 37, No. 1, Wind-Fnergy Development and Wildlife Conservation (March 2013), pp. 59–65.

Smith, K. 2001. Regent Parrot nest survey 2000. Report to the South Australian National Parks and Wildlife Council, Adelaide.

Wood, M. 2015. Macarthur Wind Farm Bat and Avifauna Mortality Monitoring, Prepared for AGL Energy Limited by Australian Ecological Research Services.



APPENDIX 1

Vantage Point Surveys Photographs



Photograph 1 VP 1 – View North



Photograph 2 VP 1 – View East



Photograph 3 VP 1 – View South



Photograph 4 VP 1 – View West



Photograph 5 VP 2 – View North



Photograph 6 VP 2 – View East



Photograph 7 VP 2 – View South



Photograph 8 VP 2 – View West



Photograph 9 VP 3 – View North



Photograph 10 VP 3 – View East



Photograph 11 VP 3 – View South



Photograph 12 VP 3 – View West



Photograph 13 VP 4 – View North



Photograph 14 VP 4 – View East



Photograph 15 VP 4 – View South



Photograph 16 VP 4 – View West



Photograph 17 VP 5 – View North



Photograph 18 VP 5 – View East



Photograph 19 VP 5 – View South



Photograph 20 VP 5 – View West



Photograph 21 VP 6 – View North



Photograph 22 VP 6 – View East



Photograph 23 VP 6 – View South



Photograph 24 VP 6 – View West



Photograph 25 VP 7 – View North



Photograph 26 VP 7 – View East



Photograph 27 VP 7 – View South



Photograph 28 VP 7 – View West



Photograph 29 VP 8 – View North



Photograph 30 VP 8 – View East



Photograph 31 VP 8 – View South



Photograph 32 VP 8 – View West



Photograph 33 VP 9 – View North



Photograph 34 VP 9 – View East



Photograph 35 VP 9 – View South



Photograph 36 VP 9 – View West



Photograph 37 VP 10 – View North



Photograph 38 VP 10 – View East



Photograph 39 VP 10 – View South



Photograph 40 VP 10 – View West



Photograph 41 VP 11 – View North



Photograph 42 VP 11 – View East



Photograph 43 VP 11 – View South



Photograph 44 VP 11 – View West



Photograph 45 VP 12 – View North



Photograph 46 VP 12 – View East



Photograph 47 VP 12 – View South



Photograph 48 VP 12 – View West



Photograph 49 VP 13 – View North



Photograph 50 VP 13 – View East



Photograph 51 VP 13 – View South



Photograph 52 VP 13 – View West



Photograph 53 VP 14 – View North



Photograph 54 VP 14 – View East



Photograph 55 VP 14 – View South



Photograph 56 VP 14 – View West



Photograph 57 VP 15 – View North



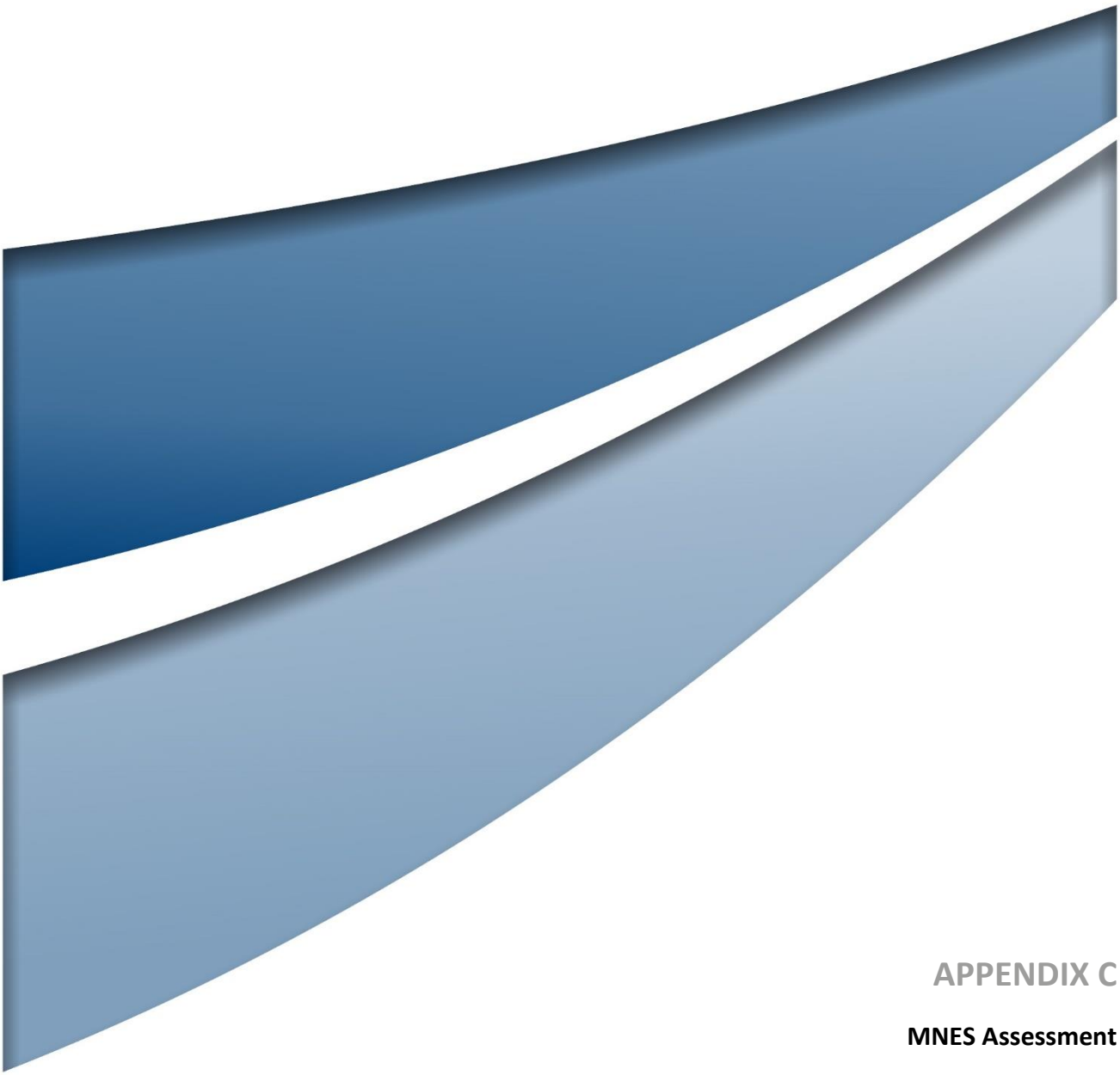
Photograph 58 VP 15 – View East



Photograph 59 VP 15 – View South



Photograph 60 VP 15 – View West



APPENDIX C

MNES Assessment

umwelt
Environmental & Social Consultants

SPARK RENEWABLES

MALLEE WIND FARM EPBC 2023/09500

Bilateral Agreement Assessment of Biodiversity MNES

FINAL

November 2024

MALLEE WIND FARM EPBC 2023/09500

Bilateral Agreement Assessment of Biodiversity MNES

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Spark Renewables Pty Ltd

Project Director: Nathan Baker
Project Manager: Jessica Henderson-Wilson
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Technical Manager: James Garnham
Report No. 22494/R10_Appendix C
Date: November 2024

Environmental & Social Consultants

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Ryan Parsons	5 November 2024	Ryan Parsons	5 November 2024

Abbreviations

Abbreviation	Definition
AEMO	Australian Energy Market Operator
agl	above ground level
AoS	Assessment of Significance
BAM	Biodiversity Assessment Method (NSW)
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* NSW
BCS	NSW Biodiversity and Conservation Science Division in Environment and Heritage Group of NSW Department of Climate Change, Energy, the Environment and Water
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BoM	Bureau of Meteorology
BOS	Biodiversity Offset Scheme (NSW)
BVMTT	Biodiversity Values Map Threshold Tool
Commonwealth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEWHA	Department of the Environment, Water, Heritage and the Arts (former Commonwealth department)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (former Commonwealth department)
DPE	NSW Department of Planning and Environment (former NSW department)
DPHI	NSW Department of Planning, Housing and Infrastructure (current)
DPIE	NSW Department of Planning, Industry and Environment (former NSW department)
EAH	Environment Agency Head
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* Commonwealth
FM Act	*Fisheries Management Act 1994* NSW
FTE	full time equivalent
GDE	groundwater dependent ecosystem
GHG	greenhouse gas emissions
GW	Gigawatt
IBRA	Interim Biogeographic Regionalisation for Australia
KBA	Key Biodiversity Area
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
LLS Act	*Local Land Services Act 2013* NSW

Abbreviation	Definition
LLS Regulation	Local Land Services Regulation 2014 NSW
MNES	Matters of National Environmental Significance
MW	megawatts
NPW Act	*National Parks and Wildlife Act 1974* NSW
NSW	New South Wales
NVMP	Native Vegetation (Multi Attribute)
NVR Map	Native Vegetation Regulatory Map
PAH	Planning Agency Head
PCT	Plant Community Type
PMST	Protected Matters Search Tool
RES	Renewable Energy Systems
REZ	Renewable Energy Zone
RtS	Response to Submissions
SAII	Serious And Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SVTM	State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* NSW
Umwelt	Umwelt (Australia) Pty Limited

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1.0 Introduction

1.1 Title of the Action

The New South Wales (NSW) Government's Electricity Strategy and Electricity Infrastructure Roadmap (the Roadmap) sets out a plan to deliver the State's first five Renewable Energy Zones (REZs). These REZs will play a vital role in delivering affordable, reliable energy generation to help replace the State's existing power stations as they come to their scheduled end of operational life.

Spark Renewables Pty Limited (Spark Renewables) proposes to develop the Mallee Wind Farm (the Project or the 'Proposed Action' where relevant) to provide a reliable and affordable source of energy for the people of NSW and contribute to reducing greenhouse gas emissions associated with energy generation.

The Proposed Action will include the installation, operation, maintenance and decommissioning of up to 76 wind turbine generators (WTGs), a single grid scale 100 megawatts (MW) / 200 megawatt hour (MWh) Battery Energy Storage System (BESS), ancillary infrastructure and temporary facilities associated with construction of the Proposed Action. The Proposed Action incorporates up to 76 WTGs, with a maximum blade-tip height of 280 metres (m) above ground level and will have an installed capacity of up to 402 megawatts (MW). An overview of the Proposed Action is provided in **Section 2.0** of this report.

The Proposed Action consists of both the "Development Footprint" (impacts and disturbance assessed within the Proposed Action Area) and the off-site road work areas, where additional minor disturbance is required, primarily within road reserves. Specific reference is provided to the "Development Footprint" herein, to provide consistent terminology with the BDAR, and to target discussion to impacts within the Project Area as there is limited biodiversity value, and no vegetation that conforms to a NSW Plant Community Type (PCT) within the off-site areas of disturbance.

1.2 Proponent

1.2.1 Proponent Details

Spark Renewables is one of Australia's leading developers and long-term owners of renewable energy generation assets. Founded in 2018, the company was established as the renewables arm for the Spark Infrastructure Group, a A$5 billion company with investments in leading energy infrastructure across Australia. Since September 2023, Spark Renewables has been owned by Tenaga Nasional Berhad (TNB), the largest listed energy utility company in Southeast Asia, with a market capitalisation of A$26 billion.

Spark Renewables has grown rapidly and employs an experienced team of 30 people, with over 250 years of experience in end-to-end development, construction and operations of wind, solar and BESS projects between them. The company retains industry experts across the key areas of engineering, development, consenting, financing, construction and commissioning, with the team having cumulatively worked on over 36 GW of capacity globally.

The company specialises in southwestern NSW, having constructed the 120 MWdc Bomen Solar Farm in Wagga Wagga, which was commissioned in 2020. The company has a development pipeline of highly advanced projects across Australia, exceeding five (5) GW of total generation capacity.

The title of the Proposed Action and details of the Proponent are provided in **Table 1.1**.

Table 1.1 General information on the Action and Proponent

Requirement	Details
Title of the Action	Mallee Wind Farm
Full name of the designated Proponent	Spark Renewables Pty Limited (Spark Renewables)
Postal address of the designated Proponent	Level 4, 1A Rialto Lane, Manly, NSW 2095
Street address (Location of the Action)	Arumpo Road, Mallee NSW 2738
ABN	90 632 860 023
Nominated contact	Laurie Wallis

1.2.2 Environmental Record of the Proponent

Spark Renewables has no prior proceedings under a Commonwealth, State or Territory law relating to the protection of the environment or the conservation and sustainable use of resources.

Spark Renewables is committed to responsible environmental management. This has been demonstrated through the construction and operation of their Bomen Solar Farm in NSW for which no environmental enforcements have occurred since approval was received in 2018.

Spark Renewables have demonstrated a commitment to sharing the benefits of their projects with the local community. They have established one of Australia's largest solar farm community funds at Bomen Solar Farm. This is a $1 million fund set up in conjunction with Westpac, who purchase electricity from the project. Spark Renewables have also established agricultural partnerships to co-locate activities such as sheep-grazing and beekeeping at the Bomen Solar Farm and have a strong ongoing commitment to the community.

1.3 Approval Pathway

1.3.1 NSW Approval Pathway

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the primary instrument which regulates the environmental impact assessment and approval process for development in NSW.
The relevant assessment pathway for a development is determined by environmental planning instruments such as local environmental plans and State Environmental Planning Policies (SEPPs).

State Environmental Planning Policy (Planning Systems) 2021 (SEPP Planning Systems) declares certain developments to be State Significant Development (SSD). Planning SEPP, Schedule 1, clause 20(a) prescribes that development for the purpose of electricity generating works that has an estimated development cost of more than $30 million is SSD. As the proposed Mallee Wind Farm will generate electricity and has an estimated development cost of more than $30 million, it meets these criteria and is therefore SSD.

As SSD, the Proposed Action is subject to the general assessment requirements under Part 4 of the EP&A Act and approval is being sought from NSW Department of Planning, Housing and Infrastructure (DPHI).

A Scoping Report was prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Spark Renewables and was submitted to the NSW Department of Planning and Environment (DPE) (now DPHI) in November 2022 (Application Number: SSD-53293170).

Umwelt has been engaged by Spark Renewables to prepare the Biodiversity Development Assessment Report (BDAR) (Umwelt 2024a) and Environmental Impact Statement (EIS) for the Project (Umwelt 2024b).

1.3.2 NSW and Commonwealth Bilateral Agreement

The Project was referred under Part 7 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to the Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW). Commonwealth DCCEEW determined that the Proposed Action is a controlled action and requires assessment and approval under the EPBC Act (EPBC Number: 2023/09500).

The controlled action determination identified that the Proposed Action has the potential to impact on matters of national environmental significance (MNES), specifically:

- World Heritage properties
- National Heritage places
- Listed threatened species and communities
- Listed migratory species.

The determination identified that the Proposed Action will be assessed under the bilateral agreement with NSW. Supplementary Secretary's Environmental Assessment Requirements (SEARs) were issued by NSW DPHI for the Proposed Action to support the controlled action determination (EPBC 2023/09500, determined on 7 June 2023).

The Bilateral Agreement was made under Section 45 of the EPBC Act and allows a single environmental assessment process to be jointly implemented by the Commonwealth DCCEEW and NSW DPHI. When the assessment process for a project is complete, DPHI provides a report to Commonwealth DCCEEW assessing the potential impacts on MNES listed under the EPBC Act.

This MNES Assessment will be used by the DPHI to prepare its assessment report of the Project / Proposed Action for Commonwealth DCCEEW review.

DPHI and Commonwealth DCCEEW will make separate approval decisions under the EP&A Act and EPBC Act, respectively.

An Amending Agreement between Commonwealth DCCEEW and DPHI was entered into on 24 March 2020, which endorses the NSW Biodiversity Offset Scheme (BOS) including the:

- NSW Biodiversity Assessment Method (BAM) for assessing impacts on MNES under the EPBC Act
- Biodiversity credit system
- Offset rules set out in the Biodiversity Conservation Regulation 2017.

Like-for-like offsets are required under the EPBC Act for any residual significant adverse impacts on listed threatened species and communities under the EPBC Act. The Bilateral Agreement applies to all NSW projects that require approval under the EPBC Act to achieve streamlining benefits for projects that use the BOS.

1.3.3 Other Approvals and Conditions

The Development Footprint intersects some areas that include properties with a Property Vegetation Plan (PVP) and Wildlife Refuge agreement. Refer to the EIS (Umwelt 2024b) for details.

Table 1.2 summarises biodiversity legislation and approvals that may apply to the Proposed Action. Other approvals and conditions that apply to the Proposed Action are described where relevant in the broader EIS (Umwelt 2024b), noting that other MNES have been considered following detailed heritage (Austral Archeology,2024), aviation (Aviation Project, 2024 with regard to aviation safety / night lighting), and visual (Moir Landscape Architecture, 2024) impact assessment.

Table 1.2 Biodiversity legislation and approvals

Legislation	Relevance to the Proposed Action	Reference
State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity SEPP)	Chapters 3 and 4 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity SEPP) aim to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas. Schedule 2 identifies that the provisions of Chapters 3 and 4 apply in the Wentworth Shire Local Government Area. Both chapters apply to development applications to Councils, accordingly there are no specific obligations to consider the Biodiversity SEPP for SSD. Notwithstanding this, the following addresses the aims of the SEPP as relevant to the Proposed Action. The majority of the Project Area is zoned primarily RU1 (Primary Production) with some small patches of C2 Environmental Conservation and accordingly Chapter 3 Koala Habitat Protection 2020 applies to this zoning. Koala Habitat Protection 2020 applies to development applications to Council requiring that proponents determine if the land is potential koala habitat (based on occurrence of 10 koala feed trees) and if so it is core koala habitat. Parts of the Project Area are zoned C2 Environmental Conservation and accordingly Chapter 4 Koala Protection 2021 applies. This chapter identifies a larger number of koala feed trees as listed in Schedule 3 of the SEPP for different koala management areas. The vegetation in the Project Area does not support any of the 10 koala feed trees listed in Schedule 1 (Chapter 3) and accordingly potential koala habitat as defined by Chapter 3 does not occur on the RU1 (Primary Production) zoned land. The Wentworth LGA is in the far west koala management area which identifies 20 koala feed trees for the purposes of defining koala habitat in accordance with Chapter 4. Vegetation communities in the Project Area do not support any of the koala feed trees and accordingly the Project Area does not provide highly suitable koala habitat.	Not applicable

Legislation	Relevance to the Proposed Action	Reference
Biodiversity Conservation Act 2016 (BC Act)	Under the BC Act, biodiversity assessment in accordance with the NSW BAM is required for any SSD project. A BDAR has been prepared to assess the potential impacts of the Proposed Action in accordance with the NSW BAM by accredited assessors (Umwelt 2024a).	BDAR (Umwelt 2024a)
Fisheries Management Act 1994 (FM Act)	The objectives of the FM Act are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. Objectives relevant to the Proposed Action include: • to conserve fish stocks and key fish habitats • to conserve threatened species, populations and ecological communities of fish and marine vegetation • to promote ecologically sustainable development, including the conservation of biological diversity. The SEARs issued by DPHI noted that: "The scoping report and draft SEARs have been reviewed and as there is no Key Fish Habitat (KFH) within the study area, DPI Fisheries has no comment on the proposal". Threatened fish as listed under the FM Act have been identified in **Table 4.6** as appropriate to inform the assessment of the likelihood of occurrence of EPBC Act threatened fish species in the Project Area. The FM Act does not apply to the Project given the absence of any aquatic habitat.	Not applicable
Local Land Services Act 2013 (LLS Act)	The LLS Act, supported by the Local Land Services Regulation 2014 (LLS Regulation), established 11 regional LLS organisations to provide biosecurity, natural resources management and agricultural advisory services. For the purposes of land management and biodiversity impact assessment, the LLS Act defines native vegetation and provides for the mapping and regulation of native vegetation where Part 5A of the LLS Act applies. Under Part 5A of the LLS Act and the supporting regulation, a Native Vegetation Regulatory (NVR) map showing the extent of categorised land in NSW is to be published by the Environmental Agency Head (EAH). The NVR map underpins the legislative framework for native vegetation clearing in rural areas by categorising land in NSW. Category 1 exempt lands are lands cleared of native vegetation as at 1 January 1990 or lawfully cleared of native vegetation after that date and before commencement of the LLS Act. For the purposes of the NSW BAM, Category 1 exempt lands, the clearing of vegetation and habitats on Category 1 exempt land are excluded from assessment under the BAM other than prescribed impacts.	The BDAR (Umwelt 2024a) has defined those areas of the Biodiversity Study Area that met the definition of Category 1 exempt lands. These are described in Section 4.7 of the BDAR (Umwelt 2024a) and are predominantly cropping land.
Biosecurity Act 2015	The *Biosecurity Act 2015* is a wide-ranging legislation that outlines the requirements of government, councils, private landholders, and public authorities in the management of biosecurity matters. Priority weeds are regulated under the Biosecurity Act with a general biosecurity duty to prevent, eliminate or minimize any biosecurity risk they may pose. Some priority weeds have additional management obligations which may apply generally, or under specific circumstances. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised as is reasonably practicable.	Not applicable

Legislation	Relevance to the Proposed Action	Reference
	The BAM identifies a separate list of weed species identifies as high threat weeds these do not necessarily align with priority weeds regulated under the *Biosecurity Act 2015*.	
National Parks and Wildlife Act 1974	The Mallee Cliffs National Park adjoins the Proposed Action Area. Where a Proposed Action/ Project adjoins land reserved under Part 4 of the National Parks and Wildlife Act 1974 (NPW Act), an assessment of the direct and indirect impacts on the park, its values and National Parks and Wildlife Service management of the park is required in keeping with the NPWS Developments adjacent to NPWS lands Guidelines for consent and planning authorities (DPIE 2020c). Risks to be considered include: • erosion and movement of sediment onto NPWS land • stormwater and nutrient impacts • pests, weeds and edge effects • fire management • boundary encroachments and access through NPWS land • Visual, odour, noise, vibration, air quality and amenity impacts • wildlife connectivity and groundwater-dependent ecosystems • cultural heritage • road network design changes. Development of the design of the Proposed Action has considered proximity to the Mallee Cliffs National Park, impacts on connectivity and impacts of operation of the Proposed Action on birds and bats that may occur in the national park. (a Proposed Action adjoins land reserved under the NPW Act). The design includes a 700 m buffer to the wind turbine generators (from blade tip) which exceeds the recommended buffer to avoid and minimise impacts to birds and bats. Part 12A of the NPW Act provides for the identification of Areas of Intergenerational Significance. This includes reserved land that is an environmental or cultural asset of intergenerational persistence. Under Section 153I of the NPW Act it is an offence to damage, harm or disturb an area of land declared as an Areas of Intergenerational Significance. The area of enclosed (fenced) land within the Mallee Cliffs National Park that has been established for reintroduction of a number of mammal species listed as extinct under the BC Act has been identified as an Area of Intergenerational Significance (AIS), Site# AIS_EO_221. The site has been declared for the extinct numbat (*Myrmecobius fasciatus*), bilby (*Macrotis lagotis*) and greater stick-nest rat (*Leporillus conditor*). The AIS is within the national park and a minimum of 5.1 km from the shared boundary of the Proposed Action Area and Mallee Cliffs National Park. The Proposed Action will not impact directly or indirectly the AIS values, threatened species and/or management of the AIS area (refer to Table 1.3 of the BDAR and Section 7 of the EIS).	This report and the BDAR (Umwelt 2024a) have considered the impacts direct and indirect on the Mallee Cliffs National Park, connectivity and threatened species habitat. The impacts of the Proposed Action on other risks have been addressed in the EIS (Umwelt 2024b).

1.4 Report Requirements

This report is an appendix to the BDAR (Umwelt 2024a) and has been prepared in accordance with the MNES Significant Impact Guidelines 1.1 (CoA, 2013a), Schedule 4 of the EPBC Regulations and the Supplementary SEARs for the Proposed Action (EPBC 2023/09500).

More specifically, potential impacts of the Proposed Action have been assessed for threatened ecological communities (TECs), threatened species and migratory species that are known or likely to occur in the Development Footprint against the significant impact criteria.

The MNES assessment includes the following key information:

- Summary of the Proposed Action.
- Description of the Biodiversity Study Area and Development Footprint.
- Assessment of potential impacts on MNES.
- Confirmation that all MNES (that have the potential to be impacted by the Proposed Action) have been addressed in the Environmental Impact Statement (EIS).
- Summary of consultation undertaken to date, and consultation activities planned, as part of the EIS.
- Measures to avoid and minimise impacts and any proposed alternatives.
- Offsetting requirements.
- Administrative details of the proponent.

1.4.1 Specific Risks

The supplementary SEARs issued by DPHI (formerly) DPE for the Proposed Action (EPBC 2023/09500) identified that, based on the information in the EPBC Act Referral for the Proposed Action, key risks associated with the Proposed Action include direct impacts on the following MNES:

- Willandra Lakes Region World Heritage Area:
    - outstanding universal values particularly cultural practices of the First Nations peoples
    - obstructing/ modifying/ diminishing the important associated historical views of the landscape, impacting the current and ongoing cultural practices that occur there by First Nations peoples
    - light pollution may obstruct/modify/diminish the skies and views of the stars at night, impacting the current and ongoing cultural practices that occur there by these First Nations peoples, the Barkandji/Paakantyi, Mutthi Mutthi and Ngiyampaa peoples.
- Willandra Lakes Region National Heritage Property (WLRNHP):
    - National Heritage Listed Values

- potential to seriously degrade / disrupt / obstruct / modify / diminish several National Heritage Listed Values of the WLRNHP, primarily because it is an area that has a "strong or special association with a particular community or cultural group for social, cultural or spiritual reasons."
- visual and light pollution impacts that may seriously disturb the historical connection to, and contemporary practice of, the social, cultural, and economic traditions of First Nations peoples.

- Listed threatened species, ecological communities and migratory birds from:
  - habitat clearing
  - fatal turbine strike
  - fatal blade sweep from the turbulent wake behind the blades
  - displacement from important foraging, nesting and/or breeding habitat.

The Proposed Action is likely to have indirect impacts to listed threatened species, ecological communities and migratory birds through:

- reshaping of the topography
- disturbance from over-sized over-massed vehicles
- reduced habitat quality due to noise, dust and light spill during construction and operation
- invasive species or weed dispersal
- changes to fire regimes.

This report has assessed biodiversity MNES. An assessment of the impact of the Proposed Action on the Willandra Lakes Region World Heritage Area and the Willandra Lakes Region National Heritage Place are provided in Austral Archaeology (2024) and Moir (2024).

1.4.2 Listed Threatened Species, Ecological Communities and Migratory BIRDS

1.4.2.1 Likely Significant IMPACTS on MNES

The supplementary SEARs issued by DPHI (formerly DPE) identified that, based on the information in the EPBC Act Referral for the Proposed Action, it is likely to have significant impacts on the following threatened species, ecological communities and migratory birds:

- Pink (Major Mitchell's) cockatoo (*Lophochroa leadbeatri leadbeateri*) – Endangered
- Blue-winged Parrot (*Neophema chrysostoma*) – Vulnerable
- Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered
- Sharp-tailed Sandpiper (*Calidris acuminata*) – Marine Migratory.

1.4.2.2 Potential Impacts on MNES

Additionally, the supplementary SEARs identified there is some risk that there may be significant impacts on the following MNES:

- Threatened ecological communities:
    - Buloke Woodlands of the Riverina and Murray-Darling Depressions Bioregions – Endangered
    - Mallee Bird Community of the Murray Darling Depression Bioregion – Endangered.
- Threatened fauna species:
    - Australian Painted Snipe (*Rostratula australis*) – Endangered
    - South-eastern Hooded Robin (*Melanodryas cucullata cucullata*) – Endangered
    - Numbat (*Myrmecobius fasciatus*) – Endangered
    - Grey Falcon (*Falco hypoleucos*) – Vulnerable
    - Malleefowl (*Leipoa ocellata*) – Vulnerable
    - South-eastern Long Eared Bat (*Nyctophilus corbeni*) – Vulnerable
    - Southern Whiteface (*Aphelocephala leucopsis*) – Vulnerable
    - Regent Parrot (Polytelis anthopelus monarchoides) – Vulnerable.
- Threatened flora species:
    - Menindee Nightshade (*Solanum karsense*) – Vulnerable
    - Yellow Swainson-pea (*Swainsona pyrophila*) – Vulnerable
    - Murray Swainson-pea (*Swainsona murrayana*) – Vulnerable.
- Migratory species:
    - Common Greenshank (*Tringa nebularia*) – Marine Migratory
    - Fork-tailed Swift (*Apus pacificus*) – Marine Migratory.

Further assessment is provided in this report to demonstrate if the communities and species are present in the Development Footprint and if so the extent to which they may be impacted.

1.4.3 MNES Assessment Requirements under the NSW Bilateral Agreement

The biodiversity requirements for MNES are set out in the Supplementary SEARs as replicated in **Table 2.2**, including cross-references to the relevant section of this report and the BDAR (Umwelt 2024a)/EIS (Umwelt 2024b) where each requirement is addressed.

Table 1.3 Supplementary SEARs for Mallee Wind Farm (EPBC 2023/09500)

Key Issue	Supplementary SEARs Requirement	MNES Assessment Reference	Other report reference
Introduction	1. On 7 June 2023, a delegate of the Federal Minister for the Environment and Water (formerly Department of Agriculture, Water and the Environment) determined Mallee Wind Farm was a controlled action under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act controlling provisions for the proposed actions are:	-	-
	i. World Heritage Properties (sections 12 and 12A)	Not applicable	Austral Archaeology 2024
	ii. National Heritage Places (sections 15B and 15C)	Not applicable	Austral Archaeology 2024
	iii. listed threatened species and communities (sections 18 and 18A)	Listed in **Section 1.4.2**	-
	iv. listed migratory species (sections 20 and 20A).	Listed in **Section 1.4.2**	-
	2. The proposed action will be assessed in accordance with the bilateral assessment agreement Amending Agreement No. 1, and as such, is required to be assessed in the manner specified in Schedule 1 to that Agreement, including, addressing the matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations).	This report	The EIS (Umwelt 2024b)
	3. The proponent must undertake an assessment of all protected matters that may be impacted by the development under the controlling provision identified in paragraph 1. The Commonwealth Federal Minister for the Environment and Water considers that the proposed action is likely to have a significant impact on threatened species and communities listed in Appendix A.	This report is focused on threatened species and communities and migratory species.	Austral Archaeology (2024) and Moir (2024) has assessed world heritage properties and national heritage places. The BDAR provides information on likelihood of occurrence, survey effort and results, habitats, impacts of the Proposed Action on threatened species and communities as listed under the BC Act, avoidance, mitigation and management measures and has informed this assessment.
	4. The proponent must consider each of the protected matters under the triggered controlling provisions that may be impacted by the action. Note that this may not be a complete list and it is the responsibility of the proponent to undertake an analysis of the relevant impacts and ensure all protected matters that are likely to be impacted are assessed for the Commonwealth Minister's consideration.	**Section 4.3** identifies species and communities predicted to occur, how identified and whether further assessment is required in this report.	

Key Issue	Supplementary SEARs Requirement	MNES Assessment Reference	Other report reference
General Requirements Relevant Regulations	5. The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the EPBC Regulations and all matters outlined below in relation to the controlling provisions.	This report	The EIS (Umwelt 2024b)
General Requirements Project Description	6. The title of the action, background to the action and current status.	**Section 1.1** and **Section 2.0**	-
	7. The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.	**Section 2.2**	-
	8. How the action relates to any other actions that have been, or are being taken in the region affected by the action.	**Section 2.9**	-
	9. How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	**Section 2.0**	-
General Requirements Impacts	10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts; ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; iii. analysis of the significance of the relevant impacts; and iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	**Section 6.0** summarises impacts of the Proposed Action. For individual MNES this is provided in detail in **Appendix 1**.	-
General Requirements Avoidance, mitigation and offsetting	11. For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures; ii. any statutory policy basis for the mitigation measures; iii. the cost of the mitigation measures;	**Section 5.0** summarises avoidance, minimisation, mitigation and management measures of the Proposed Action. For individual MNES this is provided in detail in **Appendix 1**.	-

Key Issue	Supplementary SEARs Requirement	MNES Assessment Reference	Other report reference
	iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing; v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.		
	12. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	**Section 7.0**	
	13. For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any: i. conservation advice or recovery plan for the species or community; ii. relevant threat abatement plan for the species or community; iii. wildlife conservation plan for the species; and iv. any strategic assessment.	**Appendix 1**	
	14. In addition to the general requirements described above, specific information is required with respect to each of the determined controlling provisions. These requirements are outlined in paragraphs 15-17.	-	-
Key Issues Biodiversity Assessment Requirements	15. The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	**Section 4.3** identifies species or communities and provides justification for those species assessed as unlikely to occur in the Development Footprint.	
	16. For each of the EPBC Act listed threatened species and communities likely to be impacted by the action the EIS must provide a separate: i. description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	**Appendix 1**	-

Key Issue	Supplementary SEARs Requirement	MNES Assessment Reference	Other report reference
	ii. details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements; iii. description of the relevant impacts of the action having regard to the full national extent of the species or community's range; iv. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action; v. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account; vi. a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established. vii. details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and viii. details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.		
	17. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy. http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy.	**Section 7.0**	-
Other approvals and conditions	18. Information in relation to any other approvals or conditions required must include the information prescribed in Schedule 4 Clause 5 (a) (b) (c) and (d) of the EPBC Regulations.	**Section 1.3.3**	-
Environmental record of person proposing to take the action	19. Information in relation to the environmental record of a person proposing to take the action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations.	**Section 1.2.2**	-
Information sources	20. For information given in an EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information	**Section 8.0**	-

2.0 Proposed Action Overview

This overview summarises the requirements of Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations), Clause 1 general information on the Proposed Action and Clause 2 description of the Proposed Action. Where appropriate cross references have been provided to supporting information in the EIS prepared by Umwelt (2024b) for the Project / Proposed Action.

2.1 Objectives of the Action

The objectives of the Proposed Action are to:

- increase renewable energy generation in NSW and contribute to strategic objectives and targets of the NSW and Commonwealth governments
- provide for cleaner reliable electricity generation and assisting with meeting current load demand while reducing greenhouse gas emissions and the impacts of climate change
- provide regional investment in the NSW renewable energy sectors
- contribute to achieving the target of 2.5 GW of renewable energy generation from the South West REZ
- create employment opportunities during Project construction, operations and decommissioning
- support communities by providing economic and employment benefits for regional NSW and to reinforce Spark Renewable's commitments under the Clean Energy Council's 'Best Practice Charter' with respect to socially responsible development
- develop the Project in a manner which supports long-term productive relationships with the local community, Traditional Owners, regulators, and industry
- avoid and minimise environmental, biodiversity, cultural heritage and social impacts where practical through careful design and best practice environmental protection and impact mitigation.

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

2.2 Project Location and Context

The Proposed Action is located in Wentworth Shire Local Government Area (LGA), close to the NSW – Victorian state border in the Riverina region of south western New South Wales (NSW). The Proposed Action is located approximately 16 kilometres (km) north east of Buronga, NSW, 22 km north east of Mildura, VIC and 40 km east of Wentworth, NSW. Smaller localities of Mallee, Red Cliffs and Trentham Cliffs are located to the south and south west of the Proposed Action (refer to **Figure 2.1**).

The Proposed Action is a renewable energy generator project within the South West Renewable Energy Zone (South West REZ). The Project Area encompasses approximately 57,330 ha of predominantly cropping and grazing land and adjoins the Mallee Cliffs National Park, which is located directly south and south east.

The Project Area is zoned as RU1 Primary Production and C2 Environmental Conservation within the Wentworth Local Environment Plan (LEP) 2011. The following components are within the Project Area:

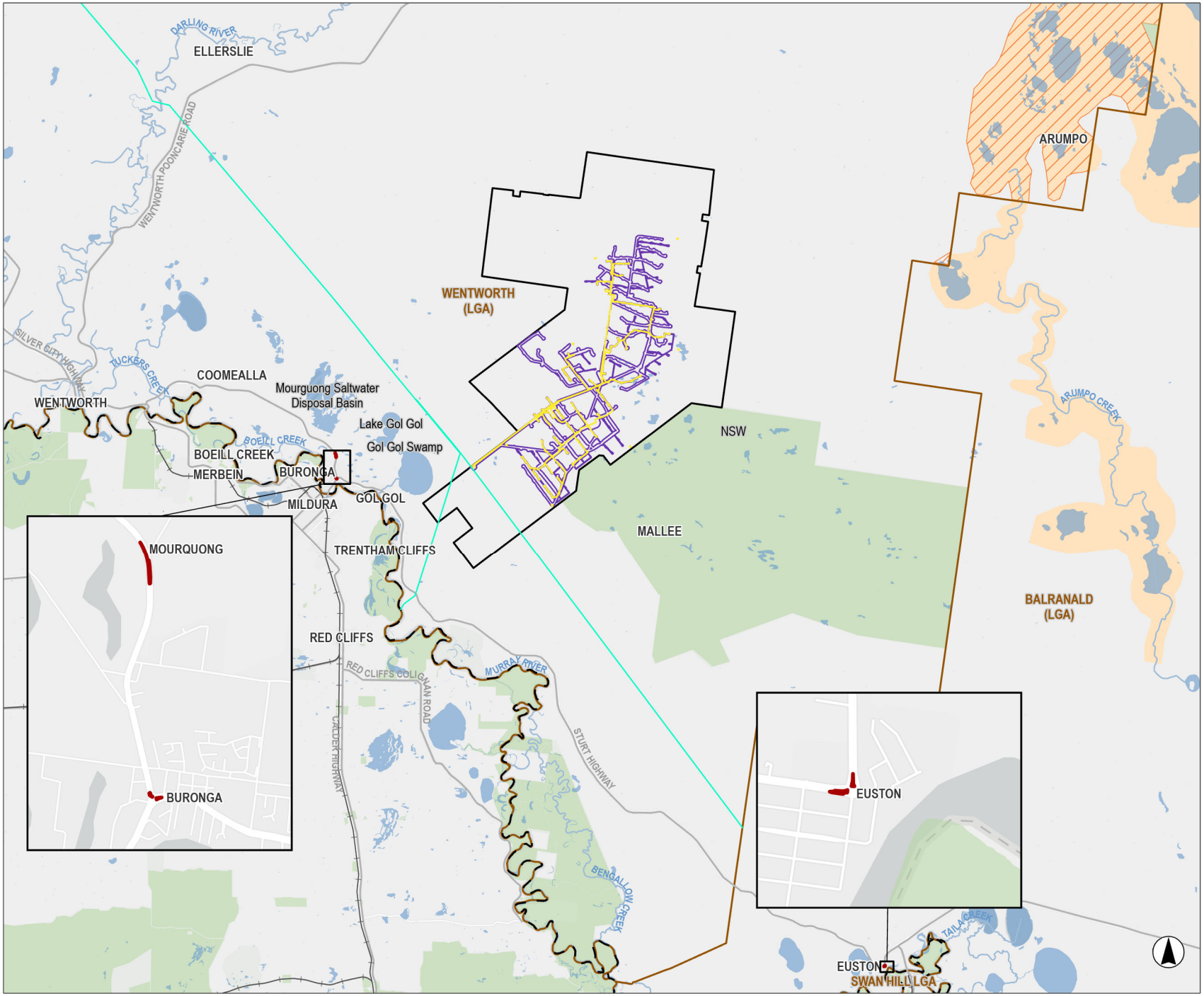
- Biodiversity Study Area is the specific areas adopted for the biodiversity study. It is the amalgamation of previous and current designs of the Project. Since 2022, the Project has undergone refinement considering various constraints. The result of surveys within each design iteration has been built upon to form a comprehensive dataset for the Biodiversity Study Area which the Development Footprint forms a smaller component. Through the process of avoidance and minimisation the Biodiversity Study Area has been refined down to the current Development Footprint. Surveys undertaken across the Biodiversity Study Area have been used in this assessment. Note that detailed vegetation surveys have been undertaken across the Biodiversity Study Area, while threatened species surveys have been undertaken within approximately 75% of the Biodiversity Study Area. All native vegetation and potential threatened species habitat within the current Development Footprint falls entirely within the portion of the Biodiversity Study Area which has been subject to detailed vegetation assessment and threatened species surveys.

- Development Footprint is the area of land that is directly impacted by the proposed development. The Development Footprint is equivalent to the total area of impact and identified within the EIS inside the Project Area. The Development Footprint is limited to areas zoned as RU1 Primary Production.

- This area of disturbance within the Project Area excludes the offsite road works associated with the Local Transport Route. The additional disturbance area (beyond that identified for the Development Footprint) associated with these offsite areas is approximately 0.25 ha. The Development Footprint and offsite road work areas have been considered within the BDAR, totalling an area of approximately 444.94 ha of land that will be directly impacted by the Proposed Action. The offsite road works do not contain any native vegetation or threatened species habitat.

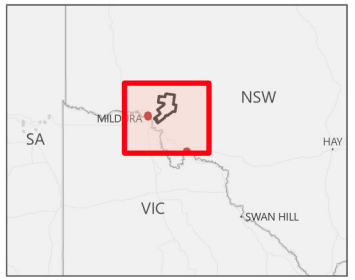
FIGURE 2.1

Regional Context



Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Off-site Road Works
- Project EnergyConnect
- Willandra Lakes Region / National Heritage Property
- Willandra Lakes World Heritage Area
- State Border
- Local Government Area (LGA)
- NPWS Estate
- Road
- Railway
- Watercourse
- Water Body



0 10 20
Kilometres

Scale 1:500,000 at A4
GDA2020 MGA Zone 54

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The Biodiversity Study Area encompasses approximately 4,887.25 hectares (ha) of predominantly cropping and grazing land and adjoins the Mallee Cliffs National Park, which is located directly to the south and south east.

The Project Area is zoned primarily as RU1 Primary Production with some small patches of C2 Environmental Conservation within the Wentworth Local Environment Plan (LEP) 2011. Lands within the Project Area include privately owned Freehold land and Crown Land. Land Parcels within the Project Boundary that are mapped as Crown Land include Lot 1726/DP763664, 1727/DP763667 and 3805/DP763156, which are associated with Crown Lands leases, established by the Host landholders as part of the broader Crown Lands 'Western Division'.

Agricultural land uses are prevalent within and surrounding the Project Area. The Project Area comprises of agricultural land, including cropping land and grazed land, as well as uncleared remnant vegetation. Grazing and modified pastures are also prevalent to the north, east and west of the Project Area.

The topography of the Project Area is relatively flat and homogeneous ranging from between 40–130 m Australian Height Datum (AHD).

Remnant native vegetation has been retained in the landscape as small patches scattered across the Project Area. These woodland patches provide habitat resources, as well as locally significant wildlife corridors for birds, microbats, reptiles and mammals within existing agricultural practices. Existing waterways also provide important linkages for wildlife movement in the landscape, there are however no major watercourses that transect the Project Area.

The Proposed Action is located within the Lower Murray-Darling River region, approximately 12 km to the north-east of the Murray River at Gol Gol (refer to **Figure 2.1**). As noted above, there are limited mapped watercourses within the Project Area, all of which are of a minor nature. No flood prone land or flood management areas are identified within the Project Area however the Murray River, which is located 8.5 km south-west of the Project Area, has been identified as flood prone land under the Wentworth LEP 2011.

The Project Area is located mostly east of the Arumpo Road however this road intersects the northern extent of the Project Area in an east to west direction (refer to **Figure 2.1**). The Proposed Action Area is located approximately 12 km north-east of Sturt Highway. The Calder Highway is located approximately 15 km south-west of the Project Area, while the Silver City Highway is located approximately 38 km west of the Project Area.

The EIS provides further detail regarding key site constraints which have influenced the location and design of the Project (refer to **Table 2.1**).

Table 2.1 Details of Key Site Constraints

Details	EIS Reference
Consolidated constraints mapping	Executive Summary
Natural cultural and built features	Section 2.4.4
Key hazards and risks	Section 2.4.5
Site selection and alternative locations	Section 2.7.3
Refinement of the Project Layout	Section 2.7.4

Consolidated constraints mapping is provided in the Executive Summary of the EIS.

2.3 Key Features of the Proposed Action

The Proposed Action will include the installation, operation, maintenance and decommissioning of up to 76 WTGs, BESS facilities, ancillary infrastructure and temporary facilities associated with construction of the Project.

The key components of the Project include:

- 76 (three (3) blade) WTGs, with a maximum blade-tip height of 280 metres (m) above ground.
- A single grid-scale 100 MW /200 MWh BESS.
- Permanent ancillary infrastructure including internal access tracks, hardstands, main and collector substations, switchyards, operations and maintenance facilities, underground and overhead electricity transmission lines and poles, telecommunications facilities and utility services, permanent meteorological masts and water storage tanks.
- Temporary facilities including temporary workforce accommodation (TWA) facility, site offices, amenities, construction compounds and laydown areas, concrete or asphalt batching plants, minor 'work front' construction access roads, environmental management and monitoring and signage.
- Off-site road works, involving upgrades to the proposed local transport route and establishment of site access points.

The layout of the key features of the Proposed Action are shown in **Figure 2.2.**

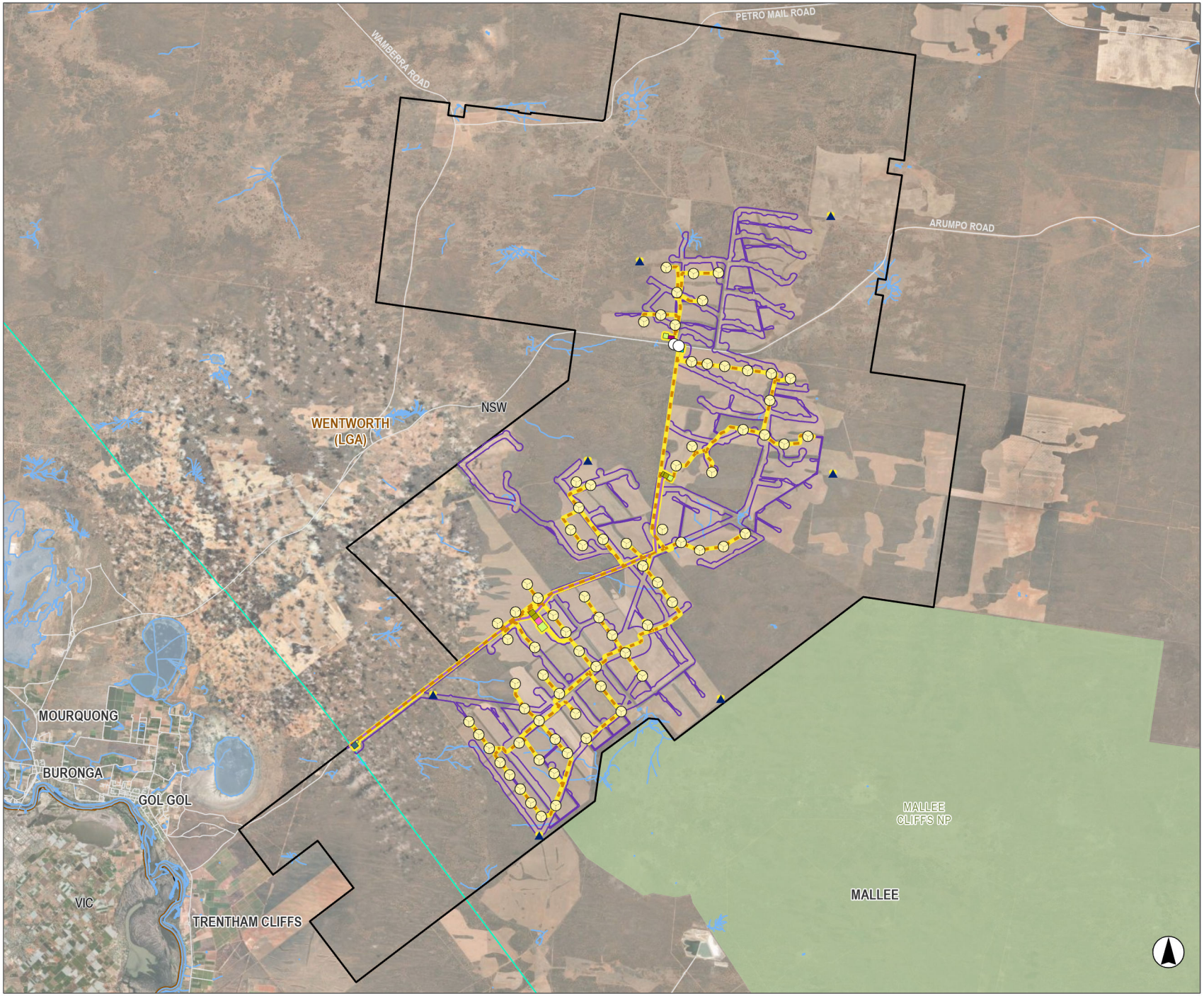


FIGURE 2.2A

Proposed Action - Development Layout

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Access Points
- Wind Turbine Generators
- Permanent Meteorological Masts
- Access Tracks Connecting Hardstands
- HV Transmission Line
- Collector Substation and Switchyard
- Operations and Maintenance Facility
- Construction Compound
- Accommodation Camp
- Switchyard
- Battery Energy Storage System (BESS)
- Project EnergyConnect
- State Border
- Local Government Area (LGA)
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 4,000 8,000
Metres

Scale 1:215,000 at A4
GDA2020 MGA Zone 54

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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024)

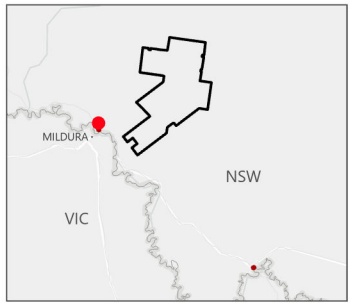


FIGURE 2.2B

Proposed Action - Development Layout Off-site Road Works - Arumpo Road

Legend

Off-site Road Works



0 50 100

Metres

Scale 1:3,000 at A4

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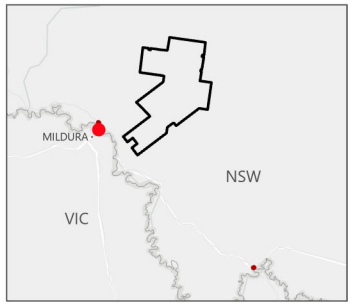


FIGURE 2.2C

Proposed Action - Development Layout Off-site Road Works - Buronga

Legend

Off-site Road Works



0 20 40

Metres

Scale 1:1,000 at A4

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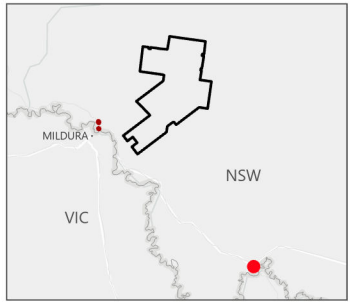
FIGURE 2.2D

Proposed Action - Development Layout Off-site Road Works - Euston



Legend

Off-site Road Works



0 20 40

Metres

Scale 1:1,000 at A4

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2.4 Development Footprint

Within the Project Area, a Development Footprint has been determined which includes all Proposed Action elements and temporary disturbance areas. The Development Footprint including offsite road work areas of disturbance is approximately 444.94 ha and has been established in consideration of environmental, social and engineering constraints in the immediate vicinity of the Project, including:

- Proximity to Mallee Cliffs National Park.
- Biodiversity impacts including threatened ecological communities (TECs) and areas of remnant woodland vegetation.
- Heritage sites.
- Waterways.
- Potential visual impacts.
- Slope and constructability constraints.
- Landholder's ongoing usage requirements.
- Crown land.

The extent of the Development Footprint is shown in **Figure 2.2**.

The Operational Footprint comprises portions of the Development Footprint that will be subject to ongoing operational use as a result of the wind farm which may result in impacts that are direct, indirect, or prescribed in nature.

2.5 Proposed Timeframes

It is anticipated that construction works will commence within one year of Project/ Proposed Action approval i.e. construction commencing in 2026. The timing of construction will be driven by additional permits and authorisations, contractor selection, detailed design and procurement processes, and a final investment decision. The construction phase of the Proposed Action is anticipated to be three years.

The Proposed Action has an estimated operational life of 30 years after which it may be decommissioned or re-powered.

In summary the anticipated timeframes for the Project/ Proposed Action are:

- Planning and approvals (prior to commencement of construction): in progress and aiming to be completed in 2025.
- Construction and Commissioning: planned to commence in 2026, for approximately 3 years.
- Operation: An estimated operational life of 30 years.

2.6 Off-site Road Works

Transportation of some Project components, such as wind turbine blades, nacelles and transformers, would require over-size, over-mass (OSOM) vehicles that exceed the regulatory limits of standard vehicle dimensions. Large components, such as wind turbine blades, would be shipped to Australia from overseas and transported from the Port of Newcastle. Any road upgrades and modifications required between Port of Newcastle and Sturt Highway/ Carey Street roundabout at Euston, NSW would be undertaken by separate planning assessment and approvals and are not considered in the Project EIS.

A 'Local Transport Route' has been established for targeted assessment in the EIS between Euston and the Arumpo Road site access points. This is required to facilitate discrete Project-related OSOM vehicle movement amendments to the road network. Offsite disturbance / road modifications are required at the following three (3) locations on the local transport route as assessed in the EIS:

- Sturt Highway roundabout at intersection of Carey Street, Euston
- Sturt Highway roundabout onto Silver City Highway, Buronga
- Silver City Highway onto Arumpo Road.

It is noted that establishment of site access points (prior to commencing construction), does not constitute off-site disturbance / road works in this instance. The site access points on Arumpo Road are contained within the Project Area and Development Footprint as follows:

- Arumpo Road into Site Entry #1, Arumpo
- Arumpo Road into Site Entry #2, Arumpo.

These road works are modifications to the road network and can generally be classified as:

- Traffic Management: Activities related to optimising traffic flow, including roundabout adjustments, sign removal, and island modifications.
- Infrastructure Installation/Modification: Tasks involving the installation or modification of hardstands, gates, and fences.
- Vegetation Management: Activities related to clearing or trimming vegetation along the road corridor.
- Signage and Lighting: Adjustments to signage and lighting fixtures for improved visibility and safety.
- Alternative Route Provision: Considerations for providing alternative routes, such as bypass options.

2.7 Design Refinements

Since the Proposed Action's concept stage, the design has evolved through consideration of constraints and opportunities related to technical, environmental and social aspects. During the development of the overall design of the Proposed Action, Spark Renewables considered outcomes of engagement with host landowners, Project neighbours, broader community, Council, State and Commonwealth Government agencies in order to minimise the potential environmental and social impacts of the Project.

The Project Area was selected due to its suitability for a wind farm and the limited environmental and social constraints identified in the initial studies. Spark Renewables have adopted an ongoing flexible approach to design which has enabled continual refinement of the Development Footprint and key features of the Proposed Action in response to identified constraints and opportunities.

- Key design refinements which took place, over four (4) key phases, between the exhibition of the Scoping Report (November 2022), design revision A (December 2023), design revision B (May 2024) and the final design (June 2024) include:

- During the Scoping phase of the Project, a Development Corridor was used as the assessment area for technical studies to determine potential design constraints. As the confidence in the design footprint increased over time, the Disturbance Footprint was used as the assessment area. Changes to the Project Boundary and internal Project layout has been an iterative process in response to consultation and advice from technical specialists.

- A reduction from up to 150 WTGs proposed at the Scoping stage to up to 76 WTG locations assessed in the EIS. The reduction in WTGs is based on Spark Renewables analysis of the available transmission capacity in this section of the NSW South West REZ and consideration of avoidance and minimisation principles.

- Refinement to a Disturbance Footprint of the Project Area of 444.69 ha as described in the EIS (Umwelt 2024b). Based on avoidance strategies implemented to reduce and minimise clearing of native vegetation, and host landholder feedback regarding the layout within the existing agricultural site setting, Spark Renewables have significantly reduced the level of direct impacts.

- A reduction of the capacity of the wind farm from up to 500 MW to a 402 MW capacity reducing the number of WTG and associated extent of disturbance.

- A reduction of the capacity of the BESS from 300 MW to 100 MW.

- Refinement of the WTG specifications (280 m blade-tip height, 180 m hub height and 200 m blade diameter) noting the blade-tip height of 280 m remains unchanged from Scoping Report to Final Design.

The inclusion of an onsite TWA facility. Based on the outcomes of the Social Impact Assessment and consultation with local stakeholders, the TWA facility is proposed to minimise impacts to local housing and accommodation service providers.

2.8 Current Status

As part of the application for SSD approval, an EIS has been prepared in accordance with the SEARs and supplementary SEARs issued for the Proposed Action. The EIS is planned to be lodged with DPHI in September 2024.

2.9 Related Actions

The South West REZ is relatively undeveloped, but there is substantial commercial interest in the area, such that there are several other renewable energy developments in the vicinity of the Proposed Action, most at the early stages of the planning and approvals pathway.

Related developments, as outlined in the NSW Government State Significant Development Guidelines (DPHI, 2024), refers to any existing or approved developments that would be incorporated into, or operated in conjunction with the Proposed Action. Related developments can also include developments by the Proponent that are subject to a separate development approval process. For the purposes of the EPBC Act, Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 state that related actions *include any actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action*.

New and nearby renewable energy and other SSD projects that have commenced a formal NSW planning application, that are located within 75 km of the Project Area and are large enough to be considered in the assessment of cumulative impacts for the Proposed Action have been assessed in the cumulative impact assessment, refer to Table 8.12 of the BDAR (Umwelt 2024a). These include, Euston Mineral Sands Project, Mallee Solar Farm, Gol Gol Solar Farm, Gol Gol Wind Farm, Gol Gol Battery Energy Storage System, Project EnergyConnect (NSW – Eastern Section), Buronga Landfill Expansion, Euston Wind Farm and Koorakee Energy Park. Other new renewable energy projects in the South West REZ are anticipated.

As described in Section 1.2.3 of the EIS, at the time of writing there are two related actions within the vicinity of the Project Area:

- The Euston Critical Minerals Project (ECM) is located within the southern extent of the Project Area. The Applicant Iluka Resources Limited (Iluka) is proposing to develop a mineral sands resource. The ECM would involve open pit strip mining of six (6) mineral sands deposits. The Castaway deposit comprising of Castaway Pits 1 and 2 is located within the Project Area. ECM is currently at Prepare EIS stage in the NSW approval pathway.

- The Mallee Solar Farm, also proposed by Spark Renewables, is a large-scale solar photovoltaic (PV) generation facility and BESS, supported by associated infrastructure. The proposed solar farm is also located adjacent to the southern extent of the Project Area. Mallee Solar Farm is currently at the Prepare EIS stage in NSW approval pathway.

Consideration of potential cumulative impacts of the Proposed Action and the above related actions is provided in Table 8.12 of the BDAR (Umwelt 2024a).

3.0 Summary of Methodology

This report has relied upon the findings of the BDAR (Umwelt 2024a). A detailed description of the assessment area, the vegetation survey methodology and threatened species surveys is provided in Section 3.1, Section 4.1 and Section 5.2 of the BDAR (Umwelt 2024a), respectively.

3.1 Desktop Literature and Database Review

The following key information sources contain existing ecological information relevant to the Project Area and have been reviewed as part of the preparation of this report. These reports and databases were reviewed to obtain information in relation to PCTs, habitat constraints, microhabitats and previous site records for threatened species in the Project Area.

3.1.1 Datasets

The NSW and Commonwealth datasets reviewed as part of preparation of the BDAR that have informed the MNES assessment are listed in **Table 3.1**.

Table 3.1 NSW Guidance and Resources Reviewed

Resource	Source	Search parameter
NSW Datasets		
BioNet Vegetation Classification, vegetation information system (VIS)	NSW DCCEEW https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet – date last accessed 02/08/2024	PCT descriptions
BioNet Threatened Biodiversity Data Collection (TBDC)	NSW DCCEEW https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet - date last accessed 02/08/2024	Threatened entities
BioNet Atlas	NSW DCCEEW https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet - Date last accessed -12/08/2024	20 km buffer around the Development Footprint All valid threatened flora, fauna, ecological community records
Important Area Maps	NSW DCCEEW https://customer.lmbc.nsw.gov.au/assessment/s/userlogin?startURL=%2Fassessment%2Fs%2F – date last accessed 11/03/2024	Project Area
Biodiversity Assessment Method Calculator (BAM-C)	NSW DCCEEW (https://customer.lmbc.nsw.gov.au/assessment/s/userlogin?startURL=%2Fassessment%2Fs%2F – date last accessed 20/09/2024	Development Footprint
Transitional NVR Map	NSW DCCEEW https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap – date last accessed 31/07/2024	Project Area

Resource	Source	Search parameter
SEED - The Central Resource for Sharing and Enabling Environmental Data in NSW	NSW DCCEEW https://www.seed.nsw.gov.au/ - date last accessed August 2024	Project Area
NSW WeedWise	DPI https://weeds.dpi.nsw.gov.au/ - date last accessed 11/08/2024	Project Area
PlantNet – NSW Flora Online	The Royal Botanic Gardens https://plantnet.rbgsyd.nsw.gov.au/ - date last accessed 02/08/2024	Species descriptions
Register of Declared Areas of Outstanding Biodiversity Value (AOBV)	DPE https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-of-outstanding-biodiversity-value/area-of-outstanding-biodiversity-value-register - date last accessed 11/08/2024	Project Area
NSW Department of Primary Industries (DPI) Fisheries NSW Spatial Data Portal	NSW DPI Fisheries https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal	Project Area
Commonwealth Datasets		
Protected Matters Search Tool (PMST)	Commonwealth DCCEEW https://www.awe.gov.au/environment/epbc/protected-matters-search-tool - date last accessed 12/08/2024	10 km buffer around the Development Footprint Refer to **Appendix 2**.
Register of Critical Habitat	Commonwealth DCCEEW https://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl - date last accessed 6/07/2024	Project Area
Atlas of Groundwater Dependent Ecosystems (GDEs)	Bureau of Meteorology (BoM) http://www.bom.gov.au/water/groundwater/gde/ - date last accessed 6/08/2024	Project Area
Climate Data Online	BoM http://www.bom.gov.au/climate/data/?ref=ftr – date last accessed 31/07/2024	Mildura Airport (076031)
Directory of Important Wetlands	Commonwealth DCCEEW https://www.awe.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands - date last accessed 30 August 2024	10 km buffer around the Project Area
National Flying Fox Monitoring Viewer	National Flying Fox Monitoring Viewer DCCEEW https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf - date last accessed 30 August 2024	LGA

3.1.2 Survey Guidelines

Table 3.2 lists the NSW and Commonwealth survey guidelines that have been applied to surveys completed within the Biodiversity Study Area. Surveys were conducted in keeping with the NSW BAM and are described in detail in the BDAR (Umwelt 2024a).

Table 3.2 NSW and Commonwealth Survey Guidelines

Resource	Source
NSW Survey Guidelines	
Threatened reptiles biodiversity assessment method survey guide (2022)	DPE https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-reptiles-biodiversity-assessment-method-survey-guide
Surveying threatened plants and habitats NSW survey guide biodiversity assessment method (2020a)	DPIE https://www.environment.nsw.gov.au/research-and-publications/publications-search/surveying-threatened-plants-and-their-habitats-survey-guide-for-the-biodiversity-assessment-method
Flora species with specific survey requirements (XLS)	NSW DCCEEW https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.lmbc.nsw.gov.au%2Fbamcalc%2Fapp%2Fassets%2FSurveyMonthsConditions_BAMC_Version1.1.xlsx&wdOrigin=BROWSELINK
Species credit threatened bats and their habitats NSW guide for biodiversity assessment method (2021)	DPIE https://www.environment.nsw.gov.au/research-and-publications/publications-search/species-credit-threatened-bats-nsw-survey-guide-for-biodiversity-assessment-method
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (2004 Working Draft)	NSW Department of Environment and Conservation (DEC) (superseded) https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-biodiversity-survey-and-assessment
Commonwealth Survey Guidelines	
Commonwealth of Australia (2010a), Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act.	Commonwealth DCCEEW https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-bats
Commonwealth of Australia (2010b), Survey guidelines for Australia's threatened birds (awe.gov.au).	Commonwealth DCCEEW https://www.dcceew.gov.au/sites/default/files/documents/survey-guidelines-birds-april-2017.pdf
Commonwealth of Australia (2011a), Survey Guidelines for Australia's threatened frogs (awe.gov.au).	Commonwealth DCCEEW https://www.dcceew.gov.au/sites/default/files/documents/survey-guidelines-frogs.pdf
Commonwealth of Australia (2011b), Survey guidelines for Australia's threatened mammals (awe.gov.au).	Commonwealth DCCEEW https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-mammals
Commonwealth of Australia (2011c), Survey guidelines for Australia's threatened reptiles (awe.gov.au).	Commonwealth DCCEEW https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-reptiles
Commonwealth of Australia (2013b), Draft survey guidelines for Australia's threatened orchids (awe.gov.au).	Commonwealth DCCEEW https://www.dcceew.gov.au/resource/draft-survey-guidelines-australias-threatened-orchids

3.2 Field Survey

A range of surveys were undertaken within the Biodiversity Study Area targeting relevant threatened species, populations and ecological communities listed under the Commonwealth EPBC Act.

Survey methods are described in detail in Section 4.1.2 and Section 5.2 of the BDAR (Umwelt 2024a). Section 2 of the turbine strike assessment (Umwelt 2024c), Appendix B of the BDAR describes in detail bird and bat surveys completed as part of the bird and bat utilisation surveys for the Proposed Action.

Table 3.3 summaries the biodiversity surveys were undertaken as part of the Proposed Action.

Table 3.3 Biodiversity Surveys Completed as part of the Proposed Action

MNES	Survey Methods	Relevant Section of the BDAR (Umwelt 2024a)
Threatened Ecological Communities	A range of survey methods have been employed to sample TECs, including: • 62 floristics plots in keeping with the BAM (DPIE 2020b) • 59 rapid vegetation assessments • Meandering transects throughout the Biodiversity Study Area.	Section 4.1.2

Targeted Fauna Species	A range of surveys methods have been employed to survey for threatened fauna species in keeping with the NSW BAM (DPIE 2020b) the TBDC survey guidelines and species survey guidelines listed in **Table 3.2**, including:
	• Deployment of 20 remote cameras (March–April 2023).
	• 132 Diurnal bird surveys targeting woodland birds over seven survey campaigns between November 2022 and May 2024 (Nov 22, Feb 23, Apr/May 23, July 23, Oct 23, Feb 24 and May 24).
	• Spotlighting across 7 nights in March 2023.
	• Stick nest, hollow-bearing tree and burrow searches October 2022, February and March 2023.
	• Call play-back across 7 nights in March 2023.
	• Bird utilisation surveys once every season from November 2022 to July 2024:
	  ○ 491 vantage points surveys (367 hours) across 15 sites for birds.
	• Bat utilisation surveys once every season from November 2022 to May 2024:
	  ○ Anabats set for 4 nights at each of the 15 sites, plus a met mast site.
		Section 5.2.5

Threatened Flora Species	Total of 34 person days of survey in spring and summer using the two-phased grid assessment survey method.	Section 5.2.4
Migratory Species	A range of surveys methods have been employed to survey for migratory species, including: • 132 Diurnal bird surveys • 491 vantage point surveys as part of bird utilisation surveys.	Section 5.2.5

The surveys have occurred within the Biodiversity Study Area as defined in the BDAR (Umwelt 2024a) and shown in **Figure 3.1**. The Biodiversity Study Area is the amalgamation of previous and current designs of the Proposed Action. Since 2022, the Proposed Action has undergone refinement considering various constraints. The result of surveys within each design iteration has been built upon to form a comprehensive dataset for the Biodiversity Study Area which the Development Footprint forms a smaller component.

Coverage of vegetation surveys and threatened flora surveys in the Biodiversity Study Area are shown in **Figure 3.2** and **Figure 3.3**, respectively.

The location of threatened fauna surveys across the Biodiversity Study Area is shown in **Figure 3.4.**

A set of detailed figures for the Biodiversity Study Area showing targeted survey coverage are provided in Appendix A of the BDAR (Umwelt 2024a).

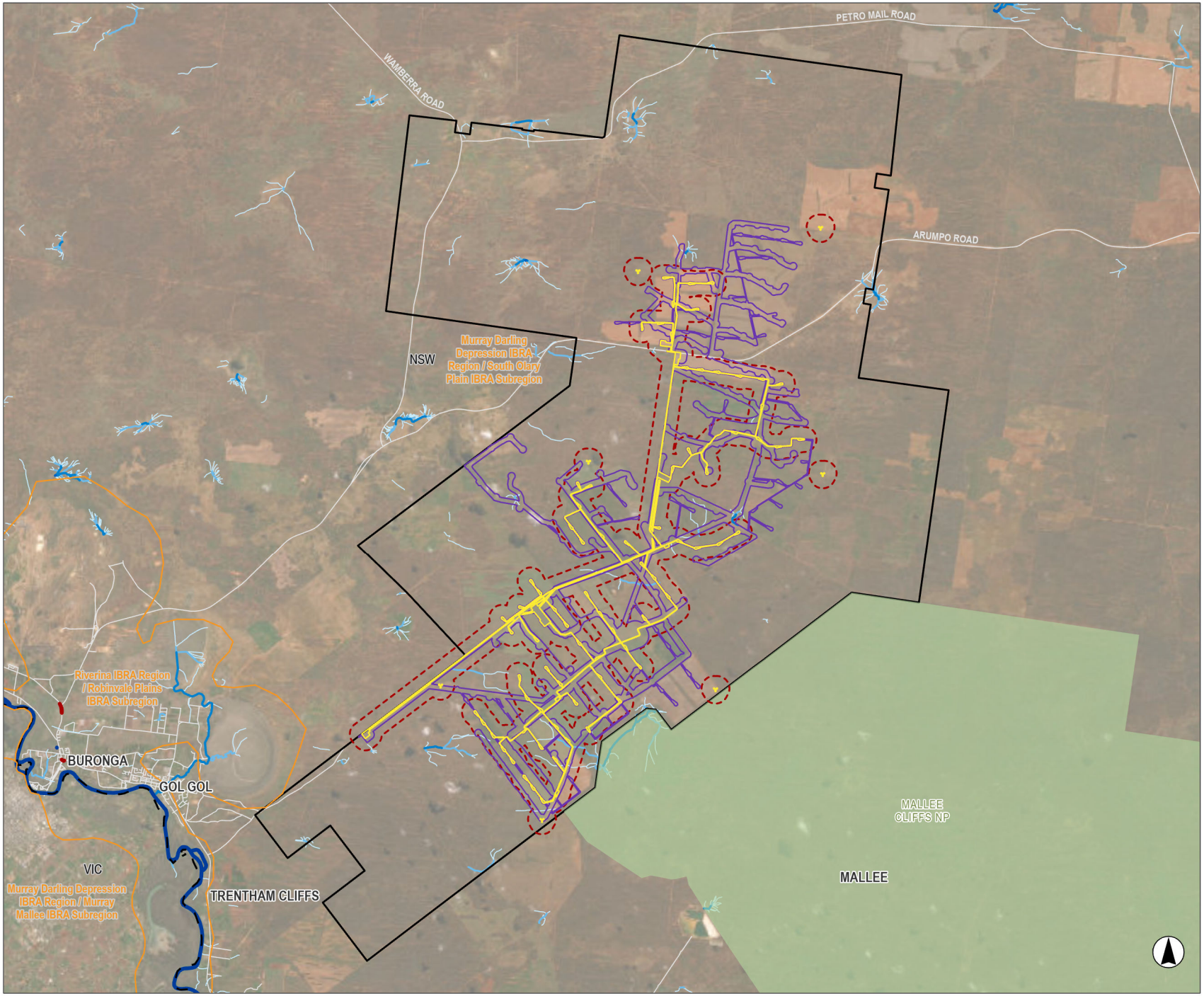


FIGURE 3.1

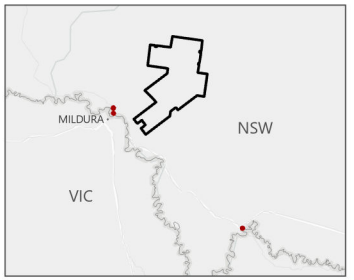
Site Map

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Assessment Area (500m buffer from Development Footprint)
- Off-site Road Works
- State Border
- IBRA Region / Subregion
- NPWS Estates
- Road

Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream or Greater



0 5 10

Kilometres

Scale 1:225,000 at A4

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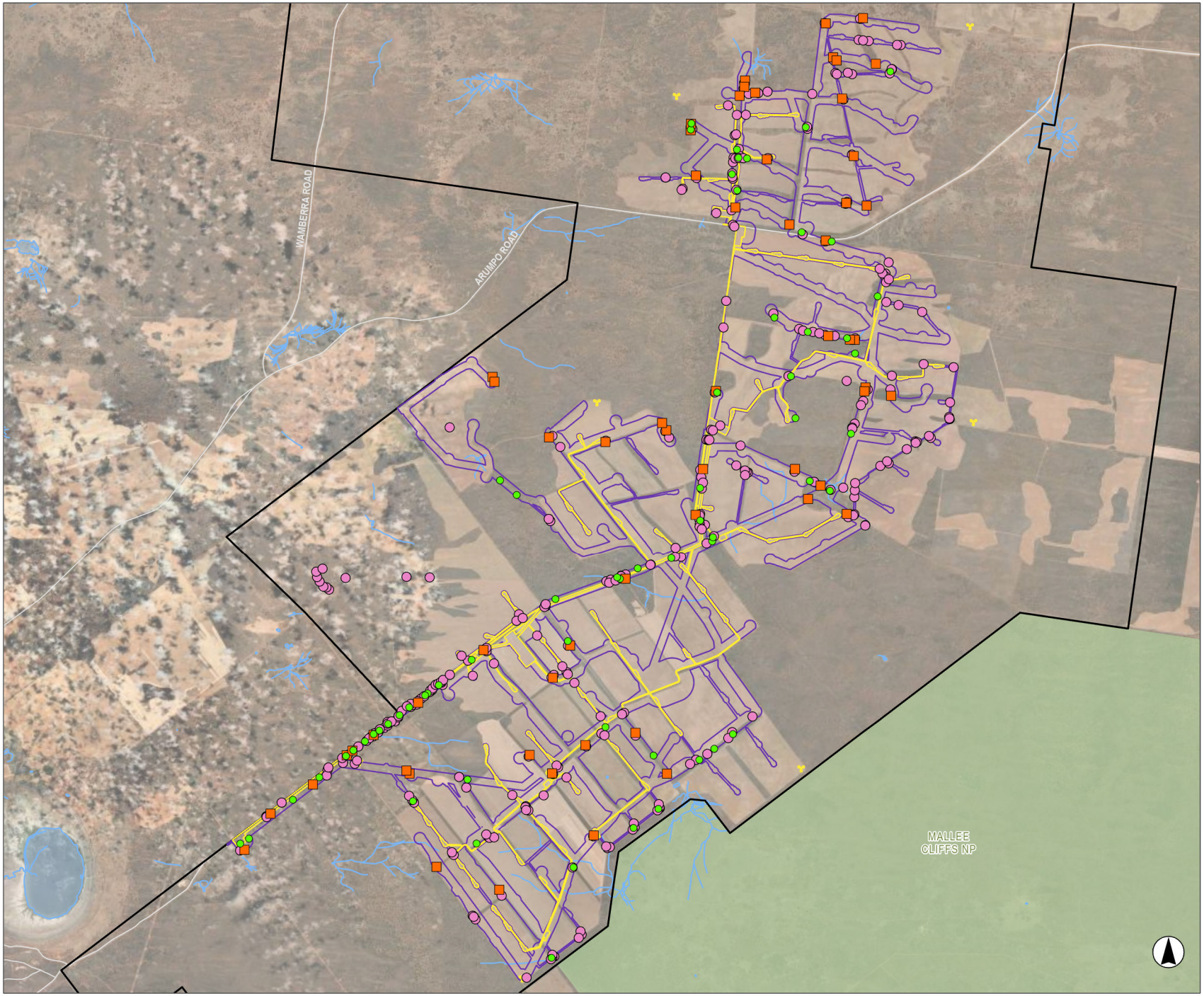


FIGURE 3.2

Assessment of Vegetation

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- BAM Plot Location
- Vegetation Notes
- Rapid Vegetation Assessments
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 2,500 5,000
Metres

Scale 1:140,000 at A4
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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024)

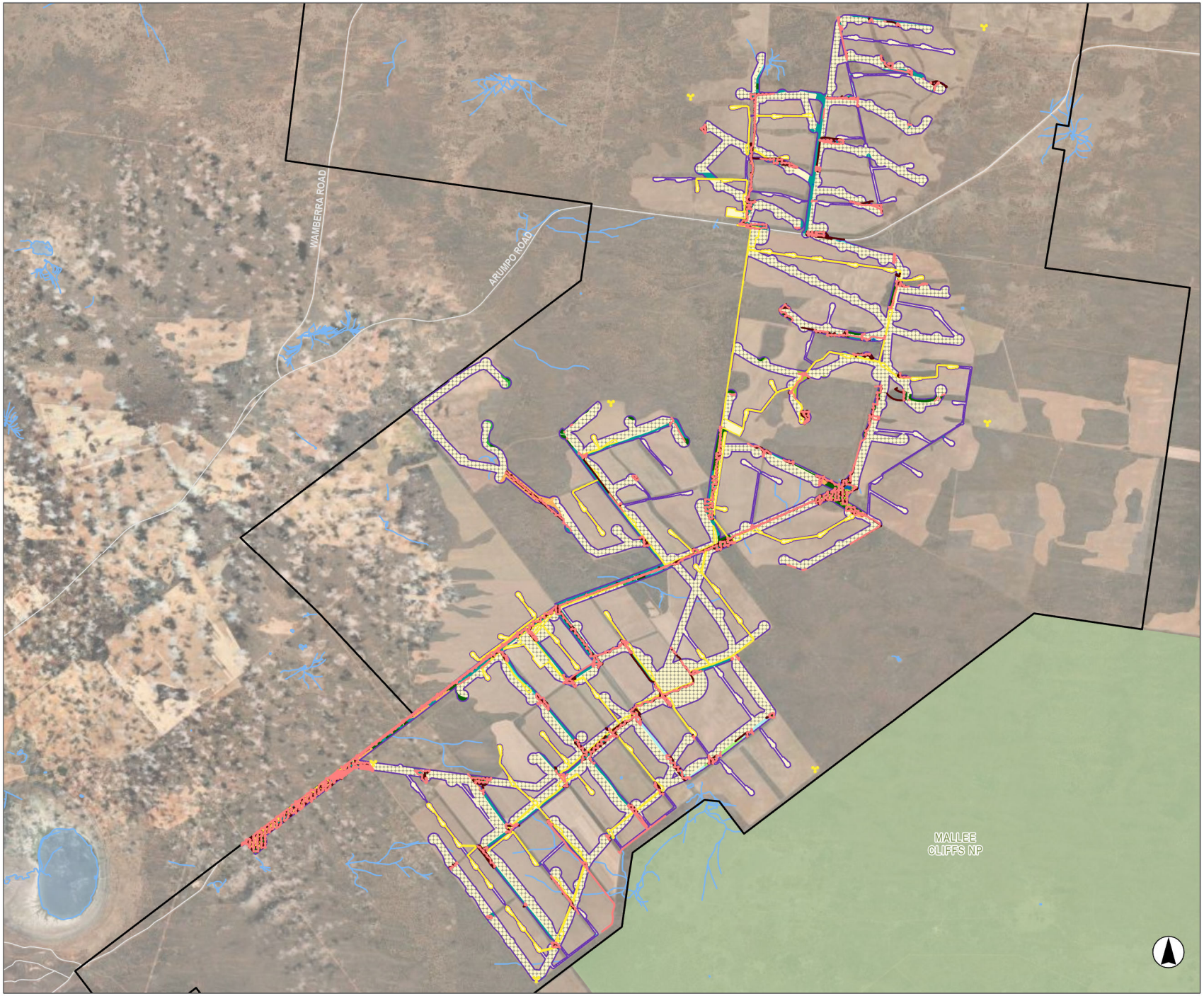


FIGURE 3.3

Threatened Flora Surveys

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Survey Grid
- Threatened Flora Transect Summer (February 2023)
- Threatened Flora Transect Spring (October 2022)

Plant Community Type

- PCT 58 (Moderate-Good)
- PCT 58 (Derived-Weedy)
- PCT 58 (Weedy understory)
- PCT 170 (Moderate-Good)
- PCT 170 (Derived-Native)
- PCT 170 (Derived-Weedy)
- PCT 170 (Weedy Understory)
- PCT 171 (Moderate-Good)
- Dam
- Category 1 – Exempt Land/Cleared/ Structure/ Tracks/ Road
- NPWS Estates
- Road
- Watercourse
- Waterbody

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Metres

Scale 1:140,000 at A4
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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024)



FIGURE 3.4

Threatened Fauna Surveys

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Diurnal Fauna Surveys (March 2023)
- Nocturnal Fauna Survey (March 2023)
- Nocturnal Reptile Surveys (March 2023)
- Diurnal Bird Survey Transects
- BBUS Vantage Point
- Remote Camera
- Anabat Location
- Diurnal Bird Survey
- Call Playback Survey Point Location

Threatened Ecological Communities - EPBC Act

- Mallee Bird Community of the Murray Darling Depression Bioregion EEC

Plant Community Type

- PCT 58 (Moderate-Good)
- PCT 58 (Derived-Weedy)
- PCT 58 (Weedy understory)
- PCT 170 (Moderate-Good)
- PCT 170 (Derived-Native)
- PCT 170 (Derived-Weedy)
- PCT 170 (Weedy Understory)
- PCT 171 (Moderate-Good)
- Dam
- Category 1 – Exempt Land/Cleared/ Structure/ Tracks/ Road
- NPWS Estates
- Road
- Watercourse
- Waterbody

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Kilometres

Scale 1:140,000 at A4
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4.0 Existing Environment

4.1 Landscape Context

The landscape context of the Biodiversity Study Area and Development Footprint is summarised in **Table 4.1** based on the findings of the BDAR (Umwelt 2024a) and the PMST.

Table 4.1 Landscape Context

Landscape feature	Landscape assessment area
IBRA bioregions and subregions	Bioregion – Murray Darling Depression (refer to **Figure 3.1**) Subregion – South Olary Plain
NSW (Mitchell) landscapes	Mallee Cliffs Sandplains and Mallee Cliffs Linear Dunes
Native vegetation cover	>10–30%
Cleared areas	The Biodiversity Study Area and Development Footprint predominantly consists of cleared land associated active agricultural practices, primarily being non-irrigated broad-acre grain cropping activities, with associated access tracks and structures.
Rivers, streams and estuaries	The Development Footprint or Biodiversity Survey Area does not contain any rivers, streams, estuaries or wetlands. Waterbodies in the wider area include the Willandra Lakes Region World Heritage Area, Mourguong Saltwater Disposal Basin, The Murray and Darling Rivers, Lake Gol Gol and Gol Gol Swamp (refer to **Figure 4.1**). There are three dams within the Biodiversity Survey Area. These exist as small farm dams that range from 0.2 to 1.8 ha in size. No dams are present in the Development Footprint (refer to **Figure 3.1**).
Wetlands	The Commonwealth Government's PMST has identified three wetlands of international importance (Ramsar listed wetlands) within 200 km of the Development Footprint. These include: • Banrock Station Wetland Complex (approximately 200 km), • Riverland (approximately 100 to 150 km downstream), and • The Coorong and Lakes Alexandria and Albert Wetland (approximately 200 to 300 km downstream). There are no wetland communities or ephemeral wetland PCTs present within the Development Footprint or within the Biodiversity Survey Area (refer to **Figure 4.1**). There is one nationally important wetland in the locality being Kings Billabong Wetland along the Murray River upstream of Mildura (refer to **Figure 4.1**). In periods of high rainfall, it is likely that water would hold across some of the landscape for a short amount of time, due to the very small differences in elevation.
Connectivity features	The Development Footprint primarily contains agricultural land with grazed grasslands and cropping land. Opportunities for wildlife movement across these landscapes would be limited to more mobile species such as large birds, microbats and macropods.

Landscape feature	Landscape assessment area
	Thin strips of native vegetation and small patches of shrubland occur throughout the Biodiversity Study Area and provide habitat links for less mobile species. These patches are often thin in nature and comprise varying levels of disturbance and understorey/ground cover, reducing the connectivity value to species sensitive to disturbance. Mallee Cliffs National Park is located south east of the Project Area, which contains an expanse of native vegetation and connects to several other large natural areas managed for conservation. Intact vegetation on the Development Footprint forms part of a large intact expanse of native vegetation in the locality (refer to **Figure 4.2**), providing connectivity between the Project Area and habitat to the north, south, east and west for a variety of threatened species such as woodland birds, amphibians, reptiles, and mammals. The Murray River, which is located approximately 10 km west of the Development Footprint, provides a movement barrier for less mobile species.
Karst, caves, crevices, cliffs, rocks or other geological features	No karst, caves, crevices, cliffs, rocks or other geological features of significance were observed within the Biodiversity Study Area. Topographically the area is flat to undulating red sandy plains and sand dunes, no significant geological features are expected to occur within the Biodiversity Study Area.
Soils	The Biodiversity Study Area falls within the Wilkurra Land System. This landscape comprises a sandplain of Quaternary aeolian material with isolated dunes and rises trending east to west, relief to 5 m; small level swales and flats. Soils are highly calcareous solonized brown soils; dunes with deep brownish sands. Vegetation largely comprises dense stands of belah and rosewood, scattered mulga, wilga and inedible shrubs; white cypress pine on sandy rises; variable speargrass, copperburrs and forbs. Soils prone to minor windsheeting and drift. Land management considerations include pasture management, erosion hazard if cleared, woody weed control and wind erosion control.
Areas of outstanding biodiversity value (AOBV)	No AOBV are present within the Biodiversity Study Area.
Important Habitat Mapping	No areas of Important Habitat Mapping fall within the Biodiversity Study Area or in the surrounding region.
Biodiversity Values Mapping	There is no Biodiversity Values Mapping in the Biodiversity Study Area.
Additional landscape features identified within the SEARs	The Project Area adjoins the Mallee Cliffs National Park. An area of enclosed (fenced) land within the Mallee Cliffs National Park that has been established for reintroduction of a number of threatened mammal species (numbat (Myrmecobius fasciatus), bilby (*Macrotis lagotis*) and greater stick-nest rat (*Leporillus conditor*)) and is identified as an Area of Intergenerational Significance (AIS) under the NPW Act, The AIS is within the national park and a minimum of 5.1 km from the shared boundary of the Proposed Action Area and Mallee Cliffs National Park. The Project Area occurs on the edge of and overlaps with the Southern NSW Mallee Key Biodiversity Area (KBA). This KBA covers about 8,316 ha and includes the Mallee Cliffs National Park. It is important for the listed malleefowl (*Leipoa ocellata*) (Key Biodiversity Areas Partnership 2024).

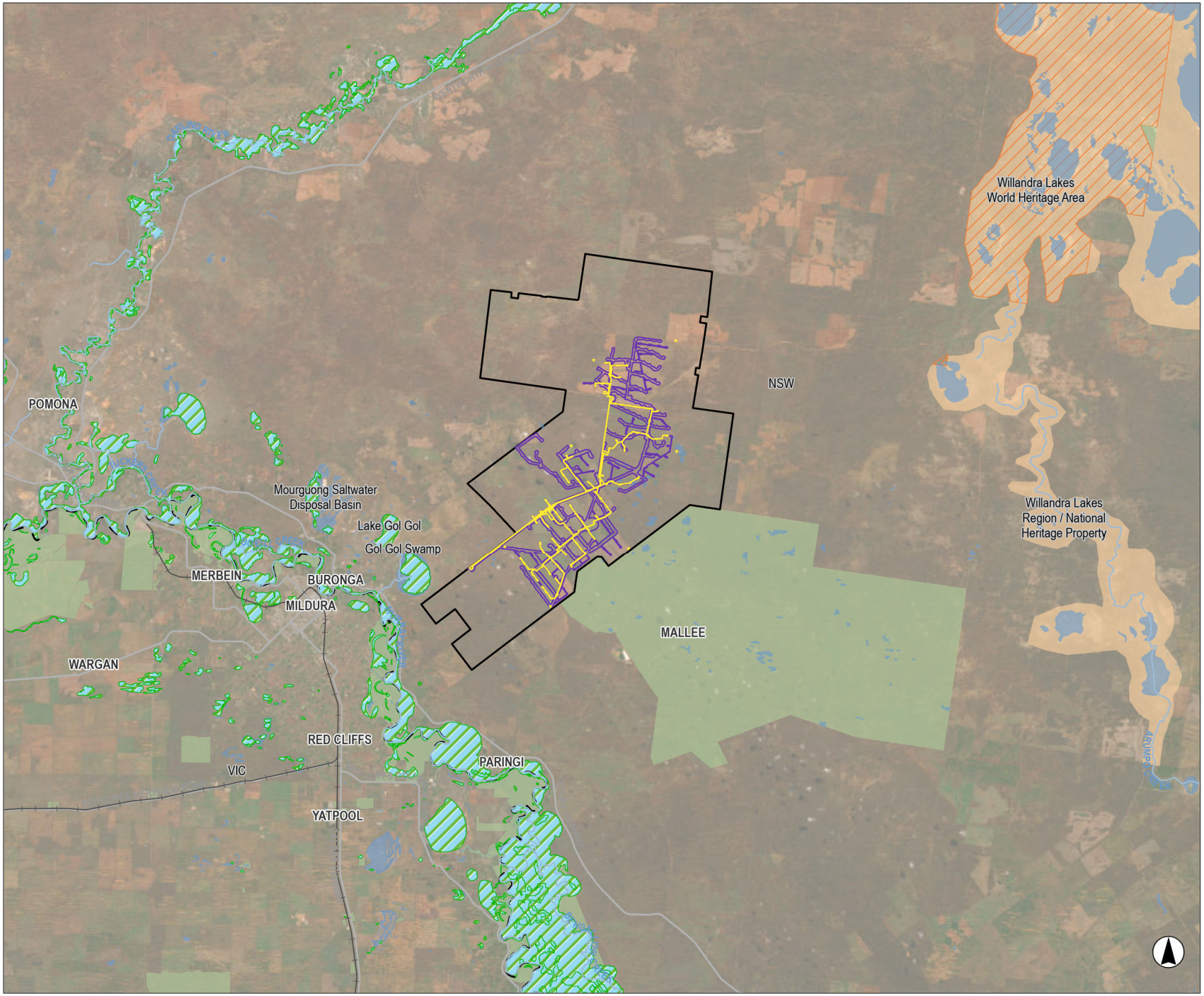
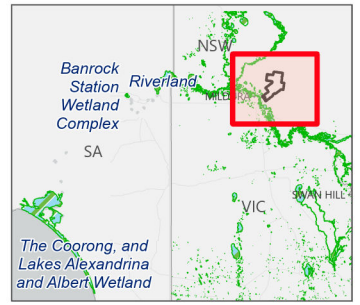


FIGURE 4.1

Rivers, Streams, Estuaries and Wetlands downstream of the Biodiversity Study Area

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Wetland
- Willandra Lakes Region / National Heritage Property
- Willandra Lakes World Heritage Area
- State Border
- NPWS Estate
- Road
- Railway
- Watercourse
- Water Body



0 10 20
Kilometres

Scale 1:500,000 at A4
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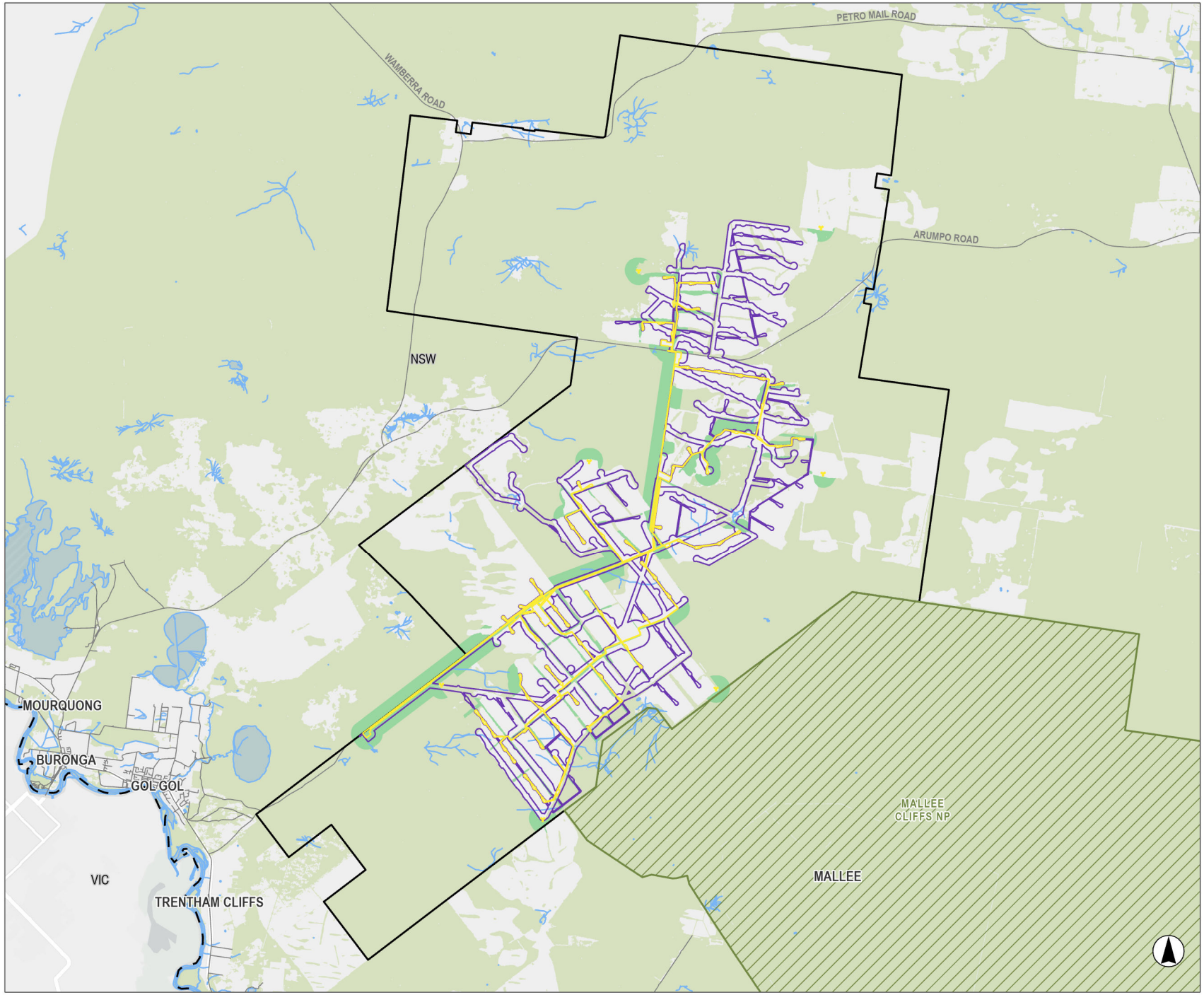


FIGURE 4.2

Habitat Connectivity

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- Woody Vegetation Formation (Umwelt)
- Woody Vegetation Formation (SVTM)
- State Border
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 5 10
Kilometres

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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024)

4.2 Native Vegetation

Vegetation within the Biodiversity Study Area has been assessed as aligning with the BioNet Vegetation Classification PCTs identified within **Table 4.2** and their extent is shown in **Figure 4.3**.

Detailed descriptions of each PCT are provided in Section 4.3 of the BDAR (Umwelt 2024a).

Table 4.2 Plant Community Types in the Biodiversity Study Area

PCT ID	PCT name	Vegetation Formation	Vegetation Class	Condition Zone	Biodiversity Study Area (ha)
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (refer to Section 4.3.2 of the BDAR)	Semi-arid Woodlands (Shrubby sub-formation)	Semi-arid Sand Plain Woodlands	Moderate-Good	588.14
				Derived-Weedy	41.42
				Weedy Understorey	35.72
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (refer to Section 4.3.3 of the BDAR).	Semi-arid Woodlands (Shrubby sub-formation)	Semi-arid Sand Plain Woodlands	Moderate-Good	157.49
				Derived-Native	22.19
				Derived-Weedy	39.01
				Weedy Understory	8.25
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (refer to Section 4.3.4 of the BDAR)	Semi-arid Woodlands (Shrubby sub-formation)	Semi-arid Sand Plain Woodlands	Moderate-Good	131.50
0	Category 1 – Exempt Land/ cleared lands / structure / tracks /roads				3,882.87
0	Waterbodies				2.58
Total					**4,879.17**

The Biodiversity Study Area is dominated by non-native vegetation which covers 3,882.87 ha or 79.6 per cent. Native vegetation covers only 993.72 ha or 20.4 per cent of the Biodiversity Study Area. Of the native vegetation 847.13 ha or 85 per cent has been assessed as being in moderate to good condition with the remaining vegetation showing evidence of previous clearance and impacts from agricultural land use.

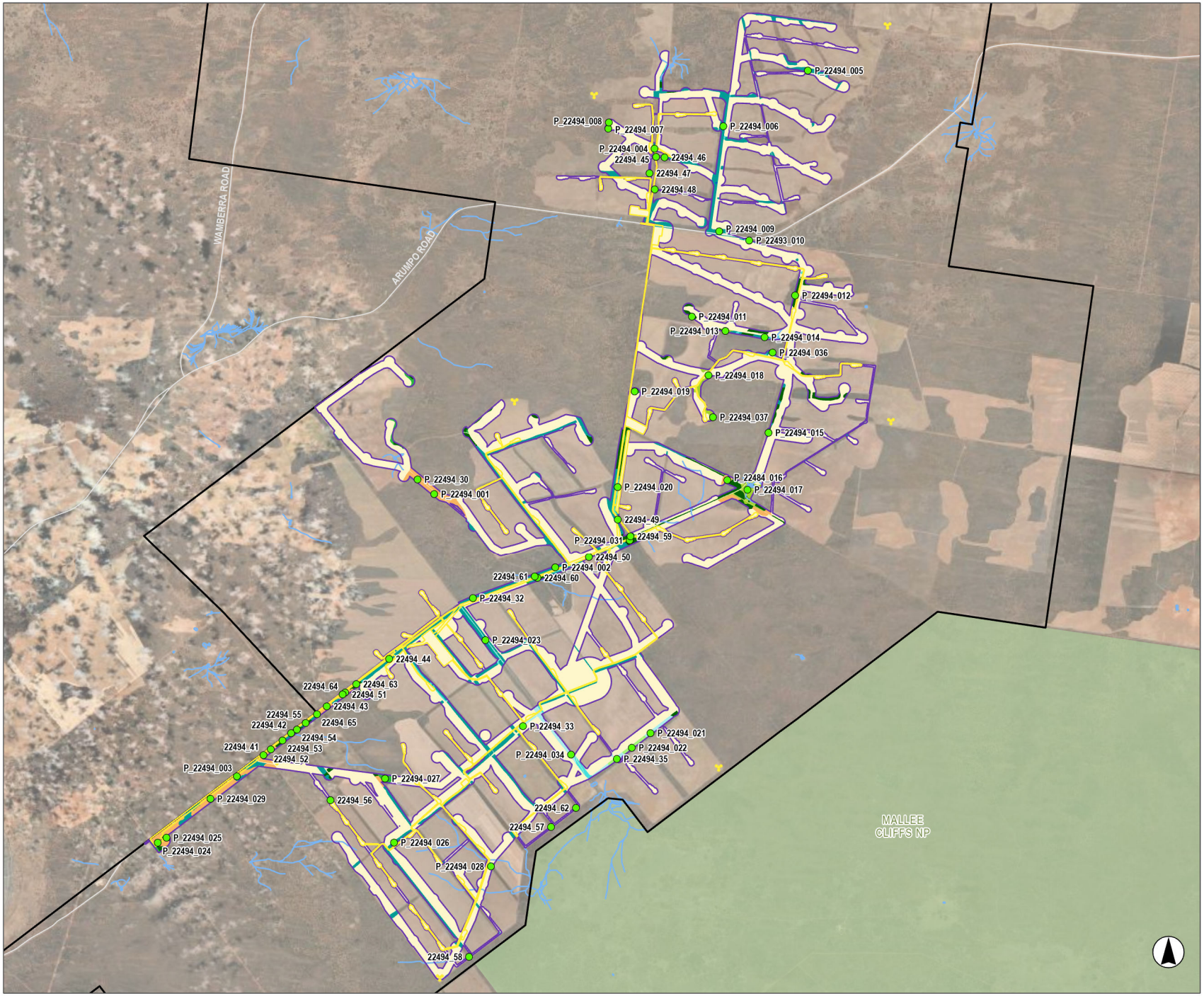


FIGURE 4.3

Plant Community Types present within the Biodiversity Study Area

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area
- BAM Plot Location

Plant Community Type

- PCT 58 (Moderate-Good)
- PCT 58 (Derived-Weedy)
- PCT 58 (Weedy understory)
- PCT 170 (Moderate-Good)
- PCT 170 (Derived-Native)
- PCT 170 (Derived-Weedy)
- PCT 170 (Weedy Understory)
- PCT 171 (Moderate-Good)
- Dam
- Category 1 – Exempt Land/Cleared/ Structure/ Tracks/ Road
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 2,500 5,000
Metres

Scale 1:140,000 at A4
GDA2020 MGA Zone 54

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4.3 Habitat Assessment

There are two broad habitat types across the Biodiversity Study Area: semi-arid woodlands (shrubby sub-formation) and grassland/shrubland habitat derived from modification of the semi-arid woodlands (refer to **Table 4.3**).

Table 4.3 Broad Fauna Habitats in Biodiversity Study Area

PCT ID	PCT Name	Condition Zone	Extent in Biodiversity Study Area (ha)	Development Footprint (ha)
Woodland (black oak)				
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Moderate-Good	588.14	26.81
Woodland (black oak) total (ha)			**588.14**	**26.81**
Woodland (mallee)				
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Moderate-Good	157.49	3.81
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Moderate-Good	131.50	18.95
Woodland (mallee) total (ha)			**288.99**	**22.76**
Grassland/Low Shrubland				
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Derived-Weedy	41.42	3.39
		Weedy Understory	35.72	0.17
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Derived-Native	22.19	1.15
		Derived-Weedy	39.01	0.06
		Weedy-understory	8.25	0
Grassland/Low Shrubland total (ha)			**146.59**	**4.77**

Within the Biodiversity Study Area there are two types of woodland: eucalypt woodland (Mallee woodland) covering approximately 288.99 ha and Black Oak woodland covering approximately 558.14 ha. The eucalypt woodland habitat in the Development Footprint is predominantly open, with some scattered patches of dense shrub layer occurring throughout. These habitats feature a low density of hollows and logs of varying diameters, providing a small amount of potential breeding or refuge habitat for hollow and log dependant threatened species.

Woodland habitat is associated with most of the threatened bird species known or predicted to occur In the Biodiversity Study Area. However, the fragmented nature of the woodland habitat occurring within the Biodiversity Study Area means that it would be unlikely to support a number of those predicted species which require a well-connected remnant woodland. Species which are known or are likely to occur include species that occupy large ranges, are highly nomadic, or small sedentary woodland birds. The eucalypt woodland habitat on site is predominantly open, with some scattered patches of dense shrub layer occurring throughout. These habitats feature a low density of hollows and logs of varying diameters, providing a small amount of potential breeding or refuge habitat for hollow and log dependant threatened species.

Grassland/low shrubland habitat covers approximately 146.59 ha of the Biodiversity Study Area and a small portion of the Development Footprint (4.77 ha) and provides habitat for both threatened flora and fauna which are known or predicted to occur on site. The grasslands are generally devoid of logs and have no areas of rocky outcrops. Threatened birds predicted to occur onsite, use the grasslands predominantly as foraging grounds for seeds, fruits or invertebrates, or hunting grounds for mammals, smaller birds such as quails, reptiles or amphibians.

Habitat assessments identified that hollow-bearing trees are rare over the Biodiversity Study Area and that fallen timber is mostly present at low densities across non-woody vegetation types increasing with canopy density. There are no termite mounds, rocky areas (including surface rocks) and no wetland communities. A number of active raptor nests were recorded in the Biodiversity Study Area and surrounding areas within the Project Area, though the nests were not active over the two breeding seasons surveyed (refer to Section 5.2.3 of the BDAR (Umwelt 2024a)).

4.4 Likelihood of Occurrence of MNES

The following sections identify those MNES threatened species and communities identified in the BDAR (Umwelt 2024a), the turbine risk assessment (Umwelt 2024c) and those species identified in the Supplementary SEARs (refer to **Section 1.4.2**) with potential habitat in the Biodiversity Study Area. Justification is provided for any species that are excluded from further assessment. Species were only excluded for assessment if a known geographical constraint prevented them from occurring, within the Biodiversity Study Area, or in the absence of suitable habitat.

4.4.1 Threatened Ecological Communities

Two threatened ecological communities (TECs) were identified within the Supplementary SEARs as being likely impacted by the Proposed Action (refer to **Section 1.4.2**). The TECs considered for further assessment are detailed with **Table 4.4**.

Of the two TECs considered, only *Mallee Bird Community of the Murray Darling Depression Bioregion Endangered Ecological Community* EEC, has been retained for further assessment, as this was the only TEC listed under the EPBC Act identified as occurring within the Biodiversity Study Area. Approximately 302.36 ha of Mallee Bird Community EEC has been identified in the Biodiversity Study Area. The extent of the Mallee Bird Community EEC in the Biodiversity Study Area is shown in **Figure 4.4.**

Table 4.4 Threatened Ecological Communities assessed as requiring further assessment

MNES Name	EPBC Act Status	Source	Further assessment required	Justification
Buloke Woodlands of the Riverina and Murray-Darling Depressions Bioregions	Endangered	PMST – may occur SEARs	No	Not identified in Biodiversity Study Area.
Mallee Bird Community of the Murray Darling Depression Bioregion	Endangered	PMST – likely to occur SEARs	Yes	Identified within the Biodiversity Study Area, associated with PCT 170 and 171 moderate/good and weedy understory condition.

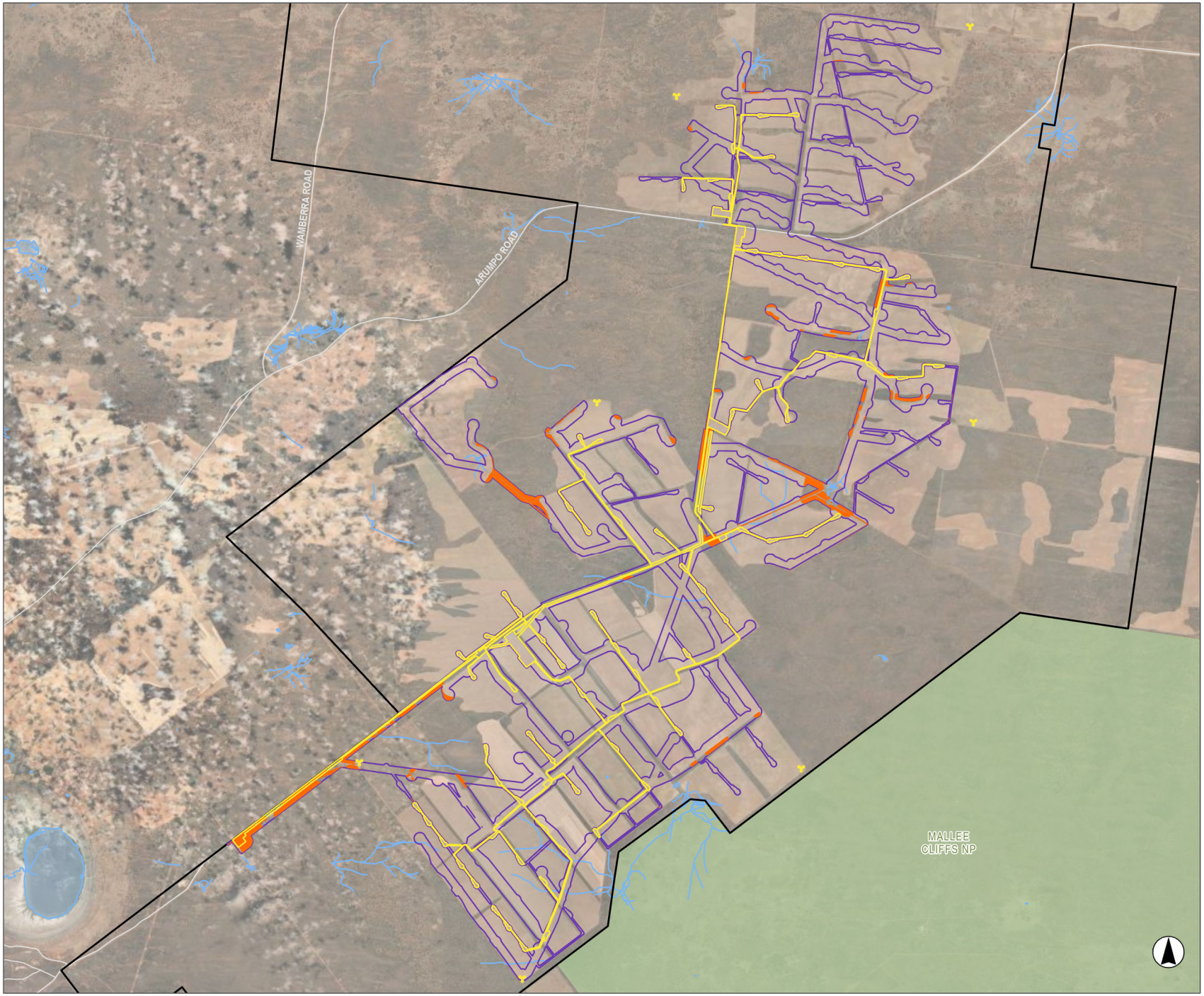


FIGURE 4.4

Distribution of Mallee Bird Community EEC in the Biodiversity Study Area

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area

Threatened Ecological Communities - EPBC Act

- Mallee Bird Community of the Murray Darling Depression Bioregion EEC
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 3 6
Kilometres

Scale 1:140,000 at A4
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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024)

4.4.2 Threatened Fauna Species

Threatened species identified within the Supplementary SEARs as being considered likely or possible to be potentially significantly impacted by the Proposed Action, threatened species identified within the BioNet and PMST desktop searches, and threatened species recorded in the Biodiversity Study Area are listed in **Table 4.5**. **Table 4.5** outlines if the species has been retained or excluded for further assessment. Justification for species that have been excluded for further assessment is also presented in **Table 4.5**.

Those threatened species recorded in the Biodiversity Study Area during field surveys are shown in **Figure 4.5.**

Those MNES species identified as potentially occurring in the Development Footprint in the NSW BAM-C automatically populated list as associated with PCTs, have been reviewed to identify whether they are to be retained or excluded from further assessment. Geographic limitations, vagrant species, habitat constraints, degradation or lack of suitable microhabitats are the permitted reasons for excluding species credit species.

Under the NSW BAM, ecosystem species are associated with PCT and assumed present and targeted surveys are not required. These species have been retained unless adequate surveys have been completed that would rule these species out from occurring in the Development Footprint. The brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) while an ecosystem species has not been retained for further assessment as surveys have been completed in keeping with survey guidelines and all brown treecreepers identified on site are not this subspecies. The diamond firetail (*Stagonopleura guttata*), an ecosystem credit species, has also not been retained due to paucity of suitable habitat and absence of recent records (refer to **Table 4.5**).

There are a number of recently gazetted BC Act listed threatened species that have been considered in **Table 4.5** as there are BioNet records in the locality or the species is predicted to occur in the PMST and/or the Supplementary SEARs. As these species are recently gazetted their treatment in the BAM has not been defined and there is no information on associated PCTs in the NSW TBDC. This includes the Murray Mallee striated grasswren (*Amytornis striatus howei*), Sharp-tailed sandpiper (*Calidris acuminata*), Latham's snipe (*Gallinago hardwickii*), the blue-winged parrot (*Neophema chrysostoma*), grey snake (*Hemiaspis damelii*) and mammals listed as extinct in NSW. As per previous NSW departmental advice surrounding the blue-winged parrot it has been assessed in the BDAR (Umwelt 2024a) as an ecosystem species under the BAM-C. Therefore, the species is assumed present under the BAM-C and requires further assessment. The two threatened migratory birds have been retained for further assessment however the Murray Mallee striated grasswren has not been retained for further assessment as the BC Act listing advice identifies that records in NSW are restricted to Scotia enclosure and Tarawi (NSW TSSC 2022). The extinct mammals have not been retained for further assessment as there are no recent BioNet records and/or the species are within the fenced enclosure in the Mallee Cliffs National Park (AWC 2024).

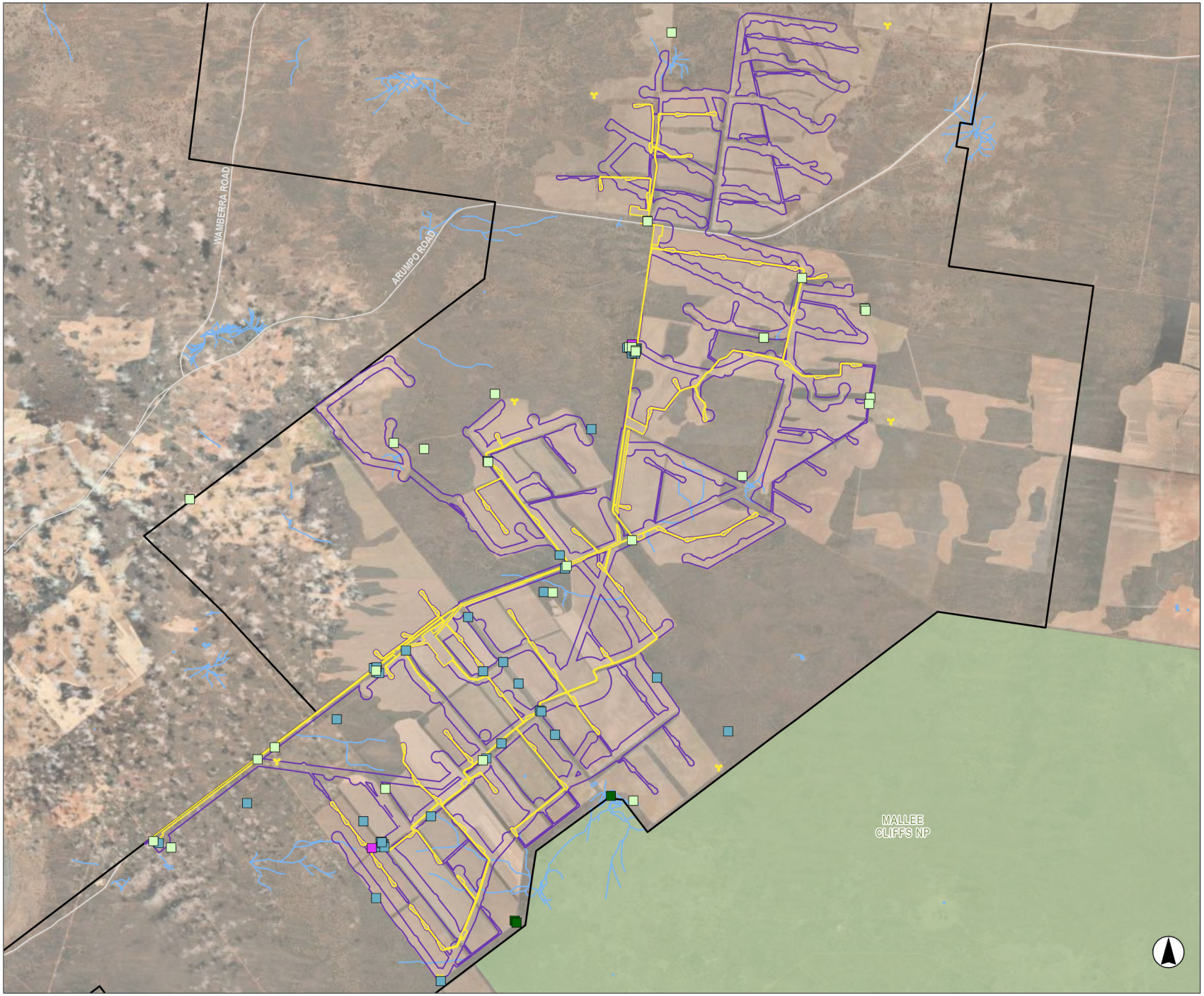


FIGURE 4.5

EPBC listed species recorded within the Development Footprint and Biodiversity Study Area

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area

EPBC listed species recorded

- Hooded Robin
- Pacific Swift (Migratory)
- Regent Parrot
- Southern Whiteface

- NPWS Estates
- Road
- Watercourse
- Waterbody

0 2,500 5,000
Metres

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Table 4.5 Threatened Fauna assessed as requiring further assessment

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
Amphibians						
southern bell frog	*Litoria raniformis*	E	V	Species credit	☐ BAM-C ☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. While there is a record approximately 5 km from Development Footprint the species is not associated with any PCTs and there is no suitable habitat in the Development Footprint. Species not expected to occur in the Development Footprint.
Birds						
Murray Mallee striated grasswren	*Amytornis striatus howei*	E	E	Not defined in the BAM-C	☐ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No Records in NSW restricted to Scotia enclosure and Tarawi (NSW TSSC 2022). While species is predicted to occur associated with PCT 170, targeted surveys undertaken during recommended survey period using diurnal surveys and BBUS did not identify the species (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
southern whiteface	*Aphelocephala leucopsis*	V	V	Ecosystem credit	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☒ Current survey	**Yes**. Data not populated within TBDC. As per previous NSW departmental advice surrounding this species, the southern whiteface is to be assessed as an ecosystem species under the BAM-C and is assumed present, that is no targeted surveys are required. The species was frequently recorded during 2022-2024 field surveys (refer to **Figure 4.5**), it is conservatively assumed that they have the potential to use all PCTs within the Development Footprint.
ruddy turnstone	*Arenaris interpres*	-	V, B,C,J,K	Not applicable	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No The Development Footprint does not contain any suitable habitat. Ruddy turnstone is very rarely record in south-west NSW. It has been recorded at approximately 10 locations within 50 km of the Development Footprint although there is only one contemporary record (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
Australasian bittern	*Botaurus poiciloptilus*	E	E	Ecosystem credit	☐ BAM-C ☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	**Yes**. While species is not associated with any PCTs in the Development Footprint, the Australasian bittern may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
sharp-tailed sandpiper	*Calidris acuminata*	-	V, M	Data not populated within TBDC	☐ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat, however sharp-tailed sandpiper may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. There is a risk of collision during the Project's operational phase (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
curlew sandpiper	*Calidris ferruginea*	CE	CE, M	Ecosystem credit	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat; however curlew sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. There is a risk of collision during the Project's operational phase (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V, P	V	Ecosystem	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	**No**. While a brown treecreeper was recorded in the Biodiversity Survey Area during the 2022–24 surveys, these observations were not of the listed subspecies (*Climacteris picumnus victoriae*). The listed subspecies is not associated with the PCTs in the Development Footprint and does not occur in the vicinity to the Development Footprint.

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
grey falcon	*Falco hypoleucos*	V	V	Ecosystem credit	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes**. Under the BAM, ecosystem species are assumed present. Grey falcon is associated with PCT 58, 170, 171. Grey falcon may very rarely disperse through the Project Area (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
Latham's snipe	*Gallinago hardwickii*	V	V	Data not populated within TBDC.	☐ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	**Yes.** Species not associated with any PCT; however Latham's snipe may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. There is a risk of collision during the Project's operational phase (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
painted honeyeater	*Grantiella picta*	V	V	Ecosystem	☒ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	**Yes** Under the BAM, ecosystem species are assumed present. The painted honeyeater is associated with PCT 58. This species may very occasionally disperse through the Project Area (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
swift parrot	*Lathamus discolor*	E	CE	Ecosystem and species credit species	☐ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. Species not associated with any PCTs and there is no important habitat mapping under the BAM-C in the Development Footprint or surrounding area. There is no suitable foraging habitat in the Development Footprint. No BioNet records within 10 km. There are historic records within 50 km of the Project Area, however the nearest record post-2000 is from 100 km south of the Project Area in the Mittyack area (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
malleefowl	*Leipoa ocellata*	E	V	Ecosystem	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☒ Previous surveys	**Yes**. Under the BAM, ecosystem species are assumed present. The malleefowl is associated with PCT 170 and 171. This species may occasionally occur in the Development Footprint given it has been recorded on two occasions in the Project Area by others and is known to occur immediately adjacent the site at Mallee Cliffs National Park (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
bar-tailed godwit	*Limosa lapponica*	-	V, B, C, J, K	Ecosystem and species-credit species	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. The Development Footprint does not contain any suitable habitat. Bar-tailed godwit has been recorded at less than 10 locations within 50 km of the Project Area. The only contemporary records are from Lake Ranfurly in Mildura in 2000 and 2004 (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
black-tailed godwit	*Limosa limosa*	V	E, B, C, J, K	Ecosystem and species-credit species	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. The Development Footprint does not contain any suitable habitat however black-tailed godwit may very rarely disperse through the Project Area given the species has been recorded at several locations in the Mildura area (DCCEEW 2024d, eBird 2024). The most recent nearby record is of an individual at Lake Hawthorn (15 km west of the Project Area) in September 2018. (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
pink cockatoo	*Lophochroa leadbeatri leadbeateri*	V	E	Ecosystem and species-credit species	☒ BAM-C ☐ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes**. Foraging habitat for species associated with PCT 58, 170 and 171. Targeted surveys undertaken during recommended survey period for breeding habitat (opportunistic habitat searches, diurnal surveys and BBUS) did not identify the species or breeding habitat. Pink cockatoo was recorded in the south-west portion of the Project Area in 1980. It is regularly recorded in the Mildura area. In the past few years pink cockatoo has been recorded adjacent the Project Area on Arumpo Road in October 2023 (1 km west of the Project Area), in Mallee Cliffs National Park in 2022 and at Gol Gol Swamp in 2024 (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
black-eared miner	*Manorina melanotis*	CE	E	Species credit	☒ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. Although the species is associated with PCT 170 and 171, the species was not detected during the targeted surveys. Furthermore, the Development Footprint contains marginal habitat, and this species is very rarely recorded near the Project Area. The nearest records are historic records from the 1960s and 1970s approximately 35 to 50 km south and south-west of the Project Area. The nearest contemporary records are from Hattah – Kulkyne National Park and Murray-Sunset National Park (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
south-eastern hooded robin	*Melanodryas cucullata cucullata*	V	E	Ecosystem	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☒ Current survey	**Yes.** Under the BAM, ecosystem species are assumed present. South-eastern hood robin is associated with PCT 58, 170, 171. Species recorded regularly during field surveys including BBUS and diurnal surveys between 2022 to 2024 (refer to **Figure 4.5**).
blue-winged parrot	*Neophema chrysostoma*	V	V	Ecosystem	☒ BAM-C ☐ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes**. Data not populated within TBDC. As per previous NSW departmental advice surrounding this species, the blue-winged parrot is to be assessed as an ecosystem species under the BAM-C. Therefore, the species is assumed present under the BAM-C and requires further assessment. It is conservatively assumed that the species has the potential to use all PCTs within the Development Footprint.
red-lored whistler	*Pachycephala rufogularis*	CE	V	Species credit	☒ BAM-C ☐ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No While this species is predicted to occur associated with PCT 171, targeted surveys (BBUS) did not identify the species. The species is very rarely recorded in south-west NSW aside from the extreme western edge of the state (i.e., in the Scotia area). Despite considerable survey effort it has not been recorded at Mallee Cliffs National Park. The nearest known population is at Hattah-Kulkyne National Park 50 km south of the Project Area (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
plains-wanderer	*Pedionomus torquatus*	E	CE	Ecosystem and species-credit species	☐ BAM-C ☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. Species not associated with any PCTs (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)). The Development Footprint does not contain any suitable habitat.
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	E	V	Ecosystem and species-credit species	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes.** Under the BAM, ecosystem species are assumed present. Regent parrot is associated with PCT 58, 170 and 171. Two flocks of regent parrots were recorded flying over the Biodiversity Study Area during targeted surveys (BBUS) (refer to **Figure 4.5**).
Australian painted snipe	*Rostratula australis*	E	E	Ecosystem	☐ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	**Yes**. While the Development Footprint does not contain any suitable habitat, the Australian painted snipe may very rarely disperse through the Project Area. The nearest records are from Lake Gol Gol (7 km to the west) in July 1984, December 1992 and February 1993. The nearest recent contemporary record (i.e., post-2000) is from Merbein Common (18 km to the west) in December 2011 (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
diamond firetail	*Stagonopleura guttata*	V	V	Ecosystem	☒ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. The Development Footprint contains marginal habitat associated with PCT 58 and 170. This species has been very rarely recorded near the Project Area in the past three decades. The majority of records in the Mildura area are from the 1950s-1970s. The nearest records are two from 1977 that may potentially be from the Project Area. These records have a spatial uncertainty of 9 km so the precise location of these records is unknown (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
common greenshank	*Tringa nebularia*	-	E, M	Not applicable	☐ BAM-C ☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	**Yes**. Species not associated with any PCTs in the Development Footprint however the common greenshank may very occasionally disperse through the Project Area from suitable habitat to the southwest. Species has been recently recorded in Mallee Cliffs National Park and from Lake Ranfurly in Mildura (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
Mammals						
boodie, burrowing bettong (mainland)	*Bettongia lesueur graii*	Extinct	Extinct	Data not populated within TBDC.	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. Species is considered extinct in mainland Australia. The single BioNet record is from 1867.
pig-footed bandicoot	*Chaeropus ecaudatus*	Extinct	Extinct	Data not populated within TBDC.	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. Species is considered extinct in mainland Australia. The single BioNet record is from 1857.
spotted-tailed quoll	*Dasyurus maculatus*	V	E	Ecosystem	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. Single BioNet record from 1975. Species not associated with any PCTs in the Development Footprint.
greater stick-nest rat	*Leporillus conditor*	Extinct	V	Data not populated within TBDC.	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. Species is considered extinct in NSW. Single BioNet record from 1857. Species has been released in the fenced enclosure in Mallee Cliffs National Park in September 2020 (AWC 2024).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
bilby	*Macrotis lagotis*	Extinct	V	Data not populated within TBDC.	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. Species is considered extinct in NSW. Single BioNet record from 1857. Species has been released in the fenced enclosure in Mallee Cliffs National Park in October 2019 (AWC 2024).
numbat	*Myrmecobius fasciatus*	Extinct	E	Not defined in BAM-C	☐ BAM-C ☐ BioNet ☒ PMST ☒ SEARs ☐ Current survey	No. The numbat is assumed extinct in NSW, with the exception of a translocated population located within the fenced enclosures in Mallee Cliffs National Park (AWC 2024). This site is managed by Australian Wildlife Conservancy in partnership with NPWS. There are no BioNet records within 10 km of the site and various surveys have been conducted across site that would have detected the numbat, including remote camera surveys, diurnal transects (flora) and diurnal wombat searches. Based on the above, the species is not expected to occur in the Development Footprint.
Corben's long-eared bat	*Nyctophilus corbeni*	V	V	Ecosystem	☒ BAM-C ☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey (probable)	Yes. Species associated with PCT 170 and171 all condition zones. Species has been recorded as part of a species complex during BBUS surveys (refer to Section 8.4.1 Umwelt 2024c). The current and historic land use within the Development Footprint (cropping and reduction in native vegetation extent) has greatly reduced the value of the habitat for this species. Species may utilise airspace above the Development Footprint.
red-tailed phascogale	*Phascogale calura*	Extinct	V	Data not populated within TBDC.	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. Species is considered extinct in NSW. Single BioNet record from 1857. Species has been released in the fenced enclosure in Mallee Cliffs National Park in November 2021 (AWC 2024).

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not?
koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	*Phascolarctos cinereus*	E	E	Species	☐ BAM-C ☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. Species not associated with any PCTs in the Development Footprint and there are no BioNet records within 10 km. The closest record is approximately 11 km to the west. In this region the species is restricted to the riparian areas that support suitable feed trees. The Development Footprint does not support suitable koala feed habitat.
Reptiles						
grey snake	*Hemiaspis damelii*	E	E	Data not populated within TBDC.	☐ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. Species not associated with any PCTs in the Development Footprint. No BioNet records within 10 km. Closest record is approximately 140 km southeast. The current and historic land use within the Development Footprint has greatly reduced the value of the habitat for this species via ploughing and cropping.

4.4.3 Threatened Flora Species

Threatened flora species identified within the Supplementary SEARs as being considered likely to potentially be impacted by the Proposed Action and threatened species identified within the BioNet and PMST desktop searches are listed in **Table 4.6**. **Table 4.6** identifies if the species has been retained or excluded for further assessment. Justification for species that have been excluded for further assessment is also presented in **Table 4.6**.

Those MNES species identified as potentially occurring in the Development Footprint according to the NSW BAM-C, have been reviewed to identify whether they are to be retained or excluded from assessment.

None of the threatened flora species have been identified in the Biodiversity Study Area during targeted flora surveys conducted in keeping with the BAM.

Table 4.6 Threatened Flora assessed as requiring further assessment

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not.
purple-wood wattle	*Acacia carneorum*	V	V	Species credit	☒ BAM-C ☐ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No While this species is associated with PCT 58, targeted surveys have not identified the species.
a saltbush	*Atriplex infrequens*	V	V	Species credit	☒ BAM-C ☐ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No While this species is associated with PCT 170, there are no BioNet records in locality and targeted surveys undertaken during recommended survey period did not identify the species.
a spear-grass	*Austrostipa metatoris*	V	V	Species credit	☒ BAM-C ☐ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No While this species is associated with PCT 170, there are no BioNet records in locality and targeted surveys undertaken during recommended survey period did not identify the species.
a burr-daisy	*Calotis moorei*	E	E	Species credit	☒ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No While this species is associated with PCT 170, there are no BioNet records in the locality and targeted surveys undertaken during recommended survey period did not identify the species.
winged peppercress	*Lepidium monoplocoides*	E	E	Species credit	☒ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No While this species is associated with PCT 170, targeted surveys undertaken during recommended survey did not identify the species.

Common name	Scientific name	BC Act Status	EPBC Act Status	Ecosystem / Species credit	Source	Species retained for further assessment. If not, why not.
ridged water-milfoil	*Myriophyllum porcatum*	-	V	Data not populated within TBDC.	☐ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No No BioNet records within 20 km. Species is an aquatic herb occurring in shallow, ephemeral and seasonal wetlands (TSSC 2016). It is endemic to Victoria (TSSC 2016). There is no suitable habitat in the Development Footprint.
desert greenhood	*Pterostylis xerophila*	-	V	Not applicable	☐ BAM-C ☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No Species not listed in NSW and not identified in the TBDC as associated with any PCTs. Little is known of the precise habitat requirements in NSW. There are no BioNet records within 10 km. Flowers June-Dec. Flora surveys have occurred during these times, including for Greenhood Orchid *Pterostylis cobarensis*, and it has not been recorded.
Menindee nightshade	*Solanum karsense*	V	V	Species	☐ BAM-C ☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	No Species is not associated with any PCTs. Three (3) BioNet records within 20 km, all from 1976. The Development Footprint is not on a floodplain (this species grows on floodplain depressions), it is unlikely to occur within the Development Footprint.
Murray or slender swainson-pea	*Swainsona murrayana*	V	V	Species	☐ BAM-C ☐ BioNet ☒ PMST ☒ SEARs ☐ Current survey	No Species is not associated with any PCTs. No BioNet records within 10 km.
yellow swainson-pea	*Swainsona pyrophila*	V	V	Species credit	☒ BAM-C ☒ BioNet ☒ PMST ☒ SEARS ☐ Current survey	No. While this species is associated with PCT 170 and 171, targeted surveys undertaken during recommended survey period did not identify the species.

4.4.4 Threatened Fish Species

Threatened fish species identified within the PMST desktop searches are listed in **Table 4.7**. **Table 4.7** outlines if the species has been retained or excluded for further assessment. Justification for species that have been excluded for further assessment is also presented in **Table 4.7**. A review of the NSW DPI Fisheries spatial tool for mapping of potential habit for threatened freshwater fish species was undertaken to identify whether any of the threatened fish species are predicted to occur.

The Development Footprint does not support any waterways that would provide habitat for threatened fish species and none of the species have been retained for further assessment.

Table 4.7 Threatened fish assessed as requiring further assessment

Common name	Scientific name	FM Act Status	EPBC Act Status	Source	Species retained for further assessment?	Reason for exclusion from further assessment?
silver perch	*Bidyanus bidyanus*	V	E	☐ DPI Fisheries ☒ PMST – Likely ☐ SEARs ☐ Current survey	No Silver perch predicted to occur in Bengallow Creek a tributary of the Murray River and the Murray River (DPI Fisheries). No habitat in Development Footprint.	There are a number of mapped hydrolines within the Biodiversity Study Area (refer to **Figure 3.1**) however these do not form tributaries of any of the nearby major waterways (Murray River) or wetlands (refer to **Figure 4.1**). There are 3 (three) small farm dams that range from 0.2 to 1.8 ha in size. No dams are present in the Development Footprint. The Development Footprint or Biodiversity Survey Area does not contain any rivers, streams, estuaries or wetlands. The Project Area does not support waterways that provide key fish habitat as defined under the NSW FM Act. This was acknowledged by NSW Department of Primary Industries Fisheries and no further assessment was required.
Murray hardyhead	*Craterocephalus fluviatilis*	CE	E	☐ DPI Fisheries ☒ PMST – May occur ☐ SEARs ☐ Current survey	No Not predicted to occur in the Murray River (DPI Fisheries) downstream of the Development Footprint.	
flathead galaxias	*Galaxias rostratus*	CE	CE	☐ DPI Fisheries ☒ PMST – Likely ☐ SEARs ☐ Current survey	No Predicted to occur in Bengallow Creek a tributary of the Murray River and the Murray River (DPI Fisheries). No habitat in the Development Footprint.	
trout cod	*Maccullochella macquariensis*	E	E	☐ DPI Fisheries ☒ PMST – May occur ☐ SEARs ☐ Current survey	No Not predicted to occur in the Murray River (DPI Fisheries) downstream of the Development Footprint.	

Common name	Scientific name	FM Act Status	EPBC Act Status	Source	Species retained for further assessment?	Reason for exclusion from further assessment?
Murray cod	*Maccullochella peelii*	-	V	☐ DPI Fisheries ☒ PMST – Known ☐ SEARs ☐ Current survey	No Not predicted to occur in the Murray River (DPI Fisheries) downstream of the Development Footprint.	
Macquarie perch	*Macquaria australasica*	E	E	☐ DPI Fisheries ☒ PMST – May occur ☐ SEARs ☐ Current survey	No Not predicted to occur in the Murray River (DPI Fisheries) downstream of the Development Footprint.	

4.4.5 Migratory Species

Migratory species identified within the Supplementary SEARs as being considered likely to be potentially significantly impacted by the Proposed Action and identified within the BioNet and PMST desktop searches are listed in **Table 4.8**. **Table 4.8** identified if the species has been retained or excluded for further assessment. Justification for species that have been excluded for further assessment is also presented in **Table 4.8**.

A number of migratory shorebirds are known to occur in waterways within the region and may fly through the Project Area. Operation of the Proposed Action (wind farm) may represent a risk to the species as defined in detail in the BDAR's prescribed risk assessment for turbine strike. These species have been retained for further assessment as indicated in **Table 4.8.** The only migratory species observed in the Biodiversity Study Area was the aerial fork-tailed swift or Pacific swift.

Table 4.8 Migratory species assessed as requiring further assessment

Common name	Scientific name	EPBC Act Status	Presence rank	Source	Species retained for further assessment? If not, why not.
common sandpiper	*Actitis hypoleucos*	B, C, J, K	May	☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. The Development Footprint does not contain any suitable habitat. Common sandpiper has been recorded at approximately 10 locations within 50 km, although there is only one contemporary record - from Cowanna Billabong in December 2001 (30 km west). The nearest records are historic records from Buronga (1962) and Merbein (1983) (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
fork-tailed swift or Pacific swift	*Apus pacificus*	C, J, K	Likely	☐ BioNet ☒ PMST ☒ SEARs ☒ Current survey	**Yes**. Recorded in the 2022 to 2024 BBUS (refer to **Figure 4.5**).
ruddy turnstone	*Arenaris interpres*	V, B, C, J, K	Not predicted	☐ BAM-C ☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No The Development Footprint does not contain any suitable habitat. Ruddy turnstone is very rarely recorded in south-west NSW. It has been recorded at approximately 10 locations within 50 km of the Project Area, although there is only one contemporary record (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
sharp-tailed sandpiper	*Calidris acuminata*	V, B, C, J, K	Likely	☐ BioNet ☒ PMST ☒ SEARs ☐ Current survey	Assessed as a threatened species.
curlew sandpiper	*Calidris ferruginea*	CE, B, C, J, K	Known.	☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	Assessed as a threatened species.

Common name	Scientific name	EPBC Act Status	Presence rank	Source	Species retained for further assessment? If not, why not.
pectoral sandpiper	*Calidris melanotos*	B, J, K	May	☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat, however pectoral sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. The most recent nearby record is of an individual adjacent Mildura Airport in February 2019 (17 km west of the Project Area). The nearest records are from Gol Gol Swamp in 1986 and 1983 (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
red-necked stint	*Calidris ruficollis*	B, C, J, K	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat, however red-necked stint may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Red-necked stint has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area. Recent records include an observation of approximately 240 birds at Mourquong Saltworks (13 km west of the Project Area) in March 2024. A flock of approximately 200 birds was also recorded at this site in February 2017. Large numbers (up to 500 birds) were recorded at Lake Ranfurly in Mildura in 2023. This species has also been recorded at Gol Gol Swamp, Lake Hawthorn, Kings Billabong Wildlife Reserve and at the Mildura Wastewater Treatment Plant (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
white-winged black tern	*Chlidonias leucopterus*	C, J, K	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	No. The Development Footprint does not contain any suitable habitat. White-winged black tern is very rarely recorded in south-west NSW. This species has only been recorded within 50 km of the Project Area on three occasions the most recent being in 2011 at Merbein South (25 km west of the Project Area) (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
Latham's snipe	*Gallinago hardwickii*	V, B, J, K	May	☒ BioNet ☒ PMST ☐ SEARs ☐ Current survey	Assessed as a threatened species.

Common name	Scientific name	EPBC Act Status	Presence rank	Source	Species retained for further assessment? If not, why not.
gull-billed tern	*Gelochelidon nilotica*	C	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat however the gull-billed tern may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west. This species has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records along the Murray River. Recent nearby records include observations from Kings Billabong Wildlife Reserve in November 2015 and October 2023 (6 km south-west of the Project Area) and two locations at Nichols Point in September 2019 and August 2023 (4 km and 7 km west of the Project Area respectively). Species may utilise airspace while migrating (refer to Table 3.1 of the turbine strike assessment (Umwelt 2024c)).
Caspian tern	*Hydroprogne caspia*	J	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat. This species is regularly observed along the Murray River to the south-west of the Project Area and has been recorded at Lake Gol Gol and Gol Gol Swamp. Although the vast majority of movements by this species in the region are likely to be restricted to the Murray River and adjacent wetlands this species may very occasionally disperse through the Project Area.
bar-tailed godwit	*Limosa lapponica*	V, B, C, J, K	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	Assessed as a threatened species.
black-tailed godwit	*Limosa limosa*	E, B, C, J, K	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	Assessed as a threatened species.

Common name	Scientific name	EPBC Act Status	Presence rank	Source	Species retained for further assessment? If not, why not.
yellow wagtail	*Motacilla flava*	C, J, K	May	☐ BioNet ☒ PMST ☐ SEARs ☐ Current survey	No. No habitat in Development Footprint for this species. Nearest known record approximately 790 km east of the Project Area.
Pacific golden plover	*Pluvialis fulva*	B, C, J, K	Not predicted	☒ BioNet ☐PMST ☐ SEARs ☐ Current survey	No. The Development Footprint does not contain any suitable habitat. Pacific golden plover is very rarely recorded in south-west NSW. This species has not been recorded within 50 km of the Project Area since 1987.
common greenshank	*Tringa nebularia*	E, B, C, J, K	Likely	☒ BioNet ☒ PMST ☒ SEARs ☐ Current survey	Assessed as a threatened species.
marsh sandpiper	*Tringa stagnatilis*	B, C, J, K	Not predicted	☒ BioNet ☐ PMST ☐ SEARs ☐ Current survey	**Yes**. The Development Footprint does not contain any suitable habitat; however marsh sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. The most recent nearby record is of two birds at Lake Hawthorn in November 2015 (15 km west of the Project Area). Marsh sandpiper has been recorded on several occasions at Gol Gol Swamp, Lake Gol Gol and in the Mourquong area.

5.0 Avoidance, Minimisation, Mitigation and Management

5.1 Summary of Measures to Avoid and Minimise Impacts

A detailed description of the measures taken to avoid and minimise direct and indirect impacts of the Proposed Action is provided in Section 7 of the BDAR (Umwelt 2024a). These measures are summarised in **Table 5.1**.

Table 5.1 Summary of Measures to Avoid and Minimise Impacts for MNES

Biodiversity Value	Avoidance Measures
Native vegetation	Proposed Action has been designed to use existing tracks and local roads and to maximise use of previously modified lands (agricultural lands) for the location of WTGs and ancillary infrastructure. Development Corridor was 3,575 ha in November 2022, as stated in the Scoping Report (Umwelt 2022) to the current Development Footprint of approximately 445 ha. Number of WTGs has reduced from 150 in November 2022 to Proposed Action seeking approval for up to 76 WTGs. Transmission line in the southern portion of the Development Footprint has been designed to minimise overall footprint. The transmission line has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. The Development Footprint impacts 54.34 ha of native vegetation or only five (5) per cent of the native vegetation mapped within the Biodiversity Study Area. There is no native vegetation within the off-site road works areas of disturbance that conforms to a PCT, remnant native vegetation or threatened species or threatened ecological community, or their habitats; hence no mitigation required.
Mallee Cliffs National Park (high value, large remnant of mallee vegetation providing habitat for threatened species)	The Project Area is directly to the west of the Mallee Cliffs National Park. The Proposed Action has been designed to avoid and minimise direct and indirect impacts to the Mallee Cliffs National Park. A literature review identified that the minimum distance from the tip of the wind turbine blade from woodlands and forests that provide habitats for microbats is 200 m (Rodrigues *et al* 2015). Accounting for wind turbine blade length, the recommended buffer to the WTG is 300 m. No WTGs are located within 300 m of the Mallee Cliffs National Park with the closest WTGs located approximately 700 m (from blade tip) from the Mallee Cliffs National Park (refer to Figure 8.3 of the BDAR (Umwelt 2024a)).
Mallee Bird Community EEC	From inception, avoidance of the Ma*llee Bird Community of the Murray Darling Depression Bioregion* EEC has been a focus of the Proposed Action. Mallee woodland communities which provide habitat for this EEC have been avoided as far as possible to reduce impacts on this EEC. The biodiversity constraints report prepared as part of the scoping stage of the Project (Umwelt 2022) mapped approximately 188 ha of habitat for the *Mallee Bird Community of the Murray Darling Depression Bioregion* EEC. The current Development Footprint contains approximately 23 ha of habitat for this EEC, a substantial reduction in the area of impact through design by Spark Renewables.

Biodiversity Value	Avoidance Measures
Habitat connectivity	The Proposed Action does not require large areas of clearing or the erection of barriers that would affect fauna movement or the disruption of ecosystem services (e.g. pollination, seed dispersal). While the turbines create strike risk for flying fauna (birds and bats), this is unlikely to be sufficient to cause a loss of habitat connectivity. Strike risk can be reduced by understanding flight patterns on the site and applying this knowledge to adaptive management (e.g. targeted turbine shut-downs and curtailment). As noted above, the Development Footprint has been designed to provide a buffer to the Mallee Cliffs National Park.

5.2 Summary of Mitigation and Management Measures

A detailed description of the mitigation and management measures of the Proposed Action is provided in Section 9, particularly Table 9.1 of the BDAR (Umwelt 2024a). These measures are summarised in **Table 5.2**.

Table 5.2 Summary of Mitigation and Management Measures

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
Removal of native vegetation	B01	Native vegetation removal will be minimised through detailed design. An initial corridor was established to identify areas of highest quality vegetation. Where possible the Development Footprint has been placed within non-native and lowest quality native vegetation. Areas of high quality vegetation have been avoided. To avoid and minimise further clearing of vegetation the Development Footprint has utilised existing tracks, existing paddocks/crops and cleared areas.	Detailed design and Project surveys	Effective	The avoidance and minimisation of vegetation and habitat clearing during the Project planning	The Proponent
	B02	Buffer mapping for habitats aid in providing the construction and maintenance teams with the information necessary for OEMP and the CEMP.	Detailed design	Effective	Pre-construction	The Proponent
The clearing of habitat, native vegetation and TECs	B03	Threatened fauna habitat removal will be minimised through detailed design.	Detailed design	Effective	Identify the residual threatened species impacts	The Proponent
	B04	The preparation and approval of a Biodiversity Management Plan (BMP) prior to construction which will be prepared by a qualified ecologist with BCS consultation. Prior to clearing, the operational management component will be approved with BCS consultation. The BMP will include but not limited to: • Implementing mitigation measures. • Evaluating mitigation measures. • Objectives for monitoring. • Performance of proposed measures. • Informing an adaptive management method for additional offsets which further impacts are identified. • Remedial action.	Pre-clearing, pre-construction, construction and operation	Effective	Planning and management to avoid, minimise and mitigate biodiversity impacts	The Proponent and contractors

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
	B05	If any unexpected threatened species (flora or fauna) are found during construction, work should be halted immediately in the vicinity of the discovery, and the onsite manager should be notified.	Pre-clearing, pre-construction, construction and operation	Effective		The Proponent and contractors
	B06	Barbed wire will be avoided for fencing where practical to avoid entrapment of fauna on fences. Fences will be designed to ensure that fauna are not funnelled toward dead ends or to create barriers between areas of habitat across the Project Area.	Detailed design	Effective		The Proponent and contractors
	B07	Mitigation measures for harm to threatened hollow dependent fauna and live animals during pre-clearing surveys and translocation activities will be detailed in the BMP. This includes, but is not limited to: • Validation and mapping of all hollow bearing trees within the Development Footprint will be undertaken at least one month prior to vegetation removal. • Qualified and licensed ecologist or wildlife handler to rescue and re-located fauna during the pre-clearing surveys. • Protocols in place when hollow bearing trees and stick nests are being removed. Furthermore, mitigation protocols for mitigating harm to hollow or stick nest dependent threatened fauna or dependent habitat known in the Development Footprint.	Pre-clearance	Effective	Mitigating, avoiding and minimising impacts to biodiversity	The Proponent and contractors
	B08	During vegetation and habitat clearance work a qualified ecologist will conduct on-foot pre-clearance surveys at the start of each day prior to daily construction. This is to confirm there is no wildlife present in the area to be cleared. A qualified ecologist or qualified wildlife handler will also be present during vegetation and habitat clearing works to rescue and relocate fauna if required in the event individuals are present at the time of clearing. Additionally:	During clearing and construction	Effective	Avoiding and minimising impacts to fauna during the clearing and construction processes	The Proponent and contractors

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		• Contracted environmental representatives are to regularly conduct sweeping by regular driving through areas of the planned construction in the Development Footprint prior to planned clearance works to disturb the area and deter fauna from utilising these areas. • In the situation that an animal or threatened species is located in the construction area during other construction works, the Project Management Site Representative and Delivery Manager are to be immediately notified. Work must immediately stop within the construction area with an ecologist or a local wildlife rescuer to be brought on-site for handling and to follow the rescue procedures listed in the BMP.				
	B09	Exclusion zones within the Development Footprint will be marked by a qualified surveyor on site with the boundary of clearing limits. There will be specific exclusion zones included of known areas of threatened flora and fauna habitat.	Pre-clearance, during construction and early operation	Effective	Avoiding and minimising impacts to fauna during the clearing and construction processes	The Proponent and contractors
	B10	Measures to mitigate the impacts associated with construction activities on retained native vegetation and habitat will include: • Prior to all vegetation removal, pre-clearance inspections will be undertaken by a qualified ecologist. • Where possible, trim vegetation rather than clear or removal whole plants. • Retain tree roots where possible. • Retain dead trees and tree trunks where practical.	During construction	Effective	Avoiding and minimising impacts to fauna during the clearing and construction processes	The Proponent and contractors

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
	B11	The preparation and approval of a Rehabilitation Plan (RP) prior to clearing will be prepared in consultation with BCS. The RP will detail the implementation of rehabilitation in areas of the Development Footprint. The detailed design will may include areas requiring rehabilitation and areas of disturbance during the construction that do not require maintenance or clearance for the operation of the Project. The RP will include but is not limited to: • Soil erosion preventative measures, re-establishing local PCTs, local native flora, habitat and detailed rehabilitation objectives which measure the outcomes for the success over the locations, target landforms and PCTs. • Restoring vegetation in riparian areas implementation measures to protect and improve areas of key habitat. • Remedial actions that have been triggered that includes notifying BCS through a Trigger Action Response Plan (TARP) with an agreement about the response. • Native indigenous species used for landscaping on pervious surfaces. • Stabilisation of exposed surfaces to prevent soil loss. • Ongoing maintenance which includes but is not limited to weed and pathogen management on rehabilitated areas. • During construction, the topsoil and subsoil generated will be used for rehabilitation and stored on-site.	Pre-construction, pre-clearance, during and post-construction	Effective	The avoidance and minimisation of soil erosion, weeds in disturbed areas and the spread to adjoining edges of native vegetation	The Proponent and contractors
Increase in weeds and disease pathogens in adjacent vegetation	B12	Weed monitoring and control programs are to be documented in the BMP and Trigger Action Response Plan as part of a Construction Soil and Water Management Plan (CSWMP) detailed in the CEMP and implemented in consultation with BCS. Any deviation from measures approved are to be raised and approved.	Pre-clearance, construction and operation	Effective	Spreading of weed controls from the Project	The Proponent and contractors

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		Additional monitoring and control measures for introduced plant establishment and spread should be implemented at and around locations utilised for sediment control structures. Weed monitoring and control programs will include adaptive management strategies for priority weed species during construction, and early operational phase.				
	B13	All priority weeds, as listed on the DPI NSW WeedWise website - https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=137 for the Wentworth (Western region), are to be managed and controlled.				
	B14	Preparation of a vehicle and machinery hygiene strategy protocol as part of the BMP, will be implemented during construction and operation. The strategy will include site specific locations, timings, and methods for removing soil and plant matter from vehicles and machinery. Hygiene measures stated in the strategy protocol must be applied during construction and operation to ensure vehicle and machinery hygiene.				
	B15	Weeds will be disposed and managed appropriately during clearing works, to stop the spread of invasive weed species.				
	B16	Construction of wash down stations will occur at suitable locations to wash down vehicles and employee shoes to stop the spread of weeds, pathogens (including *Phytophthora cinnamomi*, amphibian chytrid fungus, agricultural weeds, and exotic rust fungi) and the introduction of new species to the site.				
Increase in predatory and pest species	B17	Refuse and personal waste generated throughout the construction and operational phases will be stored in bins and discarded in a suitable waste storage facility.	During construction and operation	Effective	Controlled action to mitigate, avoid and minimise	The Proponent

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
	B18	Implementation of a monitoring program for feral animals which is based on performance triggers for adaptive management. If an increase in predator activity is identified, it will trigger the need for a control program based on measures related to performance. This will be outlined in the BMP with control done in consultation of host landowners.			introduced predators and pests to the area of construction	
Impacts on protected animals from wind farm strikes	B19	To measure impacts on bird and bat species, a Bird and Bat Adaptive Management Plan (BBAMP) will be prepared as part of the BMP. Further details are provided in Section 9.2.2 of the BDAR (Umwelt 2024a).	During construction and operation	Effectiveness with an adaptive response method and management	Monitoring fauna blade strike collision	The Proponent
	B20	Measures taken to protect birds include: • Nests within 200 m of the Development Footprint will be mapped and validated prior to the erection and operation of WTGs. • Nests will be inspected prior to removal for juvenile birds and avoidance or relocation to be undertaken under the guidance of a qualified ecologist. • Regular carcass removal will be undertaken to prevent raptors being attracted to the Project Area. • Reduction of potential perching locations where possible will be a consideration of the Project design. • Power lines will be fitted with species specific measures to avoid unnecessary collisions.				
Fragmentation resulting in reduced connectivity	B21	Clearing/works will be contained within approved areas.	During construction	Effective	No reduction in connectivity	The Proponent and contractor
Wildlife impacts from vehicle strikes	B22	40 km/h speed limits on newly formed access tracks to reduce the risk of vehicle strikes to fauna specifically in areas surrounding permanent water bodies and close to farm dams, particularly after periods of rain.	Pre-construction, during construction and decommissioning	Effective	No wildlife vehicle strikes	The Proponent and contractor

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
Surface runoff changes resulting in sedimentation changes due to the removal of habitat and vegetation. **Impacts on water quality and hydrological processes that sustain threatened species.** **Contaminant pollution.**	B23	A Construction Soil and Water Management Plan (CSWMP) will be prepared as a part of the CEMP. This will include but not limited to: • Procedures to minimise and manage erosion and sediment transport within the project site and offsite. • The preparation of Erosion and Sediment Control Plan (ESCP) for construction. • Procedures to manage accidental spills with the requirement to maintain spill kits. • Procedures to manage the potential of any acid sulfate soils (ASS) in accordance with the NSW Acid Sulfate Soil Guidelines (Ahern et al. 1998). • Procedures to manage potential tannin leachate. • Procedures to manage stockpiles. • Details of surface water quality monitoring procedures.	Pre-construction, during construction and decommissioning	Effective	Avoiding and minimising impacts to aquatic habitats and threatened fish species	The Proponent and contractor
	B24	As part of the CSWMP, a construction ESCP will be prepared. This will detail erosion and sediment control procedures that will be implemented within the Project Area in accordance with the principles and requirements of Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004).	Pre-construction and during construction			
	B25	To minimise and avoid any impacts threatened species and water quality, the following procedure will be implemented: • The total bare earth exposed at any time will be minimised. • Rehabilitation strategies to be implemented to minimise dust regeneration, soil erosion and weed incursion. • Rehabilitate all areas of the Project Area that are not proposed for future disturbance post construction and when decommissioning.	During construction and decommissioning			

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
	B26	Prior to, during and following construction and decommissioning, a surface water monitoring program will be prepared and implemented as part of the CSWMP.	Pre-construction, during construction and decommissioning			
	B27	As part of the CSWMP, Project specific procedures and controls will be prepared and implemented. This is to minimise the risk of spills, litter and leaks entering downstream waterways and/ or leaking into the soil and groundwater table. The CSWMP will include, but is not limited to: • All liquids, chemicals and fuels to be stored in a sealed bunded area and stored on level ground within the construction compound. • Appropriate storage of equipment and hazardous substances during construction and operation. • Designated areas with spill capture and management controls for refuelling and minor activities. • An emergency spill response procedure will be prepared in the CSWMP. • Regular water quality checks to be carried out at waterways within proximity to work being carried out. • Installation and maintenance of control measures such as gross pollutant traps and silt fencing.	During construction and decommissioning			
	B28	The management of stockpiles to minimise the transport of dust, sediment and leachate runoff. This will include, but is not limited to: • Minimising time that the stockpiles are left exposed, the number of stockpiles and the areas used for stockpiles. • Designating stockpiles away from waterways, drainage lines and areas where they would be susceptible to wind erosion.	During Construction			

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		• Establishing appropriate controls for sediment, stabilising stockpiles and suppressing dust as required.				
	B29	A concrete slab adjacent to the construction compound will locate all batch plants. Avoiding ingress from concrete waste into downstream waterways will be outlined with measures in the CEMP.				
	B30	Stormwater runoff increases during the Project operation will be managed through, but not limited to: • The design of permanent drainage and water management to meet the Project performance outcomes of no pollution of water. • Control procedures and maintenance of access tracks and scour protection to minimise erosion and impacts on water quality. • Potential impacts on channel erosion and scour to be monitored at receiving drainage channels and waterways downstream.	During Operation			
	B31	Within the detailed design, if the Project excavation exceeds the proposed maximum depth below ground level, potential impacts to GDEs will need to be re-assessed by a qualified hydrogeologist.	Detailed design and during construction	Effective	Avoiding impacts to GDE's	The Proponent
Fire risk during operation	B32	The Project will implement the following permanent bush fire protections: • Asset Protection Zones (APZs) around each WTG. • APZs around the BESS and substations. • An APZ around the operation and maintenance facility (to be constructed to a BAL-12.5 standard). • Perimeter firebreak. • Ongoing vegetation management. • Access for emergency response vehicles.	During construction and operation	Effective	Mitigate risks to biodiversity	The Proponent

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		• A permanent, dedicated firefighting water source. • Controls on Project actions to prevent bush fire ignition. • Fire suppression systems in substations, BESS and WTGs. • A Project fire fighting vehicle.				
	B33	Construction and Operation Bush Fire Emergency Management Plans will be developed in accordance with Planning for Bush Fire Protection (PBP) (NSW Rural Fire Service (RFS), 2019) and in consultation with the NSW RFS (including any requirements in relation to aerial firefighting). These plans will identify all pertinent bush fire risk and mitigation strategies relating to the construction and operation of the Project, including those listed in B29 and: • Actions to prevent bush fire ignition or spread from Project activities. • Work that will not be conducted during total fire bans. • Appropriate safety procedures and storage location for any fuels or other hazardous or flammable materials. • Protocols in place to alert NSW RFS regarding work with the potential to cause a fire to the surrounding vegetation. • Protocols and triggers to shut down WTGs with an approaching fire. • Measures relating to the requirements of NSW RFS or other authorities regarding the management risk to aerial firefighting in the region. • Escalation notifying protocols with contact details for the local NSW RFS Fire Control Centre, local fire brigades, CASA, Air Services Australia, and all other relevant people and / or organisations who will be notified of an emergency at the Project Area.				

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		• The locations of any firefighting water along with alternative water supplies that may be available in the case of an emergency (including any other fire suppression equipment held on and off site). Bush fire emergency planning that includes evacuation routes, evacuation triggers and when and where to take refuge.				
Light and noise vibration impacts during night works	B34	To address noise that is likely to exceed acceptable noise management levels (NMLs) a Construction Noise Management Plan will be implemented as a component of the CEMP.	During construction and operation	Effective	Mitigate risks to biodiversity	The Proponent and Contractor
	B35	Standard noise mitigation measures from the will be implemented were reasonably practicable, including the following: • Work limited to standard hours of construction unless permitted by the development consent. • Adopt low-noise and plant equipment, where feasible plant and equipment to be fitted out with silencing devices. • Consider using less intrusive alternatives to reverse beepers such as 'squawker' or broadband' alarms. • All plant and equipment to be well maintained. • Warrant equipment mufflers are functioning correctly and effectively. • When feasible, employ construction techniques that produce less vibration and are quieter. • Equipment that is on-site be turn-off when not in use. • Only have necessary equipment on-site, including only having necessary size and powered equipment for tasks. • Noisy activities will be concentrated at one location and relocate as soon as possible. • Vehicle movements limited and avoided whenever feasible.				

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		• Provide training to acquaint employees with noise sensitivity. • For concentrated, noise-intensive activities implemented temporary construction noise barriers or earth mounds. • Install enclosures around noisy mobile and fixed equipment were reasonably practicable. • Where reasonably practicable avoid coincide operation of two or more noisy plants close to receivers. • Optimise the offset distance between sensitive receivers and noisy plants. • Implement parking, loading/unloading areas and traffic flow management to minimise reversing movements. • Implement routinely monitoring of construction noise levels ensure effectiveness of mitigation measures and whether revision of measures in required.				
	B36	Standard vibration mitigation measures from the *Assessing Vibration: a technical guideline* (DECC, 2006) will be implemented were reasonably practicable, including the following: • Where reasonably practicable selecting lower-impact equipment or techniques were feasible. • Operating vibration-causing plant and equipment during the least sensitive time of day were reasonably practicable. • Avoid coincide operation of vibration-causing operations. • High-vibration activities to be located as far away from sensitive receiver areas as possible. • All plant and equipment to be well maintained. • Intensive vibration operation to not occur within the recommended safe set back distances.		Effective	Mitigate risks to biodiversity	The Proponent and Contractor

Impact	Action ID	Mitigation measure	Timing	Likely efficacy of mitigation	Outcome	Responsibility
		• Receivers to be notified regarding the nature of construction phases and vibrations-generating operations.				
Dust pollution	B37	Air quality management measures will be implemented and include but is not limited to: • Haul routes clearly marked. • Maintenance and watering of haul routes. • Vehicle speed restriction. • Immediate clean-up of any material spillage. • During adverse weather conditions e.g. during hot and windy conditions weather will be monitored.	During Construction	Effective	Avoid, minimise and mitigate impacts from dust pollution.	The Proponent and Contractor
Edge effects on adjacent native vegetation and habitat	B38	Exclusion zones will be set up at the limit of clearing.	During construction	Effective	Identify residual edge effects	The Proponent

6.0 Impact Assessment

6.1 Summary of Proposed Action Impacts

6.1.1 Direct and Indirect Impacts

The Proposed Action would directly impact up to 54.34 ha of native vegetation within the Development Footprint. The 54.34 ha of direct impacts to native vegetation represents approximately 5.4 per cent of native vegetation within the Biodiversity Study Area or only 12.2 per cent of the Development Footprint.

Table 6.1 Direct Impact of the Proposed Action on Native Vegetation and Non-native Vegetation and Disturbed Land

PCT ID	PCT name	Condition Zone	Biodiversity Study Area (ha)	Development Footprint (ha)
Native Vegetation				
58	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Moderate-Good	558.14	26.81
		Derived-Weedy	41.42	3.39
		Weedy Understorey	35.72	0.17
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Moderate-Good	157.49	3.81
		Derived-Native	22.19	1.15
		Derived-Weedy	39.01	0.06
		Weedy Understory	8.25	0.00
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Moderate-Good	131.50	18.95
Native vegetation sub-total (ha)			**993.72**	**54.34**
Non-native				
0	Category 1 – Exempt Land/ cleared lands / structure / tracks /roads		3,882.87	390.35
0	Waterbodies		2.58	0.00
Non-native sub-total (ha)			**3,885.44**	**390.35**
Total (ha)			**4,879.17**	**444.69**

Additional impacts to 0.25 ha for off-site road works however these do not contain any native vegetation associated with a PCT.

Through iterative design process and implementation of avoidance measures the Proposed Action has avoided impacts to native vegetation, threatened species and ecological communities as evident in the estimate that non-native vegetation and disturbed lands in the Development Footprint account for approximately 390.35 ha or 87.8 per cent of the Development Footprint.

The Proposed Action would impact directly 22.76 ha or 7.8 per cent of the *Mallee Bird Community of the Murray Darling Depression Bioregion* EEC in the Biodiversity Study Area (refer to **Figure 6.1**). A summary of the impacts of the Proposed Action, their nature and consequences to MNES are provided in Table 8.5 of the BDAR (Umwelt 2024a) and summarised in **Table 6.2.**

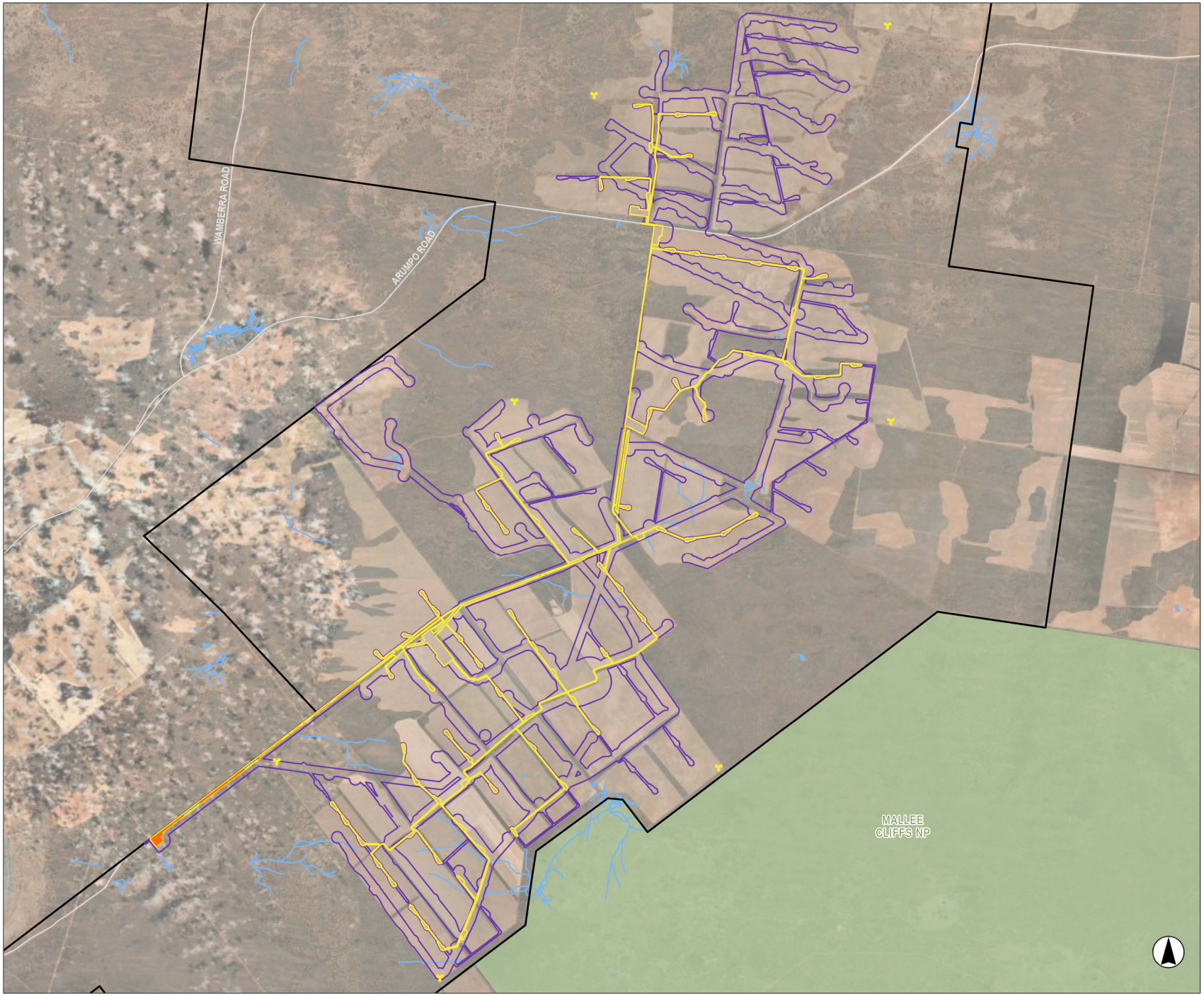


FIGURE 8.2

Direct Impacts to TEC

Legend

- Project Boundary
- Development Footprint
- Biodiversity Study Area

Threatened Ecological Communities - EPBC Act

- Mallee Bird Community of the Murray Darling Depression Bioregion EEC
- NPWS Estates
- Road
- Watercourse
- Waterbody

0 2,500 5,000
Metres

Scale 1:140,000 at A4
GDA2020 MGA Zone 54

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Image Source: ESRI Basemap (2024) **Data source:** NSW DFSI (2024), VIC DELWP (2023), Spark (2024)

Table 6.2 Summary of the impacts of the Proposed Action, their nature and consequences to MNES

MNES	Nature & consequence of impact (direct & indirect)	Duration of impact	Quantum of impact	Consequence of impact (local, state or national)	Impact requires offsetting?
Mallee Bird Community EEC	Direct removal of habitat	Construction	• PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Moderate-good, Zone 4) = 3.81 ha • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Moderate-good, Zone 8) = 18.95 ha. Total = 22.76 ha	Local	Impacts to EEC will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for these ten species recorded ranges from Negligible (for the nine passerines) – Minor (regent parrot) (Umwelt 2024c).	Local	Offsets not proposed for indirect impacts.
Australasian bittern	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Local	Offsets not proposed for indirect impacts.
curlew sandpiper	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts.
pink cockatoo	Direct removal of habitat	Construction	54.34 ha (Foraging habitat).	Local	Impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Local	Offsets not proposed for indirect impacts.
south-eastern hooded robin	Direct removal of habitat	Construction	54.34 ha	Local	Impacts to this species will be offset through ecosystem credits.

MNES	Nature & consequence of impact (direct & indirect)	Duration of impact	Quantum of impact	Consequence of impact (local, state or national)	Impact requires offsetting?
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Local	Offsets not proposed for indirect impacts
Australian painted snipe	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Local	Offsets not proposed for indirect impacts
common greenshank	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
southern whiteface	Direct removal of habitat	Construction	54.34 ha	Local	Impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Local	Offsets not proposed for indirect impacts
sharp-tailed sandpiper	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
grey falcon	Direct removal of habitat	Construction	54.34 ha	Local	Potential impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
Latham's snipe	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts

MNES	Nature & consequence of impact (direct & indirect)	Duration of impact	Quantum of impact	Consequence of impact (local, state or national)	Impact requires offsetting?
painted honeyeater	Direct removal of foraging habitat	Construction	30.37 ha	Local	Impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
malleefowl	Direct removal of foraging habitat	Construction	23.98 ha	Local	Impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
blue-winged parrot	Direct removal of foraging habitat	Construction	54.34 ha	Local	Potential impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
Corben's long-eared bat	Direct removal of foraging habitat	Construction	54.34 ha	Local	Impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts

MNES	Nature & consequence of impact (direct & indirect)	Duration of impact	Quantum of impact	Consequence of impact (local, state or national)	Impact requires offsetting?
regent parrot (eastern subspecies)	Direct removal of foraging habitat	Construction	54.34 ha (Foraging habitat)	Local	Impacts to this species will be offset through ecosystem credits.
	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Local	Offsets not proposed for indirect impacts
fork-tailed swift or Pacific swift	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Local	Offsets not proposed for indirect impacts
pectoral sandpiper	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
red-necked stint	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Local	Offsets not proposed for indirect impacts
gull-billed tern	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Local	Offsets not proposed for indirect impacts
Caspian tern	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Local	Offsets not proposed for indirect impacts
marsh sandpiper	Prescribed impacts – turbine strike	Operational	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Local	Offsets not proposed for indirect impacts

6.1.2 Prescribed Impacts

Umwelt has prepared a detailed Prescribed Impact Assessment to consider the potential impacts from blade strike and barotrauma on bird and bat species. These assessments have been prepared to address Section 6.1.5 and 8.3.5 of the BAM (DPIE 2020a). A detailed assessment of prescribed impacts is provided in Appendix B of the BDAR (Umwelt 2024a).

To assess the likelihood and consequence of impacts on aerial species, a qualitative risk-based assessment based on an assessment methodology developed by the Arthur Rylah Institute (Lumsden *et al.* 2019) has been conducted. The assessment approach comprises consideration of the likelihood of blade strike based on a species' recorded flight behaviour and status in the Project Area, as well as consideration of existing turbine strike data from Australia. The relative consequence of potential collisions and/or barotrauma is assessed with consideration of a species' total population size and degree of concentration in certain areas, conservation status and demographic resilience.

The results of the risk assessment for species recorded in the Project Area, including the assemblage of species belonging to Mallee Bird Community EEC that have been recorded in the Project Area, are provided in Table 6.3, with two species having a moderate risk rating and the remaining three considered a minor or negligible risk of being impacted by wind blade strike by the Proposed Action. The interpretation and justification for these results is provided in Section 4.0 of the Prescribed Impact Assessment (Appendix B of the BDAR).

Table 6.3 Turbine Strike Assessment for Species Recorded in the Project Area

Common Name	Species Name	Likelihood	Consequence	Risk Rating
Birds				
southern whiteface	*Aphelocephala leucopsis*	Low	Low	Negligible
Pacific swift	*Apus pacificus*	High	Low	Moderate
hooded robin	*Melanodryas cucullata cucllata*	Low	Low	Negligible
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	Moderate	Moderate	Moderate
Mallee Bird Community EEC: regent parrot		Moderate	Moderate	Moderate
Mallee Bird Community EEC: chestnut quail-thrush, crested bellbird, Jacky winter, shy heathwren, splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater and yellow-plumed honeyeater		Low	Low	Negligible
Bats				
Corben's long-eared bat	*Nyctophilus corbeni*	Low	Moderate	Minor

6.1.3 Cumulative Impacts

EnergyCorporation of NSW (EnergyCo), a NSW statutory authority, seeks to maximise opportunities created by the transformation of the NSW electricity system by coordinating investment in REZs across NSW. A REZ is the equivalent of modern-day power stations, combining new renewable energy infrastructure, including generators (such as solar and wind farms), storage (such as batteries and pumped hydro) and then high-voltage transmission infrastructure. Five (5) dedicated REZs have already been identified in NSW.
As discussed in Section 2.0, the Project is located wholly within the South West REZ.

Because of this, and the REZ benefits anticipated by NSW Government, the South West REZ has the potential to see strong interest for renewable energy development. Cumulative impacts occur when the impacts from multiple projects or developments combine, and the compounding effects are larger than any one of the projects itself has quantified and assessed.

The Project will contribute to cumulative impacts on biodiversity during construction and operation from all clean energy projects (operational, under construction, approved and proposed) in the vicinity within the South West REZ. It is considered likely that cumulative impacts will increase the loss of similar native vegetation and threatened species habitat to the project in the region.

A review of publicly available relevant clean energy projects known at the time of finalisation of this BDAR and within the South West REZ has been undertaken. Potential cumulative biodiversity impacts are provided in Section 8.7 of the BDAR (Umwelt 2024a).

6.2 Summary of MNES Impact Assessment

Item 16 of the Supplementary SEARs specified an assessment is required for each of the EPBC Act listed threatened species, communities and migratory species assessed likely to be impacted by the Proposed Action. Consideration of the requirements of Item 16 and the assessments of significance have been prepared for EPBC Act listed TECs and threatened species that have been:

- recorded onsite during Umwelt surveys.
- assumed present due to being an ecosystem species under the BAM.
- Species which may disperse through the site.

These are provided in full in **Appendix 2** together with an Assessment of the Significance of the Impact of the Proposed Action in keeping with EPBC Act guidelines. The findings of the assessment are summarised **Table 6.3** below. Overall, the Proposed Action is under likely to have a significant impact on any biodiversity MNES.

Table 6.3 Summary of Assessment of Significant Findings

Common Name	Scientific Name	EPBC Act Status	Assessment Findings
Mallee Bird Community of the Murray Darling Depression Bioregion Ecological Community		E	Not likely to have significant impact
Australasian bittern	*Botaurus poiciloptilus*	E	Not likely to have significant impact
curlew sandpiper	*Calidris ferruginea*	CE	Not likely to have significant impact

Common Name	Scientific Name	EPBC Act Status	Assessment Findings
pink cockatoo	*Lophochroa leadbeatri leadbeateri*	E	Not likely to have significant impact
south-eastern hooded robin	*Melanodryas cucullata cucullata*	E	Not likely to have significant impact
Australian painted snipe	*Rostratula australis*	E	Not likely to have significant impact
common greenshank	*Tringa nebularia*	E, M	Not likely to have significant impact
southern whiteface	*Aphelocephala leucopsis*	V	Not likely to have significant impact
sharp-tailed sandpiper	*Calidris acuminata*	V, M	Not likely to have significant impact
grey falcon	*Falco hypoleucos*	V	Not likely to have significant impact
Latham's snipe	*Gallinago hardwickii*	V	Not likely to have significant impact
painted honeyeater	*Grantiella picta*	V	Not likely to have significant impact
malleefowl	*Leipoa ocellata*	V	Not likely to have significant impact
blue-winged parrot	*Neophema chrysostoma*	V	Not likely to have significant impact
Corben's long-eared bat	*Nyctophilus corbeni*	V	Not likely to have significant impact
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	V	Not likely to have significant impact
fork-tailed swift or Pacific swift	*Apus pacificus*	M	Not likely to have significant impact
pectoral sandpiper	*Calidris melanotos*	M	Not likely to have significant impact
red-necked stint	*Calidris ruficollis*	M	Not likely to have significant impact
gull-billed tern	*Gelochelidon nilotica*	M	Not likely to have significant impact
Caspian tern	*Hydroprogne caspia*	M	Not likely to have significant impact
marsh sandpiper	*Tringa stagnatilis*	M	Not likely to have significant impact

The BAM (and BAM calculator) has been used correctly to identify the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity. **Appendix 3** provides a summary table of predicted impacts to MNES, along with a summary of applicable credit obligations as they relate to MNES.

7.0 Offset Requirements

7.1 Approach

The NSW and Australian governments agree that endorsement of the NSW BOS, that is to avoid, minimise and offset biodiversity impacts on both NSW and Commonwealth listed entities, provides for the best and most effective biodiversity and regulatory outcomes. The Australian Government supports the use of the BAM as the underpinning methodology for calculating biodiversity credit requirements.

On 22 November 2019, NSW passed an amendment to the NSW Biodiversity Conservation Regulation 2017. The amendment aligns the BOS offset rules to Australian Government requirements. The NSW BOS has requirements for retiring like-for-like credits or funding conservation actions that directly benefit the species or community impacted, and these meet the Australian Government's offsetting requirements. The NSW BOS also allows for variation rules to be used after reasonable steps have been taken to source like-for-like credits. NSW amended the Biodiversity Conservation Regulation 2017, so the variation rules do not apply to offsets required for Commonwealth listed entities for controlled actions. If the NSW approval requires biodiversity offsets for NSW only listed entities, proponents will still be able to use the variation rules for these.

To meet offsets required for Commonwealth listed entities for controlled actions under the NSW BOS, the Proponent will retire the credits required to offset the impacts of the Proposed Action. Spark Renewables is also seeking flexibility to utilise one or more of the including:

- Land based offsets through the establishment of new Stewardship Sites (and subsequent retirement of credits) or by retiring credits from existing Stewardship Sites. Spark Renewables would retire the required number and class of credits determined in accordance with the BDAR and the offset rules in the BC Regulation.
- Securing (purchasing) credits through the open credit market. And/or
- Paying into to the Biodiversity Conservation Fund (BCF).

It is noted that Mallee *Bird Community of the Murray Darling Depression Bioregion* EEC cannot be selected in the BAM calculator and therefore does not appear on the offset trading rules for the applicable vegetation zones. Offsets for PCT 170 and PCT 171, in moderate-good condition, will be provided according to the vegetation classes/percent cleared offset trading groups as listed in the credit summary report, as well as meet the requirements of the approved conservation advice for the Mallee *Bird Community of the Murray Darling Depression Bioregion* EEC.

Residual impacts (direct removal of potential habitat) for the following MNES, considered to be 'ecosystem credits' under the BAM will be offset via the ecosystem credit obligation generated by the Proposed Action:

- Pink cockatoo
- South-eastern hooded robin
- Southern whiteface

- Painted honeyeater
- Malleefowl
- Blue-winged parrot
- Corben’s long-eared Bat
- Regent parrot (eastern subspecies).

8.0 Information Sources

Austral Archaeology 2024. Mallee Wind Farm Arumpo Road, Mallee, NSW Aboriginal Cultural Heritage Assessment. Prepared for Umwelt Australia Pty Ltd. September 2024.

Australian Wildlife Conservancy (AWC) 2024. Mallee Cliffs National Park. Online: https://www.australianwildlife.org/where-we-work/mallee-cliffs-national-park/

Commonwealth of Australia (CoA) 2013a. Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (awe.gov.au), Environment Protection and Biodiversity Conservation Act 1999.

Commonwealth of Australia (CoA) 2010a. Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act.

Commonwealth of Australia (CoA) 2010b. Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act.

Commonwealth of Australia (CoA) 2010c. Survey guidelines for Australia's threatened frogs: Guidelines for detecting bats listed as threatened under the EPBC Act.

Commonwealth of Australia (CoA) 2011a. Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act.

Commonwealth of Australia (CoA) 2011b. Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act.

Commonwealth of Australia (CoA) 2013b. Draft survey guidelines for Australia's threatened orchids: Guidelines for detecting orchids listed as threatened under the EPBC Act.

Department of Environment and Conservation (DEC) 2004. Threatened Species Survey and Assessment: Guidelines for development and activities (working draft), November 2004.

Department of Planning and Environment (DPE) 2022. Threatened reptiles: Biodiversity Assessment Method Survey Guide | NSW Environment and Heritage.

Department of Planning, Housing and Infrastructure (DPHI) 2024. State Significant Development Guidelines -March 2024.

Department of Planning, Industry and Environment (DPIE) 2020a. Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method.

Department of Planning, Industry and Environment (DPIE) 2020b. Biodiversity Assessment Method, NSW Department of Planning, Industry and Environment, Parramatta.

Department of Planning, Industry and Environment (DPIE) 2020c. Developments adjacent to National Parks and Wildlife Service lands – Guidelines for consent and planning authorities.

Department of Planning, Industry and Environment (DPIE) 2021. 'Species credit' threatened bats and their habitats - NSW survey guide for the Biodiversity Assessment Method

Key Biodiversity Areas Partnership (2024) Key Biodiversity Areas factsheet: Southern NSW Mallee. Downloaded from https://keybiodiversityareas.org/ on 13 Aug 2024.

Lumsden, L., Moloney, P., and Smales, I. 2019. Developing a science-based approach to defining key species of birds and bats of concern for wind farm developments in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series No. 301. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024. Flora species with specific survey requirements (XLS). Online: <https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.lmbc.nsw.gov.au%2Fbamcalc%2Fapp%2Fassets%2FSurveyMonthsConditions_BAMC_Version1.1.xlsx&wdOrigin=BROWSELINK >

Rodrigues, L., Bach, L., Dubourg-Savage, M.J., Karapandza, B., Kovac, D., Kervyn, T., Dekker, J., Kepel, A., Bach, P., Collins, J., Harbusch, C., Park, K., Micevski, B., Minderman, J. 2015. *Guidelines for consideration of bats in wind farm projects, Revision 2014*. EUROBATS Publication Series No. 6, 133pp.

Threatened Species Scientific Committee (TSSC) 2016. Conservation advice Myriophyllum porcatum (ridged water-milfoil). Commonwealth TSSC. 16 December 2016.

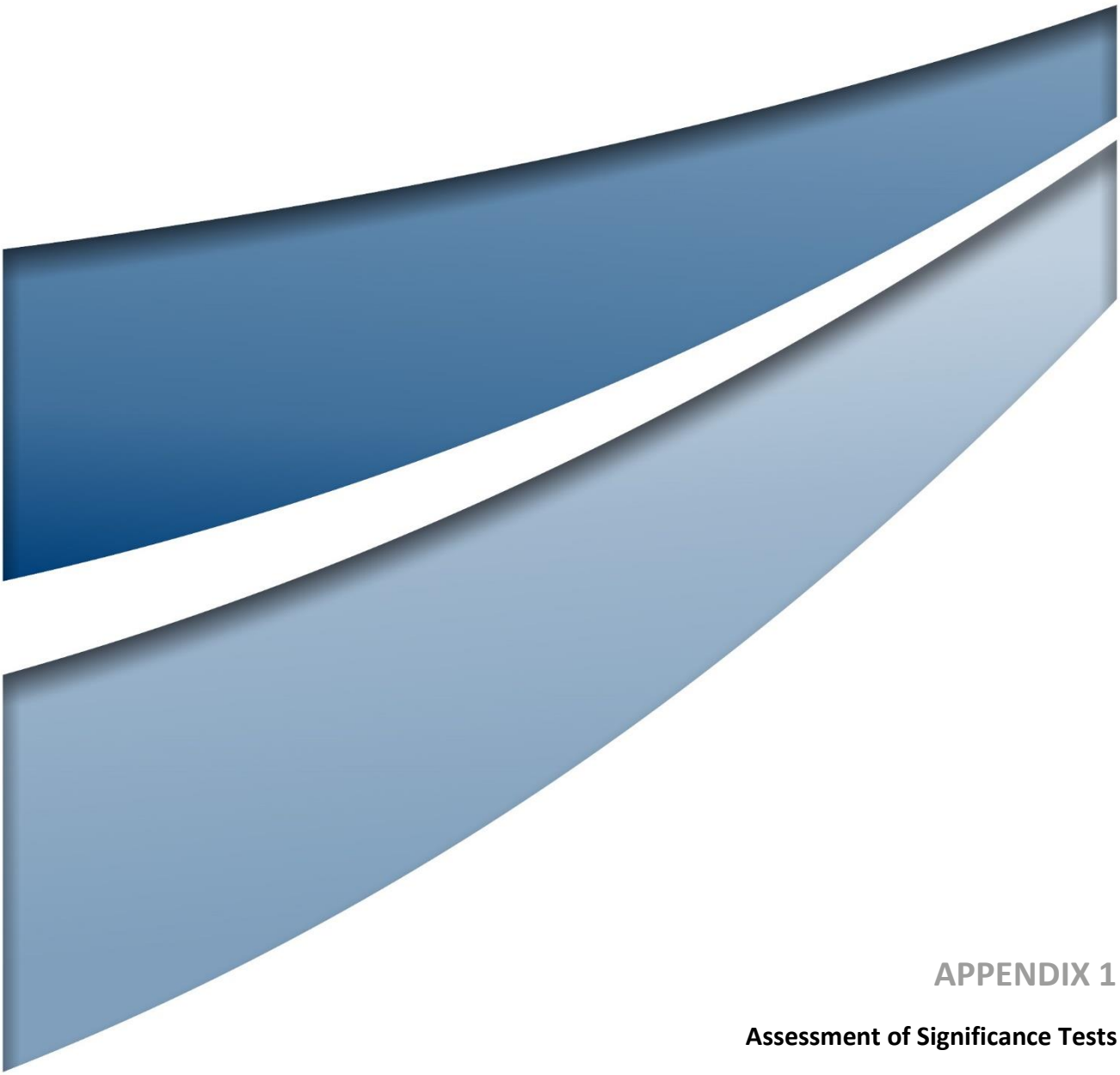
Threatened Species Scientific Committee (TSSC) 2022. Final determination to list Murray Mallee striated grasswren Amytornis striatus howei. NSW TSSC. 5 August 2022.

Umwelt (Australia) Pty Limited (2022). Mallee Wind Farm: Biodiversity Constraints Assessment. Report prepared for Spark Renewables.

Umwelt (Australia) Pty Ltd (Umwelt) 2024a. Mallee Wind Farm Biodiversity Development Assessment Report. Prepared for Spark Renewables Pty Limited. September 2024.

Umwelt (Australia) Pty Ltd (Umwelt) 2024b. Mallee Wind Farm Environmental Impact Assessment. Prepared for Spark Renewables Pty Limited. September 2024.

Umwelt (Australia) Pty Ltd (Umwelt) 2024c. Mallee Wind Farm Biodiversity Development Assessment Report – Turbine Strike Assessment. Prepared for Spark Renewables Pty Limited. September 2024.



APPENDIX 1

Assessment of Significance Tests

umwelt
Environmental & Social Consultants

SPARK RENEWABLES

MALLEE WIND FARM EPBC 2023/09500 – EPBC ACT ASSESSMENT OF SIGNIFICANCE

Appendix C1

FINAL

September 2024

MALLEE WIND FARM EPBC 2023/09500 – EPBC ACT ASSESSMENT OF SIGNIFICANCE

Appendix C1

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
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Report No.	22494 R10_Appendix C1
Date:	September 2024

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Ryan Parsons	20 September 2024	Ryan Parsons	20 September 2024

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1.0 Guidance Relevant to the Impact Assessment

1.1 MNES to be assessed

The BDAR (Umwelt 2024a) including the turbine risk prescribed impact assessment (Umwelt 2024b) have identified Matters of National Environmental Significance (MNES) that occur or may occur in the Development Footprint and are likely to be impacted by the Proposed Action. Those MNES predicted to occur in the Development Footprint and retained to be assessed for likely impacts of the Proposed Action are listed in **Table 1.1**.

Table 1.1 MNES likely to be impacted by the Proposed Action

Common Name	Scientific Name	EPBC Act Status	Refer to
Critically Endangered or Endangered Ecological Communities			
Mallee Bird Community of the Murray Darling Depression Bioregion Ecological Community		E	Section **2.1**
Critically Endangered or Endangered Species			
Australasian bittern	*Botaurus poiciloptilus*	E	Section **3.1**
curlew sandpiper	*Calidris ferruginea*	CE	Section **3.2**
pink cockatoo	*Lophochroa leadbeatri leadbeateri*	E	Section **3.3**
south-eastern hooded robin	*Melanodryas cucullata cucullata*	E	Section **3.4**
Australian painted snipe	*Rostratula australis*	E	Section **3.5**
common greenshank	*Tringa nebularia*	E, M	Section **3.6**
Vulnerable species			
southern whiteface	*Aphelocephala leucopsis*	V	Section **4.1**
sharp-tailed sandpiper	*Calidris acuminata*	V, M	Section **4.2**
grey falcon	*Falco hypoleucos*	V	Section **4.3**
Latham's snipe	*Gallinago hardwickii*	V	Section **4.4**
painted honeyeater	*Grantiella picta*	V	Section **4.5**
malleefowl	*Leipoa ocellata*	V	Section **4.6**
blue-winged parrot	*Neophema chrysostoma*	V	Section **4.7**
Corben's long-eared bat	*Nyctophilus corbeni*	V	Section **4.8**
regent parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	V	Section **4.9**
Migratory species (excluding species listed as threatened)			
fork-tailed swift or Pacific swift	*Apus pacificus*	M	Section **5.2.1**
pectoral sandpiper	*Calidris melanotos*	M	Section **5.2.2**
red-necked stint	*Calidris ruficollis*	M	Section **5.2.3**
gull-billed tern	*Gelochelidon nilotica*	M	Section **5.2.4**
Caspian tern	*Hydroprogne caspia*	M	Section **5.2.5**
marsh sandpiper	*Tringa stagnatilis*	M	Section **5.2.6**

An assessment of impact of the Proposed Action on the individual MNES to analyse the significance of the impacts, is provided in this Appendix to the MNES Bilateral Assessment Report. The analysis of significance of impact addresses the NSW Bilateral Assessment Requirements and the Significant Impact Guidelines for MNES. The approach is described in **Section 1.2** and **Section 1.3**, respectively.

1.2 NSW Bilateral Assessment Requirements

The NSW Department of Planning, Housing and Infrastructure (DPHI) issued Supplementary Secretary's Environmental Assessment Requirements (SEARs) that outlined the biodiversity assessment requirements for MNES likely to be impacted by the Proposed Action.

Item 16 of the Supplementary SEARs list the biodiversity assessment requirements for each of the EPBC Act listed threatened species and communities likely to be impacted by the Action. **Table 1.2** outlines Item 16 requirements of the supplementary SEARs, including cross-references to the relevant section of this report where each requirement is addressed.

Table 1.2 Supplementary SEARs Requirement MNES Report Reference

Supplementary SEARs Requirement		Where addressed for threatened species and communities
16i	description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	Description Relevant Guidelines and Policy Statements NSW Bilateral Assessment Requirements table for species listed in **Table 1.1**.
16ii	details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements;	• Detailed description of survey methodology is provided in Section 4.1 and Section 5.2 of the BDAR (Umwelt 2024a). • A detailed description of bird and bat surveys is provided in Section 2 of the turbine risk assessment (Umwelt 2024b), Appendix B of the BDAR. The information provided in these sections has informed the description of survey approach adopted in the BDAR (Umwelt 2024a) is provided in NSW Bilateral Assessment Requirements table for species listed in **Table 1.1**.
16iii	description of the relevant impacts of the action having regard to the full national extent of the species or community's range;	• Construction impacts are described in detail in Section 8.1 of the BDAR (Umwelt 2024a). • A risk assessment of operational impacts is provided in Section 8.2 of the BDAR (Umwelt 2024a) and in the turbine risk assessment (Umwelt 2024b) in Appendix B of the BDAR. • Assessment of likelihood and consequences of operational impacts on threatened and migratory species is provided in Section 8.2 and Section 8.4 of the turbine risk assessment (Umwelt 2024b) in Appendix B of the BDAR. The information provided in these sections has informed the description of impacts and is provided in the NSW Bilateral Assessment Requirements table for species listed in **Table 1.1** and in the Significant Impact Criteria consideration.

Supplementary SEARs Requirement		Where addressed for threatened species and communities
16iv	description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action;	Avoidance and mitigation measures are provided in Section 7 of the BDAR (Umwelt 2024a). MNES specific measures are provided in the NSW Bilateral Assessment Requirements table for species listed in **Table 1.1**.
16v	identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account;	Description of residual impacts is provided in NSW Bilateral Assessment Requirements table for species listed in **Table 1.1**.
16vi	a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established.	Summary of biodiversity credit requirements and how the NSW BAM has applied in accordance with the objects of the EPBC Act is provided in Section 11.0 and Section 12.0 of the BDAR (Umwelt 2024a) and summarised in Section 7 of the MNES Report.
16vii	details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and	
16viii	details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.	

1.3 Significant Impact Guidelines for MNES

The Significant Impact Guidelines for MNES (CoA 2013) provide overarching guidance on determining whether an Action is likely to have significant impacts on an MNES. The definitions and concepts as outlined in the Significant Impact Guidelines 1.1 (CoA 2013) that have been applied in these assessments are summarised in **Table 1.3**.

Table 1.3 Key concepts in the Significant Impact Guidelines (CoA 2013)

Term	
Significant impact	A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. A significant impact is likely if there is a real or not remote chance or possibility. In determining this the following matters are considered: • The sensitivity of the environment which will be impacted. • The timing, duration and frequency of the action and its impacts. • All on-site and off-site impacts. The total impact which can be attributed to the action over the entire geographic area affected and over time. • Existing levels of impact from other sources.

Term	
	• The degree of confidence with which the impact of the action are known and understood.
A population of an endangered or critically endangered species	A population of a species is an occurrence of the species in a particular area. Occurrences of the species are not limited to: • A geographically distinct regional population, or collection of local populations, or • A population, or collection of local populations, that occurs within a particular bioregion.
An important population of a vulnerable species	In the case of a vulnerable species, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are: • Key source populations either for breeding or dispersal; or • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range.
Important habitat for migratory species	An area of 'important habitat' for a migratory species is: • habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or • habitat that is of critical importance to the species at particular life-cycle stages, and/or • habitat utilised by a migratory species which is at the limit of the species range, and/or • habitat within an area where the species is declining.

Important habitat for migratory shorebirds	Important habitats in Australia for migratory shorebirds under the EPBC Act include those recognised as nationally or internationally (Ramsar listed) important.
	• Wetland habitat is considered internationally important if it regularly supports:
	  ○ 1 per cent of the individuals in a population of one species or subspecies of waterbird OR
	  ○ a total abundance of at least 20 000 waterbirds.
	• Wetland habitat is considered nationally important if it regularly supports:
	  ○ 0.1 per cent of the flyway population of a single species of migratory shorebird OR
	  ○ 2000 migratory shorebirds OR
	  ○ 15 migratory shorebird species (CoA 2017).

Population of a migratory species	The entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.
Habitat critical to the survival of a species or ecological community	Habitat critical to the survival of a species or ecological community refers to areas that are necessary: • for activities such as foraging, breeding, roosting, or dispersal • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long term evolutionary development, or • for the reintroduction of populations or recovery of the species or ecological community.

Term	
	Such habitat may be, but is not limited to: • habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or • habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.
Register of Critical Habitat	Section 207A of the EPBC Act provides for a register of critical habitat including the location and extent information based on up to date scientific information available to the Threatened Species Scientific Committee and the Minister. At the time of preparation of this report there are only five areas of critical habitat listed in the register. None of the threatened species and ecological communities assessed in this report are included in the register of critical habitat.

2.0 Critically Endangered or Endangered Ecological Communities

2.1 Mallee Bird Community of the Murray Darling Depression Bioregion

2.1.1 Description

The *Mallee Bird Community of the Murray Darling Depression Bioregion* Endangered Ecological Community (Mallee Bird Community) is an assemblage of 20 bird species with a strong affinity to mallee habitats listed as endangered under the EPBC Act (DAWE 2021a).

The Mallee Bird Community consists of 11 families the most common being honeyeaters (six honeyeaters) and wrens (three species) (DAWE 2021a). Within the assemblage, two broad groups of species are recognised:

- Mallee specialists. Mallee specialists are found almost exclusively in mallee habitats and include black-eared miner (*Manorina melanotis*), chestnut quail-thrush (*Cinclosoma castanotum*), mallee emu-wren (*Stipiturus mallee*), malleefowl (*Leipoa ocellata*), red-lored whistler (*Pachycephala rufogularis*), scarlet-chested parrot (*Neophema splendida*), striated grasswren (*Amytornis striatus*) and mallee western whipbird (*Psophodes leucogaster*).
- Mallee dependents. Mallee dependents are bird species dependent on mallee where it is present, but that also utilise non-mallee woodland or shrubland habitat that intergrades with mallee vegetation. Mallee dependents include: crested bellbird (*Oreoica gutturalis*), grey-fronted honeyeater (*Ptilotula plumula*), jacky winter (*Microeca fascinans*), purple-gaped honeyeater (*Lichenostomus cratitius*), regent parrot (*Polytelis anthopeplus*), shy heathwren (*Calamanthus cautus*), southern scrub-robin (*Drymodes brunneopygia*), splendid fairy-wren (*Malurus splendens*), spotted pardalote (*Pardalotus punctatus*), white-eared honeyeater (*Nesoptilotis leucotis*), white-fronted honeyeater (*Purnella albifrons*) and yellow-plumed honeyeater (*Ptilota ornata*). A number of these species are widely distributed with specific sub-species associated with mallee habitats.

The Mallee Bird Community is found in mallee woodland and shrublands habitats to the east of the Flinders Ranges in South Australia, in western Victoria and the south western corner of New South Wales (DAWE 2021a). The Mallee Bird Community is expected to occur in the Mallee Cliffs National Park which adjoins the Biodiversity Study Area. The national park provides high quality habitat for woodland birds and is known to support the mallee specialists (malleefowl and chestnut quail-thrush) and mallee dependents (white-fronted honeyeater, splendid fairy-wren, white-eared honeyeater, spotted pardalote, shy heathwren, Jacky winter, crested bellbird) (ebird 2024). Due to the size and lack of ongoing disturbances the national park provides better habitat than the habitats present within the Biodiversity Study Area which occur within an agricultural property.

Surveys in the Biodiversity Study Area have identified ten of the Mallee Bird Community species including:

- One mallee specialist – chestnut quail-thrush;
- Nine mallee dependents – crested bellbird, Jacky winter, shy heathwren, splendid fairy-wren, spotted pardalote, white-eared honeyeater, white-fronted honeyeater, yellow-plumed honeyeater and the nationally threatened regent parrot.

The distribution of Mallee Bird Community EEC in the Biodiversity Study Area is presented on **Figure 4.4.**

2.1.2 Relevant Guidelines and Policy Statement

Relevant guidelines and policy statements available for this MNES include:

- Approved Conservation Advice for the Mallee Bird Community of the Murray Darling Depression Bioregion (DAWE 2021a).
- Listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this ecological community.
- No Threat Abatement Plan has been identified as being relevant for this ecological community.

2.1.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the Mallee Bird Community EEC are presented in **Table 2.1** below.

Table 2.1 Mallee Bird Community SEARs Requirement Considerations

Item 16 Requirements		Mallee Bird Community
i	**Description of habitat**	The Mallee Bird Community has been identified in the Biodiversity Study Area associated with: • PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones moderate/good condition, covering approximately 157.49 ha of the Biodiversity Study Area • PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones weedy understorey condition, covering approximately 8.25 ha of the Biodiversity Study Area and • PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion – moderate/good condition, covering approximately 131.50 ha of the Biodiversity Study Area. Both PCTs have been assessed as Category A condition thresholds supporting ten species of the Mallee Bird Community (refer to Section 4.5.2 of the BDAR (Umwelt 2024a)). The areas critical to the survival of the ecological community are occurrences that meet the key diagnostic characteristics and condition thresholds with: • known populations of nationally threatened mallee birds, especially the limited range mallee specialists • areas where several members of the Mallee Bird Community are known to occur and can act as reservoirs or source populations to colonise other nearby sites.

Item 16 Requirements		Mallee Bird Community
		Surveys in the Biodiversity Study Area have identified ten of the Mallee Bird Community species including one mallee specialist, the chestnut quail-thrush. While this species is listed as threatened under the BC Act it is not listed as threatened nationally. The nationally listed regent parrot, a mallee dependent species was recorded. In keeping with the above criteria habitats in the Biodiversity Study Area have been assessed as an area critical to the survival of the Mallee Bird Community EEC. Habitat in the Biodiversity Study Area is contiguous with the Mallee Cliffs National Park an area known to support mallee vegetation and numerous bird species and is likely to support the Mallee Bird Community. Within 25 km of (and including) the Development Footprint it is estimated that there is up to 191,933 ha of Mallee Bird Community habitat associated with PCT 170 and PCT 171 as mapped in the State Vegetation Type Map. The conservation advice estimates that the extent of occurrence is estimated to be about 9.7 million ha with current extent of mallee woodlands in the South Olary Plain IBRA subregion estimated to be 2,699,802 ha (DAWE 2021a).
ii	**Survey methodology**	Surveys to map the extent of terrestrial habitat have been undertaken in keeping with the NSW BAM. Bird surveys were undertaken and have included 134 diurnal woodland bird surveys completed between November 2022 and May 2024. Each survey comprised an observer recording all species detected across an area of approximately 2 hectares for a minimum of 20 minutes. Flight behaviour of observed birds was not recorded. Temperature, wind speed, cloud cover and precipitation was recorded during each survey. The Conservation Advice recommends that surveys occur between August and November. Of the 134 diurnal woodland bird surveys completed in the Biodiversity Study Area, 106 surveys were completed between August and November.
iii	**Construction impacts**	Construction of the Proposed Action will remove 22.76 ha of the Mallee Bird Community EEC: • 3.81 ha of PCT 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones vegetation in moderate-good condition • 18.95 ha of PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion in moderate-good condition.
iii	**Operational impacts**	Possible moderate consequence indirect impacts during operation include transportation of weeds and pathogens and increased fire risk associated with increased traffic, increase in human activity and use of machinery. Possible minor consequence indirect impacts during operation include noise, light and dust impacts particularly along the interface of operational areas and retained habitat. Unlikely or remote likelihood of occurring and minor or insignificant consequence indirect impacts may include removal of habitat/shelter through wood collection, rubbish dumping. The Proposed Action would also modify the airspace above and around the wind farm such that bird species forming part of the Mallee Bird Community EEC may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. All species recorded which form part of the Mallee Bird Community EEC were assessed as having a 'negligible' risk of impact, except the regent parrot which was assessed as having a 'Moderate', risk of impact to blade strike and barotrauma, refer to Section 8.2.16 of the turbine strike assessment Appendix B (Umwelt 2024b) of the BDAR.
iv	**MNES specific avoidance and mitigation measures**	From inception, avoidance of the Mallee Bird Community EEC has been a focus of the Proposed Action. Mallee woodland communities which provide habitat for this EEC have been avoided as far as possible to reduce impacts.

Item 16 Requirements		Mallee Bird Community
		The current Development Footprint contains approximately 22.76 ha of habitat for this EEC, a substantial reduction from the scoping stage of approximately 188 ha through detailed design by Spark Renewables. Through design the wind turbine generators are located 800 m from the Mallee Cliffs National Park (700 m from blade tip to the national park). The main avoidance measure was to locate the Development Footprint within the boundary of existing cropped paddocks.
v	**Residual impact**	The permanent loss of up to 22.76 ha Mallee Bird Community EEC as a result of the Proposed Action. As discussed in **Table 2.2** the Proposed Action is unlikely to have a significant impact on the Mallee Bird Community EEC.
vi	**Offsets required**	The Mallee Bird Community EEC would be offset through the retirement of the Proposed Action's ecosystem credit obligation.

2.1.4 Significant Impact Criteria Consideration

The significant impact criteria considerations for the Mallee bird community EEC are presented in **Table 2.2**.

Table 2.2 Significant Impact Criteria Considerations for the Mallee bird community EEC

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:
Reduce the extent of an ecological community
Within 25 km of (and including) the Development Footprint it is estimated that there is up to 191,933 ha of Mallee Bird Community habitat associated with PCT 170 and PCT 171 as mapped in the State Vegetation Type Map. The conservation advice estimates that the current extent of mallee woodlands is about 9.7 million ha with 2,699,802 ha in the South Olary Plain IBRA subregion (DAWE 2021a). The permanent loss of up to 22.76 ha Mallee Bird Community EEC as a result of the Proposed Action represents a negligible reduction in the estimated current extent of the community across its national range and is unlikely to significantly reduce the extent of the ecological community. The Proposed Action would also modify the airspace above and around the wind farm such that bird species forming part of the Mallee Bird Community EEC may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. All species recorded which form part of the Mallee Bird Community EEC were assessed as having a 'negligible' risk, except the regent parrot which was assessed as having a 'Moderate', risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
Fragment or increase fragmentation of an ecological community
A total of 22.76 ha of PCTs associated with the EEC occurs within the Development Footprint. As this amount is proportionally small compared to the PCT area of the greater Biodiversity Study Area (165.74 ha for PCT 170 and 131.50 ha for PCT 171), the Proposed Action is unlikely to contribute to significant fragmentation of the EEC. However, as PCTs associated with the EEC are proposed for removal, this action is expected to further fragment patches of the EEC. The proposed transmission line at the southern extent of the Development Footprint will increase fragmentation of habitat for this EEC, however this is not expected to substantially restrict movement of bird species that form part of this EEC given they are highly mobile and the low shrub and groundcover in the transmission line is also expected to regrow providing some cover for species. The conservation advice (DAWE 2021a) notes that single patches of this EEC can be 100m apart given many birds in the community to traverse this distance.

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:
Adversely affect habitat critical to the survival of an ecological community
As stated in the Approved Conservation Advice for the Mallee Bird Community of the Murray Darling Depression Bioregion (DAWE 2021a), habitat critical to the survival of this EEC are where known populations of threatened mallee birds exist as well as areas where several members of the Mallee Bird Community are known to occur. Given there are several members of the Mallee Bird Community recorded within the locality, including threatened mallee birds, the Proposed Action may adversely affect habitat critical to the survival of this ecological community.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
The Proposed Action is unlikely to modify or destroy abiotic factors that are necessary for the Mallee Bird Community's survival.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, or
The Proposed Action is unlikely to substantially change the composition of the Mallee Bird Community EEC.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species that are harmful to the listed ecological community to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
The Proposed Action is unlikely to cause reduction in the quality or integrity of the occurrence of the Mallee Bird Community EEC within the locality.
Interfere with the recovery of an ecological community.
While there is currently no recovery plan for this ecological community, the Approved Conservation Advice for the Mallee Bird Community EEC (DAWE 2021a) states that a key priority action for the recovery of this species is its protection including the conservation of remaining occurrences. Given there are several members of the Mallee Bird Community EEC recorded within the locality, including threatened mallee birds, the Proposed Action may interfere with the recovery of the Mallee Bird Community.
Conclusion
The Proposed Action is considered unlikely to have a significant impact on the Mallee Bird Community EEC.

3.0 Critically Endangered and Endangered Species

3.1 Australasian Bittern (*Botaurus poiciloptilus*)

3.1.1 Description

In Australia, the Australasian Bittern occurs from south-east Queensland to south-east South Australia as far as the Adelaide Region, southern Eyre Peninsula, Tasmania and in the southwest of Western Australia (TSSC 2019). In New South Wales, it occurs along the coast and is also frequently recorded in the Murray Darling Basin, notably in floodplain wetlands of the Murray, Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers (TSSC 2019). The Action Plan for Australian Birds 2010 (Garnett *et al*. 2011) suggested there were less than 1000 mature Australasian Bitterns within the Australian population, and that the population was likely declining.

The Australasian Bittern occurs mainly in freshwater wetlands and, rarely, in estuaries or tidal wetlands (Marchant & Higgins 1990). It favours wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate (Marchant & Higgins 1990).

The species nests adjacent to relatively deep, densely vegetated freshwater swamps and pools, building its nests under dense cover over shallow water (Marchant & Higgins 1990). The Australasian bittern prefers to nest in vegetation that is up to 2.5 m tall and the nests are placed about 30 cm above the water level (Marchant & Higgins 1990).

All natural habitat (including constructed wetlands with suitable habitat) in which the Australasian bittern is known or likely to occur should be considered critical to the survival of the species (TSSC 2019). Likewise, all populations should be considered important (TSSC 2019).

3.1.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved Conservation Advice for *Botaurus poiciloptilus* Australasian Bittern (TSSC 2019).
- Commonwealth Listing Advice on *Botaurus poiciloptilus* (Australasian Bittern) (TSSC 2011).
- National Recovery Plan for the Australasian Bittern (*Botaurus poiciloptilus*) (DCCEEW 2022a).
- Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia (CoA 2015b).
- Threat abatement plan for predation by the European red fox. DEWHA, Canberra. (DEWHA 2008b).

3.1.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the Australasian bittern are presented in **Table 3.1.**

Table 3.1 Australasian Bittern SEARs Requirement Considerations

Item 16 Requirements		Australasian Bittern
i	Description of habitat	The Biodiversity Study Area does not contain any Australasian bittern foraging, breeding, or roosting habitat. However, the species may very occasionally disperse through the Project Area given there is suitable habitat present to the west and south-west of the site. All historical and current records are associated with Gol Gol Swamp (2 km north-west of south-west boundary of Biodiversity Study Area), Etiwanda Wetlands (9 km west), Mildura Wastewater Treatment Plant (12 km west) and Bob Corbould Wetland (12 km). The Biodiversity Study Area does not retain any habitat critical to the survival of the species.
ii	Survey methodology	Survey guidelines recommend surveying in breeding season when the Bittern is actively calling, (due to the cryptic nature of the species). Vegetation and habitat assessments in the Biodiversity Study Area have not identified any habitat for the Australasian bittern. Accordingly, targeted surveys have not been undertaken. Diurnal bird surveys and BBUS surveys completed between November 2022 and May 2024 have been adequate to detect the Australasian bittern.
iii	Construction impacts	The Biodiversity Study Area and Development Footprint do not contain any Australasian bittern foraging, breeding, or roosting habitat to be impacted in the construction phase.
iii	Operational impacts	The Proposed Action would modify the airspace above and around the wind farm such that the Australasian bittern may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'moderate' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including the Australian bittern: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area. • Development Footprint buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation. • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (BMP) and Bird and Bat Adaptive Management Plan (BBAMP).

Item 16 Requirements		Australasian Bittern
v	Residual impact	An assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species (refer to **Table 3.2**).
vi	Offsets required	No offset requirements for this species given that no habitat will be impacted by the Proposed Action.

3.1.4 Significant Impact Criteria Consideration

The significant impact criteria considerations for Australasian bittern are presented in **Table 3.2**.

Table 3.2 Significant Impact Criteria Considerations for Australasian Bittern

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease of a population
The Development Footprint does not impact on any Australasian bittern foraging, breeding, or roosting habitat. Construction of the Proposed Action will not lead to a long term decrease in the population of the Australasian Bittern. Operation of the Proposed Action is considered to have a Moderate likelihood of impacting the Australasian bittern by turbine strike while dispersing through the area. The Proposed Action is therefore unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of a population
Since the Development Footprint does not impact on any Australasian bittern foraging, breeding, or roosting habitat, the Proposed Action will not reduce the area of occupancy of the national population.
fragment an existing population into two or more populations
As the Proposed Action will not impact any Australasian bittern populations, the Proposed Action is unlikely to cause fragmentation into two or more populations.
adversely affect habitat critical to the survival of a species
Habitat critical to the survival of the Australasian bittern is natural habitat (including constructed wetlands) in which the species is known or likely to occur (TSSC 2019). As the Development Footprint does not contain any Australasian bittern foraging, breeding, or roosting habitat, the Proposed Action will not impact the survival of the species.
disrupt the breeding cycle of a population
No evidence of occupation or breeding of the species has been recorded in the Development Footprint. The Proposed Action is not expected to disrupt the breeding cycle of a population of the Australasian bittern.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
As the Development Footprint does not contain any Australasian bittern foraging, breeding, or roosting habitat, the Proposed Action is not expected to impact quality of habitat. The Proposed Action would modify the airspace above and around the wind farm such that the Australasian bittern may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'moderate' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in Australasian bittern habitat.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
introduce disease that may cause the species to decline
The Proposed Action is unlikely to result in the introduction of disease that may cause the Australasian bittern to decline.
interfere substantially with the recovery of the species
The Proposed Action will remove not remove any known or potential habitat for the Australasian bittern and is not likely to interfere with the recovery of this species.
Conclusion
The Proposed Action is unlikely to have a significant impact on the Australasian bittern.

3.2 Curlew Sandpiper (*Calidris ferruginea*)

3.2.1 Description

The curlew sandpiper is a critically endangered migrant species that migrates to Australia during its non-breeding period. It is common along the coast of eastern Australia and is also widely distributed across inland NSW (DoE 2015a). The closest record of curlew sandpiper is approximately 5.3 km southwest of Biodiversity Study Area. The species forages in wetland habitats including mudflats and nearby shallow water, edges of waterbodies, and sandy shorelines. The species roosts around intertidal mudflats in sheltered coastal areas and around non-tidal swamps, lakes and lagoons near the coast (DCCEEW 2023a). Less often, the curlew sandpiper are recorded inland around ephemeral and permanent lakes, dams, waterholes and bore drains usually with bare edges of mud or sand (DCCEEW 2023a).

3.2.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved Conservation Advice for *Calidris ferruginea* (curlew sandpiper) (DCCEEW 2023a).
- There is no adopted or made Recovery Plan for this species.
- No Threat Abatement Plan has been identified as being relevant for this species.
- EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (CoA 2017).

3.2.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the curlew sandpiper are presented in **Table 3.3** below.

Table 3.3 Curlew Sandpiper SEARs Requirement Considerations

Item 16 Requirements		Curlew sandpiper
i	Description of habitat	No foraging or roosting habitat for the curlew sandpiper has been identified in the Biodiversity Study Area. The curlew sandpiper has not been recorded in the Biodiversity Study Area. The species may very rarely disperse through the area given there is suitable inland habitat in the Mildura area including at Morquong Saltworks (13 km west) in February 2017 and observations from Lake Ranfurly in Mildura in September 2018 and October 2023. Curlew sandpiper has been recorded on several occasions at Gol Gol Swamp and Lake Gol Gol. Based on the conservation advice (DCCEEW 2023a) and migratory species guidance (CoA 2017) the Biodiversity Study Area does not provide important habitat for the migratory shorebird.
ii	Survey methodology	Vegetation and habitat assessments in the Biodiversity Study Area or Development Footprint have not identified any habitat for the curlew sandpiper. Accordingly, targeted surveys have not been undertaken. Diurnal Bird surveys and BBUS surveys completed between November 2022 and May 2024 have been adequate to detect curlew sandpiper.
iii	Construction impacts	The Biodiversity Study Area does not contain any curlew sandpiper foraging, breeding, or roosting habitat to be impacted in the construction phase.
iii	Operational impacts	The Proposed Action would modify the airspace above and around the wind farm such that the curlew sandpiper may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'Minor' risk of impact to blade strike and barotrauma, based on low likelihood and moderate consequences refer to turbine strike assessment Appendix B of the BDAR (Umwelt 2024b)
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including for the curlew sandpiper: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: biodiversity Management Strategy to minimise the residual impacts of the project, A CEMP, OEMP, BMP and BBAMP. Further details of avoidance, mitigation and management measures are provided in **Section 7.0** and **Section 9.0** of the BDAR, as well as **Section 5.0** of this MNES Report.
v	Residual impact	As no suitable foraging, breeding, or roosting habitat is present within the Development Footprint, the Proposed Action is not expected to have any residual impact on curlew sandpiper.
vi	Offsets required	No offset requirements for this species given that no habitat will be impacted by the Proposed Action.

3.2.4 Significant impact criteria consideration

The significant impact criteria considerations for Curlew sandpiper are presented in **Table 3.4.**

Table 3.4 Significant Impact Criteria Considerations for Curlew sandpiper

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease of a population
The Development Footprint does not impact on any curlew sandpiper foraging, breeding, or roosting habitat. Given that the species is mobile, it is very unlikely that injury or mortality would occur during construction, and it is considered to have a Minor likelihood of being impacted by turbine strike. The Proposed Action is therefore unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of a population
Since the Development Footprint does not impact on any curlew sandpiper foraging, breeding, or roosting habitat, the Proposed Action will not reduce the area of occupancy of a population.
fragment an existing population into two or more populations
As the Proposed Action will not be impacting any curlew sandpiper populations, the Proposed Action is unlikely to cause fragmentation into two or more populations.
adversely affect habitat critical to the survival of a species
Habitat critical to the survival of the species include areas necessary for foraging, breeding, roosting or dispersal including tidal and upper tidal flats and inland wetlands (DCCEEW 2023a). As the Development Footprint does not contain any curlew sandpiper foraging, breeding, or roosting habitat, the Proposed Action will not impact the survival of the species.
disrupt the breeding cycle of a population
Australia provides non-breeding habitat for the curlew sandpiper. No evidence of occupation of the species has been recorded in the Development Footprint. The Proposed Action is not expected to disrupt the breeding cycle of a population of the curlew sandpiper.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
As the Development Footprint does not contain any curlew sandpiper foraging, breeding, or roosting habitat, the Proposed Action is not expected to impact quality of habitat. The Proposed Action would modify the airspace above and around the wind farm such that the Australasian bittern may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'minor' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Invasive species recognised as a threat to the curlew sandpiper is the spread of vegetation (particularly mangroves) into roosting and foraging habitat (DCCEEW 2023a). The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in curlew sandpiper habitat.
introduce disease that may cause the species to decline
The Proposed Action is unlikely to result in the introduction of disease that may cause the curlew sandpiper to decline.
interfere substantially with the recovery of the species
The Proposed Action will not remove any curlew sandpiper habitat. Thus, the Proposed Action is unlikely to interfere with the recovery of this species.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Conclusion
The Proposed Action is unlikely to have a significant impact on the curlew sandpiper.

3.3 Pink cockatoo (*Lophochroa leadbeateri leadbeateri*)

3.3.1 Description

The Pink Cockatoo occurs in the Murray-Darling, Eyre and Bulloo River basins, from Isisford and Roma in the north, through western NSW to north-west Victoria and west to eastern South Australia (DCCEEW 2023b). They inhabit arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*). The main requirements within these vegetation types are fresh surface water and trees with suitable nesting hollows (DCCEEW 2023b).

Suitable nesting hollows are found in trees that are large and tall relative to the typical structure or arid and semi-arid woodlands. The subspecies tend to prefer hollows that have an:

- average hollow entrance diameter 13.3 x 27.7 cm (range 8–30 x 9–80 cm)
- average hollow depth of 53.9 cm (range 19–180 cm)
- average nest chamber floor diameter of 18 cm (range 9–34 cm)
- average nest tree diameter at breast height of 72.5 cm (range 34–149 cm).

The pink cockatoo prefers not to nest in close proximity to other breeding pairs, with breeding pairs having a relatively large home range of approximately 30 km^2. Pairs usually renest in the same area each season and stay together throughout the year. Eggs are laid in August and September (DCCEEW 2023b).

3.3.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved Conservation Advice for *Lophochroa leadbeateri leadbeateri* (eastern Major Mitchell's cockatoo) (DCCEEW 2023b)
- Listing assessment information may be available in the approved Conservation Advice
- There is no adopted Recovery Plan for this species
- No Threat Abatement Plan has been identified as being relevant for this species.

3.3.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the pink cockatoo are presented in **Table 3.5**.

Table 3.5 Pink Cockatoo SEARs Requirement Considerations

Item 16 Requirements		Pink cockatoo
i	**Description of habitat**	Foraging habitat for the pink cockatoo has been identified in the Biodiversity Study Area associated with PCTs 58, 170 and 171. There is approximately 993.72 ha of suitable habitat within the Biodiversity Study Area, and 54.34 ha of suitable foraging habitat for this species within the Development Footprint. Habitat assessments and opportunistic surveys did not record any evidence of breeding. Habitat critical to the survival of the pink cockatoo consist of: • arid and semi-arid woodlands dominated by mulga, mallee and box eucalypts, slender cypress pine or belah • known habitat containing suitable attributes, including potential habitat for the subspecies, especially where there are large mature trees and suitable hollows • surrounding matrix of these areas for the role of providing movement corridors for dispersal (DCCEEW 2023b).
ii	**Survey methodology**	Survey requirements are not explicitly stated. Band *et al.* (2007) recommend vantage point surveys. It is recommended that the pink cockatoo is surveyed between September and December. Surveys for the pink cockatoo have been undertaken between September 2022 and May 2024 using opportunistic habitat searches, BBUS and diurnal bird surveys. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area from November 2022–May 2024 to assess bird occurrence and flight behaviour across the Project Area. Two (2) of the seven (7) survey period occurred within the pink cockatoo's breeding period and acquaints to a total of 94.5 survey hours. Targeted and opportunistic searches for pink cockatoo breeding sites were undertaken across the Biodiversity Study Area. Opportunistic searches were undertaken concurrently during all biodiversity survey effort across the Biodiversity Study Area. Where suitable habitat was identified, GPS location, tree species, hollow size and location (spout, trunk, branch) were recorded within digital survey platforms. Diurnal bird surveys in November 2022 to May 2024 were completed. Diurnal bird surveys were conducted across a 20-minute period, the methodology consists of searching woodland habitat across an approximately 2-ha area, meandering slowly and recording all visual and aural observations of birds. Surveys were undertaken by two observers experienced in identifying birds in the region. The pink cockatoo and breeding sites have not been recorded during surveys.
iii	**Construction impacts**	The Proposed Action will directly impact on 54.34 ha or five percent of potential foraging habitat in the Biodiversity Study Area.
iii	**Operational impacts**	The pink cockatoo has been assessed as having a Moderate likelihood of being impacted by turbine strike during the Project's operational phase, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
iv	**MNES specific avoidance and mitigation measures**	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including for the pink cockatoo: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation

Item 16 Requirements		Pink cockatoo
		• Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: biodiversity Management Strategy to minimise the residual impacts of the project, A CEMP, OEMP, BMP and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR as well as Section 5.0 of this MNES Report.
v	**Residual impact**	The Proposed Action would directly impact on 54.34 ha of potential foraging habitat. Living or dead tree with hollows greater than 10 cm diameter may also be impacted by the Proposed Action, however despite extensive surveys no breeding activity was recorded within the Biodiversity Study Area. An AoS has been provided (refer to **Table 3.6**). The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
vi	**Offsets required**	Potential impacts to this species will be offset through the retirement of the Proposed Action's ecosystem credit obligation. The pink cockatoo was not recorded within the Development Footprint and no species-credits (breeding habitat) are required for the Proposed Action.

3.3.4 Significant Impact Criteria Consideration

The significant impact criteria considerations for pink cockatoo are presented in **Table 3.6** below.

Table 3.6 Significant Impact Criteria Considerations for Pink Cockatoo

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease of a population
The national population of the pink cockatoo is considered to be one population and estimated (with low reliability) to be 15,000 mature individuals in 2011, based on the area of occupancy and a density of 1 pair per 30 km^2 (DCCEEW 2023b). There are no more recent estimates. The pink cockatoo and suitable breeding habitat have not been recorded within the Biodiversity Study Area or Development Footprint. The Proposed Action will clear approximately 54.34 ha of potential foraging habitat for the species. As the Proposed Action will not impact breeding habitat, it is considered unlikely to result in a long-term decrease in the population. Further to this, the species is mobile, it is very unlikely that injury or mortality would occur during construction, and it is considered to have a Moderate likelihood of being impacted by turbine strike refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
Reduce the area of occupancy of a population
The area of occupancy of the Pink Cockatoo is 225,000 km^2 (150,000–300,000 km^2) and contracting (DCCEEW 2023b). The removal of 54.34 ha (0.543 km^2) will lead to a <0.01% reduction in the area of occupancy of this species. This is a negligible reduction in the area of occupancy of the pink cockatoo.
fragment an existing population into two or more populations
Within the Biodiversity Study Area and broader Project Area an extensive amount of suitable habitat for this subspecies will remain. It is therefore unlikely that the removal of 54.34 ha of suitable foraging habitat within the Development Footprint will fragment this highly mobile species into two or more populations.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
adversely affect habitat critical to the survival of a species
The Proposed Action is expected to impact habitat that is considered critical to the survival of the pink cockatoo, in the form of mallee vegetation. Approximately 54.34 ha of foraging habitat will be directly impacted by the proposed removal of associated PCTs within the Development Footprint.
disrupt the breeding cycle of a population
Given that neither suitable breeding habitat nor the species has been detected during the extensive surveys in the breeding season, the Proposed Action is not expected to disrupt the breeding cycle of the pink cockatoo.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
A relatively small amount of potential habitat will be removed, with potential habitat remaining for this species in the Biodiversity Study Area. The Proposed Action would however modify the airspace above and around the wind farm such that pink cockatoo may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. The species was assessed as having a 'moderate' risk of impact to blade strike and barotrauma within Appendix B of the BDAR (Umwelt 2024b). Further to this, no pink cockatoo was recorded during the bird utilisation surveys completed for the Proposed Action. Based on this it is considered unlikely that the Proposed Action will decrease the amount of potential habitat to the extent that the species will decline.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Grazing by rabbits and feral goats is listed as a key threat to this species in the Conservation Advice (DCCEEW 2023b). The Proposed Action may lead to an increase in invasive species within the Development Footprint. Monitoring and management of invasive fauna and flora will be undertaken throughout the construction and operational phases of Proposed Action.
introduce disease that may cause the species to decline
Psittacine Beak and Feather Disease (PBFD) is listed as a key threat to this species in the Conservation Advice (DCCEEW 2023b). It is unlikely that the Proposed Action will result in this disease being introduced into the Development Footprint.
interfere substantially with the recovery of the species
There is no approved recovery plan for this species. Conservation and recovery actions in the Conservation Advice (DCCEEW 2023b) include: • increasing nesting habitat and improve connectivity of woodland habitat • protect habitat and hollow-bearing trees • maintain vegetation near water points • identify important populations • fire management • trial use of artificial hollows. The Proposed Action would directly impact 54.34 ha of foraging habitat. It will not clear any hollow-bearing trees potentially used for breeding by the species and will not clear vegetation near water points. Management of the Proposed Action would include management of fires. The Proposed Action is not expected to substantially interfere with the recovery of the species.
Conclusion
The Proposed Action is unlikely to significantly impact on the pink cockatoo.

3.4 South-eastern Hooded Robin (*Melanodryas cucullata cucullata*)

3.4.1 Description

The south-eastern hooded robin is listed as endangered under the EPBC Act. This species occurs in south-eastern Australia from far south-east Queensland to Yorke Peninsula, South Australia, intergrading with *Melanodryas cucullata picata* in the southern Murray Darling basin (DCCEEW 2023c).

South-eastern hooded robins typically occur in pairs or small groups in dry eucalypt and acacia woodlands and shrublands with an open understorey, some grassy areas and a complex ground layer (DCCEEW 2023c). South-eastern hooded robins generally avoid woodlands with tall trees or dense tree cover but sometimes occur in tall, dense heaths with scattered open areas (DCCEEW 2023c).

The south-eastern hooded robin was regularly recorded in the Biodiversity Study Area during the 2022–2024 bird surveys especially in the central and the south-west parts of the site. The species was recorded on 55 occasions, including 28 times during vantage point surveys, 15 times during woodland bird surveys and 12 times incidentally across all seven seasonal surveys.

The records of south-eastern hooded robin within the Biodiversity Study Area are presented in Figure 4.5 of the MNES Report.

3.4.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved Conservation Advice for *Melanodryas cucullata cucullata* (South-eastern Hooded Robin). (DCCEEW 2023c).
- Listing assessment information may be available in the approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- No Threat Abatement Plan has been identified as being relevant for this species.

3.4.3 NSW Bilateral Agreement requirements

The NSW bilateral assessment requirement considerations for the south-eastern hooded robin are presented in **Table 3.7.**

Table 3.7 South-eastern Hooded Robin SEARs Requirement Considerations

Item 16 Requirements		South-eastern Hooded Robin
i	Description of habitat	Foraging habitat for the south-eastern hooded robin has been identified in the Project Area associated with PCTs 58, 170 and 171. There is 993.72 ha of suitable habitat within the Biodiversity Study Area, and 54.34 ha of suitable foraging habitat for this species within the Development Footprint. Habitat critical to the survival of the hooded robin (south-eastern) include areas of: • dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas; • structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses; • standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging; • moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat (DCCEEW 2023c). Habitat in the Development Footprint is generally fragmented due to land use and access tracks and is unlikely to meet definitions of habitat critical to the survival of the species. Habitat in the transmission line alignment may provide habitat critical to the survival of the species.
ii	Survey methodology	A total of 491 vantage point surveys were conducted across 15 sites in the Biodiversity Study Area from November 2022–May 2024 to assess bird occurrence and flight behaviour across the Project Area. The south-eastern hooded robin was regularly recorded in the Biodiversity Study Area during the 2022–2024 bird surveys especially in the central and the south-west parts of the site. The species was recorded on 55 occasions, including 28 times during vantage point surveys, 15 times during woodland bird surveys and 12 times incidentally across all seven seasonal surveys.
iii	Construction impacts	The Proposed Action will directly impact on 54.34 ha or five per cent of foraging habitat within the Biodiversity Study Area.
iii	Operational impacts	The south-eastern hooded robin is highly unlikely to fly at the RSA height, thus operational impacts are unlikely to occur. The overall collision risk rating for the south-eastern hooded robin is Negligible, based on a Low likelihood and Low consequence of collisions. Furthermore, there is no records of blade strikes of this species in available literature. Refer to turbine strike assessment Appendix B of the BDAR (Umwelt 2024a).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including for the south-eastern hooded robin: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation.

Item 16 Requirements		South-eastern Hooded Robin
		• The implementation of environmental management plans and strategies including Biodiversity Management Strategy to minimise the residual impacts of the project, A CEMP, OEMP, BMP and BBAMP. Further details of avoidance, mitigation and management measures are provided in **Section 7.0** and **Section 9.0** of the BDAR as well as **Section 5.0** of this MNES Report.
v	Residual impact	The Proposed Action would directly impact on 54.34 ha of habitat for the species. An assessment of significance has been provided in **Table 3.8**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
	Offsets required	The south-eastern hooded robin is an ecosystem credit species, impacts to this species will be offset through the retirement of the Proposed Action's credit obligation.

3.4.4 Significant Impact Criteria Consideration

The significant impact criteria considerations for south-eastern hooded robin are presented in **Table 3.8**.

Table 3.8 Significant Impact Criteria Considerations for South-eastern Hooded Robin

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease of a population
The population estimate for the south-eastern hooded robin is 68,000 mature individuals (DCCEEW 2023c). The south-eastern hooded robin was regularly recorded in the Biodiversity Study Area during the 2022–2024 bird surveys especially in the central and the south-west parts of the site. Construction of the Proposed Action would directly impact on 54.34 ha of foraging habitat or 5 per cent of habitat identified in the Biodiversity Study Area. The south-eastern hooded robin is highly unlikely to fly at the RSA height, thus operational impacts are unlikely to occur. Furthermore, there is no records of blade strikes of this species in available literature. It is unlikely that the Proposed Action will lead to a long-term decrease in a population of south-eastern hooded robin.
Reduce the area of occupancy of a population
The area of occupancy for the south-eastern hooded robin is estimated to be 30,000 km^2 (DCCEEW 2023c). Proposed Action will remove 54.34 ha of native vegetation associated with PCT 58, 170 and 171 which provides suitable habitat for the south-eastern hooded robin. This small area of potential suitable habitat proposed is considered unlikely to result in the reduction of the area of occupancy for the species.
fragment an existing population into two or more populations
Given the small scale of potentially suitable habitat proposed to be impacted, the Proposed Action is unlikely to fragment an existing population into two or more populations.
adversely affect habitat critical to the survival of a species
Habitat critical to the survival of the hooded robin (south-eastern) include areas of: • dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas; • structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses; • standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging;

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
• moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat (DCCEEW 2023e). The Proposed Action may affect a small area of habitat that is critical to the survival of the south-eastern hooded robin. However, given the small scale of proposed impact, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the species.
disrupt the breeding cycle of a population
The south-eastern hooded robin form monogamous pairs and usually return to the same breeding site each season building nests in tree forks or crevices one to five metres above the ground (DCCEEW 2023c). While the south-eastern hooded robin has been recorded in the Biodiversity Study Area no evidence of nesting has been recorded. Given the small scale of potentially suitable habitat proposed to be impacted (only five per cent of habitat in the Biodiversity Study Area) and the unlikelihood for this species to be impacted by the operation for the Proposed Action, the Proposed Action is unlikely to disrupt the breeding cycle of a population of south-eastern hooded robin.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Given the small scale of potentially suitable habitat proposed to be impacted, the Proposed Action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the south-eastern hooded robin is likely to decline.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Predation by cats and foxes is listed as a key threat to this species in the Conservation Advice (DCCEEW 2023c). The Proposed Action may lead to an increase in invasive species within the Development Footprint. Monitoring and management of invasive fauna and flora will be undertaken throughout the construction and operational phases of Proposed Action.
introduce disease that may cause the species to decline
The conservation advice does not identify a disease that the south-eastern hooded robin is vulnerable too. The Proposed Action is unlikely to result in the introduction of disease that may cause the south-eastern hooded robin to decline.
interfere substantially with the recovery of the species
The species is affected by serious threats, most notably habitat loss, degradation, fragmentation and removal, climate change, predation from invasive species, invasive weeds, firewood collection and competition with noisy miners (*Manorina melanocephala*) (DCCEEW 2023c). Given the small area of suitable habitat proposed to be impacted and the low likelihood of operational impacts, the Proposed Action is considered unlikely to interfere substantially with the recovery of the south-eastern hooded robin.
Conclusion
The Proposed Action is unlikely to significantly impact on the south-eastern hooded robin.

3.5 Australian Painted Snipe (*Rostratula australis*)

3.5.1 Description

The Australian Painted Snipe is endemic to Australia. Historically, the species was distributed through most of the continent. The Murray-Darling Basin, particularly the Riverina Region of Victoria and NSW, appeared to have been a stronghold for the species. The patterns of present-day distribution are poorly understood DCCEEW 2022b).

The Australian Painted Snipe occurs in shallow freshwater, or occasionally brackish, ephemeral and permanent wetlands. This includes lakes, swamps, claypans inundated and waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains. Typically, these areas also contain a good cover of grasses, rushes and reeds, low scrub, Muehlenbeckia spp., open timber or samphire (DCCEEW 2022b).

The Australian Painted Snipe may breed in response to rainfall, with breeding recorded in all months. Breeding habitat for this species is quite specific: shallow wetlands with areas of bare wet mud and mixed heights of low vegetation. The Australian Painted Snipe has also been recorded nesting in and near swamps, canegrass swamps, flooded areas including grazing land, among cumbungi, sedges, tussock grasses, various couch grasses, and samphires (Tecticornia spp.), also in ground cover of water-buttons and grasses, at the base of tussocks and under low saltbush (DCCEEW 2022b).

3.5.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved Conservation Advice for *Rostratula australis* (Australian painted snipe) (DSEWPaC 2013).
- Commonwealth Listing Advice on *Rostratula australis* (Australian Painted Snipe) (TSSC 2013).
- National Recovery Plan for the Australian Painted Snipe (*Rostratula australis*) (DCCEEW 2022b).
- No Threat Abatement Plan has been identified as being relevant for this species.

3.5.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the Australian painted snipe are presented in **Table 3.9.**

Table 3.9 Australian Painted Snipe SEARs Requirement Considerations

Item 16 Requirements		Australian Painted Snipe
i	Description of habitat	The Biodiversity Study Area does not support any shallow terrestrial freshwater wetland habitat associated with the Australian painted snipe. However, the species may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. The nearest records are from permanent waterbodies, including Lake Gol Gol (7km west of the Project Area).
ii	Survey methodology	Targeted species search was not carried out specifically for the Australian painted snipe as it is an ecosystem-credit species and there is no suitable habitat within the Biodiversity Study Area or Development Footprint. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. As the Australian Painted Snipe's breeding period has been recorded across all months, any of these surveys occurred within a suitable detection period.

Item 16 Requirements		Australian Painted Snipe
		Further to this, surveys were conducted across a range of seasons and climatic variations, including those associated with increased rainfall. As the Australian Painted Snipe may breed in response to rainfall, surveys during these periods would further increase the chance of detection. The Australian painted snipe was not recorded during the Bird Utilisation Surveys.
iii	Construction impacts	As no suitable foraging, breeding, or roosting habitat is present within the Development Footprint, the Proposed Action is not expected to impact the Australia painted snipe during construction.
iii	Operational impacts	The Proposed Action would modify the airspace above and around the wind farm such that the Australian painted snipe may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'moderate' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A CEMP, OEMP, BMP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 3.10**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
vi	Offsets required	No offset requirements for this species given that no habitat will be impacted by the Proposed Action.

3.5.4 Significant Impact Criteria Consideration

The significant impact criteria considerations for Australian painted snipe are presented in **Table 3.10.**

Table 3.10 Significant Impact Criteria Considerations for Australian Painted Snipe

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease of a population
The population of the Australian painted snipe is estimated to be less than 340 mature individuals (DCCEEW 2022b). The Development Footprint does not support any Australian painted snipe foraging, breeding, or roosting habitat therefore construction of the Proposed Action is unlikely to lead to a long-term decrease in the population Given that the species is mobile, it is very unlikely that injury or mortality would occur during construction, and it is considered to have a 'moderate' likelihood of being impacted by turbine strike. The Proposed Action is therefore unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of a population
In 2010 the area of occupancy of the Australian painted snipe was estimated to be 2000km2 (TSSC 2013). The Development Footprint does not provide suitable Australian painted snipe foraging, breeding or roosting habitat, and therefore the Proposed Action will not reduce the area of occupancy of a population.
fragment an existing population into two or more populations
As the Proposed Action will not be impacting any freshwater wetland habitat, it is unlikely that the Proposed Action will cause fragmentation into two or more populations.
adversely affect habitat critical to the survival of a species
As the Development Footprint does not contain any Australian painted snipe foraging, breeding, or roosting habitat, the Proposed Action will not impact the survival of the species.
disrupt the breeding cycle of a population
No evidence of occupation or breeding of the species has been recorded in the Development Footprint. The Proposed Action is not expected to disrupt the breeding cycle of a population of the Australian painted snipe.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
As the Development Footprint does not contain any Australian painted snipe foraging, breeding, or roosting habitat, the Proposed Action is not expected to impact quality of habitat. The Proposed Action would modify the airspace above and around the wind farm such that the Australian painted snipe may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'moderate' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
The European red fox (*Vulpes vulpes*) and feral cats (*Felis catus*) as well as the invasive weed Parkinsonia (*Parkinsonia aculeata*), have been noted as invasive species which can cause adverse impacts to the Australian painted snipe (DSEWPaC 2013; DCCEEW 2022b). Other invasive species capable of degrading habitat include pigs, goats and deer (DCCEEW 2022b) The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in Australian painted snipe habitat. Management of the Proposed Action would reduce the threats of invasive species on all biodiversity.
introduce disease that may cause the species to decline
The recovery plan (DCCEEW 2022b) does not identify disease threats the species. As the Development Footprint does not support any habitat for the species the Proposed Action is unlikely to result in the introduction of disease that may cause the Australian painted snipe to decline.
interfere substantially with the recovery of the species
The Recovery Plan (DCCEEW 2022b) identifies 6 strategies to achieve objective of sustaining a positive population trend by 2023: • manage and protect known habitat at a landscape scale • develop and apply techniques to measure changes in population

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
• reduce or eliminate threats at breeding and non-breeding habitat • undertake research • engage community stakeholders • coordinate, review and report on recovery progress. The Development Footprint does not support any Australian painted snipe foraging, breeding, or roosting habitat or any individuals of the Australian painted snipe. The Proposed action is unlikely to interfere with implementation of the actions and objections of the recovery plan for the species
Conclusion
The Proposed Action is unlikely to have a significant impact on the Australian Painted Snipe.

3.6 Common Greenshank (*Tringa nebularia*)

3.6.1 Description

The common greenshank is listed as Endangered as well as a marine and migratory species under the EPBC Act. The species is listed as migratory under the Bonn Convention, CAMBA, JAMBA, and ROKAMBA.
The common greenshank is a non-breeding migrant to Australia, arriving from August, passing mainly through West Australia (DCCEEW 2024a). The common greenshank starts moving southwards in Western Australia from November onwards, with numbers increasing slowly at most inland and coastal sites during August and September. The largest increases at some scattered sites are reported in October and November (DCCEEW 2024a). It is widespread in coastal regions, occurring in all types of wetlands, and has one of the widest distributions of any shorebird in Australia (DCCEEW 2024a).

The common greenshank forages at the edge of wetlands, in soft mud on mudflats, in channels, or within shallows around the edge of waterbodies. These locations are often situated near or among mangroves or other sparse, emergent or fringing vegetation such as sedges or saltmarsh (DCCEEW 2024a). Common greenshanks roost both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms, and flooded crops (DCCEEW 2024a).

Habitat critical to the survival of common greenshank includes a mosaic of feeding and roosting habitat (DCCEEW 2024a). Common greenshank frequents a variety of freshwater, marine, and artificial wetlands. The species has been recorded within swamps, open muddy or rocky shores of lakes and large rivers, sewage farms, saltworks, inundated rice-fields, ponds, reservoirs, flooded grasslands, saltmarshes, sandy or muddy coastal flats, mangroves, estuaries, lagoons, pools on tidal reefs, or in areas of exposed coral (DCCEEW 2024a).

3.6.2 Relevant Guidelines and Policy Statements

- Conservation Advice for *Tringa nebularia* (common greenshank) (DCCEEW 2024a).
- There is no adopted or made Recovery Plan for this species.
- EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (CoA 2017).

3.6.3 NSW Bilateral Agreement Requirements

The NSW bilateral assessment requirement considerations for the common greenshank are presented in **Table 3.11.**

Table 3.11 Common Greenshank SEARs Requirement Considerations

Item 16 Requirements		Common Greenshank
i	Description of habitat	The Biodiversity Study Area does not contain any common greenshank, breeding, or roosting habitat. The Biodiversity Study Area does not support habitat critical to the survival of the common greenshank or nationally important habitat as defined in the conservation advice (DCCEEW 2024a). However common greenshank may very occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. The common greenshank has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area (DCCEEW 2024, eBird 2024). Recent nearby records include observations of a single bird at Mallee Cliffs N.P in November and December 2018 and from Lake Ranfurly in Mildura in March 2022. Common greenshank has been recorded on several occasions at Gol Gol Swamp, Lake Gol Gol and in the Mourquong area.
ii	Survey methodology	Targeted species search was not carried out specifically for the common greenshank given the absence of suitable habitat within the Biodiversity Study Area. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area The common greenshank has not been recorded as part of these surveys.
iii	Construction impacts	As no suitable foraging, breeding, or roosting habitat is present within the Development Footprint, the Proposed Action is not expected to impact the common greenshank during construction.
iii	Operational impacts	The Proposed Action would modify the airspace above and around the wind farm such that the common greenshank may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'minor' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, include: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Malee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation

Item 16 Requirements		Common Greenshank
		• Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A CEMP, OEMP, BMP and BBAMP. Further details of avoidance, mitigation and management measures are provided in **Section 7.0** and **Section 9.0** of the BDAR, as well as **Section 5.0** of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 3.12**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
vi	Offsets required	No offset requirements for this species given that no habitat will be impacted by the Proposed Action.

3.6.4 Significant Impact Criteria Consideration

The significant impact criteria considerations for common greenshank are presented in **Table 3.12.**

Table 3.12 Significant Impact Criteria Considerations for Common Greenshank

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
Lead to a long-term decrease of a population
There are an estimated 23,700 mature individuals in Australia (DCCEEW 2024a). No foraging, breeding, or roosting habitat for the common greenshank occur in the Development Footprint. Construction of the Proposed Action will not impact on any common greenshank foraging, breeding, or roosting habitat. The prescribed impact assessment considers that operation of the wind farm has a 'minor' likelihood of impacting the common greenshank by turbine strike. The Proposed Action is therefore unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of a population
The area of occupancy for the common greenshank is estimated to be 13,000 km^2 (DCCEEW 2024a). The Development Footprint does not contain any common greenshank, breeding, or roosting habitat. Thus, the Proposed Action is considered unlikely to reduce the area of occupancy of a population of common greenshank.
fragment an existing population into two or more populations
As the Development Footprint does not provide any habitat for the common greenshank construction of the Proposed Action will not be impacting any populations, it is unlikely that the Proposed Action will cause fragmentation into two or more populations.
adversely affect habitat critical to the survival of a species
As noted in **Table 3.11** the Development Footprint does not contain habitat that may be considered critical to the survival of the common greenshank or any nationally important habitat.
disrupt the breeding cycle of a population
Australia provides non-breeding habitat for the common greenshank. The Development Footprint does not support any habitat suitable for the common greenshank. The Proposed Action is not expected to disrupt the breeding cycle of a population of the common greenshank.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
As the Development Footprint does not contain any common greenshank foraging, breeding, or roosting habitat, the Proposed Action is not expected to impact quality of habitat. The Proposed Action would modify the airspace above and around the wind farm such that the common greenshank may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'minor' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Within Australia, mangroves are listed as key threat invasive species to the common greenshank (DCCEEW 2024a). The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in common greenshank habitat.
introduce disease that may cause the species to decline
The Proposed Action is unlikely to result in the introduction of disease that may cause the common greenshank to decline.
interfere substantially with the recovery of the species
Key threats to the common greenshank include: • Habitat loss, degradation, and fragmentation • Anthropogenic disturbance • Climate change • Invasive species • Exploitation • Pollution The Proposed Action is unlikely to result in any substantial interference with the recovery of the common greenshank as the species has not been recorded within the Development Footprint nor has any suitable habitat been identified within the Development Footprint.
Conclusion
The Proposed Action is unlikely to have a significant impact on common greenshank.

4.0 Vulnerable Species

4.1 Southern Whiteface (*Aphelocephala leucopsis*)

4.1.1 Description

The southern whiteface is small thornbill-like bird with a brown dorsum, white belly, dark brown wings and a black tail with a narrow white tip. Adult birds reach 11.5 cm in length with a cream colour eye, grey legs and a stubby dark grey bill. The species occurs across much of mainland Australia south of the tropics, from the north-eastern edge of the Western Australia wheatbelt, east to the Great Dividing Range. They inhabit a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. Generally dominated by acacias or eucalypts on ranges, foothills and lowlands and plains (DCCEEW 2023d).

Southern whiteface feed on invertebrates, foraging almost exclusively on the ground, favouring habitat with low tree densities and herbaceous understorey litter cover (DCCEEW 2023d). Breeding predominately takes place between July and October throughout the species range, with nests generally being built in hollows and crevices (DCCEEW 2023d).

Associated PCTs for this species are currently not provided within the TBDC. Hence, it is conservatively assumed that they have the potential to use all PCTs within the Subject Land.

The records of the southern whiteface within the Biodiversity Study Area are presented in **Figure 4.5**.

4.1.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved Conservation Advice for *Aphelocephala leucopsis* (Southern Whiteface) (DCCEEW 2023d).
- Listing assessment information in the approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- No Threat Abatement Plan has been identified as being relevant for this species.

4.1.3 NSW Bilateral Assessment Requirement

The NSW bilateral assessment requirement considerations for the southern whiteface are presented in **Table 4.1** below**.**

Table 4.1 Southern Whiteface SEARs Requirement Considerations

Item 16 Requirements		Southern Whiteface
i	Description of habitat	No associated PCTs for the southern whiteface have been stated in the TBDC at the time of writing. The southern whiteface was regularly recorded in the Biodiversity Study Area and it was conservatively assumed that they have the potential to use all PCTs within the Biodiversity Study Area. Therefore, there is 993.72 ha of potential habitat available within the Biodiversity Study Area, and 54.34 ha of potential habitat within the Development Footprint. Habitat critical to the survival of the southern whiteface include areas of: • Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both; • Habitat with low tree densities and herbaceous understorey litter cover which provides essential foraging habitat; • Living and dead trees with hollows and services which are essential for roosting and nesting. Habitat in the Development Footprint is generally fragmented due to land use and access tracks and is unlikely to meet definitions of habitat critical to the survival of the species. However, habitat in the transmission line alignment is more intact and is considered habitat critical to the survival of the species.
ii	Survey methodology	Targeted species search was not carried out specifically for the southern whiteface it is an ecosystem-credit species. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. Two (2) of the seven (7) survey periods occurred during the species breeding season (from June to October) This equates to 94.5 hours of survey. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area, with 26 surveys occurring within the breeding season. The southern whiteface was regularly recorded in the Project Area during the 2022–2024 bird surveys having been recorded during each of the seven seasonal surveys. Southern Whiteface was recorded at six of the 15 vantage point and were recorded on 30 occasions, including nine times during vantage point surveys, 11 times during woodland bird surveys and 10 times incidentally. No evidence of nesting was observed.
iii	Construction impacts	54.34 ha of potential habitat occurs within the Development Footprint and will be removed by the Proposed Action. The Proposed Action will impact on the foraging and potential breeding habitat of the species.
iii	Operational impacts	The Proposed Action would modify the airspace above and around the wind farm such that the southern whiteface may be at risk of mortality resulting from blade strike while dispersing through this area. The southern whiteface is highly unlikely to fly at RSA. This species was assessed as having a 'negligible' risk of impact to blade strike and barotrauma, refer to turbine strike assessment in Appendix B of the BDAR (Umwelt 2024b).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including the southern whiteface: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area

Item 16 Requirements		Southern Whiteface
		• The Development Footprint buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A CEMP, OEMP, BMP and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, Table 9.1, as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.2**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
vi	Offsets required	As southern whiteface is considered an ecosystem credit species, impacts to this species would be offset through the retirement of the Proposed Action's credit obligation.

4.1.4 Significant Impact Criteria Consideration

For the purpose of this assessment, it is noted that:

- There are no defined important populations within the conservation advice (DCCEEW 2024d).
- The southern whiteface is widespread across southern Australia and any individuals occurring within the Biodiversity Study Area would not belong to a key source population for breeding or dispersal, a population necessary for maintaining genetic diversity and are not near the limit of the species range. Therefore, any population occurring within the Biodiversity Study Area would not constitute an important population for the purposes of the assessment.

The significant impact criteria considerations for southern whiteface are presented in **Table 4.2.**

Table 4.2 Significant Impact Criteria Considerations for Southern Whiteface

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
Currently there are estimated to be 477,000 (range 236,000–954,000) mature individuals in the wild (DCCEEW 2023d). Any southern whiteface occurring within the Development Footprint would not be considered to represent an important population, therefore the Proposed Action will not lead to a long-term decrease in the size of an important population
reduce the area of occupancy of an important population
The area of occupancy of the southern whiteface is estimated to be 80,000 km^2 (range 65,000–140,000 km^2) with a contracting trend (DCCEEW 2023d). Any southern whiteface occurring within the Development Footprint would not be considered to represent an important population, therefore the Proposed Action would not reduce the area of occupancy of an important population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
The area of occupancy of the national population of the Southern Whiteface is estimated to be 80,000 km^2, hence the removal of 54.34 ha (0.543 km^2) potential habitat would result in a < 0.01% reduction in the area of occupancy for this species. This is a negligible reduction in the area of occupancy of the southern whiteface national population.
fragment an existing important population into two or more populations
Any southern whiteface occurring within the Development Footprint would not be considered to represent an important population, therefore the Proposed Action would not reduce the area of occupancy of an important population. The Proposed Action is unlikely to fragment the national southern whiteface population given that suitable habitat is present throughout surrounding region, and the species is mobile.
adversely affect habitat critical to the survival of a species
Habitat within the Development Footprint is considered habitat critical for the survival of the species, as it is mapped as likely habitat for the southern whiteface. Therefore, the Proposed Action would conservatively directly impact 54.34 ha of habitat critical for this species.
disrupt the breeding cycle of an important population
Any southern whiteface occurring within the Development Footprint would not be considered to represent an important population, therefore the Proposed Action would not disrupt the breeding cycle of an important population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The removal of 54.34 ha of suitable habitat would result in a negligible reduction in the amount of available habitat for the southern whiteface. However, there is a large amount of suitable habitat within the surrounding region that the species can utilise. Hence, it is unlikely that the removal would lead to the decline of the species. The Proposed Action would however modify the airspace above and around the wind farm such that southern whiteface may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. Southern whiteface was recorded 30 times during the bird utilisation surveys completed for the Proposed Action. The species was assessed as having a 'negligible' risk of impact to blade strike and barotrauma within Appendix B of the BDAR (Umwelt 2024b) because the likelihood of flight at RSA is deemed extremely unlikely based on knowledge of the species' flight behaviour and observations from the Project Area.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
No invasive species are stated as a key threat to the southern whiteface in the Conservation Advice. Further, to ensure that the direct and indirect impacts to this species from invasive species is minimised, Sparkes Renewables has committed to designing and implementing a comprehensive biodiversity mitigation strategy to minimise unavoidable impacts of the Project. This will include the preparation of a BMP, CEMP, OEMP and BBAMP with associated biodiversity management measures. With the implementation of these measures, the Proposed Action would not result in an increase in invasive species within southern whiteface habitat.
introduce disease that may cause the species to decline
No diseases are stated as a key threat to the southern whiteface in the Conservation Advice (DCCEEW 2024d). Further, it is unlikely that the Proposed Action would introduce a disease that would cause the species to decline.
interfere substantially with the recovery of the species
There is currently no approved Recovery Plan for this species. The Conservation Advice identified that the primary conservation outcome is stable population trend and that the causes of current population declines are understood with priorities to not clear habitat critical to the survival of the species, secure occupied habitat patches where the birds have a patchy distribution, undertake revegetation, promote ecological management and connectivity (DCCEEW 2024d).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
The Proposed Action will impact 54.34 ha of potential habitat including habitat that may be considered critical to the survival of the species along the transmission line. The transmission line is located adjoining an existing access track to minimise further fragmentation of habitats. However, it is not considered likely that the removal of 54.34 ha of potential habitat will lead to a decline in the species, and therefore will not impact the recovery of the species.
Conclusion
The Proposed Action is unlikely to significantly impact the southern whiteface.

4.2 Sharp-tailed Sandpiper (*Calidris acuminata*)

4.2.1 Description

The Sharp-tailed Sandpiper are a migratory species that breed in northern Siberia, east to the Chaun Gulf and the Kolyma River delta. The species generally passages through eastern Mongolia, China, Korea, Japan, Micronesia, the Philippines and southeast Asia. In the non-breeding season, arriving in mid-August to December, approximately 91 per cent of the East Asian – Australasian population occurs in Australia and New Zealand. They occur across the entirety of Australia, however, are most common in the south-east (DCCEEW 2024b). The sharp-tailed sandpiper is widespread in most regions of NSW and Victoria, especially in coastal areas (DCCEEW 2024b).

The species inhabits both fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands and sewage ponds. After rainfall events the species may also feed on areas of agricultural pasture (DCCEEW 2024b).

4.2.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Department of Climate Change, Energy, the Environment and Water (2024b). Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper).
- Listing advice is provided in the Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- No Threat Abatement Plan has been identified as relevant for this species.
- Department of the Environment (DoE) (2015b). Wildlife Conservation Plan for Migratory Shorebirds.
- EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (CoA 2017).

4.2.3 NSW Bilateral Assessment Requirement

The NSW bilateral assessment requirement considerations for the sharp-tailed sandpiper are presented in **Table 4.3.**

Table 4.3 Sharp-tailed Sandpiper SEARs requirements Considerations

Item 16 Requirements		
i	Description of habitat	The sharp-tailed sandpiper has recently been listed and associated PCTs have not yet been entered into the NSW TBDC. It has been assessed in the BDAR (Umwelt 2024a) as an ecosystem-credit species under the BAM-C. The sharp-tailed sandpiper inhabits both fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands and sewage ponds (DCCEEW 2024b). The Biodiversity Study Area does not contain any suitable habitat. However sharp-tailed sandpiper may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Sharp-tailed sandpiper has been recorded at over 20 locations within 50 km of the Biodiversity Study Area, with a particularly high number of records in the Mildura area. Recent records include an observation of approximately 300 birds at Gol Gol Swamp in March 2017 following records of 25 and 33 birds at this location in January 2017 and December 2016 respectively. The Biodiversity Study Area does not support habitat critical to the survival of the sharp-tailed sandpiper or nationally important habitat. Gol Gol Swamp and Mildura wetlands are recognised as a nationally significant wetland for this species (Weller et al 2020).
ii	Survey methodology	Targeted species search was not carried out specifically for the sharp-tailed sandpiper as there is no suitable habitat present. However, extensive bird utilisation and woodland bird surveys were undertaken seasonally from November 2022 to May 2024 which would have detected the presence of this species. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area. The sharp-tailed sandpiper was not recorded during any of the bird surveys.
iii	Construction impacts	The Biodiversity Study Area does not contain any sharp-tailed sandpiper, breeding, or roosting habitat to be impacted in the construction phase.
iii	Operational impacts	The Proposed Action would modify the airspace above and around the wind farm such that the sharp-tailed sandpiper may be at risk of mortality resulting from blade strike while dispersing through this area. This species was assessed as having a 'Minor' risk of impact to blade strike and barotrauma, refer to turbine strike assessment Appendix B of the BDAR (Umwelt 2024b).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, include: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation.

Item 16 Requirements		
		• The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.4**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
	Offsets required	No offset requirements for this species given that no habitat will be impacted by the Proposed Action.

4.2.4 Significant Impact Criteria Consideration

For the purpose of this assessment, criteria are assessed under the following assumptions:

- The National Directory of Important Migratory Shorebird Habitat identifies all known feeding and roosting sites of sharp-tailed sandpiper in Australia (Weller *et al.* 2020). These areas are identified as internationally or nationally important in accordance with the EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. No known feeding and roosting sites are identified within the Biodiversity Study Area, therefore no habitat critical to the survival of this species occurs.
- There are no defined important populations within the conservation advice (DCCEEW 2024b).
- The species does not breed in Australia and is widespread both globally and in Australia. Therefore, any individuals occurring within the Biodiversity Study Area would not belong to a key source population for breeding or dispersal, a population necessary for maintaining genetic diversity and are not near the limit of the species range. Hence, any population occurring within the Biodiversity Study Area would not be considered an important population.

The significant impact criteria considerations for sharp-tailed sandpiper are presented in **Table 4.4** below.

Table 4.4 Significant Impact Criteria Considerations for Sharp-tailed Sandpiper

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
There are currently estimated to be 71,000 (range 9,500–268,900) mature individuals in the wild with a continuing declining trend (DCCEEW 2024b). There is no habitat for and the sharp-tailed sandpiper has not been recorded in the Development Footprint. The Proposed Action will not lead to a long-term decrease in the size of an important population.
reduce the area of occupancy of an important population
The area of occupancy of the sharp-tailed sandpiper in Australia is estimated to be 13,000 km^2 (13,000–20,000 km^2) within Australia and stable (DCCEEW 2024b). The Development Footprint does not support habitat for the sharptailed sandpiper, The Proposed Action will not reduce the area of occupancy of an important population.
fragment an existing important population into two or more populations
The Proposed Action is unlikely to fragment the national sharp-tailed sandpiper population given how widespread the population is, that suitable habitat is present throughout surrounding region, and the species is highly mobile.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
adversely affect habitat critical to the survival of a species
No habitat that is considered critical to the survival of the sharp-tailed sandpiper occurs within the Development Footprint.
disrupt the breeding cycle of an important population
The sharp-tailed sandpiper does not breed in Australia and therefore the Proposed Action will not disrupt the breeding cycle of the species.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
There is no habitat for the sharp-tailed sandpiper in the Development Footprint. The Proposed Action would however modify the airspace above and around the wind farm such that sharp-tailed sandpipers may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. The species was assessed as having a 'minor' risk of impact to blade strike within Appendix B of the BDAR (Umwelt 2024b).
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Development Footprint does not contain any habitat for the sharp-tailed sandpiper.
introduce disease that may cause the species to decline
No diseases that are harmful to the sharp-tailed sandpiper are listed in the Conservation Advice. Further, it is unlikely that the Proposed Action will lead to the introduction of disease.
interfere substantially with the recovery of the species
The Proposed Action is unlikely to result in any substantial interference with the recovery of the sharp-tailed sandpiper as the species has not been recorded within the Development Footprint nor has any suitable habitat been identified within the Development Footprint.
Conclusion
The Proposed Action is unlikely to significantly impact the sharp-tailed sandpiper.

4.3 Grey Falcon (*Falco hypoleucos*)

4.3.1 Description

The grey falcon occurs at low densities across inland Australia (BirdLife International 2024b). The grey falcon is known to inhabit the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant and Higgins 1993).

The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses (TSSC 2020). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (TSSC 2020). Due to the mobile and enigmatic nature of the species it is assumed for this assessment that there is one national population of the grey falcon.

4.3.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved conservation advice for *Falco hypoleucos* (Grey Falcon) (TSSC 2020).
- Listing assessment information in the approved Conservation Advice.

- There is no adopted or made Recovery Plan for this species.
- No Threat Abatement Plan has been identified as being relevant for this species.

4.3.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the grey falcon are presented in **Table 4.5.**

Table 4.5 Grey Falcon SEARs Requirement Considerations

Item 16 Requirements		Grey Falcon
i	Description of habitat	Habitat for the grey falcon has been identified in the Project Area associated with PCTs 58, 170 and 171. Therefore, there is 993.72 ha of potential habitat available within the Biodiversity Study Area and 54.34 ha of suitable foraging habitat occurs within the Development Footprint. No nests have been identified in the Development Footprint. No habitat critical to the survival of the species is defined within the Conservation Advice (TSSC 2020). Given its broad habitat preferences, it is unlikely that any habitat within the Development Footprint would constitute habitat critical to the survival of the species.
ii	Survey methodology	Targeted species search was not carried out specifically for the grey falcon as it is an ecosystem-credit species. However, extensive bird utilisation and woodland bird surveys were undertaken seasonally from November 2022 to May 2024 which would have detected the presence of this species. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area. Opportunistic searches for large stick nests during all surveys were also undertaken in the correct survey period. The grey falcon was not recorded during any of the surveys completed on site. There are no records for the species within 20 km of the Development Footprint on BioNet Wildlife Atlas.
iii	Construction impacts	The Proposed Action is expected to remove 54.34 of vegetation from PCT 58, 170 and 171, all of which the grey falcon is associated with. Therefore, the Proposed Action will impact on the foraging and potential breeding habitat of the species.
iii	Operational impacts	The grey falcon has been assessed as having a minor likelihood of being impacted by turbine strike during the Project's operational phase.
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including the grey falcon: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area. • The Development Footprint buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation

Item 16 Requirements		Grey Falcon
		• Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, as well as Section 5.0 of this MNES Report.
v	Residual impact	The removal of 54.34 ha is considered a negligible reduction in occupancy of the grey falcon national population. The assessment of significance of impact (refer to **Table 4.6**) has concluded that this is not considered to be a significant residual impact on the species.
	Offsets required	As grey falcon is an ecosystem credit species, potential impacts to this species would be offset through the retirement of the Proposed Action's credit obligation.

4.3.4 Significant Impact Criteria Consideration

For the purpose of this assessment the following assumptions have been made:

- There are no defined important populations for the grey falcon within the Conservation Advice (TSSC 2020).
- Grey falcons are widespread across mainland Australia and any individuals occurring within the Biodiversity Study Area would not belong to a key source population for breeding or dispersal, a population necessary for maintaining genetic diversity and are not near the limit of the species range. Therefore, any population occurring within the Development Footprint would not be considered an important population.

The significant impact criteria considerations for grey falcon are presented in **Table 4.6.**

Table 4.6 Significant Impact Criteria Considerations for Grey Falcon

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
The total population of the grey falcon is estimated to be <1,000 mature individuals. This species consists of a single population across its national range (TSSC2020). Any grey falcons occurring within the Development Footprint would not be considered to be an important population, and therefore the Proposed Action will not lead to a long-term decrease in the size of an important population.
reduce the area of occupancy of an important population
The area of occupancy of this species is 6,000 km^2 (TSSC 2020). Any grey falcons occurring within the Development Footprint would not be considered to be an important population, therefore the Proposed Action will not reduce the area of occupancy of an important population. The area of occupancy of the national population of the grey falcon is estimated to be 6,000 km^2, the removal of 54.34 ha (0.543 km^2) of potential habitat will result in a 0.1% reduction in the area of occupancy of this species. This is a minor reduction in the area of occupancy of the national Grey Falcon population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
fragment an existing important population into two or more populations
The grey falcon has a wide distribution and a mobile nature. The Proposed Action is unlikely to fragment an existing important population of grey falcon into two or more populations.
adversely affect habitat critical to the survival of a species
Potential habitat within the Development Footprint is not considered habitat critical to the survival of the species and therefore the Proposed Action will not adversely affect habitat that is critical to this species.
disrupt the breeding cycle of an important population
No nest sites were identified in the Development Footprint during targeted surveys. The Proposed Action would clear about five per cent of available foraging habitat in the Biodiversity Study Area. The Proposed Action is unlikely to disrupt the breeding cycle of an important population of the species.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Proposed Action will remove up to 54.34 ha of foraging habitat or five per cent of available foraging and potential nesting habitat in the Biodiversity Study Area. However, protected potential habitat exists in the adjoining Mallee Cliffs National Park and nearby Hattah-Kulkyne National Park and , as well as Mungo National Park to the northeast. As such, the Proposed Action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat such that the species is likely to decline. The Proposed Action would however modify the airspace above and around the wind farm such that grey falcon may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. The species was assessed as having a 'minor' risk of impact to blade strike and barotrauma within Appendix B of the BDAR (Umwelt 2024b). No grey falcon were recorded during the bird utilisation surveys completed for the Proposed Action.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Conservation Advice (TSSC 2020) notes cats as a significant predator to this species. The Proposed Action is unlikely to result in invasive species that are harmful to the grey falcon.
introduce disease that may cause the species to decline
The Conservation Advice does not identify any disease that the grey falcon is susceptible to. Proposed Action is unlikely to introduce disease that may cause the species to decline.
interfere substantially with the recovery of the species
The Conservation Advice (TSSC 2020) notes the following as threats to the grey falcon: • Predation by cats • Increased temperatures in arid and semi-arid Australia • Small population size • Grazing by exotic herbivores • Nest shortage • Birdwatchers and photographers • Collision with traffic • Collision with fences and powerlines • Egg collecting • Falconry The Proposed Action is considered unlikely to interfere with the recovery of the species.
Conclusion
The Proposed Action is unlikely to significantly impact the grey falcon.

4.4 Latham's Snipe (*Gallinago hardwickii*)

4.4.1 Description

Latham's snipes are a migratory species that breed in Japan and in far eastern Russia. During the non-breeding season they migrate to south-eastern Australia, arriving in northern Australia from late July to early August onwards then moving southwards along the coastline to arrive in southern Australia between August and November and departing north by late February, eventually leaving Northern Queensland by mid-April. The Latham's snipe is dispersive during its stay in Australia. The species probably moves in response to rainfall and the availability of food. For example, the species abandons seasonally drying wetlands and moves to wetter or more permanent habitats elsewhere. Data from regular counts in southern Australia indicate that the species is highly mobile during the non-breeding season (Higgins & Davies 1996).

In Australia, Latham's snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (Higgins & Davies 1996).

Associated PCTs are not provided for this species. Latham's snipe has been recorded at over ten locations within 50 km of the Project Area, with a particularly high number of records within 5 km of the Murray River. The nearest record is from Gol Gol Swamp (2 km from the Project Area) in January 2017.

4.4.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice for *Gallinago hardwickii* (Latham's Snipe) (DCCEEW 2024d).
- Listing advice is provided in the Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- (DEWHA) (2008b). Threat abatement plan for predation by the European red fox.
- EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (CoA 2017).

4.4.3 NSW bilateral Agreement Requirements

The NSW bilateral assessment requirement considerations for the Latham's snipe are presented in **Table 4.7.**

Table 4.7 Latham's Snipe SEARs Requirements Considerations

Item 16 Requirements		Latham's snipe
i	Description of habitat	The Study Area does not support any wetland habitat associated with the Latham's snipe. However, it may very occasionally disperse through the Proposed Area given there is suitable habitat present to the south-west of the site. Latham's snipe has been recorded at over ten locations within 50 km of the Biodiversity Study Area, with a particularly high number of records within 5 km of the Murray River (DCCEEW 2024, eBird 2024). The nearest record is from Gol Gol Swamp (2km from the Project Area) in January 2017. The next closest record is from Etiwanda Wetlands (9 km west of the Project Area) in November 2008. The Biodiversity Study Area does not support habitat critical to the survival of Latham's snipe. For Latham's snipe important habitat for the species is described as areas that have previously been identified as internationally important or areas that support at least 18 individuals (DCCEEW 2024d). Gol Gol Swamp is not recognised as a nationally important wetland for this species (Weller et al 2020).
ii	Survey methodology	Targeted species search was not carried out specifically for the Latham's snipe due to the absence of suitable habitat. However, extensive bird utilisation and woodland bird surveys were undertaken seasonally from November 2022 to May 2024 which would have detected the presence of this species. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area. Latham's snipe was not recorded during the bird surveys.
iii	Construction impacts	As no suitable foraging, breeding, or roosting habitat is present within the Development Footprint, the Proposed Action is not expected to impact Latham's snipe during construction.
iii	Operational impacts	Latham's snipe has been assessed as having a minor likelihood of being impacted by turbine strike during the Project's operational phase.
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including Latham's Snipe: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP.

Item 16 Requirements		Latham's snipe
		Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, as well as Section 5.0 of this MNES Report.
v	Residual impact	An Assessment of Significance of the impact has been provided in **Table 4.8**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
	Offsets required	No offset requirements for this species given that no habitat will be impacted by the Proposed Action.

4.4.4 Significant Impact Criteria Consideration

For the purpose of this assessment, criteria are assessed under the following assumptions:

- Habitat critical to the survival of the species refers to areas that are necessary:
    - For activities such as foraging, breeding, roosting, or dispersal.
    - For the long-term maintenance of the species (including the maintenance of species essential to the survival of Latham's snipe, such as macrobenthos).
    - To maintain genetic diversity and long-term evolutionary development. Or
    - For the re-introduction of populations or recovery of the species.
- The National Directory of Important Migratory Shorebird Habitat identifies all known feeding and roosting sites of Latham's Snipe in Australia (Weller et al. 2020). These areas are identified as internationally or nationally important in accordance with the EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. No known feeding and roosting sites are identified within the Biodiversity Study Area, therefore no habitat critical to the survival of this species occurs.
- There are no defined important populations within the conservation advice. The species does not breed in Australia. Therefore, any individuals occurring within the Biodiversity Study Area would not belong to a key source population for breeding or dispersal, a population necessary for maintaining genetic diversity and are not near the limit of the species range. Hence, any population occurring within the Subject Land would not be considered an important population.

The significant impact criteria considerations for Latham's snipe are presented in **Table 4.8.**

Table 4.8 Significant Impact Criteria Considerations for Latham's Snipe

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
There are currently estimated to be 19,000 (range 12,000–46,000) mature individuals in the flyway. Not all birds overwinter in Australia with an estimated 70 per cent of the flyway population migrating here annually (DCCEEW 2024d).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
There is no habitat for the Latham's snipe in the Development Footprint. Any Latham's snipe occurring within the Development Footprint would not be considered to represent an important population, therefore the Proposed Action will not lead to a long-term decrease in the size of an important population.
reduce the area of occupancy of an important population
The area of occupancy for the Latham's snipe is estimated at 13,000 km^2 (range 13,000–20,000 km^2) (DCCEEW 2024d). There is no habitat for the Latham's snipe in the Development Footprint. Any Latham's snipe occurring within the Development Footprint are not considered to represent an important population; therefore the Proposed Action will not reduce the area of occupancy of an important population.
fragment an existing important population into two or more populations
Any Latham's snipes occurring within the Development Footprint are not considered to represent an important population, therefore the Proposed Action will not fragment an important population into two or more populations. The Proposed Action is unlikely to fragment the national Latham's Snipes population given how widespread the population is, that suitable habitat is present throughout surrounding region, and the species is highly mobile.
adversely affect habitat critical to the survival of a species
Habitat critical to the survival of the species refers to areas that are necessary: • For activities such as foraging, breeding, roosting, or dispersal. • For the long-term maintenance of the species (including the maintenance of species essential to the survival of the sharp-tailed sandpiper, such as macrobenthos). • To maintain genetic diversity and long-term evolutionary development. Or For the re-introduction of populations or recovery of the species (DCCEEW 2024d).No habitat that is considered critical to the survival of the Latham's snipe occurs within the Development Footprint. Further the Development Footprint does not support nationally or internationally important habitat.
disrupt the breeding cycle of an important population
Any Latham's snipe occurring within the Development Footprint are not considered to represent an important population, therefore the Proposed Action will not disrupt the breeding cycle of an important population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Development Footprint does not provide habitat for Latham's snipe. Construction of the Proposed Action will not modify, destroy or remove potential habitat for the Latham's snipe. The Proposed Action would however modify the airspace above and around the wind farm such that Latham's snipe may be at risk of mortality resulting from blade strike while dispersing through this area. The species was assessed as having a minor likelihood risk of impact to blade strike and barotrauma within Appendix B of the BDAR (Umwelt 2024b). No Latham's snipe were recorded during the bird surveys completed for the Proposed Action.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Conservation Advice states that predation by cats and foxes is a threat to the Latham's snipe. Also, invasive weeds are considered to be a threat. The Proposed Action may lead to an increase in invasive species within the Biodiversity Study Area. Monitoring and management of invasive fauna and flora will be undertaken throughout the construction and operational phases of Proposed Action.
introduce disease that may cause the species to decline
No diseases that are harmful to the Latham's snipe are listed in the Conservation Advice. Further, it is unlikely that the Proposed Action will lead to the introduction disease.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
interfere substantially with the recovery of the species
There is no approved Recovery Plan for this species. Threats in Australia identified in the Conservation Advice (DCCEEW 2024d) include: • habitat loss, fragmentation and degradation • habitat degradation caused by high-intensity grazing • climate change (drought, increase in frequency, scale or severity of fires) • invasive species Given the absence of habitat, the Proposed Action is unlikely to interfere substantially with the recovery of the species.
Conclusion
The Proposed Action is unlikely to significantly impact the Latham's snipe.

4.5 Painted Honeyeater (*Grantiella picta*)

4.5.1 Description

The painted honeyeater is a small to medium honeyeater with a wholly or mostly pink bill and almost wholly white underparts. The species is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. The largest population and almost all breeding records occur from south of 26 degrees south, on inland slopes of the Great Diving Range between the Grampians (Victoria) and Roma (Queensland).

The painted honeyeater makes seasonal north-south movements determined by fruiting mistletoe, before moving to semi-arid regions after breeding. The species is considered to have a single population, based on its dispersive habits.

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

The recovery plan for the painted honeyeater identifies Key Biodiversity Areas (KBAs) for the painted honeyeater being sites of critical importance to the long-term persistence of the Painted Honeyeater (DAWE 2021b). There are seven KBAs for the painted honeyeater in Australia including five in NSW:

- Binya and Cocoparra KBA is the Cocoparra National Park in the Riverina region, covering about 8,357 ha.
- Capertee Valley KBA which occurs partly in the Gardens of Stone National Park and Wollemi National Park.
- Goonoo KBA covers about 1034 km^2 of woodland, between the towns of Dubbo, Gilgandra and Dunedoo, which is partly within national park estate.

- Pilliga Forests/Scrub KBA covering over 5,000 km^2 of semi-arid woodland in temperate north-central NSW.
- South-west slopes of NSW and ACT KBA covers an area of 25,653 km^2 supporting significant wintering populations of a number of threatened species (DAWE 2021b).

The painted honeyeater is associated with PCT 58 within the Biodiversity Study Area. There is 638.19 ha (all condition types of PCT 58) of suitable habitat within the Biodiversity Study Area, of which 30.37 ha is within the Development Footprint and will be removed.

4.5.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Approved conservation advice for *Grantiella picta* (Painted Honeyeater) (DOE 2015c).
- Listing assessment information may be available in the approved Conservation Advice.
- National Recovery Plan for the Painted Honeyeater (*Grantiella picta*) (DAWE 2021b).
- No Threat Abatement Plan has been identified as being relevant for this species.

4.5.3 NSW Bilateral Agreement Requirements

The NSW bilateral assessment requirement considerations for the painted honeyeater are presented in **Table 4.9.**

Table 4.9 Painted Honeyeater SEARs Requirement Considerations

Item 16 Requirements		Painted honeyeater
i	Description of habitat	There is 635.28 ha (all condition types of PCT 58) of suitable habitat within the Biodiversity Study Area, of which 30.37 ha is within the Development Footprint and will be removed. Habitat critical to the survival of the painted honeyeater include: • Breeding habitat in boree/weeping myall, brigalow woodlands, box-gum woodlands and box-ironbark forest on the inland slopes of the Great Dividing Range. • Foraging habitat within known and likely foraging species particularly mistletoes of the genus *Amyema*. • Habitat for long term maintenance of the species including all KBAs for the painted honeyeater and suitable habitat in future climate change niches (DAWE 2021b). The Development Footprint is not within a KBA for the species. The Development Footprint supports marginal habitat for the painted honeyeater and is not considered habitat critical to the survival of the painted honeyeater.
ii	Survey methodology	Targeted species searches were not carried out specifically for the painted honeyeater as it is an ecosystem-credit species. However, Bird utilisation surveys undertaken seasonally from November 2022 to May 2024 and woodland bird surveys would have provided for detection of the species. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area.

Item 16 Requirements		Painted honeyeater
		Breeding occurs from October to March when mistletoe fruits are most available. However, almost all records of breeding come from south of 26ºS, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland. Four (4) of the seven (7) survey period occurred during the period during the species breeding season. This equates to 202 hours of survey. Additionally, a total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area. The Painted Honeyeater was not recorded during the bird surveys. This species may very occasionally disperse through the Biodiversity Study Area. Contemporary nearby records include a single bird adjacent the Murray River in Mildura in January 2017 (10 km west of the Biodiversity Study Area) and records from Merbein Common in 2005 and 2006 (18 km west of the Biodiversity Study Area).
iii	Construction impacts	30.37 ha of potential habitat is within the Development Footprint and will be removed.
iii	Operational impacts	The painted honeyeater has been assessed as having a low likelihood, minor risk of being impacted by turbine strike during the Project's operational phase.
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, including the painted honeyeater: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.10**. The assessment has concluded that the Proposed Action unlikely to have a significant impact on the species.
	Offsets required	As the painted honeyeater is an ecosystem credit species, impacts to this species would be offset through the retirement of the Proposed Action's credit obligation.

4.5.4 Significant Impact Criteria Consideration

For the purpose of this assessment the following assumptions have been made:

- The recovery plan (DAWE 2021a) defines habitat critical to the survival of the painted honeyeater as:
    - Known or likely breeding habitat in boree/weeping myall, brigalow woodlands, box-gum woodland and box-ironbark forest on the inland slopes of the Great Dividing Range.
    - All preferred foraging species particularly mistletoes of the genus Amyema growing on forest and woodland eucalypts and Acacias.
    - Habitat for long-term survival of the species being all key biodiversity areas with Painted Honeyeater as a trigger species and suitable habitat in future climate niches.
    - Key considerations in environmental impact assessments are that the painted honeyeater occurs across a large area and are known to be highly mobile however knowledge of their movement is not fully understood. Movement may be seasonal linked to plant productivity, food supply and drought impacts (DAWE 2021a).
- There are no defined important populations within the conservation advice. Painted honeyeater are widespread across mainland Australia and any individuals occurring within the Biodiversity Study Area would not belong to a key source population for breeding or dispersal, a population necessary for maintaining genetic diversity and are not near the limit of the species range. Therefore, any population occurring within the Biodiversity Study Area would not be considered an important population.

The significant impact criteria considerations for painted honeyeater are presented in **Table 4.10**.

Table 4.10 Significant Impact Criteria Considerations for Painted Honeyeater

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
The total number of individuals at the time of listing was estimated to be <10 000, based on an extrapolation of counts undertaken in areas of NSW and Victoria. The population is suspected to have declined by 20–29 per cent over the last three generations based on monitoring, a reduced area of occupancy and deteriorating habitat quality (DAWE 2021b). The Proposed Action will remove up to 30.37 ha of associated 'PCT 58 Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion' of potential habitat within the Development Footprint. The removal of this habitat is unlikely to have an adverse impact on the survival of painted honeyeater utilising foraging resources within, or dispersing through, the greater region, given that the removal of potential habitat within the Development Footprint is minimal and the high mobility of the species.
reduce the area of occupancy of an important population
The area of occupancy is estimated to be 1000 km^2 (DoE 2015c). The removal of 30.37 ha (0.3 km^2) of potential habitat would result in a <0.01% reduction of in the area of occupancy for the national population of this species. This is a negligible reduction in the area of the occupancy of this species. Any painted honeyeater occurring within the Development Footprint would not represent an important population, therefore the Proposed Action will not result in a reduction in the area of occupancy of an important population. .
fragment an existing important population into two or more populations
The Proposed Action will not fragment an existing population of painted honeyeaters into two or more populations given the species' mobility and distribution compared to the spatial extent of the Proposed Action.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
adversely affect habitat critical to the survival of a species
The recovery plan defines habitat critical to the survival of the painted honeyeater as: • Known or likely breeding habitat in boree/weeping myall, brigalow woodlands, box-gum woodland and box-ironbark forest on the inland slopes of the Great Dividing Range. • All preferred foraging species particularly mistletoes of the genus Amyema growing on forest and woodland eucalypts and Acacias. • Habitat for long-term survival of the species being all key biodiversity areas with painted honeyeater as a trigger species and suitable habitat in future climate niches (DAWE 2021b). The habitat to be removed is unlikely to be critical to the survival of the painted honeyeater given this species has not been recorded breeding or foraging in the Development Footprint.
disrupt the breeding cycle of an important population
Any painted honeyeater occurring within the Development Footprint would not represent an important population, and therefore the Proposed Action will not disrupt the breeding cycle of an important population. This species has not been recorded as part of extensive bird surveys between 2022 and 2024.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Proposed Action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the painted honeyeater is likely to decline. The Proposed Action will however modify the airspace within the Referral Area such that painted honeyeaters may be at risk of mortality resulting from blade strike whilst foraging at, or dispersing through, this area. The species was assessed as having a 'minor' risk of impact to blade strike and barotrauma within Appendix B of the BDAR (Umwelt 2024b).
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Recovery Plan (DAWE 2021b) recognises predation by invasive species such as the black rat (*Rattus rattus*) may pose a potential threat to painted honeyeaters. The Proposed Action is not likely to result in the black rat, or other invasive species that are harmful to the painted honeyeater, becoming established in its habitat.
introduce disease that may cause the species to decline
The approved conservation advice and recovery plan do not identify any disease that is a threat to the painted honeyeater. The Proposed Action is unlikely to result in the introduction of disease that may cause the painted honeyeater to decline.
interfere substantially with the recovery of the species
The recovery plan objectives are that by 2031: • There is a measured and sustained positive population trend in the number of mature individuals. • The extent, condition and connectivity of habitat of the painted honeyeater has been maintained or improved (CoA 2021a). The Proposed Action will lead to the removal of 30.37 ha of potential habitat for this species, however this minor reduction in suitable habitat is unlikely to substantially interfere with the recovery of the species.
Conclusion
The Proposed Action is unlikely to significantly impact the painted honeyeater.

4.6 Malleefowl (*Leipoa ocellata*)

4.6.1 Description

Malleefowl have been documented to be generalist feeders with a diet consisting of seeds, flowers, fruits, herbs, invertebrates, tubers, and fungi. The diet of malleefowl varies between locations and time of year. In habitats bordering croplands, malleefowl are often observed feeding on fallen grain at the edges of uncleared habitat and up to 100 m or so into cropland, and these foods may be crucial to the persistence of the birds in small reserves (Brickhill 1987; Storr 1991; Copley & Williams 1995).

In the semi-arid zone, where malleefowl densities are highest, the clearing of habitat has been the major cause of decline in the distribution of the species. Apart from removing much of the habitat supporting high densities of the species, this clearing has fragmented the distribution of malleefowl, and over much of its range the species now persists in small patches of habitat that are inadequate for its long-term conservation without careful planning and management (Benshemesh 2007).

Malleefowl are generally ground dwelling birds apart from when they are disturbed or to roost in the canopy (Frith 1962b). Various anecdotal reports suggest they use corridors of relatively thick vegetation when dispersing through open landscapes (Benshemesh 2007). While breeding pairs have been recorded to move several kilometres between nesting seasons, breeding birds have been found to typically remain sedentary, nesting in the same region for successive years (Frith 1959; Benshemesh 1992).

Malleefowl occur in a wide range of habitat types and habitat critical to the survival of the species is understood broadly. The habitat requirements of malleefowl anywhere in Australia are poorly understood and have as yet received limited study due to the difficulty of efficiently assessing the abundance of the birds at different sites. An abundance of leaf litter and sandy substrate have been documented as clear requirements in the construction of the birds' nesting mounds (Frith 1959, 1962a).

4.6.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- There is no approved Conservation Advice for this species.
- There is no Listing Advice for this species.
- National Recovery Plan for Malleefowl (Benshemesh 2007).
- The following threat abatement plans apply:
    - Threat abatement plan for predation by feral cats, Canberra, ACT: Commonwealth of Australia (CoA 2015b).
    - Department of the Environment and Energy (2017). Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*).
    - Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008a). Threat abatement plan for competition and land degradation by unmanaged goats.

- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b). Threat abatement plan for predation by the European red fox.

4.6.3 NSW Bilateral Assessment Requirement

The NSW bilateral assessment requirement considerations for the malleefowl are presented in **Table 4.11.**

Table 4.11 Malleefowl SEARs Requirement Considerations

Item 16 Requirements		Malleefowl
i	Description of habitat	Malleefowl are typically found in semi-arid to arid shrublands and low woodlands, particularly those dominated by mallee and/or acacias. Habitat for the Malleefowl has been identified in the Biodiversity Study Area associated with PCTs 170 and 171. There is 358.44 ha of potential habitat available within the Biodiversity Study Area of which 23.97 ha is proposed for removal within the Development Footprint. The malleefowl is known to occur in the adjoining Mallee Cliffs National Park (OEH 2018). The recovery plan has not mapped specific areas of habitat critical to the survival of the species (Benhsemesh 2007).
ii	Survey methodology	Targeted species search was not carried out specifically for the malleefowl as it is an ecosystem-credit species. However, extensive, bird utilisation surveys were undertaken seasonally from November 2022 to May 2024. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. Additionally, a total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area. The species was not recorded during bird surveys.
iii	Construction impacts	The proposed action is expected to remove 23.97 ha of vegetation from PCT 170 and 171, which the malleefowl is associated with. Therefore, the Proposed Action will impact on the foraging and potential breeding habitat of the species.
iii	Operational impacts	The overall risk rating for the malleefowl is considered Minor, based on a Low likelihood and Moderate consequence of collisions by turbine strike during the Project's operational phase.
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, include: • Minimise impacts to native vegetation.. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP.

Item 16 Requirements		Malleefowl
		Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.12**. The assessment has concluded that the Proposed Action is unlikely to have significant impact on the species.
	Offsets required	As the Malleefowl is an ecosystem credit species, impacts to this species would be offset through the retirement of the Proposed Action's credit obligation

4.6.4 Significant Impact Criteria Consideration

For the purpose of this assessment the following assumptions have been made:

- The recovery plan does not identify any important populations stating that no particular populations or general areas can be described as being of greater importance for the long-term survival of the malleefowl (Benshemesh 2007).
- The malleefowl has been recorded previously by others in the south west of the Project Area in 2001 and 2003 and has not been recorded during recent surveys (2022 to 2024). Most recent records are from the adjoining conservation reserve (Mallee Cliffs National Park).
- The Development Footprint provides marginal fragmented habitat, given the lack of recent records the Development Footprint is not considered to support an important population of the species.

The significant impact criteria considerations for malleefowl are presented in **Table 4.12** below.

Table 4.12 Significant Impact Criteria Considerations for Malleefowl

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
The estimated number of mature individuals in 2018 scorecard was 18,700 (National Environmental Science Program Threatened Species Research Hub 2019). Habitat for the malleefowl has been identified in the Development Footprint however the species has not been detected in the last two years. The malleefowl has recently been recorded in the adjoining conservation reserve. The Proposed Action will clear about 23.97 ha of potential habitat. The Proposed Action will not directly or indirectly impact the adjoining known habitat in the national park and is not anticipated to lead to a long-term decrease in the size of an important population of this species.
reduce the area of occupancy of an important population
Current and historic land use within the Biodiversity Study Area (removal of native vegetation for cropping and grazing) have reduced the value of the habitat for this species. The Development Footprint supports up to 23.97 ha of potential malleefowl habitat. The Proposed Action will not directly or indirectly impact the adjoining known habitat in the national park and is not anticipated to reduce the area of occupancy of an important population of this species.
fragment an existing important population into two or more populations
As the native vegetation in the Referral Area has already been greatly fragmented for current and historic agricultural practices, the Proposed Action is considered unlikely to fragment an existing population into two or more populations.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
adversely affect habitat critical to the survival of a species
As noted in the National Recovery Plan for Malleefowl (Benshemesh 2007), no populations or general areas have currently been described as being of greater importance for the long-term survival of malleefowl. The lower Murray Darling Depression is a known region which provides habitat to the malleefowl and the locality holds 12 records of this species. The Proposed Action will remove up to 23.97 ha of potential malleefowl habitat. The Proposed Action will not directly or indirectly impact the adjoining known habitat in the national park and is not anticipated to adversely affect habitat that is critical to the survival of the malleefowl.
disrupt the breeding cycle of an important population
The Proposed Action will remove up to 23.97 ha of potential habitat in the Development Footprint. The Proposed Action will not directly or indirectly impact the adjoining known habitat in the national park and is not anticipated to disrupt breeding cycle of an important population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The National Recovery Plan for Malleefowl (Benshemesh 2007) states that habitat reduction and fragmentation is a major threat to the malleefowl. The Proposed Action will remove up to 23.97 ha of potential malleefowl habitat. The Proposed Action is unlikely to significantly increase habitat fragmentations for the species. The Proposed Action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline the extent the species is likely to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
As noted in the National Recovery Plan for Malleefowl (Benshemesh 2007), predation by the introduced fox, and to a lesser extent, cats, is a major cause of mortality of malleefowl. The Proposed Action is unlikely to increase the likelihood of an invasive species becoming established in the species' habitat.
introduce disease that may cause the species to decline
There is no information on disease in wild malleefowl populations. As such, the Proposed Action is unlikely to introduce disease that may cause the species to decline.
interfere substantially with the recovery of the species
The main threats to malleefowl as noted in the Recovery Plan include: clearing, fragmentation and isolation, grazing, predation, fire (wildfire and intentional burns), disease, inbreeding, chemical exposure, and climate change. Due to the Proposed Action possibly further fragmenting existing malleefowl habitat with the removal of up to 23.97 ha of potential malleefowl habitat, the Proposed Action may interfere with the recovery of this species.
Conclusion
The Proposed Action is unlikely to have a significant impact on an important population of the malleefowl.

4.7 Blue-winged Parrot (*Neophema chrysostoma*)

4.7.1 Description

The Blue-winged Parrot is a slender parrot that breed on mainland Australia, south of the Great Dividing Range in southern Victoria from Port Albert in Gippsland west to Nelson, and sometimes in the far south-east of South Australia, and the north-western, central and eastern parts of Tasmania. The species is a partial migrant, with variable numbers of parrots migrating from Bass Straight in winter. During the non-breeding period, from autumn to early spring, birds are recorded from northern Victoria, eastern South Australia, south-western Queensland and western NSW, with some birds reaching south-eastern NSW and eastern Victoria, particularly on the southern migration (DCCEEW 2023e).

They inhabit a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. They generally favour grasslands and grassy woodlands and often found near wetlands and both near the coast and in semi-arid zones. The species has also been known to inhabit modified environments such as airfields, golf courses and paddocks. They breed in Tasmania, coastal south-eastern Australia and Southern Victoria in Spring and Summer. Nests are made in hollows and prefer a vertical opening in live or dead trees or stumps (DCCEEW 2023e).

4.7.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- Conservation Advice for *Neophema chrysostoma* (blue-winged parrot) (DCCEEW 2023e).
- Listing advice is provided in the Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- No Threat Abatement Plan has been identified as relevant for this species.

4.7.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the blue-winged parrot are presented in **Table 4.13** below.

Table 4.13 Blue-winged parrot SEARs Requirement Considerations

Item 16 Requirements		Blue-winged parrot
i	Description of habitat	No associated PCTs for the blue-winged parrot have been stated in the TBDC at the time of writing. Hence, it is conservatively assumed that they have the potential to use all PCTs within the Development Footprint as foraging habitat during the non-breeding season. Therefore, there is 993.72 ha of potential habitat within the Biodiversity Study Area, and 54.34 ha proposed for removal in the Development Footprint. Habitat critical to the survival of the blue-winged parrot includes: • Foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including: grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs.

Item 16 Requirements		Blue-winged parrot
		• Wetlands both near the coast and in semi-arid zones used for foraging and staging. • Eucalypt forests and woodlands within the breeding range in Tasmania, coastal southeastern South Australia and southern Victoria. • Live and dead trees and stumps with suitable hollows within the breeding range (DCCEEW 2023e). Any habitat mapped as known or likely should be considered habitat critical to the survival of the species. Potential habitat in the Development Footprint has been assessed as marginal foraging habitat due to disturbance from past land uses and fragmentation impacts except for a section of the proposed transmission line and absence of nesting sites. There is a moderate likelihood of the species occurring in the Development Footprint based on presence of records about five kilometres to the west in August 2022, about nine kilometres to the west in December 2022 and further west in June 2021. Habitat in the Development Footprint may be assessed as habitat critical to the survival of the species.
ii	Survey methodology	Targeted species search was not carried out specifically for the blue-winged parrot as it is an ecosystem-credit species. However, bird utilisation surveys were undertaken seasonally from November 2022 to May 2024 and woodland bird surveys would have provided for detection of the species throughout the seasons. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area to assess bird occurrence and flight behaviour across the Project Area. One (1) of the seven (7) survey period occurred during the autumn-early spring period, where the species is expected to occur in western NSW. This equates to 34.5 hours of survey. A total of 134 woodland bird surveys were conducted throughout the Project Area from November 2022–May 2024 to assess bird occurrence in areas of native vegetation in the Project Area The Blue-winged Parrot was not recorded during the Bird Utilisation Surveys.
iii	Construction impacts	54.34 ha of potential foraging habitat occurs within the Development Footprint and would be removed by the Proposed Action. The extent of occurrence and area of occupancy of this species are estimated to be 170,000 km^2, and 11,000 km^2 respectively. The removal of 54.34 ha is unlikely to have a significant impact on the Blue-winged Parrot.
iii	Operational impacts	The Blue-winged Parrot has been assessed as having a low likelihood and minor risk of being impacted by turbine strike during the Project's operational phase.
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, include: • Minimise impacts to native vegetation.. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation.

Item 16 Requirements		Blue-winged parrot
		• The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.14**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
	Offsets required	As Blue-winged Parrot is an ecosystem credit species, impacts to this species will be offset through the retirement of the Proposed Action's credit obligation.

4.7.4 Significant Impact Criteria Consideration.

For the purpose of this assessment the following assumptions have been made:

- There are no important populations defined within the conservation advice. Blue-winged parrots are widespread across south-eastern Australia and do not breed in NSW, therefore any individuals occurring within the Development Footprint would not belong to a key source population for breeding or dispersal, a population necessary for maintaining genetic diversity and are not near the limit of the species range. Hence, any population occurring within the Development Footprint would not constitute an important population.

The significant impact criteria considerations for blue-winged parrot are presented in **Table 4.14**.

Table 4.14 Significant Impact Criteria Considerations for Blue-winged Parrot

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
It is currently estimated that there are 10,000 (range 7,500–15,000) mature blue-winged parrots in the wild, with a declining trend (DCCEEW 2023e). Blue-winged parrots occurring within the Development Footprint would not represent an important population, therefore the Proposed Action will not lead to a long-term decrease in the size of an important population.
reduce the area of occupancy of an important population
The area of occupancy of this species is estimated to be 11,000 km^2 (range 9,000–19,000 km^2). Blue-winged Parrots occurring within the Development Footprint are not considered to represent an important population, therefore the Proposed Action will not reduce the area of occupancy of an important population. The area of occupancy of the national population of the blue-winged parrot is estimated to be 11,000 km^2, hence the removal of 54.34 (0.543 km^2) of suitable habitat would result in a < 0.01% reduction of the area of occupancy for this species. This is a negligible reduction in the area of occupancy of the national Blue-winged Parrot population.
fragment an existing important population into two or more populations
Blue-winged parrots occurring within the Development Footprint would not be considered to represent an important population, therefore the Proposed Action will not reduce the area of occupancy of an important population. The Proposed Action is unlikely to fragment the national blue-winged parrot population given that the species is highly mobile and suitable habitat is present throughout the surrounding region.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
adversely affect habitat critical to the survival of a species
Habitat within the Development Footprint is considered critical habitat, as it is mapped as likely habitat for the blue-winged parrot. Hence, the Proposed Action will adversely affect 54.34 ha of habitat critical to the survival of this species. While the Proposed Action will lead to the removal of some habitat critical to the survival of the species, large areas of habitat will remain within the Biodiversity Study Area. Much of the habitat throughout the blue-winged parrots distribution is likely to be considered habitat critical to the survival of the species. The removal of 54.34 ha of critical habitat is minor in comparison, and is unlikely to significantly impact on the Blue-winged Parrot.
disrupt the breeding cycle of an important population
Blue-winged parrots occurring within the Development Footprint are not considered to represent an important population, therefore the Proposed Action will not disrupt the breeding cycle of an important population. Further, the species does not breed within NSW, and therefore the Proposed Action will not disrupt the breeding cycle of the national blue-winged parrot population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Proposed Action will lead to the removal of 54.34 ha of suitable habitat. However, a large amount of suitable habitat will remain in the Biodiversity Study Area and adjoining Mallee Cliffs National Park. Hence, it is unlikely that the removal of suitable habitat will lead to the decline of the species. The Proposed Action would however modify the airspace above and around the wind farm such that blue-winged parrot may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area. The species was assessed as having a 'minor' risk of impact to blade strike and barotrauma within Appendix B based on a Low likelihood and Moderate consequence of collisions.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Conservation Advice states that predation by cats and foxes is a threat to the blue-winged parrot. Also, invasive weeds are considered to be a threat. The Proposed Action may lead to an increase in invasive species within the Development Footprint. Monitoring and management of invasive fauna and flora will be undertaken throughout the construction and operational phases of Proposed Action.
introduce disease that may cause the species to decline
The blue-winged parrot is susceptible to PBFD; a transmissible viral disease which impacts parrots. The Proposed Action is unlikely to result in the introduction of PBFD that may cause the blue-winged parrot to decline.
interfere substantially with the recovery of the species
There is currently no approved Recovery Plan for this species. The Conservation Advice identified that the primary conservation outcome is establish causes of recent declines and stable or increasing abundance across the distribution with priorities • to not clear habitat critical to the survival of the species, establish new habitat patches, promote ecological management of woodland protect • inappropriate fire regime management • restore degraded grassland and grassy woodlands habitat to support recovery (DCCEEW 2024d). The Proposed Action will impact 54.34 ha of potential habitat. However, it is not considered likely that the removal of 54.34 ha of suitable habitat will lead to a decline in the species, and therefore will not impact the recovery of the species.
Conclusion
The Proposed Action is unlikely to significantly impact the blue-winged parrot.

4.8 Corben's long-eared Bat (*Nyctophilus corbeni*)

4.8.1 Description

The south-eastern form of Corben's long-eared bat (*Nyctophilus corbeni*), also known as the south-eastern long-eared bat, is patchily distributed from southern central Queensland, central western NSW, through to north-west Victoria (TSSC 2015). It is listed as vulnerable under the EPBC Act. NSW accounts for about 50 per cent of the species known distribution (TSSC 2015c). Most records are inland from the Great Dividing Range with the Pilliga Scrub region a known stronghold for the species in NSW (TSSC 2015c). There are few records in Victoria which are from widely scattered locations in the Northern Plains and the Mallee regions (TSSC 2015c)

The species utilises a range of inland woodland habitats including box, ironbark, and cypress pine woodlands, bull oak woodland, Brigalow woodland, and black box woodland. In NSW it is distinctly more common in extensive stands of vegetation with a distinct tree canopy of box/ironbark/cypress pine vegetation along the western slopes and plains and a dense understorey (TSSC 2015c).

Corben's long-eared bat roosts solitarily, mainly in stag trees and dead limbs of living trees. In Victoria most bats are found in mallee eucalypts in areas of long unburnt mallee eucalypts, under bark or in fissures of dead buloke (*Allocasuarine leuhmannii*) or belah (*Casuarina cristata*) (TSSC 2015c). Maternity colonies of 10 to 20 individuals are in dead trees (TSSC 2015c).

4.8.2 Relevant guidelines and policy statements

Relevant guidelines and policy statements available for this species include:

- Conservation advice *Nyctophilus corbeni* south-eastern long-eared bat (TSSC 2015).
- Commonwealth listing advice on ten species of bats (TSSC 2001).
- There is no adopted or made Recovery Plan for this species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.

Other policy statements and guidelines: Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010).

4.8.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the Corben's long-eared bat are presented in **Table 4.15.**

Table 4.15 Corben's Long-eared Bat SEARs Requirement Considerations

Item 16 Requirements		Corben's long-eared bat
i	Description of habitat	Corben's long-eared bat is assessed as an ecosystem species under the NSW BAM and is associated with PCT 170 and 171, all condition zones. While not definitively recorded, calls of the species have been recorded as part of a species complex during BBUS surveys (refer to Section 8.4.1 Umwelt 2024b). Corben's long-eared bat was recorded in the Biodiversity Study Area as part of a species complex consisting of large-footed myotis/Corben's long-eared bat/lesser long-eared bat/Gould's long-eared bat and as *Nyctophilus* sp. on a combined total of 1,082 occasions in all seven four survey periods (Umwelt 2024b). This species has been recorded at Mallee Cliffs National Park. The conservation advice does not identify habitat that is critical for the survival of the species however the majority of records are associated with extensive stands of vegetation and large remnants are likely critical for Corben's long-eared bat (TSSC 2015c). While the current and historic land use within the Development Footprint (cropping of open grassland area and reduction in native vegetation extent) has greatly reduced the value of the habitat for this species, the Biodiversity Study Area and contiguous Mallee Cliffs National Park provide habitat critical to the survival of the species. Species may utilise airspace above the Development Footprint. The Biodiversity Study Area supports up to 358.44 ha of potential habitat, of which 23.97 ha will be impacted by the Proposed Action.
ii	Survey methodology	Microbat (microchiropteran) echolocation calls were sampled using various bat detector units (Chorus units). Microbat survey sites were established in proximity to vantage point locations. A total of 10 survey points were surveyed during the first year of BBUS. From October 2023, an additional five survey points were added in response to consultation with BCDS regarding BBUS methodology. Two bat detector units were installed on a met mast at heights of 50 m and 75 m. At height data was collected during every survey period since November 2022, except for October 2023 as a safety exclusion zone was established around the met mast which meant bat detectors could not be deployed during that period. The bat detectors were set out for a minimum of four nights, during each bird and bat survey event. Bat detectors were placed approximately two metres above ground level, positioned to face a cleared area or flyway. The bat detectors were set to night mode, where they recorded for a 12-hour period from 6 pm – 6 am.
iii	Construction impacts	The Proposed Action has potential to impact on the species through clearance of up to 23.97 ha of potential habitat.
iii	Operational impacts	Corben's long-eared bat may rarely fly at RSA height. There are no published records of blade strike of Corben's long-eared bats in the available literature in Victoria (Moloney et al. 2019), south-east NSW (BCS unpublished data) or NSW more broadly (Jacobs 2022). The majority of wind farms monitored to date in Victoria are located outside of this species' distribution. The overall collision risk rating for Corben's long-eared bat is Minor, based on a Moderate Low likelihood and Moderate consequence of collisions (refer to Section 8.4.1 of the turbine risk assessment, Appendix B of the BDAR (Umwelt 2024b)).
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, include: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area

Item 16 Requirements		Corben's long-eared bat
		• The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in **Section 7.0** and **Section 9.0** of the BDAR, **Table 9.1**, as well as **Section 5.0** of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.16**. The assessment has concluded that the Proposed Action is unlikely to have a significant impact on the species.
	Offsets required	As Corben's long-eared bat is an ecosystem credit species, impacts to this species will be offset through the retirement of the Proposed Action's credit obligation.

4.8.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The conservation advice for Corben's long-eared bat does not identify any important populations for the species (TSSC 2015c).
- The conservation advice does not identify habitat that is critical for the survival of the species however the majority of records are associated with extensive stands of vegetation and large remnants are likely critical for Corben's long-eared bat (TSSC 2015c). The Biodiversity Study Area and contiguous Mallee Cliffs National Park provide a large remnant of habitat that may support an important population.

The significant impact criteria considerations for Corben's long-eared bat are presented in **Table 4.16** below.

Table 4.16 Significant Impact Criteria Considerations for Corben's long-eared Bat

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Lead to a long-term decrease in the size of an important population of a species
The national population of Corben's long-eared bat is not fully quantified but is likely to be between 5,000 and 20,000 individuals (Pennay et al. 2011). The Conservation Advice (TSSC 2015c) for the species state that there is little information on the current population size and structure and determined that it has a declining population. The species roosts solitarily with maternity colonies of 10 to 20 individuals (TSSC 2015c). The Proposed Action has potential to impact on the species through clearance of up to 23.97 ha of potential roosting and foraging habitat and turbine strike and/or barotrauma associated with the wind farm. The Biodiversity Study Area supports 358.44 ha of potential roosting and foraging habitat, therefore 334.47 ha or 93 per cent of the habitat will not be impacted by the Proposed Action.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Given the large area of potential habitat that is to be avoided, the Proposed Action is unlikely to lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population
The area of occupancy for Corben's long-eared bat is undefined in the conservation advice for this species (TSSC 2015c). The Biodiversity Study Area supports 358.44 ha of potential roosting and foraging habitat. The Proposed Action will clear up to 23.97 ha, therefore 344.47 ha or 93 per cent of the habitat will not be impacted by the Proposed Action. Given the large area of potential habitat that is to be avoided, the Proposed Action is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations
The Development Footprint is clearing an area fragmented by agricultural practices and tracks. While it is noted that Corben's long-eared bat appears to be highly sensitive to fragmentation from wide-scale clearing for agriculture (Pennay et al 2011), clearance of potential habitat in the Development Footprint, is unlikely to fragment a population. Genetic exchange is likely to remain unaffected due to the highly mobile nature of the species. The Proposed Action will not fragment an existing important population of Corben's long-eared bat into two or more populations given the species' mobility and the spatial extent of the Proposed Action.
Adversely affect habitat critical to the survival of a species
The conservation advice does not identify habitat that is critical for the survival of the species however the majority of records are associated with extensive stands of vegetation and large remnants are likely critical for Corben's long-eared bat. The Proposed Action will clear up to 23.97 ha, therefore 334.47 ha or 93 per cent of the habitat will not be impacted by the Proposed Action. Further, the Development Footprint wind turbine generators are 700 m from the Mallee Cliffs National Park and the Proposed Action is unlikely to directly or indirectly habitat in the national park. It is unlikely that the Proposed Action will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population
There is little available information of Corben's long-eared bat reproductive biology, breeding is likely to be seasonal with maternity colonies of 10 to 20 individuals in dead trees (TSSC 2015c). Up to 23.97 ha of potential roosting and foraging habitat will be cleared in the Development Footprints.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Up to 23.97 ha of potential roosting and foraging habitat will be cleared in the Development Footprint. The habitat that will be removed is already highly fragmented and disturbed in nature due to the agricultural use of the land. The removal or modification of habitat for the transmission line, where there are large tracts of contiguous habitat, is unlikely to isolate or decrease the availability of habitat given the mobility of the species. The Proposed Action will remove or modify approximately 23.97 ha of potential roosting and foraging habitat within the Development Footprint which will cause minor loss, fragmentation and decrease in quality of potential habitats at a local scale but this is not expected to modify habitat for the species to the point where it will be at risk of further decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in Corben's long-eared bat habitat.
Introduce disease that may cause the species to decline, or
There are no diseases known to be a threat to the species.
Interfere with the recovery of the species.
There is no adopted recovery plan for this species. Conservation Advice (TSSC 2015c) identifies threats likely to substantially interfere with the survival of the species:

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
The Proposed Action is not expected to: • result in habitat loss and fragmentation • result in a reduction in hollow availability. • increase the likelihood of bushfires in and around the Development Footprint • increase the likelihood of exposure to agrochemicals • increase grazing activities in the Development Footprint • increase predation by feral animals.
Conclusion
The Proposed Action is unlikely to significantly impact Corben's long-eared bat.

4.9 Regent Parrot (eastern subspecies) (*Polytelis anthopeplus monarchoides*)

4.9.1 Description

Regent parrots generally forage on the ground in mallee vegetation, while also in mallee trees, vineyards, orchards, cereal crops and riparian woodlands and have been known to eat along roadsides on silt grain (Baker-Gabb and Hurley 2011). More specifically, in mallee woodlands, a large range of grass seeds, chenopods, daisies and eucalypts are consumed, including bluebushes (*Maireana erioclada*), (*Marieana gracilis*) and (*Maireana pentatropis*), climbing twinleaf (*Zygophyllum eremaeum*), red mallee (*Eucalyptus oleosa* subsp. *oleosa*), yorrell (*Eucalyptus gracilis*) and white mallee (*Eucalyptus dumosa*) (Burbidge 1985; Higgins 1999; Webster 2001; Webster & Belcher 2008a, b). In riparian woodlands, regent parrot consume seeds of daisies, grasses, bladder saltbush (*Atriplex vesicaria*), babaggia (*Osteocarpum acropterum*) and cats ear (*Hypochaeris radicata*) (Burbidge 1985; Webster 1993), as well as river red gum (*Eucalyptus camaldulensis*) and black box (*Eucalyptus largiflorens*) flower buds (Webster 2001; Webster & Belcher 2008a, b). Eastern Regent Parrots also feed on cereal crops including oats, triticale, barley, rye and wheat (Baker-Gabb and Hurley 2011).

The total adult breeding population of eastern regent parrots is estimated at 1,500 pairs, with 600 in NSW, 500 in Victoria and 400 in South Australia (Baker-Gabb and Hurley 2011). The eastern regent parrot occurs in the lower Murray-Darling basin region of South Australia, New South Wales and Victoria, in an area roughly bounded by Murray Bridge (South Australia), Pooncarie (NSW), Swan Hill and Dimboola (Vic), in the Murray Darling Depression and Riverina IBRA bioregions (Baker-Gabb and Hurley 2011).

Within this broad distribution, there are three separate breeding areas:

1. The Wimmera River drainage system in Victoria, predominantly in Wyperfeld National Park Lake Albacutya and Lake Hindmarsh.
2. The lower Murray River, upstream from Swan Reach in South Australia to north-western Victoria (Lindsay Island).
3. The mid Murray River in Victoria and NSW, between Red Cliffs (south-east of Mildura) and Piangil, including the lower Murrumbidgee and Wakool Rivers in NSW.

There is a gap of about 150 km (between Lindsay Island and Mildura) between the two breeding areas along the Murray River. This area contains large areas of unsuitable saltbush plains rather than mallee near the river (Baker-Gabb and Hurley 2011).

The eastern regent parrot breeds almost entirely in river red gum forest and woodland, and all known breeding colonies are located along the Murray River, lower Wakool River, lower Murrumbidgee and Wimmera River floodplains or associated anabranch creeks and lakes. A small colony in Wyperfeld National Park (Victoria) nests in slender cypress pine (*Callitris gracilis* ssp. *gracilis*) (Baker-Gabb and Hurley 2011).

During the breeding season, eastern regent parrots feed mostly in large blocks of intact mallee woodlands within 20 km (usually 5–10 km) of nest sites, with areas containing red/grey mallee (*Eucalyptus socialis*), or ridge-fruited/yellow mallee (*Eucalyptus incrassate*) apparently favoured (Baker-Gabb and Hurley 2011).

Nesting is restricted to stretches of mature riverine forest within 20 km of suitable feeding habitat, because male regent parrots are limited by their need to make at least 2–3 return trips per day to feed nesting females. Some birds appear to move away from their riverine breeding areas and will use mallee woodlands for foraging up to 100 km from the river, although other birds remain closer to the river throughout the year (Baker-Gabb and Hurley 2011).

Eastern regent parrots are reluctant to fly over open areas where they are vulnerable to predation by raptors, particularly during the breeding season. Corridors of vegetation between nesting and foraging sites are therefore essential for bird movement. Birds will use remnant woodlands along roadsides or in farm paddocks for movement and occasionally foraging, and rarely use more extensively cleared areas (Baker-Gabb and Hurley 2011).

The records of the regent parrot within the Biodiversity Study Area are presented in **Figure 4.5**.

4.9.2 Relevant Guidelines and Policy Statements

Relevant guidelines and policy statements available include:

- There is no approved Conservation Advice for this species.
- There is no Listing Advice for this species.
- National Recovery Plan for National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides* (Baker-Gabb and Hurley 2011).
- Threat abatement plan for competition and land degradation by rabbits.

4.9.3 NSW Bilateral Assessment Requirements

The NSW bilateral assessment requirement considerations for the regent parrot are presented in **Table 4.17**.

Table 4.17 Regent Parrot SEARs Requirement Considerations

Item 16 Requirements		Regent parrot
i	Description of habitat	Habitat for the regent parrot has been identified in the Biodiversity Study Area associated with PCTs 58, 170 and 171. There is 1,023.72 ha of potential habitat available within the Biodiversity Study Area. 54.34 ha of suitable foraging habitat for this species is proposed for removal within the Development Footprint. The Development Footprint does not occur within one of the three separate breeding areas (Baker-Gabb and Hurley 2011) with one of the two breeding areas along the Murray River occurring approximately 150 km upstream of Mildura and the second downstream of Mildura. The Development Footprint is unlikely to provide breeding habitat. The regent parrot has a large range at the species level however a relatively high proportion of the eastern subspecies' population is concentrated along the Murray River and its tributaries. Given the Biodiversity Study Area's location relative to the Murray River and the findings of the bird surveys conducted at the site to date it is unlikely that a high proportion of this species' population regularly flies through the Biodiversity Study Area. Habitat critical to the survival of the eastern regent parrot contains all known sites for nesting, food resources, water, shelter, essential travel routes, dispersal, and buffer areas, and is defined in the species' Recovery Plan as all potential eastern regent parrot habitat within its 'current normal range' (Baker-Gabb and Hurley 2011). The Development Footprint provides foraging habitat but is not a known nesting site and occurs to the north of dispersal routes for the species along the Murray River. The Development Footprint provides non-breeding foraging habitat.
ii	Survey methodology	Under the NSW BAM, the regent parrot is assessed as a species credit species and ecosystem credit species. As an ecosystem credit species, the regent parrot is assumed present associated with PCTs 58, 170 and 171. As a species credit species surveys are required to identify breeding habitat. These searches are required between August and November focusing on living or dead river red gum (*Eucalyptus camaldulensis*) with hollows greater than 5 cm diameter, greater than 5 m above the ground or trees with DBH of greater than 40 cm, within 1 km of watercourses or billabongs. Surveys for the regent parrot have been undertaken between September 2022 and January 2024 using opportunistic habitat searches, BBUS and diurnal bird surveys. Targeted and opportunistic searches for regent parrot and breeding sites/trees were undertaken across the Biodiversity Study Area. Opportunistic searches were undertaken concurrently during all biodiversity survey effort across the Biodiversity Study Area. Where suitable habitat was identified, GPS location, tree species, hollow size and location (spout, trunk, branch) were recorded within digital survey platforms. Any hollows within suitable size for either species were revisited often during concurrent biodiversity surveys, to investigate for any changes in occupation with the latest re-visit being in August 2024 concurrent with winter BBUS. however, bird utilisation surveys were undertaken seasonally from November 2022 to May 2024. A total of 491 vantage point surveys were conducted across 15 sites in the Project Area from November 2022–May 2024 to assess bird occurrence and flight behaviour across the Project Area. Two (2) of the seven (7) survey period occurred within the Regent Parrot breeding period (August-December) and equants to a total of 94.5 survey hours. Diurnal bird surveys occurred in November 2022 and October 2023. Diurnal bird surveys were conducted across a 20-minute period, the methodology consists of searching woodland habitat across an approximately 2-ha area, meandering slowly and recording all visual and aural observations of birds. Surveys were undertaken by two observers experienced in identifying birds in the region.

Item 16 Requirements		Regent parrot
		Regent parrot was recorded on three occasions on the south-eastern boundary of the Project Area during the 2022 – 2024 surveys, including once during vantage point surveys and twice incidentally.
iii	Construction impacts	The proposed action is expected to remove 54.34 ha of vegetation from PCT 58, 170 and 171, of which the regent parrot is associated with. Habitat in the Development Footprint it likely to be foraging habitat only with breeding concentrated in habitats to the south east and south west along the Murray River.
iii	Operational impacts	As the regent parrot is considered likely to occasionally fly at RSA height, collision with wind turbines while foraging or dispersing through Referral Area is a possible impact. The overall risk rating for the regent parrot is considered Moderate, based on a Moderate likelihood and Moderate consequence of collisions (Table 8.18 Appendix B of the BDAR) by turbine strike during the Project's operational phase.
iv	MNES specific avoidance and mitigation measures	Specific design refinements made by Spark Renewables during the development of the BDAR to avoid and minimise impacts to biodiversity values, include: • Minimise impacts to native vegetation. • Relocation of WTGs away from the edges of the larger remnant native vegetation on the periphery of the Project Area, to reduce interaction with higher quality vegetation on the margins of the Project Area • The Development Footprint Buffer between the eastern-most WTG and Mallee Cliffs National Park has increased to 700 m from blade tip. • Spark Renewables has opted to use existing access tracks and local roads to prevent further impacts to remnant vegetation • Transmission line in the southern portion of the Development Footprint has been co-located adjacent to an existing access road to minimise any increase in edge effects to the remnant vegetation. • The implementation of environmental management plans and strategies including: Biodiversity Management Strategy to minimise the residual impacts of the project, A Construction Management Plan (CEMP), Operational Environmental Management Plan (OEMP), Biodiversity Management Plan (MP) and BBAMP. Further details of avoidance, mitigation and management measures are provided in Section 7.0 and Section 9.0 of the BDAR, Table 9.1, as well as Section 5.0 of this MNES Report.
v	Residual impact	An AoS has been provided in **Table 4.18.** The assessment has concluded that the Proposed Action will potentially have a significant impact on the species.
	Offsets required	The regent parrot is a dual credit species, offsets can be either species credit or ecosystem credit, depending on the type of habitat being impacts. While flocks of the regent parrot have been recorded flying through the Biodiversity Study Area near Mallee Cliffs National no evidence of breeding was recorded. The species is assumed to be present onsite as an ecosystem species. As such, impacts to this species will be offset through the retirement of the Proposed Action's credit obligation.

4.9.4 Significant Impact Criteria Consideration

For the purpose of this assessment the following assumptions have been made:

- The recovery plan does not identify any important populations of the regent parrot. Within this broad distribution, there are three separate breeding areas of which two occur along the Murray River upstream and downstream of Mildura. These areas would support important populations of the regent parrot.
- Given the Development Footprint's location relative to the Murray River and the findings of the bird surveys conducted at the site to date it is unlikely that a high proportion of this species' population regularly flies through the Development Footprint and the Development Footprint is unlikely to support an important population of the regent parrot.

The significant impact criteria considerations for regent parrot are presented in **Table 4.18** below.

Table 4.18 Significant Impact Criteria Considerations for Regent Parrot

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
The 2011 recovery plan identifies that the total breeding population of the eastern regent parrot was estimated at 1,500 pairs (Baker-Gabb and Hurley 2011). The regent parrot has a large range at the species level however a relatively high proportion of the eastern subspecies' population is concentrated along the Murray River and its tributaries. Given the Biodiversity Study Area's location relative to the Murray River and the findings of the bird surveys conducted at the site to date it is unlikely that a high proportion of this species' population regularly flies through the Biodiversity Study Area. The regent parrot is likely to only rarely fly at RSA and only occasionally fly through or forage in the Biodiversity Study Area as it is likely to concentrate along the Murray River, 10 km to the west of the Biodiversity Study Area. Operation of the wind farm may impact the species. The lack of information regarding their level of susceptibility to blade strike in Australia, and more specifically a lack of quantitative information on the proportion of individuals that fly at RSA height at a location with turbines likely to be impacted by blade strike means that there is a high level of uncertainty when estimating the actual likely number of individuals that may be impacted.
reduce the area of occupancy of an important population
The area of occupancy of the regent parrot has not been defined in the recovery plan. Important populations of the regent parrot occur along the Murray River approximately 150 km upstream of Mildura and downstream of Mildura in two of the three key breeding areas. The Proposed Action would not reduce the area of occupancy of these important populations.
fragment an existing important population into two or more populations
The Development Footprint supports foraging habitat for this species but does not support suitable breeding habitat, and it is considered unlikely that a high proportion of the species population regularly flies through the Development Footprint with most movement of the species along the Murray River. Therefore, it is unlikely that the Proposed Action will fragment an existing important population into two or more populations.
adversely affect habitat critical to the survival of a species
The habitat critical to the survival of the eastern regent parrot contains all known sites for nesting, food resources, water, shelter, essential travel routes, dispersal, and buffer areas, and is defined in the species' recovery plan as all potential eastern regent parrot habitat within its 'current normal range' (Baker-Gabb and Hurley 2011). The Proposed Action will remove up to 54.34 ha of potential regent parrot foraging habitat. The Development Footprint may contain foraging habitat and travel routes. The Proposed Action is unlikely to adversely affect habitat critical to the survival of the species.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
disrupt the breeding cycle of an important population
The Development Footprint does not support suitable breeding habitat. The Proposed Action is unlikely to disrupt the breeding cycle of an important population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
As the species is associated with PCTs recorded and has been observed numerous times in the south of the Biodiversity Study Area, it can be assumed that the removal of the 54.34 ha will alter quality habitat. However, as the amount proposed for removal does not contain suitable breeding habitat and is considered small in proportion to the suitable foraging habitat of the greater area, it is unlikely that the Proposed Action will modify, destroy, remove, or isolate or decrease the availability or quality of habitat for the regent parrot.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
As stated in the National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides* (Baker-Gabb and Hurley, 2011), while the impact of predation on the eastern regent parrot is currently unknown, it is understood that ground-foraging leaves birds vulnerable to introduced predators. Furthermore, the European weeping willow (*Salix babylonica*) is known to compete with river red gum which can reduce the availability of nest trees. The Proposed Action is unlikely to increase the likelihood of an invasive species becoming established in the species' habitat.
introduce disease that may cause the species to decline
The Proposed Action is considered unlikely to introduce disease that may cause the species to decline.
interfere substantially with the recovery of the species
Key threats include clearing and degradation of mallee woodland, loss of habitat and flyways, timber harvesting of river red gums, altered hydrological regimes, fires, disturbance around nesting colonies, competition from invasive plants, human-caused mortality, take from the wild, and predation. The Proposed Action will remove up to 54.34 ha of potential regent parrot foraging habitat this is unlikely to interfere with the recovery of this species.
Conclusion
The Proposed Action is unlikely to have a significant impact on the regent parrot.

5.0 Migratory Species

5.1 International obligations for Migratory Species

The EPBC Act is the key mechanism for meeting Australia's obligations and responsibilities under a number of international agreements.

5.1.1 Convention on International Trade in Endangered Species of Wild Fauna and Flora

The EPBC Act regulates movements of animals, plants and products to and from Australia. The EPBC Act helps to protect the environment from risks associated with the international movement of wildlife. It is how Australia meets its obligations under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments that aims to ensure that the international trade in wildlife does not threaten wild populations of plants and animals.

The Proposed Action does not provide for trade or movement of animals or plants protected under CITES and is not inconsistent with Australia's obligations under CITES.

5.1.2 The Apia Convention

The main objective of the Convention on Conservation of Nature in the South Pacific (Apia Convention) is to commit the parties to take action for the conservation, utilisation and development of natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations. The purpose of the Apia Convention is to encourage the creation of protected areas, national parks and reserves and to commit to not alter national parks so as to reduce their area except after the fullest investigations.

The Apia Convention was suspended with effect from 13 September 2006 and many of the commitments in the Apia Convention have been superseded by commitments under the Convention on Biological Diversity, 1992.

The Proposed Action Area is directly to the west of the Mallee Cliffs National Park. The Mallee Cliffs National Park is reserved under the NSW National Parks and Wildlife Act 1974 (NPW Act). The objectives in the Plan of Management include:

- Ensure that the park is managed to retain an important place in the network of conserved lands (mallee land systems) in western NSW.
- Protect and where necessary restore a healthy, stable, representative sample of mallee and belah ecosystems of south-west NSW.
- Protect and restore threatened and rare plant communities, native animal populations and rare and threatened species.
- Manage the park (fire and pests) to conserve and maintain semi-arid ecosystems.
- Look after our culture and heritage (OEH 2018).

The Mallee National Park covers about 58,000 ha and was reserved in March 1977 for the purposes of protecting mallee land systems (OEH 2018). In 2017, the reintroduction of locally extinct mammals project under the NSW Saving our Species program commenced in the park with an area of approximately 9,570 ha in the south-west of the park (adjacent to the Proposed Action Area), enclosed with a predator proof fence (OEH 2018). This area is managed by the Australian Wildlife Conservancy (AWC) in partnership with NSW National Parks and Wildlife Service. The program began in October 2019 with the release of the greater bilby (*Macrotis lagotis*), the greater stick-nest rat (*Leporillus conditor*) in September 2020, numbats (*Myrmecobius fasciatus*) in December 2020, brush-tailed bettongs (*Bettongia penicillata penicillata*) in September 2021, the vulnerable red-tailed phascogales (*Phascogale calura*) in November 2021, Mitchell's hopping mouse in July 2022 (AWC 2024). The vulnerable malleefowl (*Leiopoa ocellata*) is known to occur naturally in the national park.

The Proposed Action has been designed to avoid direct and indirect impacts to the Mallee Cliffs National Park. A literature review identified that the minimum distance from the tip of the wind turbine blade from woodlands and forests that provide habitats for microbats is 200 m (Rodrigues et al 2015). Accounting for wind turbine blade length, the recommended buffer to the wind turbined generator is 300 m. No wind turbine generators are located within 300 m of the Mallee Cliffs National Park with the closest wind turbine generators located approximately 800 m from the Mallee Cliffs National Park (refer to Figure 8.3 of the BDAR (Umwelt 2024a)) (700 m to blade tip).

5.1.3 Convention on Biological Diversity

The Convention on Biological Diversity 1992 is dedicated to the conservation of biological diversity, sustainable use of biodiversity components and sustainable development. The Convention identifies a common problem, sets overall goals and policies, and identifies general obligations for signatory countries. Under the Convention, governments undertake to conserve and sustainably use biodiversity. Obligations include:

- Development of national biodiversity strategies and action plans to be integrated into broader national plans for environment and development.
- Identifying and monitoring the important components of biodiversity that need to be conserved and used sustainably.
- Establishing protected areas to conserve biodiversity while promoting environmentally sound development around these areas.
- Rehabilitation and restoring degraded ecosystems and promoting the recovery of threatened species in collaboration with local residents.
- Respecting, preserving and maintaining traditional knowledge of the sustainable use of biodiversity.
- Preventing the introduction of, controlling, and eradicating alien species that could threaten ecosystems, habitats or species.
- Controlling the risks posed by organisms modified by biotechnology.
- Promoting public participation, particularly in assessing environmental impacts of developments that threaten biodiversity.

- Education and reporting on goals (Secretariat of the Convention of Biological Diversity 2000).

Australia's Biodiversity Conservation Strategy 2010-2030 (CoA 2010) has been developed to meet these obligations. The strategy identifies national priorities for action to help stop the decline of Australia's biodiversity (engaging all Australians in biodiversity conservation, building ecosystem resilience in a changing climate and getting measurable results) and is the guiding policy framework for the governments and private sector approach to biodiversity conservation.

The strategy, identifies the main threats to Australia's biodiversity as:

- habitat loss, degradation and fragmentation
- invasive species
- unsustainable use and management of natural resources
- changes to the aquatic environment and water flows
- changing fire regimes
- climate change.

These threats are inherently considered in the assessment of impact of the Proposed Action on MNES and in the environmental impact assessment framework of the EPBC Act and BC Act. The Proposed Action will result in and/or exacerbate some of these threats to biodiversity particularly habitat loss, degradation and fragmentation. Through detailed design the extent of these threats may be avoided and minimised. Implementation of management plans will minimise these threats.

Building ecosystem resilience to climate change is recognised in the strategy as a national priority action. Climate change is increasing the rate at which we are losing biodiversity by amplifying existing pressures and introducing new threats, particularly long-term changes in rainfall and temperature patterns, rising sea levels, and changes to frequency and severity of extreme events (CoA 2010). Transition from reliance on fossil fuel energy sources to renewable energy is fundamental to reducing human-induced elements of climate change. Maintaining and building resilience in ecosystems is the other main way to improve chances of a reasonable future for biodiversity (CoA 2010). This is to be achieved through reducing impacts of existing threats and maintaining large areas of linked habitat.

The Proposed Action has been designed to avoid and minimise clearance of large tracts of native vegetation and higher quality patches. As described in Section 7 of the BDAR (Umwelt 2024a), broadly speaking, much of the Development Footprint occurs where the connectivity of native vegetation and habitat corridors has been previously compromised by agricultural land uses.

The Australia's Biodiversity Conservation Strategy 2010–2030 was reviewed, and the updated strategy was released in 2017. Australia's Strategy for Nature 2019–2030 (CoA 2019) is the overarching framework for all national, state/territory and local strategies, legislation, policies and actions that target nature (CoA 2019). The Strategy for Nature has three priority goals. Relevant to the Proposed Action is the goal of care for nature in all diversity. The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them.

All environmental components, ecosystems and habitat values potentially affected by the Proposed Action have been assessed in the BDAR (Umwelt 2024a) which includes detailed measures to avoid and minimise impacts to biodiversity.

5.1.4 Bilateral Agreements

Australia entered into bilateral agreement to conserve migratory birds in the East Asian – Australasian Flyway with Japan (Japan-Australia Migratory Bird Agreement (JAMBA)), China (China-Australia Migratory Bird Agreement (CAMBA)) and the Republic of Korea (Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)) for:

- Protection and conservation of migratory birds and their important habitats.
- Protection from take or trade.
- The exchange of information and building cooperative relationships.

The EPBC Act gives effect to Australia's obligations to pursuing conservation outcomes for migratory birds of these agreements through the protection of migratory bird species listed under the Act and under these agreements.

There are a number of MNES relevant to the Proposed Action that are listed as migratory species under these bilateral agreements.

- The majority of the migratory species predicted to occur in the Development Footprint of the Proposed Action are species reliant on wetland habitats external to the Development Footprint in the region but may fly through the area and have been assessed for risk of turbine collision in Appendix B (Umwelt 2024b) of the BDAR. This includes the:
    - sharp-tailed sandpiper (*Calidris acuminata*) - assessed as threatened species (refer to **Section 4.2**)
    - curlew sandpiper (*Calidris ferruginea*) - assessed as threatened species (refer to **Section 3.2**)
    - pectoral sandpiper (*Calidris melanotos*) - assessed as migratory species (refer to Section **5.2.2**)
    - red-necked stint (*Calidris ruficollis*) - assessed as threatened species (refer to Section **5.2.3**)
    - Latham's snipe (*Gallinago hardwickii*) - assessed as threatened species (refer to **Section 4.4**)
    - common greenshank (*Tringa nebularia*) - assessed as threatened species (refer to **Section 3.6**)
    - marsh sandpiper (*Tringa stagnatilis*) - assessed as migratory species (refer to Section **5.2.6**).

The assessments of impact for these species as threatened or migratory species has considered the guidance in EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (CoA 2017).

- Two seabirds have been predicted to fly through the operating Proposed Action Area:
    - Caspian Tern (*Hydroprogne caspia*) - assessed as migratory species (refer to Section **5.2.5**)
    - Gull-billed Tern (*Gelochelidon nilotica*) - assessed as migratory species (refer to **Section 5.2.4**).

The only migratory species observed in the Proposed Action Area is the fork-tailed swift (*Apus pacificus*). As a largely aerial species the assessment is focused on risks associated with the wind turbine collision (refer to **Section 5.2.1**).

5.1.5 The Bonn Convention

Australia is signatory to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The Bonn Convention provides a global platform for the conservation and sustainable use of migratory species and their habitats and migration routes.

The convention definition of migratory species is 'the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries'. This definition has been adopted in the EPBC Act.

The Bonn Convention prioritises protection of migratory species listed in Appendix I of the Convention as threatened with extinction, protecting these animals, conserving or restoring their habitats and mitigating obstacles to migration. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II of the Bonn Convention.

MNES assessed that are listed under the Bonn Convention include sharp-tailed sandpiper (*Calidris acuminata*), curlew sandpiper (*Calidris ferruginea*), pectoral sandpiper (*Calidris melanotos*), Latham's snipe (*Gallinago hardwickii*), red-necked stint (*Calidris ruficollis*), common greenshank (*Tringa nebularia*) and marsh sandpiper (*Tringa stagnatilis*). None of these species are listed individually in Appendix I of the Bonn Convention but are listed as A2H that is as a member of a family listed in Appendix II of the Bonn Convention as species that are native to Australia and are known to be cyclical and predicable migrants into and out of Australia.

5.2 Operational impacts - migratory species

5.2.1 Fork-tailed Swift or Pacific swift (*Apus pacificus*)

The fork-tailed swift is listed as a migratory species under the CAMBA, JAMBA, and ROKAMBA, and listed as both a migratory and marine species under the EPBC Act. This species is a non-breeding migrant to Australia in October, and more rarely September (BirdLife 2023a).

The fork-tailed swift is almost exclusively aerial, ranging from heights of one metre to 300 metres and higher, regularly flying at RSA height (BirdLife 2023a). The fork-tailed swift is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed. Within Australia, this species largely occurs over inland plains but sometimes above foothills or in coastal areas, often over cliffs, beaches, islands, and sometimes seen well out to sea (BirdLife 2023a). The fork-tailed swift mostly occurs over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, treeless grassland and sandplains covered with spinifex, open farmland, and inland and coastal sand-dunes (BirdLife 2023a).

For the purposes of this assessment:

- an area of 'important habitat' for a migratory species is non-breeding habitat only: found across a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial (DoEa 2015)
- ecologically significant proportions of the fork-tailed swift is 1000 (internationally significant) or 100 individuals (nationally significant) (DoEa 2015)

Fork-tailed swift was recorded on two occasions in the Proposed Action Area during the 2022–2024 surveys. Both observations were recorded during vantage point surveys. The first observation was of one individual flying at 20 m above ground level (AGL) during a morning survey at vantage point (VP)1 on 8 November 2022. The second observation was of a flock of 20 birds flying at approximately 90 m AGL during a midday survey at VP6 on 16 February 2023.

Fork-tailed swift population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) (BirdLife International 2024c).

The Proposed Action Area supports important habitat but given low numbers of sightings it is unlikely to support an ecologically significant proportion of the population of the fork-tailed swift. Operation of the Proposed Action is unlikely to have a significant impact on fork-tailed swift.

5.2.2 Pectoral Sandpiper (*Calidris melanotos*)

The pectoral sandpiper is listed as migratory under the Bonn Convention, JAMBA, and ROKAMBA, and listed as both migratory and marine under the EPBC Act. This species is typically a regular visitor to Australia, but in small numbers.

In Australasia, pectoral sandpiper is usually found in shallow fresh to saline wetlands, typically coastal or near coastal, but occasionally farther inland. These include coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands (BirdLife 2023b). In NSW the pectoral sandpiper is widespread in the Riverina and in Victoria, in the valley of Murray River between Kerang and Piangil.

The Proposed Action Area does not contain any suitable roosting or feeding habitat. It is unlikely to be an area of important habitat as defined by the shorebird guidelines (CoA 2017) as no roosting or feeding habitat and no records of the species.

The pectoral sandpiper may very rarely disperse through the Project Area given there is suitable habitat present in the Mildura area. The most recent nearby record is of an individual adjacent Mildura Airport in February 2019 (17 km west of the Project Area). The nearest records are from Gol Gol Swamp in 1986 and 1983.

The Proposed Action is unlikely to have a significant impact on pectoral sandpiper.

5.2.3 Red-necked Stint (*Calidris ruficollis*)

The red-necked stint is listed as migratory under the Boon Convention, CAMBA, JAMBA, and ROKAMBA, and listed as both migratory and marine under the EPBC Act. In Australasia, this species is typically coastal, occurring in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats; often near spits, islets and banks; sometimes on protected sandy or coralline shores (BirdLife 2023c). The red-necked stint usually forage on bare wet mud on intertidal mudflats or sandflats, or in very shallow water mostly in areas with film of surface water, close to edge of water; also, though less often, in very shallow water, <2.5 cm deep and ≤30 cm from edge of water (BirdLife 2023c).

The population of red-necked stint visiting Australia is estimated at 353,000 individuals. The red-necked stint arrives to Australia in late August with large numbers appearing in September. The species then leaves in early March to mid-April.

The Project Area does not contain any suitable roosting or feeding habitat however red-necked stint may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site. Red-necked stint has been recorded at over 20 locations within 50 km of the Project Area, with a particularly high number of records in the Mildura area. Recent records include an observation of approximately 240 birds at Mourquong Saltworks (13 km west of the Project Area) in March 2024. A flock of approximately 200 birds was also recorded at this site in February 2017. Large numbers (up to 500 birds) were recorded at Lake Ranfurly in Mildura in 2023. This species has also been recorded at Gol Gol Swamp, Lake Hawthorn, Kings Billabong Wildlife Reserve and at the Mildura Wastewater Treatment Plant.

The Proposed Action is unlikely to have a significant impact on red-necked stint.

5.2.4 Gull-billed tern (*Gelochelidon nilotica*)

The gull-billed tern is listed as migratory under CAMBA and listed as both migratory and marine under the EPBC Act. This species breeds in warmer parts of the world in southern Europe, temperate and eastern Asia, both coasts of North America, eastern South America. The gull-billed tern breeds in colonies on lakes, marshes and coasts (ALA 2024). Important habitat for this species is likely to be wetlands external to the Proposed Action where the species forage and roost. No Important habitat is known to occur in the Proposed Action Area.

5.2.5 Caspian tern (*Hydroprogne caspia*)

The Caspian tern is listed as migratory under JAMBA and listed as both migratory and marine under the EPBC Act. This species usually occurs in sheltered coastal bays, including harbours, lagoons, inlets, bays, estuaries and river deltas, usually with sandy or muddy margins (BirdLife 2023d).

The Caspian tern typically forage in open wetlands, including lakes and rivers, often preferring sheltered shallow water near margins; also in open coastal waters (BirdLife 2023d). This species breeds irregularly in some areas with a generally widespread foraging distribution, mainly at scattered coastal sites, but occasionally inland. Important habitat for this species is likely to be wetlands external to the Proposed Action where the species forage and roost.

The Proposed Action is unlikely to have a significant impact on Caspian tern.

5.2.6 Marsh sandpiper (*Tringa stagnatilis*)

The marsh sandpiper is listed as migratory under the Bonn Convention, CAMBA, JAMBA, and ROKAMBA, and listed as both migratory and marine under the EPBC Act. This species occurs in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats; also, regularly at sewage farms and saltworks (BirdLife 2023e). The species typically forage in shallow water at edge of wetlands (BirdLife 2023e). Important habitat for this species is likely to be wetlands external to the Proposed Action where the species forage and roost.

The marsh sandpiper migratory population in Australia is estimated at 9000 individuals. The species migrates to Australia in the non-breeding season in September. While there are movements during this period, individuals may remain at sites for up to at least three weeks (BirdLife 2023e).

The Proposed Action is unlikely to have a significant impact on marsh sandpiper.

5.2.7 Significant Impact Criteria Consideration for Migratory Species

The significant impact criteria considerations for migratory species are presented in **Table 5.1.**

Table 5.1 Significant Impact Criteria Considerations for Migratory Species

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
The Proposed Action will clear 54.34ha of terrestrial habitat that only provides potential habitat for the aerial fork-tailed swift. The Proposed Action does not fragment, alter nutrient cycles or hydrological cycles of wetland habitats that may support migratory shorebirds or seabirds. All of the assessed migratory species have been identified to be at risk of collision from the operating wind farm based on the risk assessment provided in the turbine risk collision prescribed impact assessment (Umwelt 2024b) in the BDAR: • fork-tailed swift regularly flies in rotor swept area (RSA) and has a moderate risk of collision based on a high likelihood of flying in RSA but likely that this will have low consequences of impact on the population • pectoral sandpiper has a minor risk rating based on low likelihood of collision and moderate consequences • red-necked stint has a minor risk rating based on low likelihood of collision and moderate consequences • gull-billed tern has a negligible risk rating based on low likelihood of collision and low consequences • Caspian tern has a negligible risk rating based on low likelihood of collision and low consequences • marsh sandpiper has a negligible risk rating based on low likelihood of collision and low consequences. Given the small scale of proposed impact against the broader distribution and migratory nature of these species, it is considered unlikely that the proposed works would modify, destroy or isolate an area of important habitat for the fork-tailed swift, pectoral sandpiper, red-necked stint, gull-billed tern, Caspian tern, and marsh sandpiper.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
There are no known invasives species that are harmful to the fork-tailed swift. The Proposed Action Area does not support important habitat for the assessed migratory species therefore the Proposed Action will not result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.
Given the negligible scale of proposed impact against the broader distribution of the species and migratory nature of the species, it is considered unlikely that the proposed works would lead to a disruption in the lifecycle of an ecologically significant proportion of the population of the fork-tailed swift, pectoral sandpiper, red-necked stint, gull-billed tern, Caspian tern, and marsh sandpiper.

The Development Footprint (including all areas of off-site areas of road works) is unlikely to support an area of important habitat for migratory species and is considered marginal potential seasonal migratory habitat for the fork-tailed swift, pectoral sandpiper, red-necked stint, gull-billed tern, Caspian tern, and Marsh sandpiper. The Proposed Action is unlikely to have a significant impact on the assessed migratory species.

6.0 References

Atlas of Living Australia (ALA). 2014. Common Gull-Billed Tern. Available from: < https://bie.ala.org.au/species/https://biodiversity.org.au/afd/taxa/72b23d0a-7050-413f-9100-3562d383888e> Accessed on 14 August 2024.

Baker-Gabb, D. 2003. Recovery Plan for the Black-eared Miner Manorina melanotis 2002-2006: Conservation of old-growth dependant mallee fauna. Department for Environment and Heritage, Adelaide.

Baker-Gabb, D., & V.G. Hurley 2011. National Recovery Plan for the Regent Parrot (eastern subspecies) *Polytelis anthopeplus monarchoides*. Department of Sustainability and Environment, Melbourne.

Band, W., Madders, M. and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: Janss, G., de Lucas, M. and Ferrer, M. (eds.) Birds and Wind Farms. Quercus, Madrid. 259–275.

Benshemesh, J. 2007. National Recovery Plan for Malleefowl. Department for Environment and Heritage, South Australia.

Benshemesh, J. 1992. The conservation ecology of Malleefowl, with particular regard to fire. Pages 1-224.Monash University, Clayton.

BirdLife Australia 2023a. Fork-tailed Swift. [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.] Birdlife Australia. Birdlife Australia. Last modified 2023-11-14 11:41. Source: https://hanzab.birdlife.org.au/species/fork-tailed-swift/ Accessed: August 14, 2024.

BirdLife Australia 2023b. Pectoral Sandpiper. [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.] Birdlife Australia. Birdlife Australia. Last modified 2023-11-14 11:42. Source: https://hanzab.birdlife.org.au/species/pectoral-sandpiper/ Accessed: August 14, 2024.

BirdLife Australia 2023c. Red-necked Stint. [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.] Birdlife Australia. Birdlife Australia. Last modified 2023-11-19 12:55. Source: https://hanzab.birdlife.org.au/species/red-necked-stint/ Accessed: August 14, 2024.

BirdLife Australia. 2023d. Caspian Tern. [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.] Birdlife Australia. Birdlife Australia. Last modified 2023-11-14 11:42. Source: https://hanzab.birdlife.org.au/species/caspian-tern/ Accessed: August 14, 2024.

BirdLife Australia. 2023e. Marsh Sandpiper. [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.] Birdlife Australia. Birdlife Australia. Last modified 2023-11-14 11:42. Source: https://hanzab.birdlife.org.au/species/marsh-sandpiper/ Accessed: August 14, 2024.

BirdLife International. 2024a. IUCN Red List for birds. Downloaded from https://datazone.birdlife.org on 10/08/2024.

BirdLife International 2024b. Species factsheet: Grey Falson *Falco hypoleucos*. Downloaded from https://datazone.birdlife.org/species/factsheet/grey-falcon-falco-hypoleucos

BirdLife International 2024c. Species factsheet: Pacific Swift *Apus pacificus*. Downloaded from https://datazone.birdlife.org/species/factsheet/pacific-swift-apus-pacificus

Brickhill, J. (1987). Breeding success of malleefowl Leipoa ocellata in central New South Wales. *Emu*, *87*(1), 42-45.Burbidge, A.H. 1985. The Regent Parrot. A report on the breeding distribution and habitat requirements along the Murray River in south-eastern Australia. Australian National Parks and Wildlife Service, Report Series No. 4.

Commonwealth of Australia (CoA) 2013. Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (awe.gov.au), Environment Protection and Biodiversity Conservation Act 1999.

Commonwealth of Australia (CoA) 2015b. Threat abatement plan for predation by feral cats.

Commonwealth of Australia (CoA) 2017. EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species.

Copley, P. & S. Williams, 1995. Distribution, relative abundance and conservation of Malleefowl in South Australia: 9-35.— Working Papers, Nat. Malleefowl Forum, Adelaide.

Department of Agriculture, Water and the Environment (DAWE) 2021a. Approved Conservation Advice for the Mallee Bird Community of the Murray Darling Depression Bioregion. Department of Agriculture, Water and the Environment, Canberra.

Department of Agriculture, Water and the Environment (DAWE) 2021b. National Recovery Plan for the Painted Honeyeater (Grantiella picta). Department of Agriculture, Water and the Environment, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2022a. National Recovery Plan for the Australasian Bittern (Botaurus poiciloptilus). Department of Climate Change, Energy, the Environment and Water, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2022b. National Recovery Plan for the Australian Painted Snipe (Rostratula australis), Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023a. Conservation Advice for Calidris ferruginea (curlew sandpiper). Canberra: Department of Climate Change, Energy, the Environment and Water. 18 December 2023.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023b. Conservation Advice for Lophochroa leadbeateri leadbeateri (eastern Major Mitchell's cockatoo). Canberra: Department of Climate Change, Energy, the Environment and Water. 31 March 2023.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023c. Conservation Advice for Melanodryas cucullata cucullata (hooded robin (south-eastern)). Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023d. Conservation Advice for *Aphelocephala leucopsis* (southern whiteface). Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023e. Conservation Advice for Neophema chrysostoma (blue-winged parrot). Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024a. Conservation Advice for Tringa nebularia (common greenshank). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/832-conservation-advice-05012024.pdf. In effect under the EPBC Act from 05-Jan-2024.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024b. Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper). Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024c. BioNet Atlas Threatened Biodiversity Profile Data Collection (20km buffer). https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet. Date last accessed: 12 August 2024.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024d. Conservation Advice for Gallinago hardwickii (Latham's snipe). Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of the Environment (DoE) 2015a. Referral guideline for 14 birds listed as migratory species under the EPBC Act – Draft.

Department of the Environment (DoE) 2015b. Wildlife conservation plan for migratory shorebirds.

Department of the Environment (DOE) 2015c. Conservation Advice Grantiella picta painted honeyeater. Canberra: Department of the Environment.

Department of the Environment and Energy (DOEE) 2016. Threat abatement plan for competition and land degradation by rabbits. Canberra, ACT.

Department of the Environment and Energy (DOEE) 2017. Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017). Canberra, ACT.

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008. Threat abatement plan for predation by the European red fox.

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008a. Threat abatement plan for competition and land degradation by unmanaged goats. DEWHA, Canberra.

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008b. Threat abatement plan for predation by the European red fox. DEWHA, Canberra.

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2010. Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. DEWHA, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2013. Approved Conservation Advice for Rostratula australis (Australian painted snipe). Canberra.

eBird 2024. Mallee Cliffs National Park bird list. Available from< https://ebird.org/hotspot/L6485566/bird-list?yr=all&rank=mrec> Accessed August 2024.

Frith, H.J., 1959. Breeding of the Mallee Fowl, Leipoa ocellata Gould (Megapodiidae).— CSIRO Wildl. Res. 4: 31--60.

Frith, H.J., 1962a. Conservation of the Mallee Fowl, Leipoa ocellata Gould (Megapodiidae).— CSIRO Wildl. Res. 7: 33–49.

Frith, H. J. 1962b. The Mallee Fowl. Angus and Robertson, Sydney.

Garnett, S. T., Szabo, J. K., and Dutson, G. 2011. The action plan for Australian birds 2010. CSIRO, Melbourne.

Higgins, P.J. and Davies, S. J. J. F. 1996. Handbook of Australian, New Zealand and Antarctic Birds. Volume 3: Snipe to Pigeons. Oxford University Press, Melbourne.

Marchant, S., & P.J. Higgins (eds) 1993. Handbook of Australian, New Zealand and Antarctic Birds. Volume 2: Raptors to Lapwings. Oxford University Press, Melbourne.

National Environmental Science Program Threatened Species Research Hub, 2019. Threatened Species Strategy Year 3 Scorecard – Malleefowl. Australian Government, Canberra.

Office of Environment and Heritage (OEH), 2018. Mallee Cliffs National Park Plan of Management. State of NSW and OEH. April 2018.

Rodrigues, L., Bach, L., Dubourg-Savage, M., Karapandza, B., Kovac, D., Kervyn, T., Dekker, J., Kepel, A., Bach, P., Collins, J., Harbusch, C., Park, K., Micevski, B. and Minderman, J. 2015. Guidelines for consideration of bats in wind farm projects - revision 2014, EUROBATS publication series no. 6 (English version). Bonn.

Secretariat of the Convention on Biological Diversity. 2000. Sustaining life on Earth. How the Convention on Biological Diversity promotes nature and human well-being. April 2020.

Threatened Species Scientific Committee (TSSC) (2013). Commonwealth Listing Advice on Rostratula australis (Australian Painted Snipe). Department of Sustainability, Environment, Water, Population and Communities.

Threatened Species Scientific Committee (TSSC) 2011. Commonwealth Listing Advice on Botaurus poiciloptilus (Australasian Bittern). Department of Sustainability, Environment, Water, Population and Communities. Canberra, ACT.

Threatened Species Scientific Committee (TSSC) 2015. Conservation Advice Nyctophilus corbeni Corben's long-eared bat. Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC) 2016. Conservation Advice Manorina melanotis black-eared miner. Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC) 2019. Conservation Advice Botaurus poiciloptilus Australasian Bittern. Canberra, ACT: Department of the Environment and Energy.

Threatened Species Scientific Committee (TSSC) 2020. Conservation Advice Falco hypoleucos Grey Falcon. Canberra: Department of Agriculture, Water and the Environment.

Umwelt (Australia) Pty Ltd (Umwelt) 2024a. Mallee Wind Farm Biodiversity Development Assessment Report. Prepared for Spark Renewables Pty Limited. September 2024.

Umwelt (Australia) Pty Ltd (Umwelt) 2024b. Mallee Wind Farm Biodiversity Development Assessment Report – Turbine Strike Assessment. Prepared for Spark Renewables Pty Limited. September 2024.

Webster, R. 2001. Trial Regent Parrot Polytelis anthopeplus foraging study. Unpublished report to the and New South Wales National Parks and Wildlife Service.

Webster, R. and Belcher, C. 2008a. A Survey to Locate Regent Parrot Polytelis anthopeplus monarchoides Foraging Habitat in the Lower Murray Darling CMA Area during the 2006 & 2007 Breeding Seasons. Report to Department of Environment and Climate Change and the Lower Murray Darling Catchment Management Authority. Ecosurveys Pty Ltd, Deniliquin.

Webster, R. and Belcher, C. 2008b. Survey for the foraging habitat of the Regent Parrot Polytelis anthopeplus monarchoides in the non-breeding season in the Lower Murray Darling CMA Area. Report to Department of Environment and Climate Change and the Lower Murray Darling Catchment Management Authority. Ecosurveys Pty Ltd, Deniliquin.

Weller, D., Kidd, L., Lee, C., Klose, S., Jaensch, R. and Driessen, J. 2020. Directory of Important Habitat for Migratory Shorebirds in Australia. Prepared for Australian Government Department of Agriculture, Water and the Environment by BirdLife Australia, Melbourne.

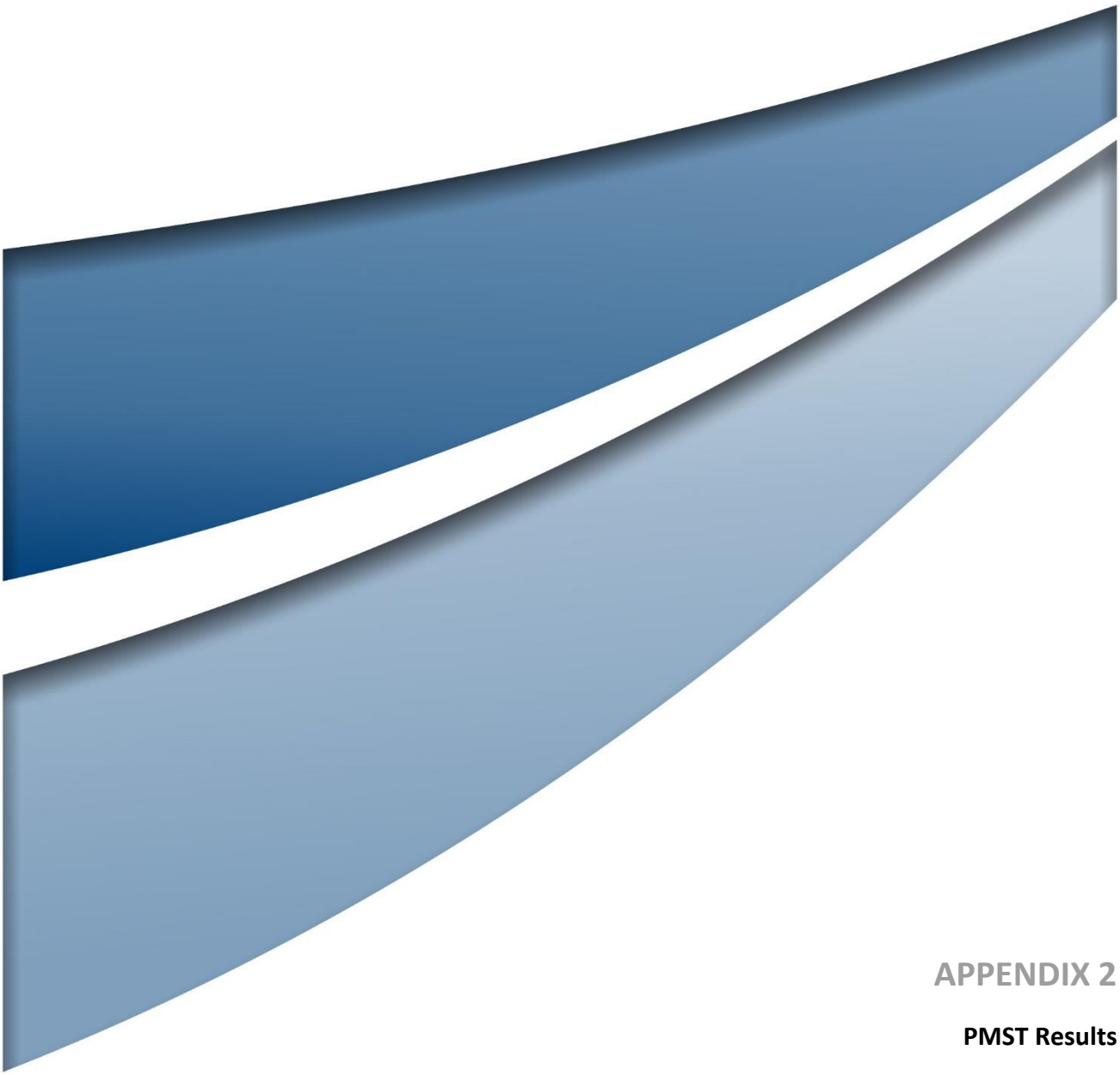
Williams, S.L., 1994. Malleefowl as a flagship species for conservation on farms in the Murray Mallee of South Australia: 316-320.— In: D.A. Saunders, J.L. Craig & E.M. Mattiske, eds. Nature Conservation 4: The Role of Networks. Chipping Norton.



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APPENDIX 2

PMST Results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 13-Aug-2024

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	36
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	4
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	8
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	150 - 200km upstream from Ramsar site	In feature area
Riverland	100 - 150km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	200 - 300km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area	In feature area
Mallee Bird Community of the Murray Darling Depression Bioregion	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Amytornis striatus howei			
Murray Mallee Striated Grasswren, Striated Grasswren (sandplain) [91648]	Endangered	Species or species habitat may occur within area	In feature area
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lophochroa leadbeateri leadbeateri Major Mitchell's Cockatoo (eastern), Eastern Major Mitchell's Cockatoo, Pink Cockatoo (eastern) [82926]	Endangered	Species or species habitat known to occur within area	In feature area
Manorina melanotis Black-eared Miner [449]	Endangered	Species or species habitat may occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area	In feature area
Polytelis anthopeplus monarchoides Regent Parrot (eastern) [59612]	Vulnerable	Breeding likely to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only
FISH			
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Craterocephalus fluviatilis Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area	In buffer area only
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area	In buffer area only
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macquaria australasica			
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In buffer area only
FROG			
Litoria raniformis			
Southern Bell Frog,, Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area	In feature area
MAMMAL			
Myrmecobius fasciatus			
Numbat [294]	Endangered	Translocated population known to occur within area	In feature area
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat may occur within area	In buffer area only
PLANT			
Lepidium monoplocoides			
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In feature area
Myriophyllum porcatum			
Ridged Water-milfoil [19919]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterostylis xerophila			
Desert Greenhood [7997]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Solanum karsense			
Menindee Nightshade [7776]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Swainsona murrayana			
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Swainsona pyrophila			
Yellow Swainson-pea [56344]	Vulnerable	Species or species habitat likely to occur within area	In feature area
REPTILE			
Hemiaspis damelii			
Grey Snake [1179]	Endangered	Species or species habitat may occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Commonwealth Trading Bank of Australia		
Commonwealth Land - Commonwealth Trading Bank of Australia [16417]	NSW	In buffer area only
Commonwealth Land - Commonwealth Trading Bank of Australia [16416]	NSW	In buffer area only
Commonwealth Land - Commonwealth Trading Bank of Australia & Moya Grace Murphy [16415]	NSW	In buffer area only
Commonwealth Land - Commonwealth Trading Bank of Australia & Moya Grace Murphy [16418]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Corporation [16073]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Kings Billabong Park	Conservation Park	VIC	In buffer area only
Mallee Cliffs	National Park	NSW	In feature area
River Murray Reserve	Natural Features Reserve	VIC	In buffer area only
Southern Mallee	NRS Addition - Gazettal in Progress	NSW	In feature area

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Kings Billabong Wetlands	VIC	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
EnergyConnect NSW - Eastern Section	2020/8766		Post-Approval	In feature area
Mallee Wind Farm	2023/09500		Assessment	In feature area
Controlled action				
Electricity Transmission Line	2001/380	Controlled Action	Completed	In buffer area only
EnergyConnect NSW - Western Section	2020/8673	Controlled Action	Post-Approval	In buffer area only
Great Darling Anabranch - pipeline construction and environmental water flow ma	2004/1319	Controlled Action	Post-Approval	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

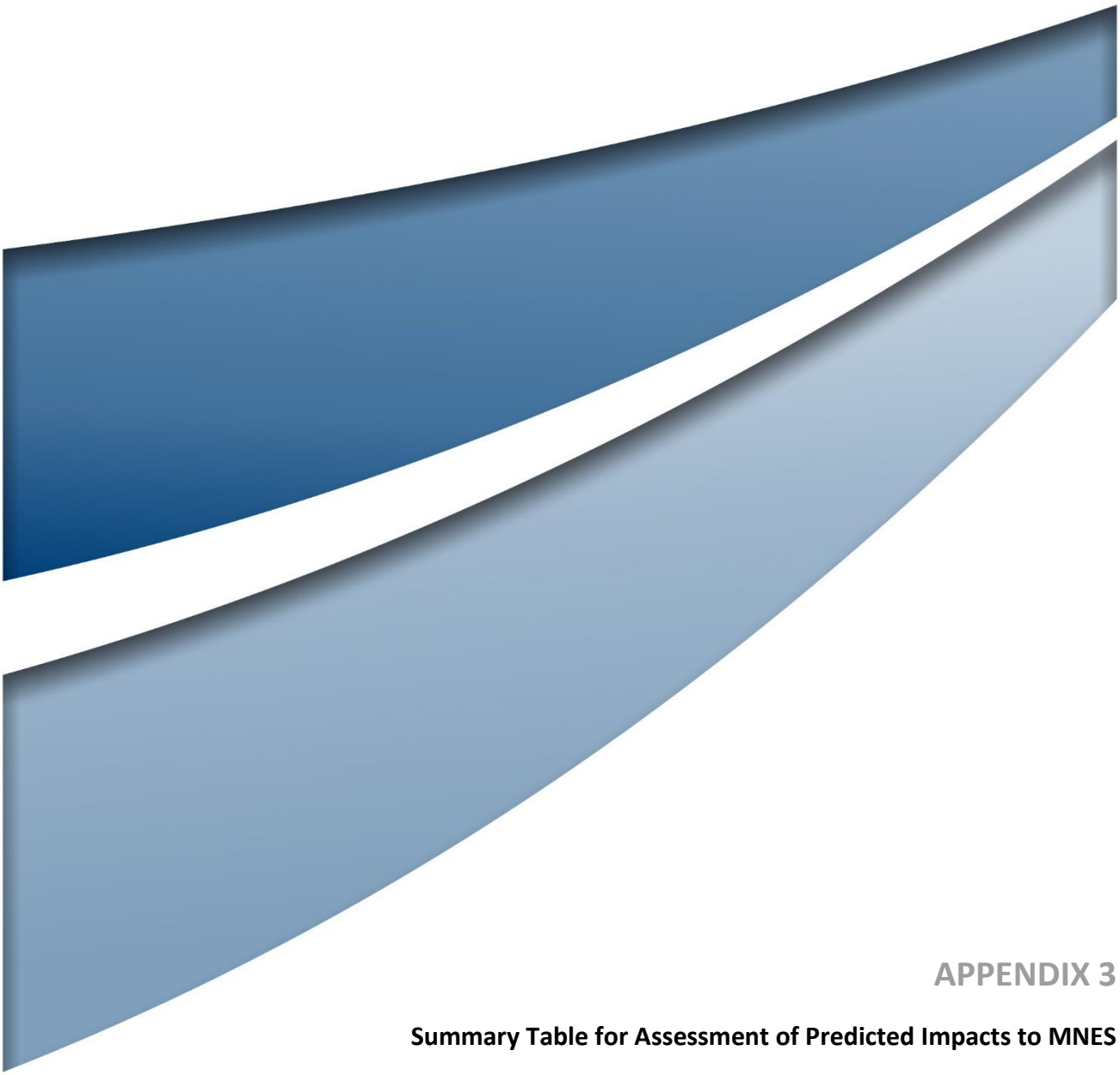
This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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APPENDIX 3

Summary Table for Assessment of Predicted Impacts to MNES

Table A3.1 Summary Table for Assessment of Predicted Direct Impacts on EPBC Act-listed Threatened Species and Communities

Description of Threatened Species / Community listed under EPBC Act	Description of PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Predicted Direct Impact (ha)	Offsetting Approach	Ecosystem Credits	Page references
Mallee Bird Community EEC	• PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Moderate-good, Zone 4) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Moderate-good, Zone 8).	Removal of 22.76 ha of habitat (comprising 3.81 ha of PCT 170 and 18.95 ha of PCT 171)	Direct impacts will be offset through ecosystem credits	412	MNES Assessment **Appendix 1**, Section 2.1 (Assessment of Significance (AoS) BDAR Section 10.1 (Ecosystem Credits)
Pink cockatoo	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 54.34 ha of foraging habitat	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 3.3 (AoS) BDAR Section 10.1 (Ecosystem Credits)
South-eastern hooded robin	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 54.34 ha of habitat.	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 3.4 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Southern whiteface	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6)	Removal of 54.34 ha of habitat	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 4.1 (AoS) BDAR Section 10.1 (Ecosystem Credits)

Description of Threatened Species / Community listed under EPBC Act	Description of PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Predicted Direct Impact (ha)	Offsetting Approach	Ecosystem Credits	Page references
	• PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).				
Grey Falcon	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 54.34 ha of foraging and potential breeding habitat	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 4.3 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Painted honeyeater	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3).	Removal of 30.37 ha of foraging habitat	Direct impacts will be offset through ecosystem credits	707	MNES Assessment **Appendix 1**, Section 4.5 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Malleefowl	• PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 23.98 ha of foraging habitat	Direct impacts will be offset through ecosystem credits	424	MNES Assessment Appendix C1, Section 4.6 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Blue-winged parrot	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 54.34 ha of foraging habitat	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 4.7 (AoS) BDAR Section 10.1 (Ecosystem Credits)

Description of Threatened Species / Community listed under EPBC Act	Description of PCTs associated with the ecosystem credit species / ecological community (if applicable)	Area of Predicted Direct Impact (ha)	Offsetting Approach	Ecosystem Credits	Page references
Corben's long-eared bat	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 54.34 ha of foraging habitat	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 4.8 AoS) BDAR Section 10.1 (Ecosystem Credits)
Regent parrot (eastern subspecies)	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	Removal of 54.34 ha of foraging habitat	Direct impacts will be offset through ecosystem credits	1,131	MNES Assessment **Appendix 1**, Section 4.9 AoS) BDAR Section 10.1 (Ecosystem Credits)

Table A3.2 Summary Table for Assessment of Predicted Prescribed Impacts (Turbine Strike) on EPBC Act-listed Threatened Species and Communities

Description of Threatened Species / Community listed under EPBC Act	Description of habitat / associated PCTs (if applicable)	Quantum of Predicted Indirect Impact	Offsetting Approach	Page references
Mallee Bird Community EEC	• PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Moderate-good, Zone 4) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Moderate-good, Zone 8).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for these ten species recorded ranges from Negligible (for the nine passerines) – Minor (regent parrot).	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 2.1 (Assessment of Significance (AoS)) BDAR Section 10.1 (Ecosystem Credits)
Australasian bittern	Nil - No suitable foraging, breeding, or roosting habitat is present within the Development Footprint.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 3.1 (AoS)
Curlew sandpiper	Nil - No suitable foraging, breeding, or roosting habitat is present within the Development Footprint.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 3.2 (AoS)
Pink cockatoo	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 3.3 (AoS) BDAR Section 10.1 (Ecosystem Credits)
South-eastern hooded robin	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6)	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 3.4 (AoS) BDAR Section 10.1 (Ecosystem Credits)

Description of Threatened Species / Community listed under EPBC Act	Description of habitat / associated PCTs (if applicable)	Quantum of Predicted Indirect Impact	Offsetting Approach	Page references
	• PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).			
Australian painted snipe	Nil - No suitable foraging, breeding, or roosting habitat is present within the Development Footprint.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 3.5 (AoS)
Common greenshank	Nil – No suitable breeding, or roosting habitat is present within the Development Footprint.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 3.6 (AoS)
Southern whiteface	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.1 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Sharp-tailed sandpiper	Nil – No suitable breeding, or roosting habitat is present within the Development Footprint.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.2 (AoS)
Grey falcon	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4– 6)	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.3 (AoS) BDAR Section 10.1 (Ecosystem Credits)

Description of Threatened Species / Community listed under EPBC Act	Description of habitat / associated PCTs (if applicable)	Quantum of Predicted Indirect Impact	Offsetting Approach	Page references
	• PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).			
Latham's snipe	Nil – No suitable breeding, or roosting habitat is present within the Development Footprint.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.4 (AoS)
Painted honeyeater	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.5 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Malleefowl	• PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.6 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Blue-winged parrot	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.7 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Corben's long-eared bat	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3)	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.8 (AoS) BDAR Section 10.1 (Ecosystem Credits)

Description of Threatened Species / Community listed under EPBC Act	Description of habitat / associated PCTs (if applicable)	Quantum of Predicted Indirect Impact	Offsetting Approach	Page references
	• PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).			
Regent parrot (eastern subspecies)	• PCT 58: Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion (Zones 1–3) • PCT 170: Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones (Zones 4–6) • PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion (Zone 8).	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 4.9 (AoS) BDAR Section 10.1 (Ecosystem Credits)
Fork-tailed swift or Pacific swift	The Proposed Action Area supports important habitat but given low numbers of sightings it is unlikely to support an ecologically significant proportion of the population of the fork-tailed swift.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Moderate.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 5.2.1 (AoS)
Pectoral sandpiper	The Proposed Action Area does not contain any suitable roosting or feeding habitat. It is unlikely to be an area of important habitat as defined by the shorebird guidelines (CoA 2017) as no roosting or feeding habitat and no records of the species.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 5.2.2 (AoS)
Red-necked stint	The Project Area does not contain any suitable roosting or feeding habitat however red-necked stint may occasionally disperse through the Project Area given there is suitable habitat present to the south-west of the site.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Minor.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 5.2.3 (AoS)

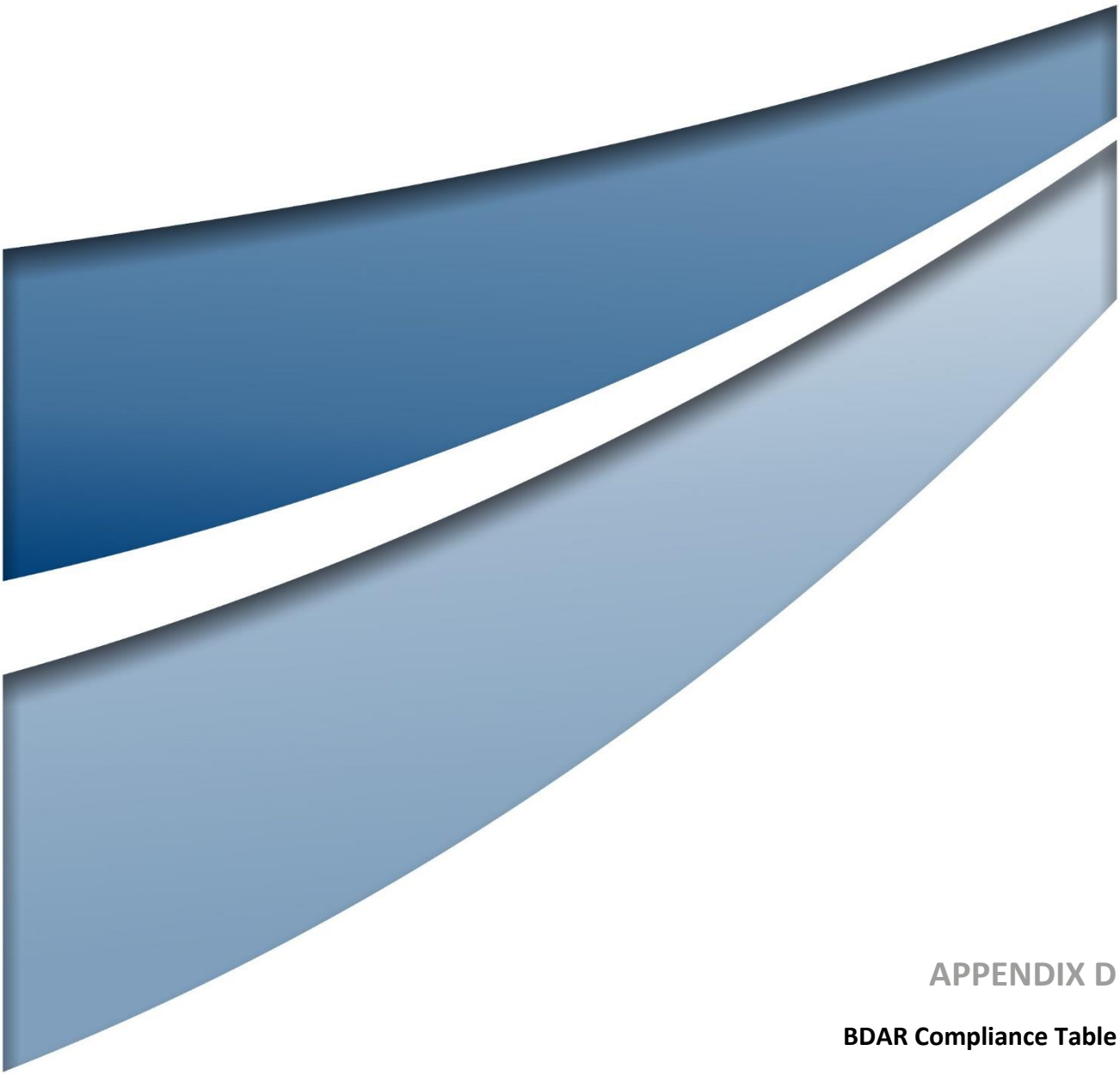
Description of Threatened Species / Community listed under EPBC Act	Description of habitat / associated PCTs (if applicable)	Quantum of Predicted Indirect Impact	Offsetting Approach	Page references
Gull-billed tern	Important habitat for this species is likely to be wetlands external to the Proposed Action where the species forage and roost. No Important habitat is known to occur in the Proposed Action Area.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 5.2.4 (AoS)
Caspian tern	Important habitat for this species is likely to be wetlands external to the Proposed Action where the species forage and roost.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 5.2.5 (AoS)
Marsh sandpiper	Important habitat for this species is likely to be wetlands external to the Proposed Action where the species forage and roost.	The indirect impacts are difficult to quantify, as such their quantum has not been estimated. The overall risk rating for this species is Negligible.	Offsets not proposed for indirect impacts	MNES Assessment **Appendix 1**, Section 5.2.6 (AoS)



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APPENDIX D

BDAR Compliance Table

1.0 BDAR Requirement Compliance

1.1 BDAR Requirements Compliance Details

Compliance with the BDAR minimum information requirements of the BAM is documented in **Table D.1**.

Table D.1 Assessment of Compliance with BDAR Minimum Information Requirements

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	**Section 2.0**
		☒ identification of subject land boundary, including: ☒ operational footprint ☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	**Section 1.2.1 and Section 1.2.2 and Figure 1.1 and Figure 1.2**
		☒ general description of the subject land	**Section 1.2.1**
		☒ sources of information used in the assessment, including reports and spatial data	**Section 1.4, Section 4.1.1, and Section 5.2.1. Also referenced in text and listed in the References Section.**
		☒ identification and justification for entering the BOS	**Section 1.3.1 and Table 1.1**
		Maps and tables	
		☒ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	**Figure 1.2**
Landscape	Section 3.1 and Section 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	–
		☒ general description of subject land topographic and hydrological setting, geology and soils	**Section 1.2.1, Table 3.2**
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	**Section 3.3 and Table 3.3**
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	**Section 3.2, Table 3.2 and Appendix A, Figure 3.1**
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	**Table 3.2 and Appendix A, Figure 3.3**
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	**Section 3.2, Table 3.2, Appendix A, Figure 3.3**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	**Section 3.2, Table 3.2, Appendix A, Figure 3.4**
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	**Section 3.2, Table 3.2, Appendix A**
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	**Section 3.2, Table 3.2**
		☒ any additional landscape features identified in any SEARs for the proposal	**Section 3., Table 3.2**
		☒ NSW (Mitchell) landscape on which the subject land occurs	**Section 3.2, Table 3.2, Appendix A, Figure 3.2**
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	**Section 4.1.2 and 4.1.3, Section 4.23, Table 4.1**
		Maps and tables	
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3.	**Figure 3.1**
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land ☒ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	**Figure 1.1 and Figure 3.2**
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands ☒ connectivity of different areas of habitat ☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☒ areas of outstanding biodiversity value occurring on the subject land and assessment area ☒ any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the subject land occurs	**Figure 3.1, Figure 3.2, Figure 3.3, Figure 3.4 and Figure 3.5**
		Data	
		☒ All report maps as separate jpeg files	**To be issued to BCS as separate data package**
		Individual digital shape files of:	**–**
		☒ subject land boundary	**To be issued to BCS as separate data package**
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	**To be issued to BCS as separate data package**
		☒ cadastral boundary of subject land	**To be issued to BCS as separate data package**
		☒ areas of native vegetation cover	**To be issued to BCS as separate data package**
		☒ landscape features	**To be issued to BCS as separate data package**
Native vegetation	Chapter 4, Appendix A and Appendix H	**Information**	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	**Section 4.2 and Figure 3.1 and Figure 3.6**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	**Section 4.1.3, Section 4.2, Section 4.7 and Section 4.8**
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	**Section 4.1.1**
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	**Section 4.1.2, Table 4.1, Table 4.2, Table 4.3, Figure 4.1, Figure 4.2**
		☒ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	**Not applicable**
		For each PCT within the subject land, describe:	**–**
		☒ PCT name and ID	**Section 4.3 and Table 4.3**
		☒ vegetation class	**Section 4.3, Table 4.4 – Table 4.14**
		☒ extent (ha) within subject land	**Section 4.3 and Table 4.4 – Table 4.14**
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	**Section 4.3.1 to Section 4.3.4**
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	**Section 4.3.1 to Section 4.3.4**
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	**Section 4.5 and Table 4.16 to Table 4.19**
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	**Table 4.4 to Table 4.14**
		Describe the vegetation integrity assessment of the subject land, including:	**–**
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	**Method provided in Section 4.1, Results provided in Section 4.3 and Table 4.7**
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	**Table 4.1, Section 4.3.1 to Section 4.3.4 and Figure 4.2**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ area (ha) of each vegetation zone	**Section 4.3.1 to Section 4.3.4 and Table 4.15**
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	**Section 4.1.4**
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	**Section 4.1.2.3, Table 4.2 and Table 4.15**
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	**Section 4.3.1 to Section 4.3.4**
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	–
		☐ identify the PCT or vegetation class for which local benchmark data will be applied ☐ identify published sources of local benchmark data (if benchmarks obtained from published sources) ☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	**Not applicable**
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	Not applicable
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	Not applicable
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:1,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	**Figure 3.6 and Figure 4.1**
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	**Figure 4.2 and Appendix A**
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	**Figure 4.2 and Appendix A**
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	**Figure 4.2 and Appendix A**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	**Table 4.16 to Table 4.19 and Figure 4.3**
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	**Section 4.1.4, Appendix A**
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	**–**
		☒ composition condition score ☒ structure condition score ☒ function condition score ☒ presence of hollow bearing trees	**Section 4.4 and Table 4.15**
		Data	
		☒ All report maps as separate jpeg files	**To be issued to BCS as separate data package**
		☒ Plot field data (MS Excel format)	**To be issued to BCS as separate data package**
		☒ Plot field datasheets	**To be issued to BCS as separate data package**
		Digital shape files of:	-
		☒ PCT boundaries within subject land	**To be issued to BCS as separate data package**
		☒ TEC boundaries within subject land	**To be issued to BCS as separate data package**
		☒ vegetation zone boundaries within subject land	**To be issued to BCS as separate data package**
		☒ floristic vegetation survey and vegetation integrity plot locations	**To be issued to BCS as separate data package**
Threatened species	Chapter 5	**Information**	
		Identify ecosystem credit species likely to occur on the subject land, including:	**–**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	**Section 5.1.1 and Table 5.1**
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	**Section 5.1.1 and Table 5.1**
		☒ justification for addition of any ecosystem credit species to the list	**Section 5.1.1 and Table 5.1**
		Identify species credit species likely to occur on the subject land, including:	**–**
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	**Section 5.1.2 and Table 5.2**
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	**Section 5.1.2 and Table 5.2**
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	**Section 5.1.2 and Table 5.2**
		☒ justification for addition of any species credit species to the list	**Section 5.1.2 and Table 5.2**
		From the list of candidate species credit species, identify:	**–**
		☒ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) ☒ species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) ☒ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.)) ☒ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	**Section 5.1.2 and Table 5.2 and Table 5.3**
		Present the outcomes of species credit species assessments from:	**–**
		☒ threatened species survey (as described in BAM Section 5.2.4)	**Section 5.2.4 and 5.2.5, Table 5.5 and Table 5.6**
		☐ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	**Section 5.3, Appendix H**
		Where survey has been undertaken include detailed information on:	**–**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ survey method and effort (as described in BAM Section 5.3)	**Section 5.2**
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	**Section 5.2.4 and Section 5.2.5**
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	**Section 5.2.2, Section 5.2.3, Section 5.2.4 and Section 5.2.5**
		☒ survey personnel and relevant experience	**Page ii**
		☒ describe any limitations to surveys and how these were addressed/overcome	**Section 5.5**
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	**–**
		☐ justification of the use of an expert report ☐ identify the expert, provide evidence of their expert credentials and departmental approval of expert status ☐ all requirements of Box 3 have been addressed in the expert report	**Section 5.3, Appendix H**
		Where use of local data is proposed (BAM Subsection 1.4.2):	**–**
		☐ identify relevant species ☐ identify data to be amended ☐ identify source of information for local data, e.g. published literature, additional survey data, etc. ☐ justify use of local data in preference to VIS Classification or TBDC data	**Section 5.4 - Not applicable**
		☐ provide written confirmation from the decision-maker that they support the use of local data	Not applicable
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	**–**
		☐ the unit of measure for each species is documented	**Not applicable**
		for species assessed by area:	**–**
		☐ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	**Not applicable**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	**No applicable**
		for species assessed by counts of individuals:	**–**
		☐ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	**Not applicable**
		☐ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	**Not applicable**
		☐ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	**Not applicable**
		☐ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	**Not applicable**
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	**Section 5.1, Table 5.1**
		☒ the ecosystem credit species removed from the list	**Section 5.1, Table 5.1**
		☒ the sensitivity to gain class of each species	**Section 5.1, Table 5.1**
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	**Section 5.2, Table 5.2 and Table 5.3**
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	**Section 5.2, Table 5.2 and Table 5.3**
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	**Section 5.6**
		☐ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	**Not applicable**
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	**Section 5.6, Figure 5.6**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	**To be issued to BCS as separate data package**
		☒ Survey locations including GPS coordinates of any plots, transects, grids	**To be issued to BCS as separate data package**
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	**To be issued to BCS as separate data package**
		☒ Species polygon map in jpeg format	**To be issued to BCS as separate data package**
		☒ Expert reports and any supporting data used to support conclusions of the expert report	**To be issued to BCS as separate data package**
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	**Field data captured digitally** **To be issued to BCS as separate data package**
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	–
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) ☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) ☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	**Section 6.0 and Table 6.1**
		☐ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	**Section 6.0, Section 8.3 and Table 6.1**
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	**Section 6.0 and Table 6.1**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	**Section 6.0 and Table 6.1**
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	**Section 8.3 and Table 8.6 to Table 8.8, Appendix B**
		Where the proposed development is for a wind farm:	**–**
		☒ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	**Appendix B**
		☒ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	**Appendix B**
		☒ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	**Appendix B**
		Where the proposal may result in vehicle strike:	**–**
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	**Section 6.0, Table 6.1 and Appendix B**
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	**No applicable**
		☒ Map showing location of potential vehicle strike locations	**Not applicable**
		☒ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	**Appendix B**
		Data	
		☒ Digital shape files of prescribed impact feature locations	**To be issued to BCS as separate data package**
		☒ Prescribed impact features map in jpeg format	**To be issued to BCS as separate data package**
Avoid and	Chapter 7	**Information**	

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
minimise impacts		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	**Section 7.1 and 7.2 and Table 7.1 to 7.4**
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	Section 7.1 and 7.2 and Table 7.1 to 7.4
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	**Section 7.1**
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	**Section 7.1 and Figure 7.1 and Figure 7.2**
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	**Section 7.2 and Table 7.5**
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	**Section 7.1 and Table 7.1 to Table 7.4**
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	**Section 7.3**
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	**Section 7.1, Table 7.1 to Table 7.4 and Section 7.2 and Table 7.5**
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	**Figure 7.1 and Figure 7.2**
		☒ Maps demonstrating indirect impact zones where applicable	**Appendix B**
		Data	
		Digital shape files of:	**To be issued to BCS as separate data package**
		☒ alternative and final proposal footprint	**To be issued to BCS as separate data package**

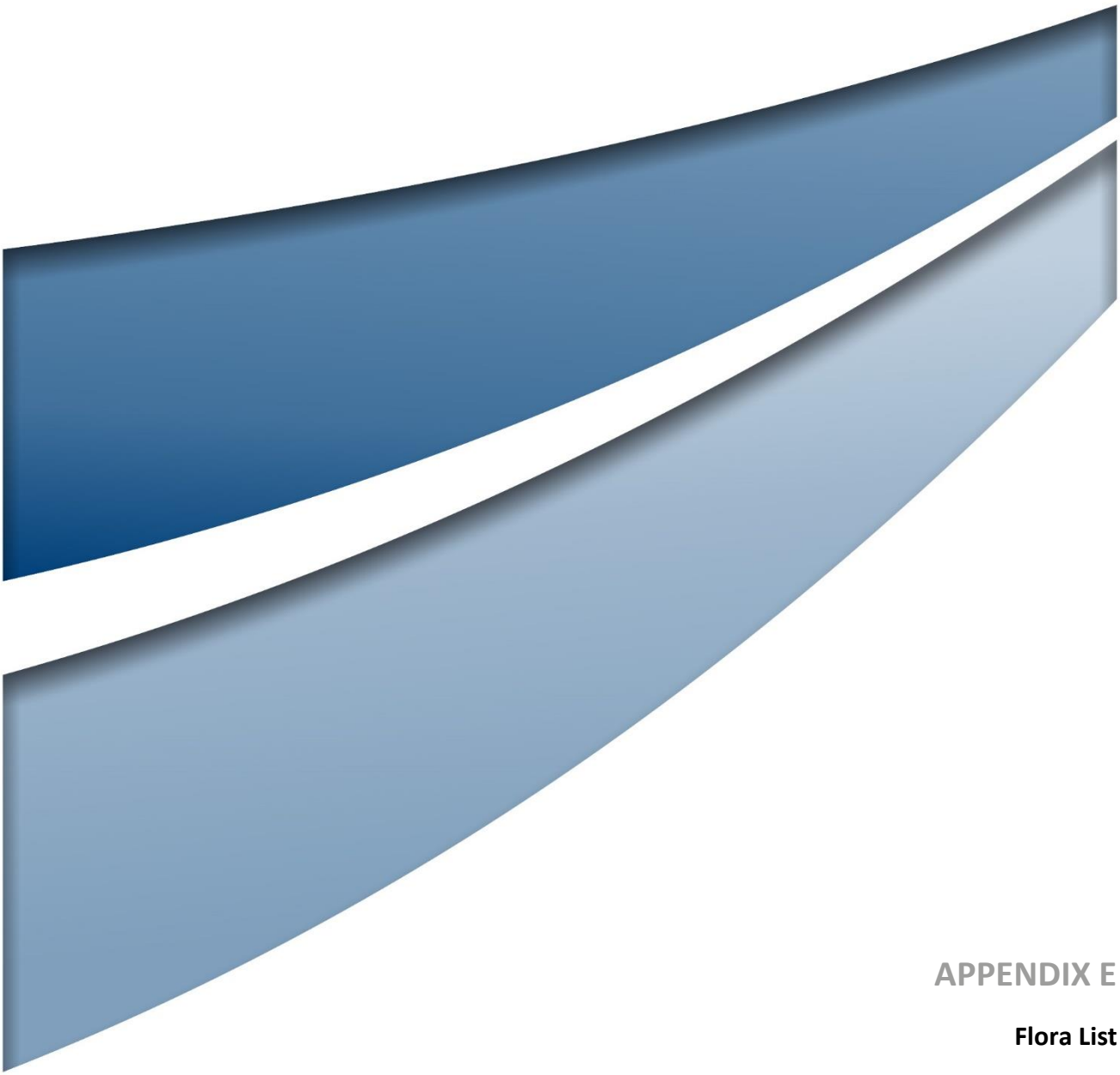
BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ direct and indirect impact zones	**To be issued to BCS as separate data package**
		☒ Maps in jpeg format	**To be issued to BCS as separate data package**
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	**Information**	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	**Section 8.1, Table 8.1 and Table 8.2**
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	**–**
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	**Section 8.2 and Table 8.5**
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	**Section 8.2, Table 8.5**
		☒ reporting any limitations or assumptions, etc. made during the assessment	**Section 4.1.5 and Section 5.5**
		☒ identification of the threatened entities and their habitat likely to be affected	**Section 8.2 and Table 8.5**
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	**–**
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	**–**
		☒ karst, caves, crevices, cliffs, rocks and other features of geological significance	**Not applicable**
		☒ human-made structures	**Section 8.3.1**
		☒ non-native vegetation	**Section 8.3.1**
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	**Section 8.3.2**
		☒ movement of threatened species that maintains their life cycle	**Section 8.3.2**
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	**Section 8.3.3**
		☐ assessment of the impacts of wind turbine strikes on protected animals	**Section 8.3.4 and Appendix B**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	**Section 8.3**
		☒ evaluate the consequences of prescribed impacts	**Section 8.3 and Appendix B**
		☒ describe impacts that are uncertain	**Section 8.3 and Appendix B**
		☒ document limitations to data, assumptions and predictions	**Section 4.1.5 and Section 5.5**
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	**Section 8.1 and Table 8.1 and Table 8.2**
		Data	
		N/A	**Appendix I**
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility ☒ identify measures for which there is risk of failure ☒ evaluate the risk and consequence of any residual impacts	**Section 9.1 and Table 9.1** **Section 9.2 and Table 9.2**
		☒ document any adaptive management strategy proposed	**Section 9.2 and Table 9.2** **Section 7.4**
		Identification of measures for mitigating impacts related to:	–
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) ☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) ☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	**Section 7.4** **Section 9.1 and Table 9.1** **Section 9.2 and Table 9.2**
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	**Section 9.2 and Table 9.2**
		Maps and tables	

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	**Section 9.1 and Table 9.1**
		Data	
		N/A	–
Impact summary	Chapter 9	**Information**	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	–
		☒ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	**Not appliable**
		☒ for each TEC, report the extent of the TEC in NSW	**Not applicable**
		☒ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	**Not applicable**
		☒ for each threatened species, report the population size in NSW	**Not applicable**
		☒ documenting assumptions made and/or limitations to information ☒ documenting all sources of data, information, references used or consulted ☒ clearly justifying why any criteria could not be addressed	**Not applicable**
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	**Section 10.1, Table 10.1**
		☒ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	**Section 10.2**
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	**Section 10.2**
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the subject land	**Not appliable**
		☒ Map showing location of threatened species at risk of an SAII within the subject land	**Not applicable**
		Map showing location of:	–
		☒ impacts requiring offset	**Figure 8.1, Figure 8.2, Figure 10.1**
		☒ impacts not requiring offset	**Figure 8.1, Figure 8.2, Figure 10.1**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ areas not requiring assessment	**Figure 4.5 to Figure 4.9. Appendix A**
		Data	
		Digital shape files of:	-
		☒ extent of TECs at risk of an SAII within the subject land	**No applicable**
		☒ location of threatened species at risk of an SAII within the subject land	**To be issued to BCS as separate data package**
		☒ boundary of impacts requiring offset	**To be issued to BCS as separate data package**
		☒ boundary of impacts not requiring offset	**To be issued to BCS as separate data package**
		☒ boundary of areas not requiring assessment	**To be issued to BCS as separate data package**
		☒ Maps in jpeg format	**To be issued to BCS as separate data package**
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	–
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM Subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	**Section 8.1, Table 8.1 and Table 8.2** **Section 10.1 and Table 10.1**
		☒ biodiversity risk weighting for each	**Section 10.1 and Table 10.1**
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	**Section 10.1**
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	**Section 10.1 and Table 10.1**

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Table of threatened species requiring offset and the number of species credits required	**Section 10.1 and Table 10.1**
		Data	
		☒ Submitted proposal in the BAM Calculator	**Appendix I**
Biodiversity credit report	Chapter 10	**Information**	
		☒ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	**Section 11.1 and Table 11.1** **Section 11.2**
		☒ BAM credit report in pdf format	**Appendix I**
		Maps and tables	
		☒ Table of credit class and matching credit profile	**Section 11.1 and Table 11.1** **Section 11.2**
		Data	
		☒ BAM credit report in pdf format	**Appendix I**



APPENDIX E

Flora List

1.0 Appendix E Flora List

1.1 Vegetation Zone 1 Floristic Data

Table 1.1 Vegetation Zone 1 Floristic Data

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Aizoaceae	*Psilocaulon granulicaule*	HTW	0	0	0	0	10	100	20	200	0	0	0	0	0	0	0	0	5	100	10	100	10	100	5	100	1	10	0.2	1	0	0	0	0
	Tetragonia moorei	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	1
Amaranthaceae	*Ptilotus exaltatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus exaltatus var. exaltatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus semilanatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus seminudus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
Apiaceae	*Daucus glochidiatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apocynaceae	*Marsdenia australis*	Other	0	0	0	0	0	0	0.1	1	0	0	0.1	10	0	0	0.1	1	0.1	1	0.2	10	0	0	0.1	1	0	0	0.1	2	0	0	0	0
	Parsonsia eucalyptophylla	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
	Rhyncharrhena linearis	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphodelaceae	*Asphodelus fistulosus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulbine alata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella porracea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta var. revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	*Actinobole uliginosum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome ciliaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	3	0.1	5	0	0	0	0	0	0	0	0	0	0
	Brachyscome	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0.1	3

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	linearioba																															
	Calotis hispidula	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	100	1	100	0.2	20	0.1	10	0	0	0	0	0.1	20
	Chrysocephalum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chthonocephalus pseudevax	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza bonariensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dittrichia graveolens	Exotic	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris glabra	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris radicata	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Minuria leptophylla	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0
	Monoculus monstrosus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olearia muelleri	Shrub	0	0	0.3	10	0	0	0	0	0	0	5	50	0.5	20	2	20	0	0	0	0	0	0	0	0	0	0	0	5	20	0	0	1	5
	Olearia pimeleoides	Shrub	0.1	10	0.1	5	0	0	0	0	0.2	10	0.1	10	0.5	50	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Onopordum acaulon	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis capillaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis jaceoides	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pycnosorus pleiocephalus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reichardia tingitana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0
	Rhodanthe moschata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe pygmaea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senecio glossanthus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigesbeckia australiensis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20	0	0	0	0	0	0	0	0	0	0
	Sonchus asper	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus oleraceus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	1	0.1	1	0.1	1	0.2	5	0.1	1

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Vittadinia cervicularis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia cuneata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2
	Vittadinia dissecta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia dissecta var. hirta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia pterochaeta	Forb	0.1	100	0.1	20	0	0	0.1	10	0.1	10	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waitzia acuminata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum subsp. bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boraginaceae	*Cynoglossum australe*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Halgania cyanea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	10
	Heliotropium europaeum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	*Arabidella trisecta*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	10
	Brassica tournefortii	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	20	0.6	50
	Carrichtera annua	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	1000	5	100	0	0	1	50	20	1000	30	1000	20	1000	20	1000	45	2000
	Hirschfeldia incana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sisymbrium irio	Exotic	0	0	0	0	0.1	10	0.1	5	0.1	5	0.1	5	0	0	0.2	20	0.5	20	0.2	20	0.5	10	0	0	0	0	0.5	20	0	0	0	0
	Stenopetalum lineare	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	59	0	0	0.1	5	0	0	0	0	0	0	0.1	20	0	0	0	0
Campanulaceae	*Wahlenbergia communis*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capparaceae	*Apophyllum anomalum*	Shrub	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	*Silene apetala*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Casuarinaceae	*Casuarina pauper*	Tree	5	1	15	5	5	7	10	2	10	7	10	6	10	6	20	10	15	9	15	3	20	10	15	3	20	5	20	5	20	3	20	6
Chenopodiaceae	*Atriplex*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0.1	1	0	0	0	0	0.2	1	0.2	1

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	acutibractea																															
	Atriplex acutibractea subsp. acutibractea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex spongiosa	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	2	20	0	0
	Atriplex stipitata	Shrub	5	100	0.2	5	0.2	20	0	0	0.3	30	0.5	20	2	100	2	20	0.1	3	0.2	10	0.1	3	0.5	5	0.2	3	0	0	0	0	0.7	6
	Chenopodium cristatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chenopodium curvispicatum	Shrub	0.5	20	15	100	0.3	5	0.3	10	2	200	1	50	1	50	5	50	0	0	0	0	0	0	5	20	0	0	0	0	0.1	1	5	20
	Chenopodium desertorum	Shrub	0	0	0	0	0.1	20	0.5	50	0.1	20	0.5	50	0.1	10	0	0	0	0	0	0	0	0	0.5	5	0	0	0	0	0	0	0	0
	Chenopodium desertorum subsp. anidiophyllum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	50	0	0	0.5	5	0	0	0	0	0	0
	Chenopodium desertorum subsp. desertorum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	20	2	20	0	0	0	0	0	0	0.5	20	0	0	6	40
	Dissocarpus paradoxus	Shrub	0	0	0	0	0.3	20	0	0	0	0	0	0	0.1	20	5	50	5	100	5	50	10	100	5	20	5	50	0	0	0	0	5	20
	Dysphania carinata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dysphania pumilio	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Einadia nutans	Forb	0.2	20	0.1	10	0	0	0.1	10	0	0	0.1	20	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0
	Enchylaena tomentosa	Shrub	0.1	20	0	0	1	20	0.5	10	1	50	1	50	1	100	5	50	0.5	10	1	10	5	20	2	20	0.5	5	0.5	10	1	20	5	20
	Maireana appressa	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana brevifolia	Shrub	0	0	0.5	50	1	30	0	0	0	0	0.5	50	0.2	20	0.1	1	0.2	2	0	0	0.1	1	0.2	1	0.2	1	0	0	0.2	2	0.3	3
	Maireana georgei	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0.1	1	0	0	0.2	5
	Maireana microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana ovata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana pentatropis	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0.5	5
	Maireana sclerolaenoides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	1	0.2	10	0	0	1	50	1	20	2	50	0	0	1	20

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Maireana trichoptera	Shrub	2	50	15	100	0	0	0	0	0.5	100	0	0	0	0	1	50	0.2	5	0	0	0	0	0	0	0.2	2	15	500	0	0	15	100
	Maireana triptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana turbinata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	2	0.1	1	0	0
	Rhagodia spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	20	0	0	0	0	0	0	0	0	0	0	1	10	5	20	2	2
	Rhagodia ulicina	Shrub	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0
	Salsola australis	Shrub	0	0	0.1	10	0	0	0.1	10	0	0	0.1	10	0.1	10	0	0	0.1	1	0.1	1	0.1	1	0	0	0	0	0	0	0.1	1	0	0
	Sclerolaena diacantha	Shrub	2	100	0	0	0	0	0	0	0	0	0	0	0.1	50	5	50	5	50	2	20	0	0	0.5	5	0	0	5	50	5	50	5	25
	Sclerolaena obliquicuspis	Shrub	0	0	15	300	60	200	15	150	20	200	30	100	0.1	50	5	50	40	509	40	1000	40	1000	40	1000	35	1000	15	500	40	500	50	600
	Sclerolaena parviflora	Shrub	0.1	5	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	*Convolvulus remotus*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae	*Crassula colorata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	0	5	1000	5	1000	5	1000	0.5	20	2	1000	0	0	1	1
Cucurbitaceae	*Citrullus amarus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cupressaceae	*Callitris verrucosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Schoenus subaphyllus*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	*Euphorbia drummondii*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Caesalpinioideae)	*Senna artemisioides nothosubsp. artemisioides*	Shrub	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriacea	Shrub	2	10	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriaceae	Shrub	0	0	0.2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. filifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
	Senna artemisioides subsp. petiolaris	Shrub	0.5	10	1	10	0	0	0	0	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																											
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Senna artemisioides subsp. X artemisioides	Shrub	0	0	0.3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X coriacea	Shrub	0	0	0	0	0	0	0.1	1	0	0	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. x petiolaris	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0.2	1	0	0	0	0
Fabaceae (Faboideae)	*Aotus subspinescens*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eutaxia microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicago laciniata	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	50	0.5	20	0	0	0	0	0	0	0	0
	Medicago minima	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Mimosoideae)	*Acacia colletioides*	Shrub	5	10	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	0	0	0	0	5	4
	Acacia oswaldii	Tree	0.5	10	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sclerophylla var. sclerophylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sp.	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
Geraniaceae	*Erodium crinitum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodeniaceae	*Goodenia pinnatifida*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia willisiana	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaevola spinescens	Shrub	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	*Salvia verbenaca*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Westringia rigida	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandraceae	*Lomandra effusa*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loranthaceae	*Amyema preissii*	Other	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae	*Sida corrugata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sida fibulifera	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Sida intricata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Eucalyptus dumosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1
	Eucalyptus gracilis	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2
	Eucalyptus oleosa subsp. oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus socialis	Tree	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalidaceae	*Oxalis perennans*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxalis sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittosporaceae	*Pittosporum angustifolium*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago turrifera*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Aristida nitidula*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aristida vickeryae	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa eremophila	Grass & grasslike	0	0	0	0	0	0	0.1	20	0.1	50	0.1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	60
	Austrostipa nitida	Grass & grasslike	0.1	50	0.1	100	0.1	20	0.1	50	0.1	50	0	0	0.1	10	5	20	15	100	5	50	5	50	5	50	5	50	5	50	1	10	20	500
	Austrostipa nodosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	10	50
	Bromus sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0
	Enneapogon cylindricus	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon nigricans	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eragrostis cilianensis	Exotic	0	0	0	0	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hordeum sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lolium perenne	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0
	Paspalidium constrictum	Grass & grasslike	0.2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Poa sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	20	5	1000	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Rostraria pumila	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0.1	20	0	0
	Triodia scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triodia scariosa subsp. scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triticum aestivum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0
	Walwhalleya proluta	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulacaceae	*Calandrinia eremaea*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	20	0	0	0	0	0	0	0	0	0	0	0.2	50	0	0	0	0
Proteaceae	*Grevillea huegelii*	Shrub	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hakea leucoptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutaceae	*Geijera parviflora*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1	2	1	0	0	0	0	0	0	5	1	0	0	1	1
Santalaceae	*Exocarpos aphyllus*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0
Sapindaceae	*Alectryon oleifolius*	Tree	0.1	1	5	5	5	2	0	0	5	10	1	5	0.2	1	1	1	1	1	2	2	5	1	0	0	1	1	5	5	2	1	5	4
	Alectryon oleifolius subsp. canescens	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0.3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustissima	Shrub	10	30	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1
Scrophulariaceae	*Eremophila deserti*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila glabra	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila longifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila oppositifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
	Myoporum montanum	Shrub	1	5	0.3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum platycarpum	Shrub	0	0	0	0	0	0	5	2	0	0	0.1	1	0	0	2	2	3	2	0	0	0	0	0	0	2	1	0.2	1	0	0	0	0
	Myoporum platycarpum subsp.	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 1 - PCT 58 - Moderate-Good																													
			22494_42		22494_44		22494_46		22494_48		22494_49		22494_50		22494_61		P_22494_002		P_22494_004		P_22494_005		P_22494_006		P_22494_009		P_22494_014		P_22494_026		P_22494_028		P_22494_032	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	platycarpum																															
Solanaceae	*Solanum esuriale*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thymelaeaceae	*Pimelea microcephala subsp. microcephala*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygophyllaceae	*Roepera apiculata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	100	0	0	0	0	0	0	0	0	3	20	0	0	0	0	10	20
	Roepera eremaea	Forb	0	0	0	0	0	0	0	0	0	0	0.1	10	0.1	10	1	20	0	0	0	0	0.1	2	0	0	0	0	0	0	15	50	25	150
	Roepera glauca	Forb	0	0	0.1	10	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Roepera ovata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum eremaeum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum ovatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.2 Vegetation Zone 2 & 3 Floristic Data

Table 1.2 Vegetation Zone 2 & 3 Floristic Data

Family	Species Name	Growth Form	Zone 2 - PCT 58 - Derived-Weedy														Zone 3 - PCT 58 - Weedy-Understory							
			22494_45		22494_47		22494_58		P_22494_010		P_22494_020		P_22494_023		P_22494_036		P_22494_021		P_22494_33		P_22494_034		P_22494_35	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Aizoaceae	*Psilocaulon granulicaule*	HTW	5	50	0	0	0.1	10	0	0	0	0	0	0	5	100	0	0	0	0	10	150	0	0
	Tetragonia moorei	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae	*Ptilotus exaltatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0
	Ptilotus exaltatus var. exaltatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus semilanatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus seminudus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	*Daucus glochidiatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apocynaceae	*Marsdenia australis*	Other	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0
	Parsonsia eucalyptophylla	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhyncharrhena linearis	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphodelaceae	*Asphodelus fistulosus*	Exotic	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0
	Bulbine alata	Forb	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella porracea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta var. revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 2 - PCT 58 - Derived-Weedy														Zone 3 - PCT 58 - Weedy-Understory							
			22494_45		22494_47		22494_58		P_22494_010		P_22494_020		P_22494_023		P_22494_036		P_22494_021		P_22494_33		P_22494_034		P_22494_35	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Dianella sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	*Actinobole uliginosum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome ciliaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome lineariloba	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Calotis hispidula	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	100	0	0	0	0	0	0
	Chrysocephalum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chthonocephalus pseudevax	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza bonariensis	Exotic	0	0	0	0	0.1	30	0	0	0	0	0	0	0.1	2	0	0	0	0	0.1	20	0	0
	Conyza sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	15	0.1	2
	Dittrichia graveolens	Exotic	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris glabra	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0.2	15	0	0	1	50	0.5	15	0.1	2
	Hypochaeris radicata	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Minuria leptophylla	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	50	0	0	0	0	0	0
	Monoculus monstrosus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olearia muelleri	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0.5	5
	Olearia pimeleoides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
	Onopordum acaulon	Exotic	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0
	Podolepis capillaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis jaceoides	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pycnosorus pleiocephalus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reichardia tingitana	Exotic	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0.1	1	0	0	0	0	0	0
	Rhodanthe moschata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe pygmaea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senecio glossanthus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigesbeckia australiensis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus asper	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5	0	0	0	0
	Sonchus oleraceus	Exotic	0	0	0	0	0.1	50	1	50	0.1	1	0.1	2	0	0	0.1	1	0	0	3	150	0	0
	Vittadinia cervicularis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	15	0	0	0	0
	Vittadinia cuneata	Forb	0	0	0	0	0	0	0	0	0.2	10	0	0	0.1	2	0	0	0	0	0.1	2	0.3	15
	Vittadinia dissecta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia dissecta var. hirta	Forb	0	0	0	0	1	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia pterochaeta	Forb	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1
	Vittadinia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0
	Waitzia acuminata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0
	Xerochrysum bracteatum subsp. bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0
Boraginaceae	*Cynoglossum australe*	Forb	0.1	20	0	0	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Halgania cyanea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 2 - PCT 58 - Derived-Weedy														Zone 3 - PCT 58 - Weedy-Understory							
			22494_45		22494_47		22494_58		P_22494_010		P_22494_020		P_22494_023		P_22494_036		P_22494_021		P_22494_33		P_22494_034		P_22494_35	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Heliotropium europaeum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
Brassicaceae	*Arabidella trisecta*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brassica tournefortii	HTW	0	0	0	0	0	0	5	50	0.2	10	0.2	5	0	0	0	0	0	0	0	0	0	0
	Carrichtera annua	HTW	0	0	0.1	5	0.1	100	20	1000	30	1000	45	0	20	1000	45	1000	20	900	25	1000	30	1000
	Hirschfeldia incana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	50	0	0	0	0	0	0
	Sisymbrium irio	Exotic	0.1	10	0.1	5	0.1	10	0	0	0	0	0	0	8	250	0	0	15	250	15	250	0	0
	Stenopetalum lineare	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Campanulaceae	*Wahlenbergia communis*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capparaceae	*Apophyllum anomalum*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	*Silene apetala*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0
Casuarinaceae	*Casuarina pauper*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	3	5	2	5	2	15	6
Chenopodiaceae	*Atriplex acutibractea*	Shrub	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex acutibractea subsp. acutibractea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0.1	1
	Atriplex spongiosa	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex stipitata	Shrub	0	0	0	0	0.1	5	0.1	1	0.1	1	0	0	1	50	0.5	10	0.2	5	5	20	10	50
	Chenopodium cristatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
	Chenopodium curvispicatum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5	0.1	3	0.2	2	0	0
	Chenopodium desertorum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0	2	10
	Chenopodium desertorum subsp. anidiophyllum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	15	1	10	0.2	20
	Chenopodium desertorum subsp. desertorum	Shrub	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0.2	5	0	0	0	0	0	0
	Dissocarpus paradoxus	Shrub	0.2	5	0.1	5	0	0	5	50	5	100	2	20	0.2	5	0	0	0	0	0.1	5	0.1	5
	Dysphania carinata	Forb	0	0	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dysphania pumilio	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Einadia nutans	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchylaena tomentosa	Shrub	0.2	20	0	0	0	0	0	0	0.1	1	0.5	5	0	0	0.5	5	8	250	4	20	8	15
	Maireana appressa	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	150
	Maireana brevifolia	Shrub	0.2	1	0	0	0.2	5	0	0	0	0	1	10	0	0	0	0	0.1	3	0.1	1	0	0
	Maireana georgei	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana ovata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	25	0	0	0	0
	Maireana pentatropis	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	15	0.1	1	0.2	3
	Maireana sclerolaenoides	Shrub	0	0	0	0	0	0	0.5	20	1	20	0	0	0	0	10	100	0	0	0	0	0	0
	Maireana trichoptera	Shrub	0	0	0	0	0	0	0.1	1	0.5	5	0	0	0	0	1	10	0.5	25	0	0	0	0
	Maireana triptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana turbinata	Shrub	0	0	0	0	0	0	0.1	1	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagodia spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagodia ulicina	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 2 - PCT 58 - Derived-Weedy														Zone 3 - PCT 58 - Weedy-Understory							
			22494_45		22494_47		22494_58		P_22494_010		P_22494_020		P_22494_023		P_22494_036		P_22494_021		P_22494_33		P_22494_034		P_22494_35	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Salsola australis	Shrub	0.2	20	0	0	0	0	0	0	0	0	0	0	0.3	4	0	0	0.1	1	0	0	0.1	1
	Sclerolaena diacantha	Shrub	0	0	0	0	0	0	2	50	1	10	0.1	1	0.2	10	15	500	0.2	20	1	100	0.5	20
	Sclerolaena obliquicuspis	Shrub	60	100	0.5	30	1	50	30	500	30	500	20	100	25	1000	1	10	20	500	15	500	15	100
	Sclerolaena parviflora	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	3	0.8	40
Convolvulaceae	*Convolvulus remotus*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae	*Crassula colorata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbitaceae	*Citrullus amarus*	Exotic	0.2	5	0.2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cupressaceae	*Callitris verrucosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Schoenus subaphyllus*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	*Euphorbia drummondii*	Forb	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Caesalpinioideae)	*Senna artemisioides nothosubsp. artemisioides*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriacea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriaceae	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. filifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0	0	0	0
	Senna artemisioides subsp. filifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. petiolaris	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X artemisioides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X coriacea	Shrub	0	0	0	0	10	30	0	0	0	0	0	0	0	0	0	0	1	3	2	3	0	0
	Senna artemisioides subsp. x petiolaris	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	1	3
Fabaceae (Faboideae)	*Aotus subspinescens*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eutaxia microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicago laciniata	Exotic	0.1	5	0.1	5	0	0	20	1000	30	1000	25	0	20	1000	1	50	0	0	0	0	0	0
	Medicago minima	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Mimosoideae)	*Acacia colletioides*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia oswaldii	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sclerophylla var. sclerophylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sp.	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geraniaceae	*Erodium crinitum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodeniaceae	*Goodenia pinnatifida*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia willisiana	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	20	0	0	0	0	0	0
	Scaevola spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 2 - PCT 58 - Derived-Weedy														Zone 3 - PCT 58 - Weedy-Understory							
			22494_45		22494_47		22494_58		P_22494_010		P_22494_020		P_22494_023		P_22494_036		P_22494_021		P_22494_33		P_22494_034		P_22494_35	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Lamiaceae	*Salvia verbenaca*	Exotic	0	0	0.1	20	0.1	20	0	0	0.5	20	0	0	3	100	0	0	0	0	0	0	0	0
	Westringia rigida	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandraceae	*Lomandra effusa*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loranthaceae	*Amyema preissii*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae	*Sida corrugata*	Forb	0	0	0	0	0	0	0	0	0	0	0.2	2	0	0	0	0	0	0	0	0	0	0
	Sida fibulifera	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
	Sida intricata	Shrub	0	0	0	0	5	100	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
Myrtaceae	*Eucalyptus dumosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus gracilis	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus oleosa subsp. oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus socialis	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalidaceae	*Oxalis perennans*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxalis sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittosporaceae	*Pittosporum angustifolium*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago turrifera*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Aristida nitidula*	Grass & grasslike	0	0	0.2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aristida vickeryae	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa eremophila	Grass & grasslike	0	0	0	0	0.1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa nitida	Grass & grasslike	0.1	50	0	0	0	0	20	100	0	0	0	0	0	0	20	100	5	30	0.3	30	5	150
	Austrostipa nodosa	Grass & grasslike	0	0	0	0	0	0	0	0	10	50	10	100	2	150	5	20	0	0	0	0	0	0
	Bromus sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon cylindricus	Grass & grasslike	0	0	3	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon nigricans	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0.5	30	0	0	0	0	0	0	0	0
	Eragrostis cilianensis	Exotic	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hordeum sp.	Exotic	0.1	10	0	0	1	1000	0	0	0.1	1	0.1	5	0	0	0	0	0	0	0	0	0	0
	Lolium perenne	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paspalidium constrictum	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Poa sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rostraria pumila	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triodia scariosa	Grass &	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 2 - PCT 58 - Derived-Weedy														Zone 3 - PCT 58 - Weedy-Understory							
			22494_45		22494_47		22494_58		P_22494_010		P_22494_020		P_22494_023		P_22494_036		P_22494_021		P_22494_33		P_22494_034		P_22494_35	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
		grasslike																						
	Triodia scariosa subsp. scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triticum aestivum	Exotic	0	0	0	0	0	0	0.2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Walwhalleya proluta	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulacaceae	*Calandrinia eremaea*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proteaceae	*Grevillea huegelii*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	0	0	0	0	0	0
	Hakea leucoptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutaceae	*Geijera parviflora*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santalaceae	*Exocarpos aphyllus*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
Sapindaceae	*Alectryon oleifolius*	Tree	0	0	0	0	0	0	0	0	0.1	2	2	7	0	0	5	10	10	7	15	15	2	7
	Alectryon oleifolius subsp. canescens	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustissima	Shrub	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0
Scrophulariaceae	*Eremophila deserti*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila glabra	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila longifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila oppositifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum montanum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum platycarpum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	5	4	3	0	0
	Myoporum platycarpum subsp. platycarpum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	*Solanum esuriale*	Forb	0.1	5	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thymelaeaceae	*Pimelea microcephala subsp. microcephala*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygophyllaceae	*Roepera apiculata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Roepera eremaea	Forb	0	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0
	Roepera glauca	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Roepera ovata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	0	0	0
	Zygophyllum eremaeum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	50	0.3	20	0.2	10
	Zygophyllum ovatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	15	2	50

1.3 Vegetation Zone 4 Floristic Data

Table 1.3 Vegetation Zone 4 Floristic Data

Family	Species Name	Growth Form	Zone 4 - PCT 170 - Moderate-Good																			
			22494_53		22494_54		22494_56		22494_59		22494_63		P_22494_007		P_22494_011		P_22494_012		P_22494_015		P_22494_025		P_22494_031	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Aizoaceae	*Psilocaulon granulicaule*	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tetragonia moorei	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae	*Ptilotus exaltatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus exaltatus var. exaltatus	Forb	0.1	5	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
	Ptilotus semilanatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus seminudus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	1	0.2	3	0.2	5	0	0
Apiaceae	*Daucus glochidiatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apocynaceae	*Marsdenia australis*	Other	0.1	5	0.1	10	0.1	5	0.1	10	0.3	20	0.1	1	0.1	2	0	0	0	0	0	0	0	0
	Parsonsia eucalyptophylla	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhyncharrhena linearis	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphodelaceae	*Asphodelus fistulosus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulbine alata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella porracea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta var. revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	*Actinobole uliginosum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome ciliaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome lineariloba	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Calotis hispidula	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chrysocephalum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chthonocephalus pseudevax	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza bonariensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dittrichia graveolens	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris glabra	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris radicata	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Minuria leptophylla	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Monoculus monstrosus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olearia muelleri	Shrub	0.1	10	0.5	10	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olearia pimeleoides	Shrub	2	100	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0
	Onopordum acaulon	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis capillaris	Forb	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis jaceoides	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pycnosorus pleiocephalus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reichardia tingitana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 4 - PCT 170 - Moderate-Good																			
			22494_53		22494_54		22494_56		22494_59		22494_63		P_22494_007		P_22494_011		P_22494_012		P_22494_015		P_22494_025		P_22494_031	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Rhodanthe moschata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe pygmaea	Forb	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0
	Senecio glossanthus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigesbeckia australiensis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus asper	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus oleraceus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0
	Vittadinia cervicularis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia cuneata	Forb	0	0	0	0	0	0	0	0	0	0	0.1	2	0.2	2	0	0	0	0	0	0	0	0
	Vittadinia dissecta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia dissecta var. hirta	Forb	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia pterochaeta	Forb	0.1	20	0	0	0.1	20	0.1	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waitzia acuminata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum subsp. bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boraginaceae	*Cynoglossum australe*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Halgania cyanea	Shrub	0	0	0	0	0	0	0.1	20	0.2	50	0	0	0	0	0	0	0	0	0	0	0	0
	Heliotropium europaeum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	*Arabidella trisecta*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brassica tournefortii	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	10	0.5	50	0	0	0	0
	Carrichtera annua	HTW	0	0	0	0	0	0	0.1	10	0	0	2	50	1	50	1	100	5	109	0	0	0	0
	Hirschfeldia incana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sisymbrium irio	Exotic	0.1	1	0	0	0	0	0	0	0	0	0.2	20	0	0	0	0	0	0	0	0	0	0
	Stenopetalum lineare	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	3	0	0	0	0
Campanulaceae	*Wahlenbergia communis*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capparaceae	*Apophyllum anomalum*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	*Silene apetala*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Casuarinaceae	*Casuarina pauper*	Tree	0	0	0	0	0	0	0	0	3	1	0	0	1	1	0	0	0	0	0	0	0	0
Chenopodiaceae	*Atriplex acutibractea*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex acutibractea subsp. acutibractea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex spongiosa	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex stipitata	Shrub	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chenopodium cristatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chenopodium curvispicatum	Shrub	0.3	10	0.1	5	0.3	20	0.3	10	0.3	10	0	0	0.2	2	0	0	0.2	1	0.3	3	0	0
	Chenopodium desertorum	Shrub	0.2	20	0.1	5	0.1	10	0	0	0.3	30	5	50	0	0	0	0	0	0	0	0	0	0
	Chenopodium desertorum subsp. anidiophyllum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	1	20	5	50	0.5	20	0	0	0	0
	Chenopodium desertorum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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			22494_53		22494_54		22494_56		22494_59		22494_63		P_22494_007		P_22494_011		P_22494_012		P_22494_015		P_22494_025		P_22494_031	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	subsp. desertorum																							
	Dissocarpus paradoxus	Shrub	0	0	0	0	0	0	0	0	0	0	5	50	0	0	0	0	0	0	0	0	0	0
	Dysphania carinata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dysphania pumilio	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Einadia nutans	Forb	0	0	0	0	0.1	10	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0
	Enchylaena tomentosa	Shrub	0.1	10	0	0	1	50	0.1	10	1	100	1	10	2	20	1	20	1	5	0.2	2	0	0
	Maireana appressa	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	5	50	20	100	0	0
	Maireana brevifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana georgei	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
	Maireana microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana ovata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana pentatropis	Shrub	0	0	0	0	0	0	0	0	0	0	5	20	2	10	2	20	0	0	10	50	0	0
	Maireana sclerolaenoides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	1	20	1	20	0.5	10	5	50	0	0
	Maireana trichoptera	Shrub	0.1	20	0.5	50	0.1	10	0.1	10	0.1	10	0	0	0	0	0.1	1	0	0	0	0	0	0
	Maireana triptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana turbinata	Shrub	0.1	10	0.1	20	0.1	20	0.1	10	0.2	50	0	0	0	0	0	0	0	0	0.1	1	0	0
	Rhagodia spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagodia ulicina	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salsola australis	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sclerolaena diacantha	Shrub	0	0	0	0	0	0	0	0	0.1	10	3	20	5	50	2	50	20	100	1	20	0	0
	Sclerolaena obliquicuspis	Shrub	1	100	0.5	50	0.1	20	1	100	0.1	10	20	100	25	500	30	500	1	20	0	0	0	0
	Sclerolaena parviflora	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convolvulaceae	*Convolvulus remotus*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae	*Crassula colorata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cucurbitaceae	*Citrullus amarus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cupressaceae	*Callitris verrucosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Schoenus subaphyllus*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	*Euphorbia drummondii*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Caesalpinioideae)	*Senna artemisioides nothosubsp. artemisioides*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriacea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriaceae	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. filifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0
	Senna artemisioides subsp. petiolaris	Shrub	0.5	5	0.5	5	0.1	10	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X artemisioides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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			22494_53		22494_54		22494_56		22494_59		22494_63		P_22494_007		P_22494_011		P_22494_012		P_22494_015		P_22494_025		P_22494_031	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Senna artemisioides subsp. X coriacea	Shrub	0.1	5	3	6	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. x petiolaris	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Faboideae)	*Aotus subspinescens*	Shrub	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eutaxia microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicago laciniata	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicago minima	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Mimosoideae)	*Acacia colletioides*	Shrub	0	0	0	0	0	0	1	2	0	0	0.5	1	0	0	0	0	0	0	0	0	0	0
	Acacia oswaldii	Tree	0	0	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	0	0
	Acacia sclerophylla var. sclerophylla	Shrub	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sp.	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geraniaceae	*Erodium crinitum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodeniaceae	*Goodenia pinnatifida*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia willisiana	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaevola spinescens	Shrub	2	4	0.1	1	0	0	0	0	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	*Salvia verbenaca*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Westringia rigida	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	2	0	0
Lomandraceae	*Lomandra effusa*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loranthaceae	*Amyema preissii*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae	*Sida corrugata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sida fibulifera	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sida intricata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Eucalyptus dumosa*	Tree	5	5	0	0	0	0	5	1	0	0	5	1	10	1	10	2	10	3	15	5	0	0
	Eucalyptus gracilis	Tree	0	0	0	0	0	0	10	2	0	0	0	0	0	0	5	1	20	5	15	5	0	0
	Eucalyptus oleosa	Tree	0	0	20	3	5	6	0	0	0	0	25	3	25	4	0	0	0	0	0	0	0	0
	Eucalyptus oleosa subsp. oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0	0	0	0
	Eucalyptus socialis	Tree	10	7	1	1	5	6	5	2	15	5	0	0	0	0	20	6	0	0	15	5	20	2
Oxalidaceae	*Oxalis perennans*	Forb	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxalis sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittosporaceae	*Pittosporum angustifolium*	Shrub	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago turrifera*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Aristida nitidula*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aristida vickeryae	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa eremophila	Grass & grasslike	0	0	0	0	0	0	5	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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			22494_53		22494_54		22494_56		22494_59		22494_63		P_22494_007		P_22494_011		P_22494_012		P_22494_015		P_22494_025		P_22494_031	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Austrostipa nitida	Grass & grasslike	0.1	20	0.1	20	0.1	50	1	100	0.1	10	10	100	5	50	10	100	5	50	1	10	0	0
	Austrostipa nodosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bromus sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon cylindricus	Grass & grasslike	0.2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon nigricans	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eragrostis cilianensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hordeum sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lolium perenne	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paspalidium constrictum	Grass & grasslike	0.1	20	0.1	20	0.1	20	0	0	0.2	30	0	0	0	0	0	0	0	0	0	0	0	0
	Poa sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rostraria pumila	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triodia scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triodia scariosa subsp. scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triticum aestivum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Walwhalleya proluta	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portulacaceae	*Calandrinia eremaea*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proteaceae	*Grevillea huegelii*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hakea leucoptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutaceae	*Geijera parviflora*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santalaceae	*Exocarpos aphyllus*	Shrub	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sapindaceae	*Alectryon oleifolius*	Tree	0	0	0	0	0	0	0	0	10	15	1	1	0	0	0	0	0	0	0	0	0	0
	Alectryon oleifolius subsp. canescens	Tree	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustifolia	Shrub	1	10	0.1	5	0	0	1	15	0.5	20	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustissima	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.2	1	0	0	0	0
Scrophulariaceae	*Eremophila deserti*	Shrub	0	0	0	0	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila glabra	Shrub	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0
	Eremophila longifolia	Shrub	0	0	0	0	15	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila oppositifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum montanum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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			22494_53		22494_54		22494_56		22494_59		22494_63		P_22494_007		P_22494_011		P_22494_012		P_22494_015		P_22494_025		P_22494_031	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Myoporum platycarpum	Shrub	0	0	0	0	0	0	0	0	0.5	1	5	2	0	0	0	0	0	0	0	0	0	0
	Myoporum platycarpum subsp. platycarpum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	5	2	0	0	0	0	0	0	0	0
Solanaceae	*Solanum esuriale*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thymelaeaceae	*Pimelea microcephala subsp. microcephala*	Shrub	0.2	1	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygophyllaceae	*Roepera apiculata*	Forb	0	0	0	0	0	0	0	0	0	0	10	50	10	100	10	100	15	50	10	50	0	0
	Roepera eremaea	Forb	0	0	0	0	0	0	0	0	0.1	5	0.1	2	0	0	0	0	0.1	1	0	0	0	0
	Roepera glauca	Forb	0.1	10	0.1	20	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Roepera ovata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2	0.5	10	0	0
	Zygophyllum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum eremaeum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum ovatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.4 Vegetation Zone 5 & 6 Floristic Data

Table 1.4 Vegetation Zone 5 & 6 Floristic Data

Family	Species Name	Growth Form	Zone 5 - PCT 170 - Derived-Native										Zone 6 - PCT 170 - Derived-Weedy											
			22494_55		22494_60		P_22494_008		P_22494_019		P_22494_027		22494_57		22494_62		P_22494_013		P_22494_017		P_22494_018		P_22494_037	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Aizoaceae	*Psilocaulon granulicaule*	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	0	0
	Tetragonia moorei	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae	*Ptilotus exaltatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus exaltatus var. exaltatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus semilanatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus seminudus	Forb	0	0	0	0	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	*Daucus glochidiatus*	Forb	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apocynaceae	*Marsdenia australis*	Other	0	0	0	0	0	0	0.1	1	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Parsonsia eucalyptophylla	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhyncharrhena linearis	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphodelaceae	*Asphodelus fistulosus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	20	0	0	0	0
	Bulbine alata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella porracea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta var. revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	*Actinobole uliginosum*	Forb	0	0	0	0	5	1000	0.2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome ciliaris	Forb	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome lineariloba	Forb	0	0	0	0	0	0	0.2	50	0.1	5	0	0	0	0	0	0	0.1	5	0	0	0	0
	Calotis hispidula	Forb	0	0	0	0	0	0	2	1000	0.5	100	0	0	0	0	0	0	0.5	50	0	0	0	0

Family	Species Name	Growth Form	Zone 5 - PCT 170 - Derived-Native										Zone 6 - PCT 170 - Derived-Weedy									
			22494_55		22494_60		P_22494_008		P_22494_019		P_22494_027		22494_57		22494_62		P_22494_013		P_22494_017		P_22494_018		P_22494_037	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Chrysocephalum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chthonocephalus pseudevax	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza bonariensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0.1	50	0	0	0	0	0	0	0	0
	Conyza sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dittrichia graveolens	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris glabra	Exotic	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0.5	40
	Hypochaeris radicata	Exotic	0	0	0	0	0	0	0	0	0	0	0.1	10	0.1	50	0	0	0	0	0	0	0	0
	Minuria leptophylla	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Monoculus monstrosus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olearia muelleri	Shrub	0	0	0.2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Olearia pimeleoides	Shrub	0	0	0	0	0	0	0	0	0.5	5	0	0	0	0	0	0	0	0	0	0	0	0
	Onopordum acaulon	Exotic	0	0	0.1	10	0	0	0	0	0	0	0.1	10	0.1	10	0	0	0	0	0.2	5	0	0
	Podolepis capillaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis jaceoides	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pycnosorus pleiocephalus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reichardia tingitana	Exotic	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe moschata	Forb	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe pygmaea	Forb	0	0	0	0	10	1000	0	0	0	0	0	0	0	0	0	0	0.2	50	0	0	0	0
	Senecio glossanthus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sigesbeckia australiensis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus asper	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus oleraceus	Exotic	0	0	0	0	0	0	0.1	2	0.1	2	0	0	0	0	0.1	5	0.2	10	0.1	1	0.5	15
	Vittadinia cervicularis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia cuneata	Forb	0	0	0	0	1	50	0	0	0.2	2	0	0	0	0	0	0	0.1	1	0	0	1	25
	Vittadinia dissecta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia dissecta var. hirta	Forb	0	0	0	0	0	0	0	0	0	0	1	100	0.2	50	0	0	0	0	0	0	0	0
	Vittadinia pterochaeta	Forb	0.5	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waitzia acuminata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum	Forb	0	0	0	0	0	0	0	0	0.2	10	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum subsp. bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
Boraginaceae	*Cynoglossum australe*	Forb	0	0	0	0	0	0	0	0	0	0	1	50	0.5	50	0	0	0	0	0	0	0	0
	Halgania cyanea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heliotropium europaeum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	*Arabidella trisecta*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brassica tournefortii	HTW	0	0	0	0	0	0	5	100	0.1	10	0	0	0	0	0.1	1	5	50	5	50	0	0
	Carrichtera annua	HTW	0.1	50	0.1	10	2	100	10	1000	40	1000	0.1	20	0.1	100	30	1000	20	1000	30	1000	15	800
	Hirschfeldia incana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 5 - PCT 170 - Derived-Native										Zone 6 - PCT 170 - Derived-Weedy											
			22494_55		22494_60		P_22494_008		P_22494_019		P_22494_027		22494_57		22494_62		P_22494_013		P_22494_017		P_22494_018		P_22494_037	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Sisymbrium irio	Exotic	0.1	100	0	0	0.2	20	0	0	0	0	0.1	20	0.1	10	0	0	0	0	0	0	10	1000
	Stenopetalum lineare	Forb	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Campanulaceae	*Wahlenbergia communis*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0
Capparaceae	*Apophyllum anomalum*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	*Silene apetala*	Exotic	0	0	0	0	0.2	20	0.2	50	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0
Casuarinaceae	*Casuarina pauper*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodiaceae	*Atriplex acutibractea*	Shrub	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex acutibractea subsp. acutibractea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex spongiosa	Forb	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex stipitata	Shrub	1	50	2	50	0	0	0	0	0	0	0.5	10	10	100	0.2	2	0	0	0.2	5	5	20
	Chenopodium cristatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chenopodium curvispicatum	Shrub	10	100	0.2	10	0	0	0.1	1	1	20	0	0	0	0	0	0	0	0	0	0	1	15
	Chenopodium desertorum	Shrub	5	100	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0
	Chenopodium desertorum subsp. anidiophyllum	Shrub	0	0	0	0	5	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5
	Chenopodium desertorum subsp. desertorum	Shrub	0	0	0	0	0	0	15	100	0.5	20	0	0	0	0	0	0	0	0	0.1	1	0	0
	Dissocarpus paradoxus	Shrub	1	50	0	0	5	100	0	0	0	0	0	0	0	0	5	50	0.5	20	0	0	0.2	10
	Dysphania carinata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dysphania pumilio	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Einadia nutans	Forb	0.2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchylaena tomentosa	Shrub	0.5	50	0.3	30	0	0	0	0	0.5	5	0.1	10	0.1	20	0	0	0	0	0.2	1	10	15
	Maireana appressa	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana brevifolia	Shrub	1	20	0.2	5	0.1	1	0	0	0.1	1	0	0	0.1	10	0	0	0	0	0	0	0	0
	Maireana georgei	Shrub	0	0	0	0	0	0	10	100	0.5	20	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana ovata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana pentatropis	Shrub	0	0	0	0	5	50	20	50	1	10	0	0	0	0	0	0	0	0	0	0	2	20
	Maireana sclerolaenoides	Shrub	0	0	0	0	0.5	20	0	0	5	50	0	0	0	0	0.2	10	0	0	0.1	1	0	0
	Maireana trichoptera	Shrub	1	50	0	0	0	0	0.5	10	5	50	0.2	50	0	0	0	0	0	0	0.3	3	0	0
	Maireana triptera	Shrub	0	0	0	0	1	10	0.5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana turbinata	Shrub	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagodia spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagodia ulicina	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Salsola australis	Shrub	15	300	0	0	0	0	0	0	0	0	0.2	10	0.2	10	0	0	0	0	0	0	0.1	1
	Sclerolaena diacantha	Shrub	0	0	0.1	100	5	59	5	100	6	70	0	0	0	0	1	20	15	500	0	0	0.3	30
	Sclerolaena obliquicuspis	Shrub	1	100	0.1	100	20	100	0	0	0	0	0.3	50	0.1	50	30	100	0.2	5	30	100	25	1000
	Sclerolaena parviflora	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0
Convolvulaceae	*Convolvulus remotus*	Other	0	0	0	0	0	0	0	0	0	0	0.1	10	0.1	10	0	0	0	0	0	0	0	0

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			22494_55		22494_60		P_22494_008		P_22494_019		P_22494_027		22494_57		22494_62		P_22494_013		P_22494_017		P_22494_018		P_22494_037	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Crassulaceae	*Crassula colorata*	Forb	0	0	0	0	0.5	1000	0.5	500	0.5	1000	0	0	0	0	0	0	1	1000	0	0	0	0
Cucurbitaceae	*Citrullus amarus*	Exotic	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0
Cupressaceae	*Callitris verrucosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Schoenus subaphyllus*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	*Euphorbia drummondii*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0
Fabaceae (Caesalpinioideae)	*Senna artemisioides nothosubsp. artemisioides*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriacea	Shrub	0	0	0.2	1	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriaceae	Shrub	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. filifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. petiolaris	Shrub	0	0	0	0	0	0	0	0	0	0	0.5	5	0.5	20	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X artemisioides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X coriacea	Shrub	0	0	0	0	0	0	0	0	0.1	1	0.2	5	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. x petiolaris	Shrub	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Faboideae)	*Aotus subspinescens*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eutaxia microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicago laciniata	Exotic	0	0	0	0	30	1000	2	20	3	100	0	0	0	0	30	1000	40	1000	5	100	0	0
	Medicago minima	Exotic	0	0	0	0	0	0	0	0	2	100	0	0	0	0	0	0	0	0	20	1000	0	0
Fabaceae (Mimosoideae)	*Acacia colletioides*	Shrub	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia oswaldii	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sclerophylla var. sclerophylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sp.	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geraniaceae	*Erodium crinitum*	Forb	0	0	0	0	0.2	5	1	20	0.2	5	0	0	0	0	0	0	2	50	0	0	0	0
Goodeniaceae	*Goodenia pinnatifida*	Forb	0	0	0	0	0	0	0.2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia willisiana	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scaevola spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	*Salvia verbenaca*	Exotic	0	0	0	0	0.2	5	0	0	0	0	0.1	20	0.1	20	0	0	5	100	0.2	20	0	0
	Westringia rigida	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomandraceae	*Lomandra effusa*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loranthaceae	*Amyema preissii*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae	*Sida corrugata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 5 - PCT 170 - Derived-Native										Zone 6 - PCT 170 - Derived-Weedy											
			22494_55		22494_60		P_22494_008		P_22494_019		P_22494_027		22494_57		22494_62		P_22494_013		P_22494_017		P_22494_018		P_22494_037	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Sida fibulifera	Forb	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sida intricata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0
Myrtaceae	*Eucalyptus dumosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus gracilis	Tree	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus oleosa	Tree	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus oleosa subsp. oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	11
	Eucalyptus socialis	Tree	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	5	5
Oxalidaceae	*Oxalis perennans*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oxalis sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittosporaceae	*Pittosporum angustifolium*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago turrifera*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Aristida nitidula*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aristida vickeryae	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa eremophila	Grass & grasslike	1	200	0.1	50	0	0	0	0	0	0	0	0	0.1	50	0	0	0	0	0	0	0	0
	Austrostipa nitida	Grass & grasslike	0.1	50	0.1	50	20	100	25	1000	0	0	0	0	0.1	50	1	20	10	100	5	100	5	500
	Austrostipa nodosa	Grass & grasslike	0	0	0	0	0	0	0	0	40	1000	0	0	0	0	0	0	0	0	0	0	15	800
	Bromus sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	20	0	0	0	0
	Enneapogon cylindricus	Grass & grasslike	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon nigricans	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eragrostis cilianensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hordeum sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0.1	1000	0.1	10	0	0	0	0	0	0	0	0
	Lolium perenne	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0
	Paspalidium constrictum	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Poa sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rostraria pumila	Exotic	0	0	0	0	0.1	20	0.2	100	0.2	20	0	0	0	0	0	0	0	0	0	0	0	0
	Triodia scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triodia scariosa subsp. scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Triticum aestivum	Exotic	0	0	0	0	0	0	0.2	20	0	0	0	0	0	0	0.1	5	0.1	10	0.2	20	0	0
	Walwhalleya proluta	Grass & grasslike	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 5 - PCT 170 - Derived-Native										Zone 6 - PCT 170 - Derived-Weedy											
			22494_55		22494_60		P_22494_008		P_22494_019		P_22494_027		22494_57		22494_62		P_22494_013		P_22494_017		P_22494_018		P_22494_037	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Portulacaceae	*Calandrinia eremaea*	Forb	0	0	0	0	0	0	0	0	0.2	20	0	0	0	0	0	0	0	0	0	0	0	0
Proteaceae	*Grevillea huegelii*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hakea leucoptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutaceae	*Geijera parviflora*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santalaceae	*Exocarpos aphyllus*	Shrub	0	0	0.3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sapindaceae	*Alectryon oleifolius*	Tree	0.1	5	0.5	1	0	0	0	0	2	10	0	0	0	0	0	0	0	0	0	0	0	0
	Alectryon oleifolius subsp. canescens	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustifolia	Shrub	0.1	5	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustissima	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	20	0	0	0	0
Scrophulariaceae	*Eremophila deserti*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila glabra	Shrub	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila longifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila oppositifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	0	0	0	0
	Myoporum montanum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum platycarpum	Shrub	0.1	5	0	0	0	0	0.2	1	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum platycarpum subsp. platycarpum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	*Solanum esuriale*	Forb	0.5	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thymelaeaceae	*Pimelea microcephala subsp. microcephala*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygophyllaceae	*Roepera apiculata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5	0	0
	Roepera eremaea	Forb	0.1	10	0	0	0	0	0	0	15	500	0	0	0	0	0	0	0	0	0	0	0	0
	Roepera glauca	Forb	0.5	100	0.1	5	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0
	Roepera ovata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum eremaeum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum ovatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	250

1.5 Vegetation Zone 7 & 8 Floristic Data

Table 1.5 Vegetation Zone 7 & 8 Floristic Data

Family	Species Name	Growth Form	Zone 7 – 170 Weedy-US		Zone 8 - PCT 171 - Moderate-Good																			
			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Aizoaceae	*Psilocaulon granulicaule*	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tetragonia moorei	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 7 – 170 Weedy-US		Zone 8 - PCT 171 - Moderate-Good																					
			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Amaranthaceae	*Ptilotus exaltatus*	Forb	0	0	0	0	0	0	0.1	5	0.1	5	0	0	0.1	5	0	0	0	0	0.5	20	0.2	10	0.2	10	0	0
	Ptilotus exaltatus var. exaltatus	Forb	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus semilanatus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ptilotus seminudus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	2	0.2	5	0	0	0.1	2	0	0
Apiaceae	*Daucus glochidiatus*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	500	0	0	0	0	0	0	0	0
Apocynaceae	*Marsdenia australis*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0
	Parsonsia eucalyptophylla	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	3	0	0
	Rhyncharrhena linearis	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2	0	0	0	0	0	0	0	0	0	0
Asphodelaceae	*Asphodelus fistulosus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bulbine alata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella porracea	Forb	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0.2	20	0.5	100	0	0	0	0	0	0	0	0	0	0	0	0
	Dianella revoluta var. revoluta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0.1	1
	Dianella sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0
Asteraceae	*Actinobole uliginosum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0
	Brachyscome ciliaris	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brachyscome lineariloba	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	50	0.5	100	0.2	20	0	0	0	0	0.2	20
	Calotis hispidula	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	100	0.1	10	0.1	5	0	0	0	0	0.2	20
	Chrysocephalum apiculatum	Forb	0	0	0.1	5	0	0	0	0	0	0	0.1	5	0.1	5	0	0	0	0	0	0	0	0	0	0	0.1	1
	Chthonocephalus pseudevax	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	500	0	0	0	0	0	0	0	0
	Conyza bonariensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conyza sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dittrichia graveolens	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris glabra	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypochaeris radicata	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Minuria leptophylla	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Monoculus monstrosus	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0
	Olearia muelleri	Shrub	0	0	0.3	5	0.2	5	0.1	10	0.1	10	0.5	20	0	0	5	20	0	0	0	0	1	5	0.1	1	0	0
	Olearia pimeleoides	Shrub	0	0	0.5	30	0	0	0	0	0	0	0	0	0.1	1	0.1	1	0	0	0.1	1	0	0	2	10	0	0
	Onopordum acaulon	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Podolepis capillaris	Forb	0	0	0.1	10	0	0	0	0	0	0	0.1	5	0.1	5	0	0	0.1	1	0	0	0	0	0	0	0.1	5

Family	Species Name	Growth Form	Zone 7 – 170 Weedy-US		Zone 8 - PCT 171 - Moderate-Good																					
			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Podolepis jaceoides	Forb	0	0	0	0	0.1	10	0	0	0.1	10	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pycnosorus pleiocephalus	Forb	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reichardia tingitana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe moschata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhodanthe pygmaea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	500	0	0	0	0	0	0	0	0
	Senecio glossanthus	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	10	0	0	0	0	0	0
	Sigesbeckia australiensis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus asper	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sonchus oleraceus	Exotic	0.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	2	0	0	0.1	1	0	0	0.1	1
	Vittadinia cervicularis	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia cuneata	Forb	0.2	10	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5	0.1	2	0.1	10	0.1	2	0.1	10	0.1	2
	Vittadinia dissecta	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0
	Vittadinia dissecta var. hirta	Forb	0	0	0	0	0	0	0	0	0.1	50	0	0	0.1	10	0.1	1	0	0	0	0	0	0	0	0	0	0
	Vittadinia pterochaeta	Forb	0	0	0.1	100	0	0	0.1	50	0.1	50	0.1	10	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0
	Vittadinia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waitzia acuminata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	2	500	0.2	10	0	0	0	0	0	0
	Xerochrysum bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Xerochrysum bracteatum subsp. bracteatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boraginaceae	*Cynoglossum australe*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Halgania cyanea	Shrub	0	0	5	300	0.2	50	0	0	0	0	0	0	5	300	0	0	1	20	0	0	0	0	5	50	0.2	10
	Heliotropium europaeum	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassicaceae	*Arabidella trisecta*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
	Brassica tournefortii	HTW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	10	0.1	1	0	0	0.2	20
	Carrichtera annua	HTW	30	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hirschfeldia incana	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sisymbrium irio	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	10	0.5	29	0	0	0	0	0	0	0	0
	Stenopetalum lineare	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	50	0	0	0.2	50	0	0	0.2	20	0.2	20
Campanulaceae	*Wahlenbergia communis*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capparaceae	*Apophyllum anomalum*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	*Silene apetala*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0.1	20
Casuarinaceae	*Casuarina pauper*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodiaceae	*Atriplex acutibractea*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex acutibractea subsp. acutibractea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Family	Species Name	Growth Form	Zone 7 – 170 Weedy-US		Zone 8 - PCT 171 - Moderate-Good																					
			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Atriplex spongiosa	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Atriplex stipitata	Shrub	0.5	5	0	0	0	0	0	0	0.2	10	0	0	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0
	Chenopodium cristatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chenopodium curvispicatum	Shrub	0	0	0.2	5	0.1	5	0.1	10	0.2	20	0.1	10	0.1	5	0	0	0	0	0.3	3	0	0	0.2	1	2	20
	Chenopodium desertorum	Shrub	0	0	0.1	10	0.1	10	1	100	0	0	0.2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chenopodium desertorum subsp. anidiophyllum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1
	Chenopodium desertorum subsp. desertorum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	50	5	20	1	20	0.5	5	0.2	5	2	20
	Dissocarpus paradoxus	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dysphania carinata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dysphania pumilio	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Einadia nutans	Forb	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enchylaena tomentosa	Shrub	1	5	0.1	50	0.1	10	0.1	5	0.2	20	0	0	0.1	10	5	20	10	29	0.5	5	0	0	0.1	1	0.2	1
	Maireana appressa	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana brevifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana georgei	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0.1	1	0	0
	Maireana microphylla	Shrub	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana ovata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maireana pentatropis	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	20	0	0	0.5	5	0	0	0	0	0.1	1
	Maireana sclerolaenoides	Shrub	2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	10	0.5	10	2	20	0.2	10	0.1	1
	Maireana trichoptera	Shrub	25	1000	0.2	20	0	0	0	0	0.1	30	0	0	0.1	10	0.1	1	10	59	0.2	5	0	0	0	0	0.2	2
	Maireana triptera	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	20	0	0	0	0	0	0	0	0
	Maireana turbinata	Shrub	0	0	0	0	0	0	0	0	0.5	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhagodia spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	50	0	0	0	0	0	0	0	0	0	0
	Rhagodia ulicina	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0
	Salsola australis	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sclerolaena diacantha	Shrub	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	5	50	10	50	5	50	2	20	5	50	2	20
	Sclerolaena obliquicuspis	Shrub	0.2	2	0	0	0.1	20	0.2	20	5	100	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sclerolaena parviflora	Shrub	0	0	0.1	10	0	0	0.1	10	0.1	10	0.1	10	0	0	0.1	1	0.1	2	0.2	10	0.5	50	0.5	20	2	20

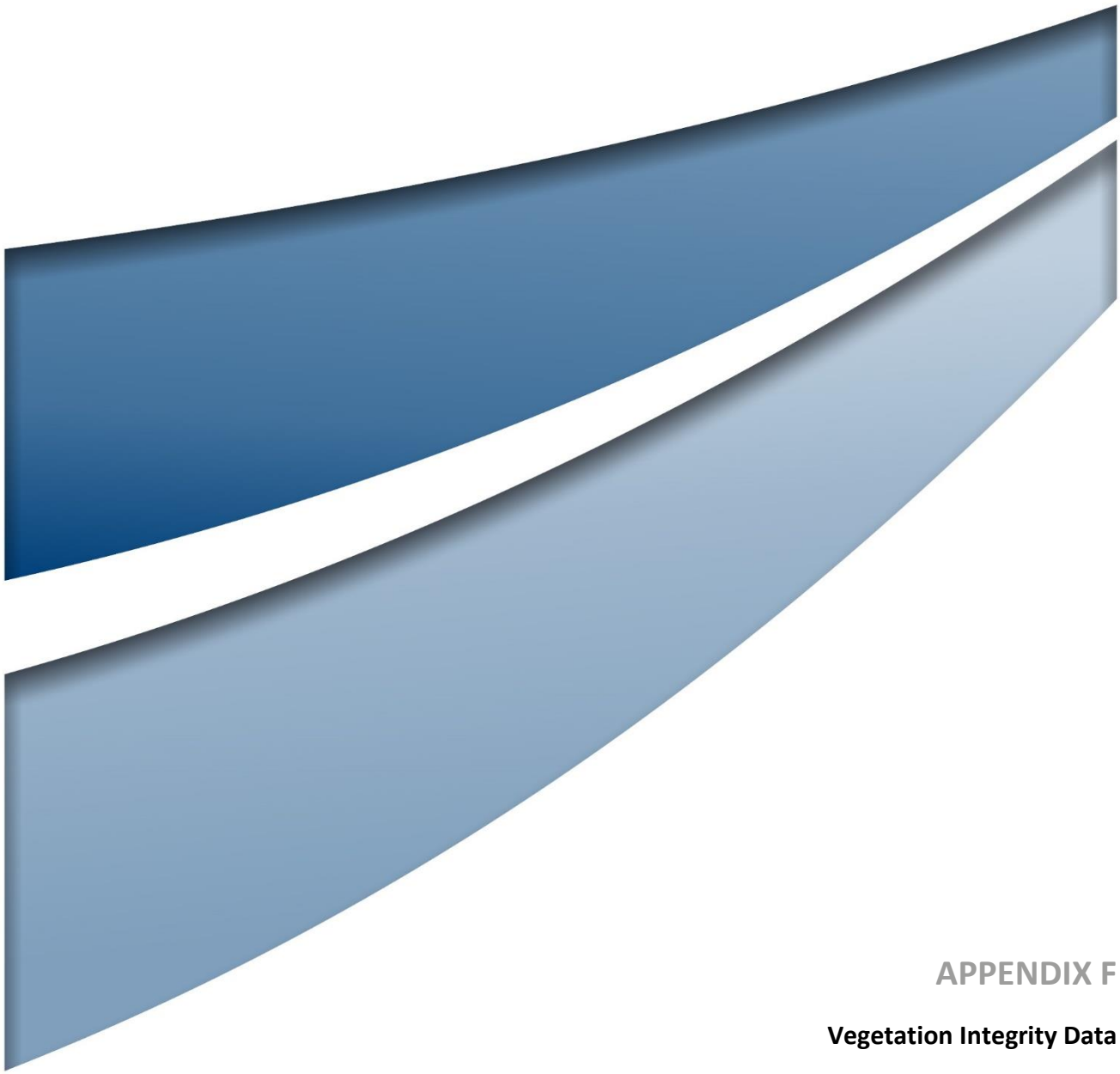
Family	Species Name	Growth Form	Zone 7 – 170 Weedy-US		Zone 8 - PCT 171 - Moderate-Good																					
			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Convolvulaceae	*Convolvulus remotus*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae	*Crassula colorata*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	1	500	0.2	100	0	0	0	0	0	0
Cucurbitaceae	*Citrullus amarus*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cupressaceae	*Callitris verrucosa*	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Cyperaceae	*Schoenus subaphyllus*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0.3	300	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	*Euphorbia drummondii*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Caesalpinioideae)	*Senna artemisioides nothosubsp. artemisioides*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriacea	Shrub	0	0	0.1	5	0	0	0	0	0	0	0.3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides nothosubsp. coriaceae	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. filifolia	Shrub	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. petiolaris	Shrub	0	0	0.3	1	0.1	5	0	0	0.5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X artemisioides	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
	Senna artemisioides subsp. X coriacea	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0
	Senna artemisioides subsp. x petiolaris	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0	0	0	0	0	0	0.2	1
Fabaceae (Faboideae)	*Aotus subspinescens*	Shrub	0	0	0	0	1	10	10	100	0	0	15	30	0.5	20	0	0	0	0	0	0	0	0	0	0	0	0
	Eutaxia microphylla	Shrub	0	0	0.1	1	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0
	Medicago laciniata	Exotic	30	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Medicago minima	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae (Mimosoideae)	*Acacia colletioides*	Shrub	0	0	0.3	2	0	0	0	0	0	0	0	0	0	0	0.1	1	1	1	0	0	0	0	0	0	0	0
	Acacia oswaldii	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	0	0
	Acacia sclerophylla var. sclerophylla	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acacia sp.	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geraniaceae	*Erodium crinitum*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.2	20	0	0	0	0	0	0
Goodeniaceae	*Goodenia pinnatifida*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Goodenia sp.	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	30	0	0	0	0	0	0
	Goodenia willisiana	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	20	0	0	0	0	0	0	0.1	2
	Scaevola spinescens	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamiaceae	*Salvia verbenaca*	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0
	Westringia rigida	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	0	0	0.5	1
Lomandraceae	*Lomandra effusa*	Grass & grasslike	0	0	0	0	0	0	0	0	0.3	5	0	0	0.1	20	0	0	0	0	0.5	5	0.2	5	0	0	0	0

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			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
Loranthaceae	*Amyema preissii*	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae	*Sida corrugata*	Forb	0.1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sida fibulifera	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sida intricata	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Eucalyptus dumosa*	Tree	5	1	5	3	2	5	10	10	1	1	5	10	2	1	0	0	0	0	10	5	25	5	10	3	0	0
	Eucalyptus gracilis	Tree	10	2	10	5	0	0	5	5	5	2	0	0	0	0	0	0	20	10	15	10	0	0	15	6	5	2
	Eucalyptus oleosa	Tree	0	0	0	0	5	10	0	0	0	0	0	0	0	0	25	7	0	0	0	0	0	0	0	0	0	0
	Eucalyptus oleosa subsp. oleosa	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eucalyptus socialis	Tree	0	0	20	10	20	15	20	20	10	4	5	10	5	6	5	1	15	5	20	10	20	5	15	6	35	10
Oxalidaceae	*Oxalis perennans*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
	Oxalis sp.	Forb	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pittosporaceae	*Pittosporum angustifolium*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago turrifera*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0
Poaceae	*Aristida nitidula*	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aristida vickeryae	Grass & grasslike	0	0	0	0	0	0	0.1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa eremophila	Grass & grasslike	0.5	5	0	0	0	0	0	0	0.1	10	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Austrostipa nitida	Grass & grasslike	1	10	0.1	50	0.1	50	0.1	50	0.2	50	0.1	50	0.1	20	5	50	0	0	5	50	1	10	1	20	5	50
	Austrostipa nodosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bromus sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon cylindricus	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0.1	30	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0
	Enneapogon nigricans	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eragrostis cilianensis	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hordeum sp.	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lolium perenne	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paspalidium constrictum	Grass & grasslike	0	0	5	500	0	0	0	0	0.1	50	0	0	0	0	1	20	0.1	1	0.2	5	0	0	0	0	0	0
	Poa sp.	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rostraria pumila	Exotic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0.1	10	0.1	10	0	0	0	0	0	0
	Triodia scariosa	Grass & grasslike	0	0	0.5	20	10	100	10	100	0.2	5	10	100	20	200	0	0	7	5	0	0	0	0	0	0	0	0
	Triodia scariosa subsp. scariosa	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	0	0	15	20	40	50	10	5	30	50

Family	Species Name	Growth Form	Zone 7 – 170 Weedy-US		Zone 8 - PCT 171 - Moderate-Good																					
			P_22494_022		22494_41		22494_43		22494_51		22494_52		22494_64		22494_65		P_22494_001		P_22494_003		P_22494_016		P_22494_024		P_22494_029		P_22494_030	
			PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab	PC	Ab
	Triticum aestivum	Exotic	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Walwhalleya proluta	Grass & grasslike	0	0	0	0	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0
Portulacaceae	*Calandrinia eremaea*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	20	0	0	0.1	10	0	0	0	0	0	0
Proteaceae	*Grevillea huegelii*	Shrub	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0	0	0	0
	Hakea leucoptera	Shrub	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutaceae	*Geijera parviflora*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santalaceae	*Exocarpos aphyllus*	Shrub	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sapindaceae	*Alectryon oleifolius*	Tree	0	0	0	0	0	0	0	0	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Alectryon oleifolius subsp. canescens	Tree	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0.2	5	0	0	0	0	0	0	0	0	0	0	0	0
	Dodonaea viscosa subsp. angustissima	Shrub	0.2	1	0.2	5	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0
Scrophulariaceae	*Eremophila deserti*	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila glabra	Shrub	1	1	0	0	0.3	5	0	0	0	0	0.1	5	0	0	1	5	0	0	0	0	0.2	1	0	0	0	0
	Eremophila longifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Eremophila oppositifolia	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Myoporum montanum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0	0
	Myoporum platycarpum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	2
	Myoporum platycarpum subsp. platycarpum	Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	*Solanum esuriale*	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thymelaeaceae	*Pimelea microcephala subsp. microcephala*	Shrub	0	0	0	0	0	0	0	0	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygophyllaceae	*Roepera apiculata*	Forb	2	20	0	0	0	0	0	0	0	0	0	0	0	0	2	20	0.1	2	0	0	0	0	0	0	0	0
	Roepera eremaea	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	0.1	1	0.5	20	0	0	2	20	0.5	5
	Roepera glauca	Forb	0	0	0	0	0	0	0	0	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Roepera ovata	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	2	0	0	0	0
	Zygophyllum apiculatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum eremaeum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zygophyllum ovatum	Forb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.6 Glossary

PC – Percentage Cover
Ab – Abundance
HTW – High Threat Weed



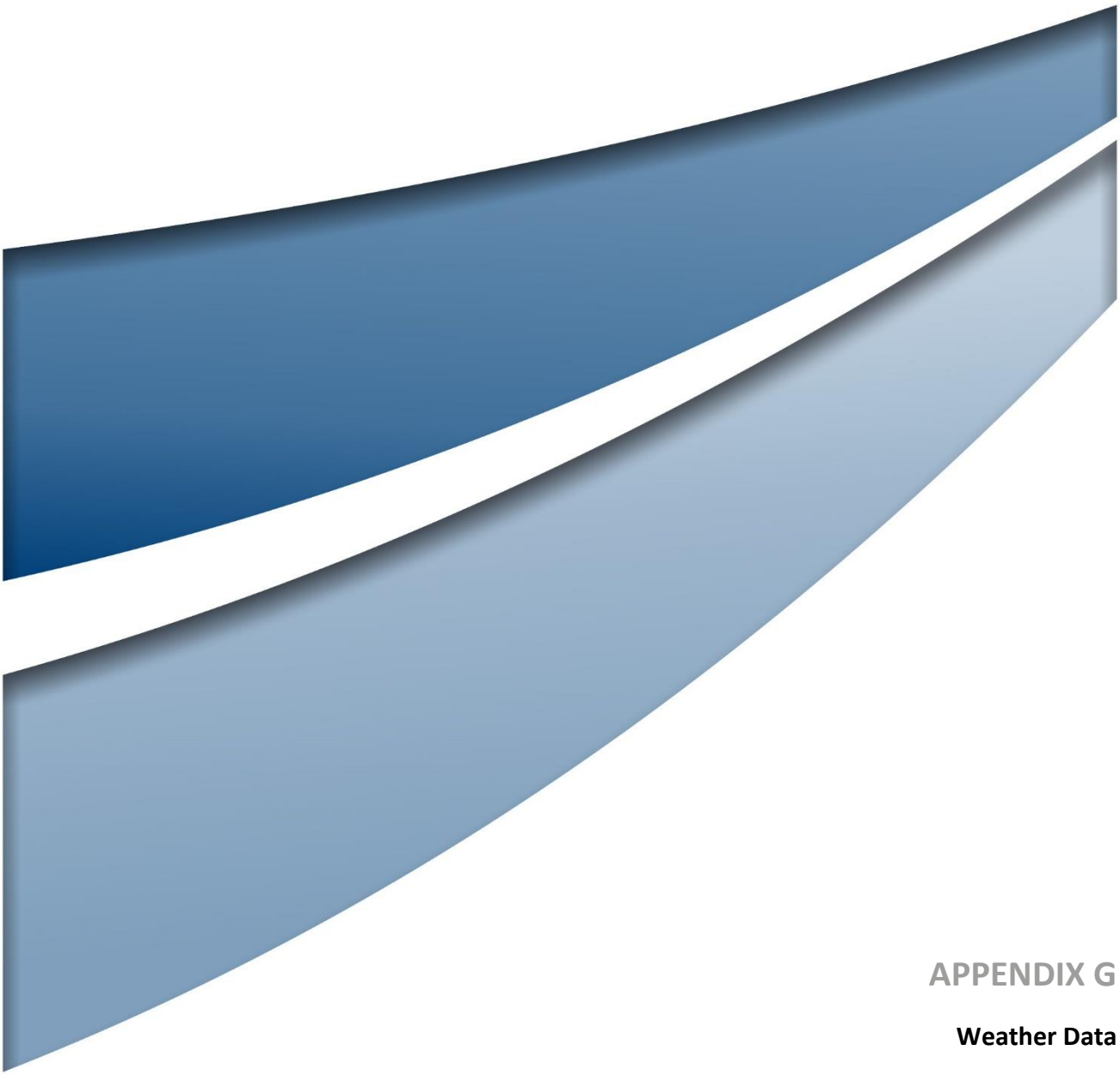
APPENDIX F

Vegetation Integrity Data

Plot	Zone	COMPOSITION						STRUCTURE						FUNCTION										
		Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)					No. Large Trees	No. Hollow Trees	Litter (%)	Logs (m)	HTW
														>5	5–10	10–20	20–30	30–50	50–80					
22494_42	1	3	16	2	2	0	1	5.6	29.5	0.3	0.3	0	0.2	1	0	0	1	1	0	3	0	48	11.8	0
22494_44	1	3	13	1	3	0	0	20.1	48.1	0.1	0.3	0	0	1	1	1	1	1	0	5	0	39	22.3	0
22494_46	1	2	7	1	0	0	0	10	62.9	0.1	0	0	0	0	1	1	0	0	0	0	0	55	41.2	10
22494_48	1	1	7	2	2	0	1	10	21.5	0.2	0.2	0	0.1	0	1	1	1	1	0	4	0	25.8	7.9	20
22494_49	1	3	10	2	1	0	0	15.2	24.8	0.2	0.1	0	0	1	0	1	1	1	0	2	0	33	39.2	0
22494_50	1	2	12	2	3	0	1	11	44.8	0.2	0.3	0	0.1	1	1	1	1	1	0	1	0	37	8.7	0
22494_61	1	2	12	2	3	0	0	10.2	6	0.2	0.3	0	0	0	2	1	1	1	0	2	0	45.2	57.4	0
P_22494_002	1	2	15	1	6	0	1	21	40.3	5	22.3	0	0.1	1	1	1	1	1	0	1	0	33	14.5	20
P_22494_004	1	2	14	2	1	0	1	16	56	15.1	0.1	0	0.1	0	1	1	1	0	0	0	0	2.6	2.5	10
P_22494_005	1	2	10	2	4	0	1	17	52.6	10	5.4	0	0.2	0	1	1	1	1	0	2	2	5.4	15	10
P_22494_006	1	2	7	2	8	0	0	25	60.3	5.1	7.5	0	0	0	1	1	0	0	0	0	0	7.4	21	11
P_22494_009	1	1	12	1	2	0	1	15	56.9	5	5.2	0	0.1	0	1	1	1	1	0	1	2	18.4	10	25
P_22494_014	1	2	12	1	3	0	0	21	45.4	5	3.6	0	0	0	1	1	0	0	0	0	0	11	22	31
P_22494_026	1	2	15	1	4	0	1	25	50.8	5	2.4	0	0.1	0	1	1	1	0	0	0	0	18.4	6	20.2
P_22494_028	1	2	11	2	3	0	0	22	52.9	1.1	17.1	0	0	0	1	1	1	1	0	1	1	14	17	20.5
P_22494_032	1	4	21	3	8	0	1	45	105.5	40	36.5	0	0.2	0	1	1	1	0	0	0	0	38	17	45.6
22494_45	2	0	5	1	2	0	0	0	60.8	0.1	0.2	0	0	0	0	0	0	0	0	0	0	64	2.7	5
22494_47	2	0	2	2	3	0	0	0	0.6	3.2	0.3	0	0	0	0	0	0	0	0	0	0	31	0	0.1
22494_58	2	0	5	1	4	0	0	0	16.3	0.1	1.3	0	0	0	0	0	0	0	0	0	0	79	0	0.2
P_22494_010	2	0	7	1	0	0	0	0	37.8	20	0	0	0	0	0	0	0	0	0	0	0	6	0	25
P_22494_020	2	1	10	1	1	0	0	0.1	38.9	10	0.2	0	0	0	0	0	0	0	0	0	0	0.6	29.5	30.2
P_22494_023	2	1	6	1	2	0	1	2	23.7	10	1.2	0	0.1	0	0	0	0	0	0	0	0	1.4	0	45.2
P_22494_036	2	0	7	2	3	0	0	0	27	2.5	0.3	0	0	0	0	0	0	0	0	0	0	10	25	25
P_22494_021	3	2	12	2	4	0	0	20	33.7	25	1.6	0	0	1	1	1	0	1	0	2	1	7.8	6	45
P_22494_034	3	2	13	1	5	0	0	20	34.6	0.3	0.8	0	0	0	1	1	1	1	0	1	0	5	70	35

Plot	Zone	COMPOSITION						STRUCTURE						FUNCTION										
		Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)					No. Large Trees	No. Hollow Trees	Litter (%)	Logs (m)	HTW
														>5	5–10	10–20	20–30	30–50	50–80					
P_22494_33	3	2	15	1	4	0	0	15	33.5	5	1.7	0	0	0	1	1	1	0	0	0	0	9	20	20
P_22494_35	3	2	15	1	4	0	0	17	44.5	5	2.8	0	0	0	1	1	1	1	1	3	0	11	26	30
22494_53	4	2	14	3	6	0	1	15	7.8	0.4	0.6	0	0.1	1	1	1	0	0	0	0	0	74	3	0
22494_54	4	3	10	2	1	0	1	21.5	5.5	0.2	0.1	0	0.1	1	0	1	0	1	0	1	0	60	0	0
22494_56	4	2	10	2	2	0	1	10	18.9	0.2	0.2	0	0.1	1	1	1	1	0	0	0	0	59	2.5	0
22494_59	4	3	15	2	2	0	1	20	7.1	6	0.2	0	0.1	0	1	1	0	0	0	0	0	24.2	12.4	0.1
22494_63	4	3	13	2	2	0	1	28	4	0.3	0.2	0	0.3	1	1	1	1	0	0	0	1	59	8.7	0
P_22494_007	4	3	8	1	4	0	1	31	44.5	10	10.3	0	0.1	0	1	1	1	0	0	0	0	33	5	2
P_22494_011	4	4	9	1	4	0	1	37	41.3	5	10.4	0	0.1	1	1	1	1	0	0	0	0	28.6	2	1
P_22494_012	4	3	9	1	2	0	0	35	41.4	10	10.1	0	0	0	1	1	0	0	0	0	0	10.4	1	1.2
P_22494_015	4	3	9	1	5	0	0	45	30.4	5	15.5	0	0	0	1	1	1	0	0	0	1	76.2	0	5.5
P_22494_025	4	4	9	1	3	0	0	45.2	37	1	10.7	0	0	0	1	1	1	0	0	0	0	50.4	10	0
P_22494_031	4	1	0	0	0	0	0	20	0	0	0	0	0	0	1	0	0	0	0	0	0	23	5	0
22494_55	5	3	14	3	5	0	0	6.1	36	1.2	1.8	0	0	1	0	0	0	0	0	0	0	16.4	0	0.1
22494_60	5	2	11	2	1	0	0	5.5	4.2	0.2	0.1	0	0	1	0	1	1	0	0	0	0	60	8	0.1
P_22494_008	5	0	9	1	9	0	0	0	41.7	20	18	0	0	0	0	0	0	0	0	0	0	3.4	0	2
P_22494_019	5	0	9	2	8	0	1	0	51.4	25.1	4.4	0	0.1	1	0	0	0	0	0	0	0	9.4	0	15
P_22494_027	5	1	12	1	9	0	1	2	20.4	40	17.1	0	0.1	0	0	0	0	0	0	0	0	1.8	15	40.1
22494_57	6	0	7	0	2	0	1	0	2	0	2	0	0.1	0	0	0	0	0	0	0	0	70	0	0.1
22494_62	6	0	10	2	4	0	1	0	11.4	0.2	0.9	0	0.1	0	0	0	0	0	0	0	0	64	0	0.1
P_22494_013	6	0	5	1	0	0	0	0	36.4	1	0	0	0	0	0	0	0	0	0	0	0	0.8	3	30.1
P_22494_017	6	0	5	2	7	0	0	0	30.7	10.2	4	0	0	0	0	0	0	0	0	0	0	1	0	25
P_22494_018	6	1	6	1	1	0	0	0.5	30.9	5	0.2	0	0	1	0	0	0	0	0	0	0	0.6	10	36
P_22494_037	6	2	9	2	3	0	0	15	43.7	20	6.1	0	0	1	0	0	0	0	0	0	0	31	180	15
P_22494_022	7	2	8	2	5	0	0	15	30.9	1.5	2.5	0	0	1	1	0	1	0	0	0	2	2.8	6	30

Plot	Zone	COMPOSITION						STRUCTURE						FUNCTION										
		Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)					No. Large Trees	No. Hollow Trees	Litter (%)	Logs (m)	HTW
														>5	5–10	10–20	20–30	30–50	50–80					
22494_41	8	3	14	3	3	0	0	35	7.6	5.6	0.3	0	0	1	1	1	0	0	0	0	0	53	3.9	0
22494_43	8	3	9	2	2	0	0	27	2.2	10.1	0.2	0	0	1	1	1	0	0	0	0	0	60	0	0
22494_51	8	3	9	3	2	0	0	35	11.9	10.2	0.2	0	0	0	1	1	0	0	0	0	0	58	3.7	0
22494_52	8	4	10	5	6	0	0	16.1	7	0.9	0.6	0	0	1	1	1	0	0	0	0	0	76.8	5.5	0
22494_64	8	2	12	5	6	0	0	10	17.2	10.4	0.7	0	0	1	1	1	0	0	0	0	0	71	0	0
22494_65	8	2	7	6	6	0	0	7	6.1	20.7	1	0	0	9	1	1	0	0	0	0	0	63	0	0
P_22494_001	8	2	13	3	11	0	2	30	33.1	9	4.2	0	0.2	1	1	1	1	0	0	0	4	38	35	0
P_22494_003	8	3	11	2	17	0	0	36	49.6	7.1	7.7	0	0	1	1	0	0	0	0	0	0	42.5	3	0
P_22494_016	8	3	14	4	14	0	0	45	9.6	20.7	3.7	0	0	0	1	1	0	0	0	0	0	67	0	0.2
P_22494_024	8	2	8	3	4	0	0	45	11.3	41.2	0.5	0	0	0	1	1	0	0	0	0	0	45	2	0.1
P_22494_029	8	4	11	2	7	0	1	43	13.6	11	2.9	0	0.1	1	1	0	0	0	0	0	0	42	7	0
P_22494_030	8	2	14	2	9	0	0	40	10.2	35	1.6	0	0	1	1	0	0	0	0	0	0	26.4	15	0.2



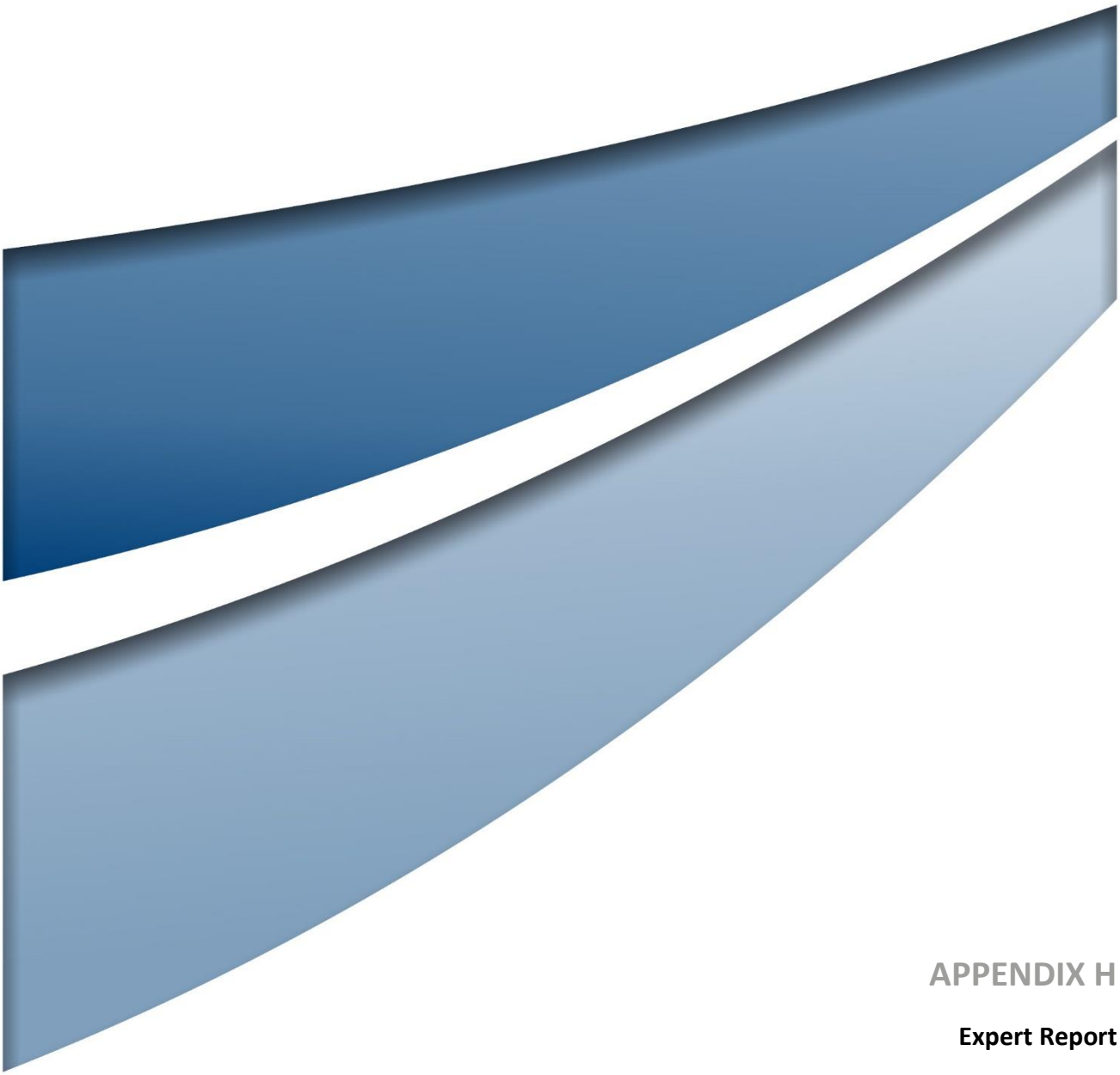
APPENDIX G

Weather Data

Date	Daily Data		Monthly Data		
	Min-Max Temp (°C)	Rainfall (mm)	Min-Max Temp (°C) mean	Rainfall total (mm)	Relative Humidity (%) mean
19/10/2022	8.8 - 25.2	0	11.5 - 22.5	85.1	121.9
20/10/2022	16.1 - 23.9	0.2			
21/10/2022	16.3 - 26.4	0.1			
22/10/2022	16 - 26.2	0			
23/10/2022	15.6 - 19.2	0			
24/10/2022	16.5 - 23.7	9.5			
25/10/2022	15 - 23.2	7			
26/10/2022	13.2 - 22.8	1.4			
27/10/2022	11.3 - 22	0			
6/02/2023	13.1 - 31.7	0	15.2 - 32.7	0	92.3
7/02/2023	13.8 - 33.2	0			
15/02/2023	12.6 - 36.6	0			
16/02/2023	19.7 - 40.1	0			
17/02/2023	23 - 43.2	0			
18/02/2023	15.6 - 33.1	0			
19/02/2023	14.5 - 35.2	0			
20/02/2023	16.6 - 37.4	0			
21/02/2023	19.8 - 36	0			
22/02/2023	14.6 - 35.5	0			
23/02/2023	18.7 - 35.9	0			
24/02/2023	23.1 - 37	0			
17/03/2023	15 - 31.1	0	13.3 - 29.0	7.3	71
18/03/2023	18.2 - 42.5	0			
19/03/2023	16.3 - 30.3	0			
20/03/2023	14.9 - 25	0			
21/03/2023	15.4 - 29.8	1			
22/03/2023	14.8 - 32.4	1.5			

Date	Daily Data		Monthly Data		
	Min-Max Temp (°C)	Rainfall (mm)	Min-Max Temp (°C) mean	Rainfall total (mm)	Relative Humidity (%) mean
2/04/2023	5 - 21.4	0	9.8 - 23.3	22.7	70
8/04/2023	12.2 - 21.1	0			
9/04/2023	10.3 - 19	0			
10/04/2023	8.8 - 20.3	0			
11/04/2023	3.9 - 20.4	0			
12/04/2023	13.4 - 23.6	1			
13/04/2023	12 - 20	0.6			
28/04/2023	13.1 - 23.3	0			
29/04/2023	5.5 - 19	0.4			
30/04/2023	3.8 - 20	1			
1/05/2023	11.2 - 20.6	0	5.8 - 19.3	12.1	63
2/05/2023	11.1 - 23.2	0.1			
3/05/2023	11.2 - 21.1	0			
5/07/2023	6 - 16.9	0	4.8 - 16.6	34.2	140.7
6/07/2023	6.6 - 15.7	0.1			
7/07/2023	5.9 - 16.3	16.4			
8/07/2023	8.6 - 16.7	0			
9/07/2023	7.3 - 16.3	0.2			
17/10/2023	4.7 - 22.4	0	9.3 - 24.8	34.1	129.7
18/10/2023	6.5 - 27.8	0			
19/10/2023	10 - 30.8	0			
20/10/2023	13.3 - 34.6	0			
21/10/2023	14.1 - 23.6	0			
23/02/2024	16 - 26.6	0	16.8 - 34.8	3.8	112.6
24/02/2024	11.3 - 28.5	0			
25/02/2024	10.7 - 34.8	0			
26/02/2024	18.7 - 32.5	0			

Date	Daily Data		Monthly Data		
	Min-Max Temp (°C)	Rainfall (mm)	Min-Max Temp (°C) mean	Rainfall total (mm)	Relative Humidity (%) mean
27/02/2024	19.9 - 37.8	0			
28/02/2024	21.7 - 43.4	0			
29/02/2024	19.4 - 34.6	0			
15/05/2024	2.4 - 20	0	5.8 - 20.0	19.4	83.1
16/05/2024	3 - 22.6	0			
17/05/2024	5.4 - 23.7	0			
18/05/2024	4.2 - 16.1	0			
19/05/2024	1.4 - 15.6	0			
20/05/2024	5.8 - 17.7	1.5			
12/08/2024	5.9 - 23.7	0	5.5 - 19.8	7.4	76.7
13/08/2024	7 - 23.9	0			
14/08/2024	6.9 - 25.7	0			
15/08/2024	9.4 - 26.4	0			
16/08/2024	12.1 - 20.7	3			
17/08/2024	10.4 - 17.4	0.2			
18/08/2024	4.7 - 18.6	1.2			
19/08/2024	3.8 - 21.9	0			
20/08/2024	11.3 - 0	0.4			



APPENDIX H

Expert Report

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Phone (08) 86481878

Mallee Wind Farm Desert Mouse and Painted Burrowing Frog

Expert Advice

September 2024



Desert Mouse showing distinctive orange eye-ring

Limitations Statement

In preparing this document Ecological Horizons Pty Ltd makes no warranty or guarantee, whether expressed or implied, with respect to the information reported or to the findings, observations or conclusions expressed in this document. Further, such information, findings, observations and conclusions are based solely on observations made and information available to Ecological Horizons Pty Ltd at the time of this study

Credentials of Expert

Pseudomys desertor

Dr Read was recognised as an authority on *Pseudomys desertor* (SF23/131992) for the Mallee Wind Farm Project by the Director South West, Biodiversity and Conservation Division, Department of Planning and Environment on 17 November 2023 (Appendix 1).

Dr John Read 'rediscovered' *Pseudomys desertor* in South Australia (Read et al.1999) and has trapped the species at numerous sites in arid and semi arid zone. Dr Read also co-authored the Mammals of Australia section on *P. desertor* (Kerle et al 2008).

Dr Read has had 30 years experience of mammals surveys in chenopod sandplain vegetation associations including many of the dominant plant species found at the Mallee Wind Farm Biodiversity study Area (Rosewood (*Alectryon oleifolius*), White Cypress Pine (*Callitris glaucophylla*), Sugarwood (*Myoporum platycarpum*), Belah (*Casuarina cristata*), dense clumps of Black Bluebush (*Maireana pyramidata*), or Pearl Bluebush (*Maireana sedifolia*), with variable speargrass (*Austrostipa variabilis*), bottlewashers (*Enneapogon* sp.) and copperburr (*Sclerolaena* sp.) on plains.

In addition Dr Read has had 20 years experience trapping in each of 3 additional study areas that either support *P. desertor* (APY Lands) or are in mallee triodia dunefields (Middleback and Immarna) similar to Mallee Cliffs Sandplains and Mallee Cliffs Linear Dunes Mitchell Landscape. Dr Read has also trapped the Wild Deserts sites in Sturt National Park for the past 8 years, where the only record of *P desertor* was recorded in NSW for the past decade

Neobatrachus pictus

Dr Read was recognised as an authority on *Neobatrachus pictus* (SF23/131995) for the Mallee Windfarm Project by Director South West, Biodiversity and Conservation Division, Department of Planning and Environment on 17 November 2023 (Appendix 1).

Dr John Read has conducted extensive research into the ecology, diet, habitats and abnormality profiles of closely related *Neobatrachus sudelli* – involving sampling over 5000 frogs (Read 1999, Read and Owens 1999). In addition, Dr Read has conducted frog surveys and research for many frog species (Read and Owens 1999, Read 2000, Read *et al* 2015a) including long term monitoring in similar environments to Mallee Cliffs at the study sites listed above.

Methods

This expert report has been prepared for Umwelt (Australia) Pty Limited, on behalf of the Spark Renewables Pty Ltd, to determine whether *Pseudomys desertor* or *Neobatrachus pictus* are likely to occur within the Mallee Wind Farm Development Footprint. This expert report has been prepared in accordance with the requirements of Box 3 of the Biodiversity Assessment Method ('BAM'; DPIE 2020).

Ecological Horizons arranged for Alex Holmes of GHD to compile regional records (including through use of BioNet database and regional ecological connections) and conduct field inspections of the Mallee Wind Farm for *Neobatrachus pictus* and suitable habitat for *Pseudomys desertor* (Appendix 2). Ecological Horizons have worked with Alex and trust and value his ecological skills, local knowledge and thoroughness and discussed with Alex optimum times and habitats for surveying both species. The GHD report is included in Appendix 2 of this report

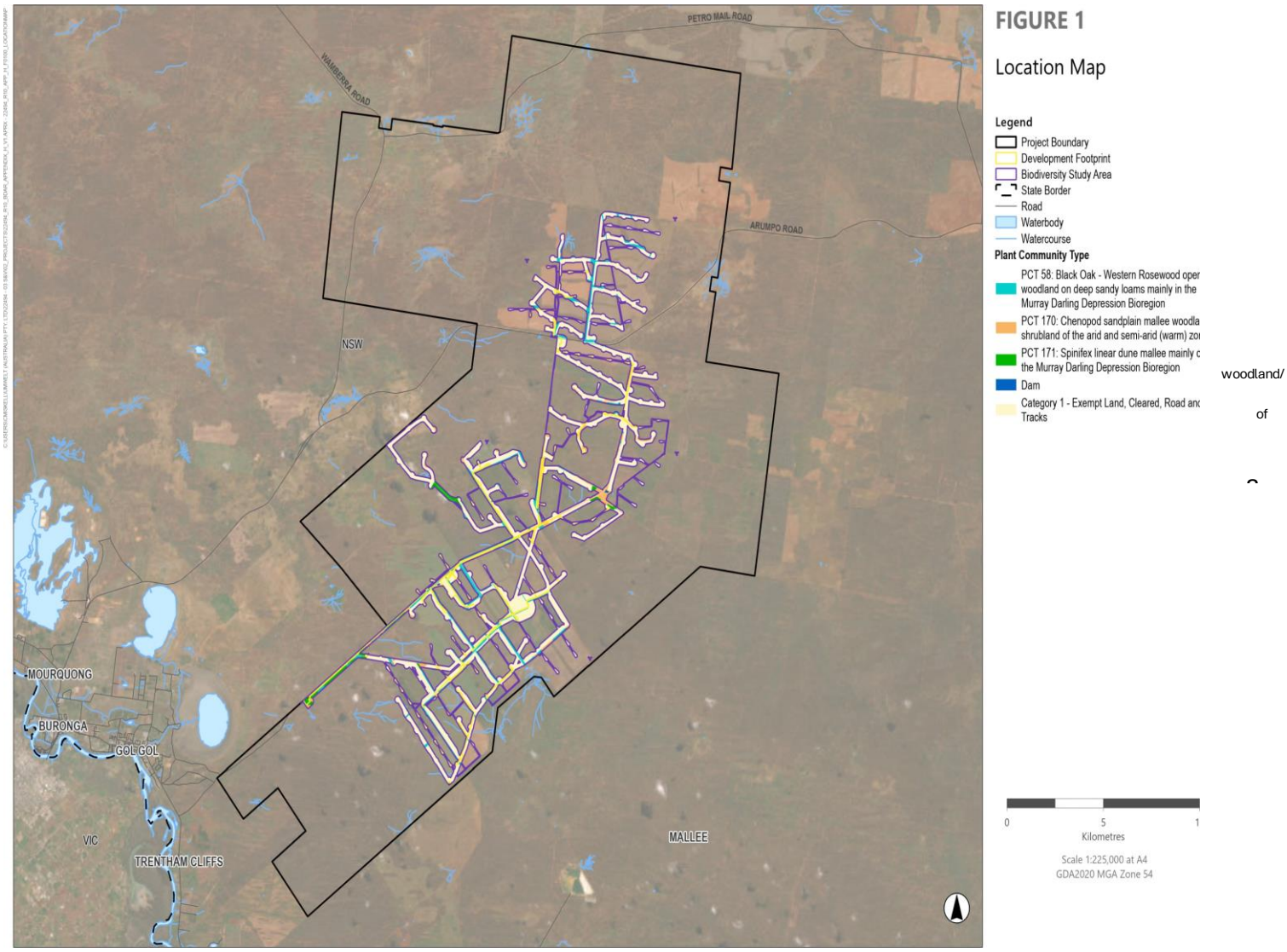
This assessment was aided by the extensive vertebrate surveys conducted within the Mallee Cliffs National Park (directly adjacent to the Development Footprint) primarily completed by the Australian Wildlife Conservancy (AWC) since 2016, which failed to detect either species. Across the AWC-NSW Parks Partnership Projects there have been 34,087 records of 171 fauna species. Prior to this, records within the national park go back to 1965 producing an additional 12,419 records and 84 species.

Results

Resident populations of both species are considered to be of unlikely to occur on the Biodiversity Study Area and Development Footprint(Figure 1) for three reasons

1) Scarcity of nearby records (including from the intensively surveyed Mallee Cliffs National Park) suggest that the Project lies on, or just beyond, the periphery of the consistently occupied range of both species, even though animal distributions are inherently dynamic.
2) The habitat of the project area is 'heavily disturbed' (GHD 2024), without the extensive tracts of *Triodia* hummockland or sedges that typify *P. desertor* habitat or ephemeral swamps or rockholes used by *N. pictus*.
3) The site appraisal failed to locate either species or likely habitat for either species within the Biodiversity Study Area and Development Footprint (GHD 2024)

Figure 1 Mallee Windfarm Development footprint



10

Image Source: ESRI Basemap (2024) Data source: NSW DESI (2024), VIC DELWP (2023), spark (2024), Umwelt (2024)

Discussion

The Desert mouse, unlike other small rodents is unlikely to be overlooked, even by many members of the public, due to its combination of long fur and especially distinctive orange eye ring. Hence the lack of records from the region are unlikely to be attributed to confusion with other rodents. Similarly, Painted burrowing frogs can really only be confused with Trilling frogs (*N. sudelli*) which have also not been recorded in the region and hence the absence of local Painted burrowing frog records is also unlikely to be attributed to misidentification.

Pseudomys desertor is susceptible to predation by feral cats and probably foxes. Because they are a folivore *P. desertor* are active for longer periods, including before dark and hence potentially more vulnerable to predators, including birds of prey than truly nocturnal rodents. The susceptibility of medium sized rodents to feral cats (Read *et al*. 2024) means that it is highly unlikely that a population of *P. desertor* could be sustained in the largely cleared Biodiversity Study Area.

Although reliant upon access to breeding ponds *Neobatrachus pictus* can move considerable distances through incremental nightly movements over cumulative rainfall events over several years. Hence dispersing animals can be found in suboptimal, even marginal habitat at considerable distances from reliable, or even intermittently suitable breeding ponds. However, the lack of suitable breeding sites in or near the Biodiversity Study Area render the site highly unlikely to be of significance for *N. pictus*.

Conclusions

The expert opinion provided here of resident or important populations of either *P. desertor* and *N. pictus* being unlikely at the Mallee Wind Farm is supported by the conclusions from the GHD site report and the lack of records from the comprehensive, long term local data from the adjacent Mallee Cliffs National Park.

However, expert opinion also suggests that should the Mallee Wind Farm proposal progress to development, there are still tangible benefits that can be provided to the local biodiversity. Infrastructure projects can make a positive contribution to conservation by addressing, as well as not exacerbating, key threats (e.g. Read 2003). For example, reduction in regional feral cat densities through proactive management can lead to profound improvements in small mammal diversity and abundance, both within (Moseby et al. 2019) and beyond (Pedler et al. 2016) conservation management areas. Other opportunities for positive biodiversity benefits could arise from revegetating with endemic plant species, including rare species, and assisting with regional control of overabundant herbivores, potentially including feral species and

kangaroos. Striving to provide positive biodiversity benefits may offset inevitable localised impacts from infrastructure developments.

References

Department of Planning, Industry and Environment (DPIE) (2020), Biodiversity Assessment Method.

GHD (2024) Mallee Wind Desert Mouse and Painted Burrowing Frog advice

Kerle, J.A., Kutt, A.S. and Read, J.L. (2008). Desert Mouse *Pseudomys desertor* pp 625-626 in : **The Mammals of Australia 3rd edition** eds S. VanDyck and R. Strahan. Reed New Holland, Sydney.

Moseby, K.E., McGregor, H. Hill, B.M. and Read, J.L. (2019) Exploring the internal and external wildlife gradients created by conservation fences **Conservation Biology** DOI: 10.1111/cobi.13389

Pedler, R.D., Brandle, R., Read, J.L., Southgate, R., Bird, P. & Moseby, K.E. (2016). Bio-control triggers landscape-scale recovery of threatened desert mammals **Conservation Biology 30**: 774-782

Read, J., Copley, P. and Bird, P. (1999). The distribution, ecology and current status of *Pseudomys desertor* in South Australia **Wildl. Res. 26**: 453-462.

Read, J.L. (1999). Abundance and recruitment patterns of the Trilling Frog (*Neobatrachus centralis*) in the Australian arid zone. **Aust. J. Zool. 47:** 393-404.

Read, J.L. (2000). Baseline abnormality study of the frogs of Tampakan, South Cotabato Province, Mindanao, Philippines. **Asia Life Sciences 9**: 1-6.

Read, J.L. (2003). Are miners the bunnies or the bilbies of the rangelands? **Rangeland Journal 25**: 172-182.

Read, J.L., Tyler, M.J. and Robinson, M. (2015a). Recruitment and abnormality incidence of a desert frog assemblage at an Australian copper mine. **Environmental Management and Restoration 16**: 224-228.

Read, J.L. and Owens, H.M. (1999). Reptiles and amphibians of the Lake Eyre South region. Vol. 1, Part 3 in: (W.J.H. Slater ed.) **Lake Eyre South Monograph Series**, RGSSA, Adelaide.

Read, J.L., Moseby, K.E. and Ward, M.J. (2015). Factors influencing trap success of sandhill dunnarts, *Sminthopsis psammophila*, and other small mammals, in *Triodia* dunefields of South Australia. **Aust. Mammalogy 37**: 212-218

Read, J.L., Moseby , K.E. and McGregor, H.W. (2024) Better to bluff than run: conservation implications of feral-cat prey selectivity **Wildlife Research** 51 https://doi.org/10.1071/WR23138

Appendix 1 Expert status verification

Department of Planning and Environment

Dr John Read
ecological67@gmail.com

Our ref: SF23/131992
Sender's ref: BE 23 10

17 November 2023

Dear Dr Read

Approval of Name as an expert for Desert Mouse (*Pseudomys desertor*)

Thank you for your application dated 23 September 2023 to the Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment.

BCD has reviewed the information provided in support of this request and is satisfied that you meet the definition of a species expert for Desert Mouse (*Pseudomys desertor*) in accordance with section 5.3 (Box 3) of the Biodiversity Assessment Method.

Please note that this formal recognition of you as an expert only applies to the Mallee Wind Farm project within the Wentworth Local Government Area.

If you require any further information regarding this matter, please contact Andrew Fisher, Senior Team Leader Planning, via rog.southwest@environment.nsw.gov.au or 02 6022 6023.

Yours sincerely

Adam Vey
Director South West
Biodiversity and Conservation Division
Department of Planning and Environment

Department of Planning and Environment

Dr John Read
ecological67@gmail.com

Our ref: SF23/131995
Sender's ref: BE 23 11

17 November 2023

Dear Dr Read

Approval of Dr John Read as an expert for Painted Burrowing Frog (*Neobatrachus pictus*)

Thank you for your application dated 23 September 2023 to the Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment.

BCD has reviewed the information provided in support of this request and is satisfied that you meet the definition of a species expert for Painted Burrowing Frog (*Neobatrachus pictus*) in accordance with section 5.3 (Box 3) of the Biodiversity Assessment Method.

Please note that this formal recognition of you as an expert only applies to the Mallee Wind Farm project within the Wentworth Local Government Area.

If you require any further information regarding this matter, please contact Andrew Fisher, Senior Team Leader Planning, via rog.southwest@environment.nsw.gov.au or 02 6022 6023.

Yours sincerely



Adam Vey
Director South West
Biodiversity and Conservation Division
Department of Planning and Environment

Appendix 2. GHD 2024 report

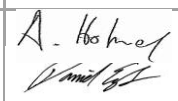
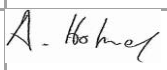
Mallee Wind Desert Mouse and Painted Burrowing Frog advice

→ The Power of Commitment



Umwelt (Australia) Pty Ltd

16 August 2024

Project name		Mallee Wind Desert Mouse and Painted Burrowing Frog advice					
Document title		Mallee Wind Desert Mouse and Painted Burrowing Frog advice					
Project number		12648079					
File name		12648079_REP_Mallee Wind Desert Mouse and Painted Burrowing Frog advice					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S0		E. Pacholli	A Holmes		A Holmes		02/08/24
S3		E. Pacholli	A Holmes		A Holmes		09/08/24
S4		E. Pacholli	A Holmes D Eyles		A Holmes		16/8/24
[Status code]							
[Status code]							

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→ **The Power of Commitment**

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Introduction

Purpose of this report

GHD Pty Ltd (GHD) has been engaged by Umwelt (Australia) Pty Limited (Umwelt) for ecological services to support the assessment of the proposed Mallee Wind Farm project. Umwelt require local ecological knowledge to assess the likelihood of occurrence of two threatened species listed under the New South Wales Biodiversity Conservation (BC) Act 2016, specifically the Desert Mouse (*Pseudomys desertor*) and Painted Burrowing Frog (*Neobatrachus pictus*) and also require the preparation of a summary report on these species to support a separate expert report to be prepared by Dr John Read from Ecological Horizons. Our local GHD ecologists have extensive experience with both species, including conducting previous trapping programs for *P. desertor* in central Australia/NSW and nocturnal surveys for *N. pictus* in Victoria and in NSW where this species is poorly known.

Scope and limitations

This report: has been prepared by GHD for Umwelt (Australia) Pty Ltd and may only be used and relied on by Umwelt (Australia) Pty Ltd for the purpose agreed between GHD and Umwelt (Australia) Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Umwelt (Australia) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

GHD has prepared this report on the basis of information provided by Umwelt (Australia) Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Assumptions

The scope did not include a detailed assessment or targeted surveys for Desert Mouse (Pseudomys desertor) or any other flora, fauna or aquatic assessments. As a result, in the future additional species may be present that were not observed during this assessment.

The BioNet Atlas (BioNet) database can be used to search a defined geographical area to produce species lists of flora and fauna that have been recorded within the searched area. The database lists are only as accurate as the quality and quantity of data that have been recorded and documented from the area.

Location details for many records (typically older records) have a relatively low degree of accuracy (e.g., within 1 km).

These datasets are not exhaustive. In other words, many locations locally and across New South Wales have a low level of documented survey effort for one or more groups of flora and fauna. During field surveys, it is not uncommon to find species at locations for which there are few or no previous nearby database records.

Maps presented in this report displaying site information should not be relied on for the detailed design during the construction process. Data collected and presented in maps is accurate to +/- 5 m.

Species Information

Painted Burrowing Frog (*Neobatrachus pictus*)

Species description

The Painted Burrowing Frog *(Neobatrachus pictus*) is a large frog, ranging from 46 to 58 mm in length. It has grey, light brown or yellow dorsal head and body with dark brown or olive green patches and a thin, light yellowish vertebral stripe. The underside of the body is smooth and white (NPWS 2000). The eye is particularly prominent and has a vertical pupil and the tympanum (eardrum) is not visible. Fingers are cylindrical and unwebbed, whereas the toes are fully webbed, with a black shovel-shaped lump on the undersurface, used for burrowing (NPWS 2000). The call is a long and musical trill.

Animals can be distinguished from the more widespread Sudell's Frog (*Neobatrachus sudelli*) by the lack of baggy skin around the groin, although this is a subjective morphological feature and not considered a highly reliable means to differentiate the species (A. Holmes pers. obs.). Other distinguishing features from *N. sudelli* is the call length, *N. pictus* has a longer call that approximately doubles that of *N. sudelli* (NPWS 2000). The most reliable way to differentiate the two species is via chromosomal analysis.



Figure 1 **Painted Burrowing Frog from the Chalka Creek, Hattah-Kulkyne National Park, Vic.**

Life cycle

The Painted Burrowing Frog can breed at all times of year however is dependent on heavy rainfall events (approximately >25mm in 24 hours). Breeding usually occurs in shallow ephemeral pools, however has also been observed in dams, around swamps and on roads. Breeding can occur from late summer through to early spring with each breeding period lasting only a few days. After breeding occurs the species burrows beneath the soil surface. Once below the soil surface this species may remain dormant for up to three months (NPWS 2000).

Distribution

The species is distributed primarily across south eastern South Australia and western Victoria with records from three locations within western New South Wales. These records are in Balranald (2014), west of Pooncarie (2000) and within Scotia sanctuary (1995) (ALA, 2024a). The species is considered to have no critical habitat within New South Wales, likely due to the sparsity of records (NPWS 2000).

Due to the breeding events being reliant on heavy rainfall there may be an underestimation of the distribution or abundance of the species. However, the infrequent *N. pictus* occurrence within NSW is likely to be attributed to several factors including difficulty in species identification, access to suitable breeding habitat during rainfall events and the likelihood that the species is at the edge of its' distribution in western NSW.

Habitat requirements

The habitat for Painted Burrowing Frog ranges widely, they have been observed in grasslands, mallee, farmland and cleared areas. The species is found after heavy rainfall events. During breeding the species utilizes leaf litter, fallen logs and large rocks for shelter (NPWS 2000).

Desert Mouse (*Pseudomys desertor*)

Species description

The Desert Mouse (*Pseudomys desertor*) is a solitary medium-sized rodent with chestnut brown fur above and a light grey-brown belly. The tail is brown dorsally and lighter around the sides and ventrally and is equal in length or shorter than the head-body length. Species has large eyes with a pale orange eye-ring. Males and females are a similar size (ALA 2024b).



Figure 2 **Desert Mouse observed during a trapping program in the Tanami Desert, NT.**

Life cycle

The Desert Mouse has a high reproduction rate with females being fertile on a 7-9 day cycle and become reproductively mature at ten weeks old. Gestation lasts 27-28 days and litter sizes average at three pups (ALA 2024b). The species has large population growth following periods of high rainfall that results in increased vegetation density. (NSW EH, 2024)

Distribution

The species is distributed throughout arid areas, including Central Australia, central inland Queensland, southern Kimberely and the Pilbara in Western Australia and far western New South Wales. There have been very few records of the Desert Mouse in New South Wales and therefore it is thought that NSW is at the edge of the species distribution. (ALA 2024b).

Recent studies have shown that areas with Dingo presence, the pressure of feral predation of small mammals has been reduced compared to areas without Dingoes (Christopher E. Gordon, 2015). The majority of the Desert Mouse distribution has Dingoes present however, the NSW part of its range does not. This may mean the species would become at an increased risk to predation of feral cats and foxes. Additionally, overgrazing in NSW suppresses the species ability to spread to suitable habitat as it is reliant on dense vegetation.

Habitat requirements

Desert Mouse is primarily found in sand dune or sand plain habitats with spinifex. They have also been found in spinifex grasslands, open eucalypt, Acacia shrubland, riparian woodlands and samphire. The species is sensitive to overgrazing due to their reliance on habitats featuring dense grass, sedge or dense groundcover. The species is also sensitive to predation, particularly by feral cats and foxes.

Mallee woodland are ecological communities occurring in semi-arid environments dominated by multi-stemmed, low growing eucalypts. They are diverse communities that support a variety of biota that depend on the specific features of the ecosystem to persist. This includes remnant population of other rare and threatened species such as the Malleefowl (*Leipoa ocellata*), Gilberts Whistler (*Pachycephala inornata)* and Southern Scrub-robin (*Drymodes brunneopygia).*

Often mallee woodland and mallee dune habitats occur in combination with spinifex (*Triodia* sp.). Spinifex provides habitats provide important ground-cover needed by a variety of reptiles and ground mammal species. This includes the Desert Mouse (*Pseudomys desertor).*

Description of area

Landscape context

The development footprint is located in the Mallee Cliffs Sandplains and Mallee Cliffs Linear Dunes Mitchell Landscape.

The Mallee Cliffs Sandplains landscape is characterised by extensive, slightly undulating sandplain of Quaternary aeolian sands with east-west trending dunes, often with blowouts, partly scalded broad swales and small depressions, relief 6 to 10m. Solonized brown soils, calcareous loamy sand, and texture-contrast soils on the plain, red and brown sands on dunes, non-cracking grey or brown clays in depressions. The landscape consists of Rosewood (*Alectryon oleifolius*), White Cypress Pine (*Callitris glaucophylla*), Sugarwood (*Myoporum platycarpum*), Belah (*Casuarina cristata*), dense clumps of Black Bluebush (*Maireana pyramidata*), or Pearl Bluebush (*Maireana sedifolia*), with variable speargrass (*Austrostipa variabilis*), bottlewashers (*Enneapogon* sp.) and copperburr (*Sclerolaena* sp.) on plains.

The Mallee Cliffs Linear Dunes landscape is characterised by extensive Quaternary dunefields and sandplains, relief to 7m. Deep brownish sands and calcareous earths with dense mallee (*Eucalyptus* sp.), Belah (*Casuarina cristata*) and Rosewood (*Alectryon oleifolius*) with Porcupine Grass (*Triodia irritans*). Narrow swales of calcareous loamy red earths with belah, rosewood, scattered shrubs, variable speargrass (*Austrostipa variabilis*), copperburr (*Sclerolaena* sp.) and forbs.

The Biodiversity Study Area is located around 8km north east of the floodplain of the Murray River. Wetlands in the area include Lake Gol Gol and Gol Gol Swamp.

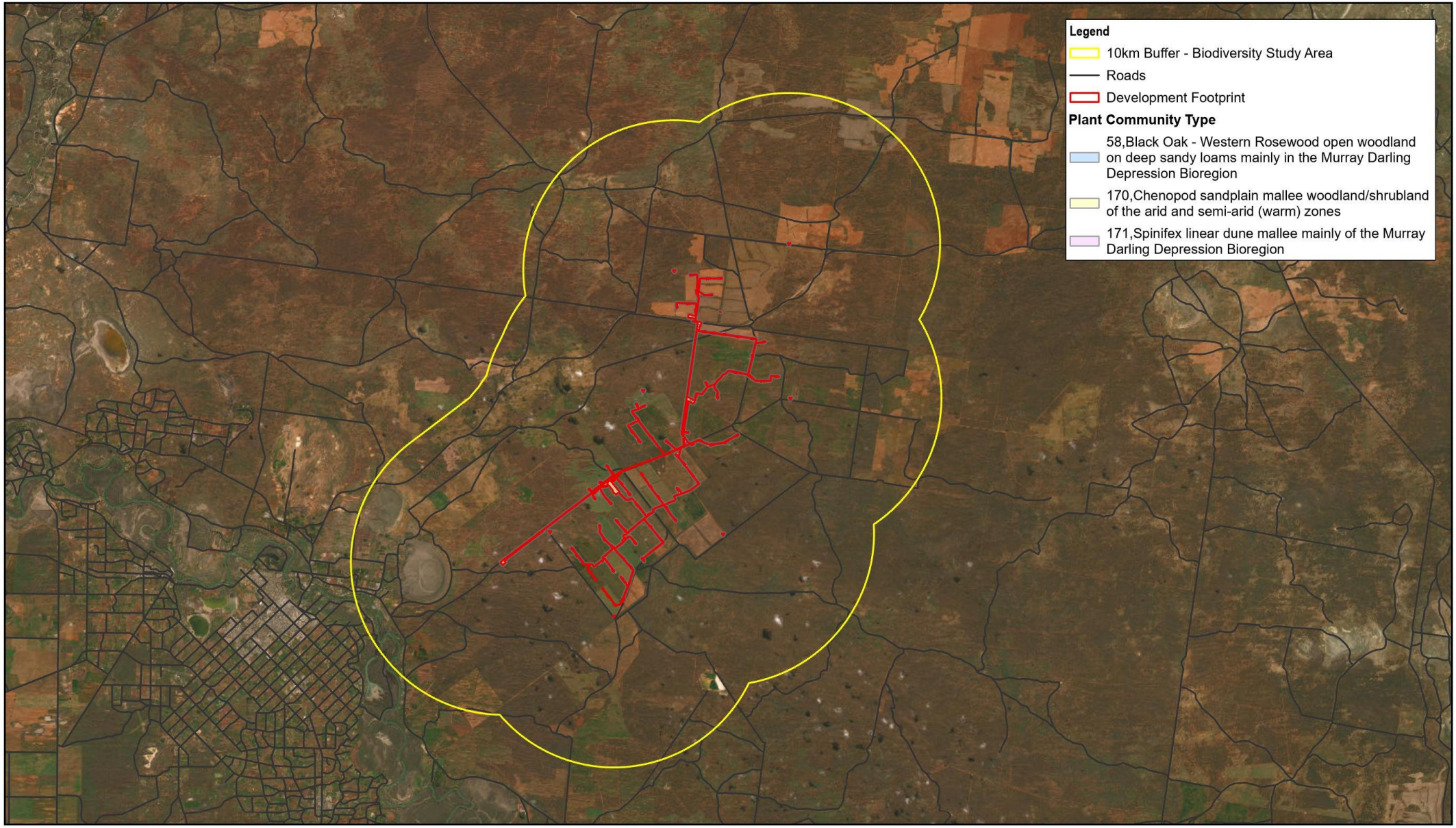
The Biodiversity Study Area is adjacent to Mallee Cliffs National Park in the south-east. Mallee Cliffs National Park is a wildlife conservation area which covers an area of 57969 ha and is managed to protect the sand plain and sand dune land systems and ecological communities (NSW National Parks and Wildlife Service).

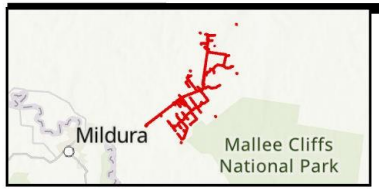
Native vegetation

The development footprint is primarily Plant Community Type (PCT) 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semiarid zones. There are an additional two PCT's with smaller areas. The description and area of each PCT is shown in Figure 3 and are described below (Table 1).

Table 1 Plant community types, status and area mapped within development footprint

PCT ID	Plant community type	Community description	State	Area (ha)
58	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Occurs as a mid-high (about 7 m high) low open woodland or isolated clumps of trees dominated by Black Oak (*Casuarina pauper*) and Western Rosewood (*Alectryon oleifolius* subsp. *canescens*) with either a shrubby or grassy understorey. Widely distributed in the far south-western NSW mainly in the Murray Darling Depression Bioregion, generally subject to less than 400 mm of annual rainfall.	Derived- Weedy	3.39
			Moderate-Good	26.81
			Weedy Understory	0.17
170	Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Occurs as a mallee woodland or open mallee shrubland most usually about 8 m tall dominated by several mallee species including White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*), Glossy-leaved Red Mallee (*Eucalyptus oleosa*) and Snap and Rattle (*Eucalyptus gracilis*). Chenopods shrubs form a major component of the understorey. Occurs on calcareous red-brown, sandy-loam or loamy clay soils, sometimes containing limestone nodules, on eolian sandplains or in inter-dune plains or swales. The largest occurrences of this community are north-west of Balranald forming a transition between the dune mallee and the Riverine Plain, south and east of Mungo National Park, north of Mildura on the Darling River plain and in the Scotia Mallee, and south-east of Menindee.	Derived - native	1.15
			Derived- Weedy	0.06
			Moderate-Good	3.81
			Weedy Understory	0
171	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Mallee shrubland or open shrubland most about 5 m tall but up to 8 m, most often in a whipstick habit, dominated by a number of mallee species including White Mallee (*Eucalyptus dumosa*), Red Mallee (*Eucalyptus socialis*) and Snap and Rattle (*Eucalyptus gracilis*) and Ridge-fruited Mallee (*Eucalyptus costata*). This community contains a species-rich understorey that is dominated by Porcupine Grass (*Triodia scariosa*). Occurs on calcareous brown-red sand or loamy sand sometimes overlying grey clay on east-west linear sand dunes mainly in the Murray-Darling Sands Bioregion in south far western plain of NSW extending into South Australia and Victoria. Mainly restricted to the arid zone and semi-arid (warm) climatic zones in NSW.	Moderate-Good	19.12
0	Not classified	Not classified		0
N/A	Non-native vegetation	Structure/Cleared/Road/Track		390.36
Total				444.87





Paper Size ISO A4

0 5 10 15

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

N

GHD

Umwelt (Australia) Pty Ltd
Mallee Windfarm advice on Desert Mouse and Painted Burrowing Frog

PCT mapping

Project No. **12618872**
Revision No. **0**
Date **16/08/2024**

FIGURE 3

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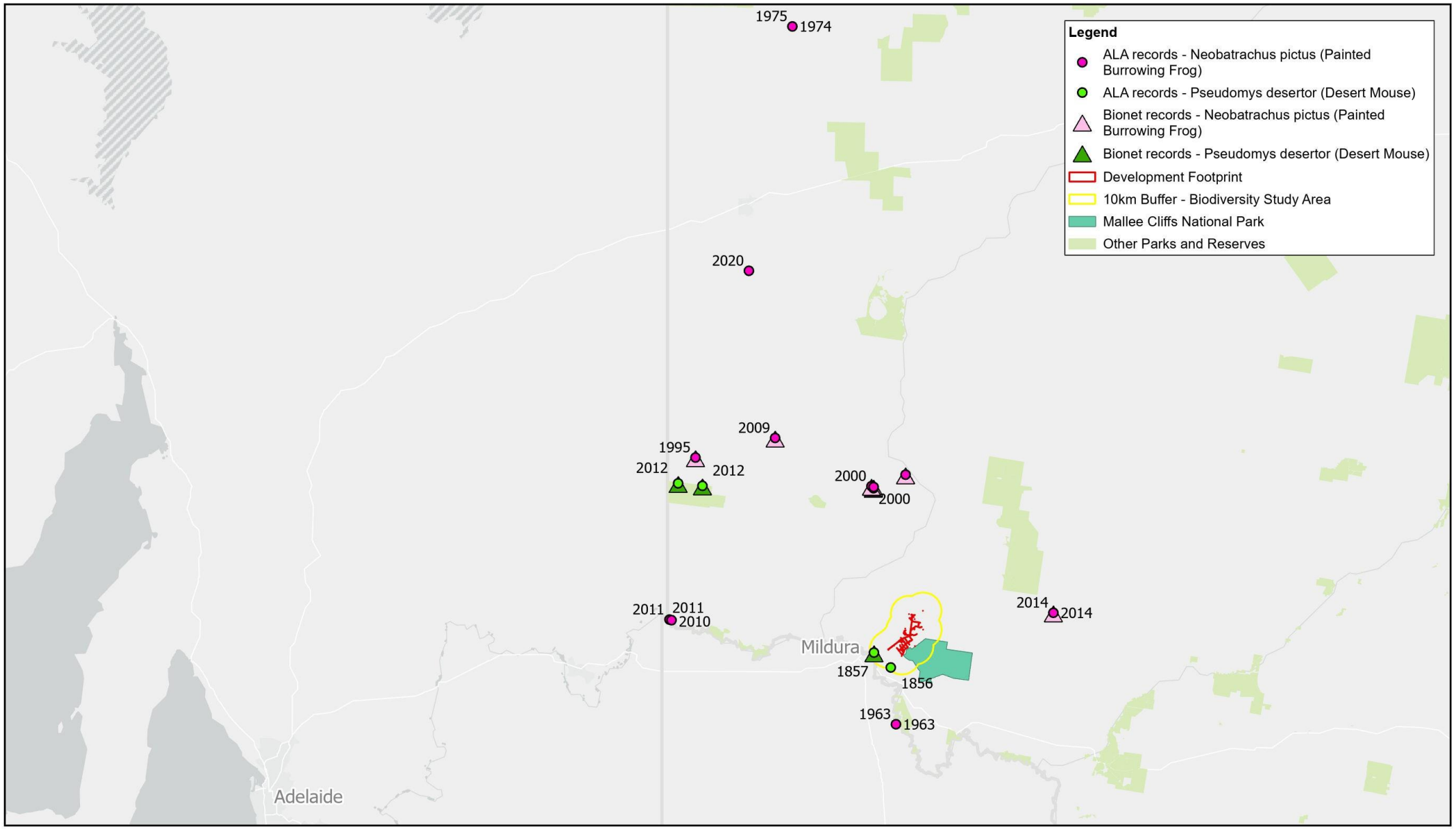
Data source: PCT, Seed,2024; UNMWELT, 2024; World Topographic Map: Vicmap, Esri, TomTom, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, CGIAR
World Imagery: Earthstar Geographics. Created by: kgardner

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Print date: 16 Aug 2024 - 14:11

Assessment of species presence and habitat suitability

Species records and habitat assessments

The target species for this assessment both have very few or no local records across historical survey effort, particularly in adjacent Mallee Cliffs National Park. Due to the proximity to the development footprint and the frequency and extent of survey at Mallee Cliffs National Park seems to be a good indicator for the likelihood of presence for both species. Historical records from ALA and from BioNet across western New South Wales are displayed in Figure 4



Paper Size ISO A4

0 20 40 60 80

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

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Umwelt (Australia) Pty Ltd
Mallee Windfarm advice on Desert Mouse and Painted Burrowing Frog

Historic ALA and Bionet records

Project No. **12618872**
Revision No. **0**
Date **16/08/2024**

FIGURE 4

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Data source: PCT, Seed,2024; UNMWELT, 2024; World Topographic Map: Vicmap, Esri, TomTom, Garmin, FAO, NOAA, USGS
Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, CGIAR. Created by: kgardner

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Painted Burrowing Frog (*Neobatrachus pictus*)

Suitable habitat for the Painted Burrowing Frog (*Neobatrachus pictus*) is primarily dependent on rainfall as opposed to vegetation type. This could lead to suitable habitat becoming present within the development footprint.

The closest record to the development footprint is from 2014 with one individual in Balranald, 90km away from the development footprint. Until 2021 there had only been two locations within NSW with records of the Painted Burrowing Frog, Scotia Sanctuary and west of Pooncarie.

The Development Footprint appears to support suboptimal habitat for this species with no previous records, appears to be on the edge of the species distribution with the closest record being 90 km away in 2014.The Development Footprint is also a considerable distance from the next closest records within NSW which are over 100km away from 2000.

Desert Mouse (*Pseudomys desertor*)

There are two records nearby to the development footprint however they are from 1856 and 1857 prior to exotic species such as the feral cat and fox becoming established as important threats to this species in western NSW. The next closest records of the Desert Mouse are from 2012 within the Tarawi Nature Reserve over 200km northwest. This record could be associated with the high rainfall within the two years prior which allowed the species to recolonize Tarawi Nature Reserve. Yearly rainfall statistics for the closest weather stations to Tarawi Nature Reserve is the Mildura Airport (station no. 076031) and Pooncarie Mail Agency (station no. 047029), a summary of these statistics can be seen in Table 2 ((BOM, 2024). The other record of Desert Mouse within NSW was in 2008 within Sturt National Park, approximately 500km north, where a singular male was detected (OEH 2024).

Table 2 Annual Rainfall Data from Mildura and Pooncarie

Year	Annual Rainfall in Mildura (mm)	Annual Rainfall in Pooncarie (mm)
2008	202.0	227.4
2009	233.0	228.6
2010	591.2	567.1
2011	657.4	533.1
2012	214.6	N/A
2013	216.4	201.9

Approximately 364 hectares of mallee woodland and spinifex dunes is predicted to occur throughout the Biodiversity Study Area. These habitats are the species preferred habitat however threats of predation and overgrazing likely limit the species ability to recolonise the area.

The infrequency of records within New South Wales in general and the age of the records nearby to the development footprint (1800s) indicate that the Development Footprint is unlikely to be within the species' current distribution.

Recent surveys in the region

Mallee Cliffs National Park

There has been extensive survey effort completed within the Mallee Cliffs National Park (directly adjacent to the Development Footprint) primarily completed by the Australian Wildlife Conservancy (AWC) from 2016 to present day. These surveys are done under the AWC-NSW Parks Partnership Projects. Across the AWC-NSW Parks Partnership Projects there have been 34,087 records of 171 species. Prior to this, records within the national park go back to 1965 producing an additional 12,419 records and 84 species.

Neither target species of the Painted Burrowing Frog or the Desert Mouse have been detected throughout the history of survey effort within Mallee Cliffs National Park despite extensive survey effort. Various survey methods were utilized including live trapping (box, cage, pitfall and funnel), camera traps, acoustic recorder deployment and spotlight transects across the standard monitoring sites. A summary of the threatened species that have been detected within the park is below (Table 3).

Status

EPBC Act - Commonwealth Environment Protection and Biodiversity Conservation Act 1999. BC Act - Biodiversity Conservation Act 2016 or Fisheries Management Act 1994.

CE – Critically Endangered
EN – Endangered population
V – Vulnerable

Table 3 Threatened Species detected within Mallee Cliffs National Park

Scientific Name	Common Name	EPBC/BC Act Listing
Mammals		
Cercartetus concinnus	Western Pygmy Possum	- / EN
Chalinolobus picatus	Little Pied Bat	- / VU
Ningaui yvonneae	Southern Ningaui	- / VU
Nyctophilus corbeni	Corben's Long-eared Bat	VU / VU
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	- / VU
Vespadelus baverstocki	Inland Forest Bat	- / VU
Aves		
Aphelocephala leucopsis	Southern Whiteface	VU / VU
Artamus cyanopterus cyanopterus	Dusky Woodswallow	- / VU
Certhionyx variegatus	Pied Honeyeater	- / VU
Cinclosoma castanotum	Chestnut Quail-thrush	- / VU
Circus assimilis	Spotted Harrier	- / VU
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	- / VU
Daphoenositta chrysoptera	Varied Sittella	- / VU

Drymodes brunneopygia	Southern Scrub-robin	- / VU
Epthianura albifrons	White-fronted Chat	- / VU
Falco subniger	Black Falcon	- / VU
Haliaeetus leucogaster	White-bellied Sea-Eagle	- / VU
Hieraaetus morphnoides	Little Eagle	- / VU
Hylacola cautus	Shy Heathwren	- / VU
Leipoa ocellata	Malleefowl	VU / EN
Lichenostomus cratitius	Purple-gaped Honeyeater	- / VU
Lophochroa leadbeateri	Pink Cockatoo	- / VU
Melanodryas cucullata cucullata	South-eastern Hooded Robin	EN / EN
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	- / VU
Pachycephala inornata	Gilbert's Whistler	- / VU
Petroica phoenicea	Flame Robin	- / VU
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	VU / EN

Scientific Name	Common Name	EPBC/BC Act Listing
Reptilia		
Aprasia inaurita	Mallee Worm-lizard	- / EN
Cyclodomorphus melanops elongatus	Mallee Slender Blue-tongue Lizard	- / EN
Strophurus elderi	Jewelled Gecko	- / VU
Tiliqua occipitalis	Western Blue-tongued Lizard	- / VU

2021 GHD site visit

In late 2021 GHD were engaged by Spark Renewables to conduct a preliminary biodiversity constraints assessment to support the development of the Mallee Wind Farm project. The purpose of this report was to identify the Plant Community Types (PCTs) and potential habitat for fauna species that have the potential to be impacted by the proposal and provide advice on potential investigations required to be undertaken during preparation of a Biodiversity Development Assessment Report (BDAR). For both species of interest, it was determined that they cannot be reliably predicted to occur within the development footprint despite the presence of potentially suitable habitat. During this assessment a preliminary field survey was conducted in which neither target species was detected. (GHD 2022).

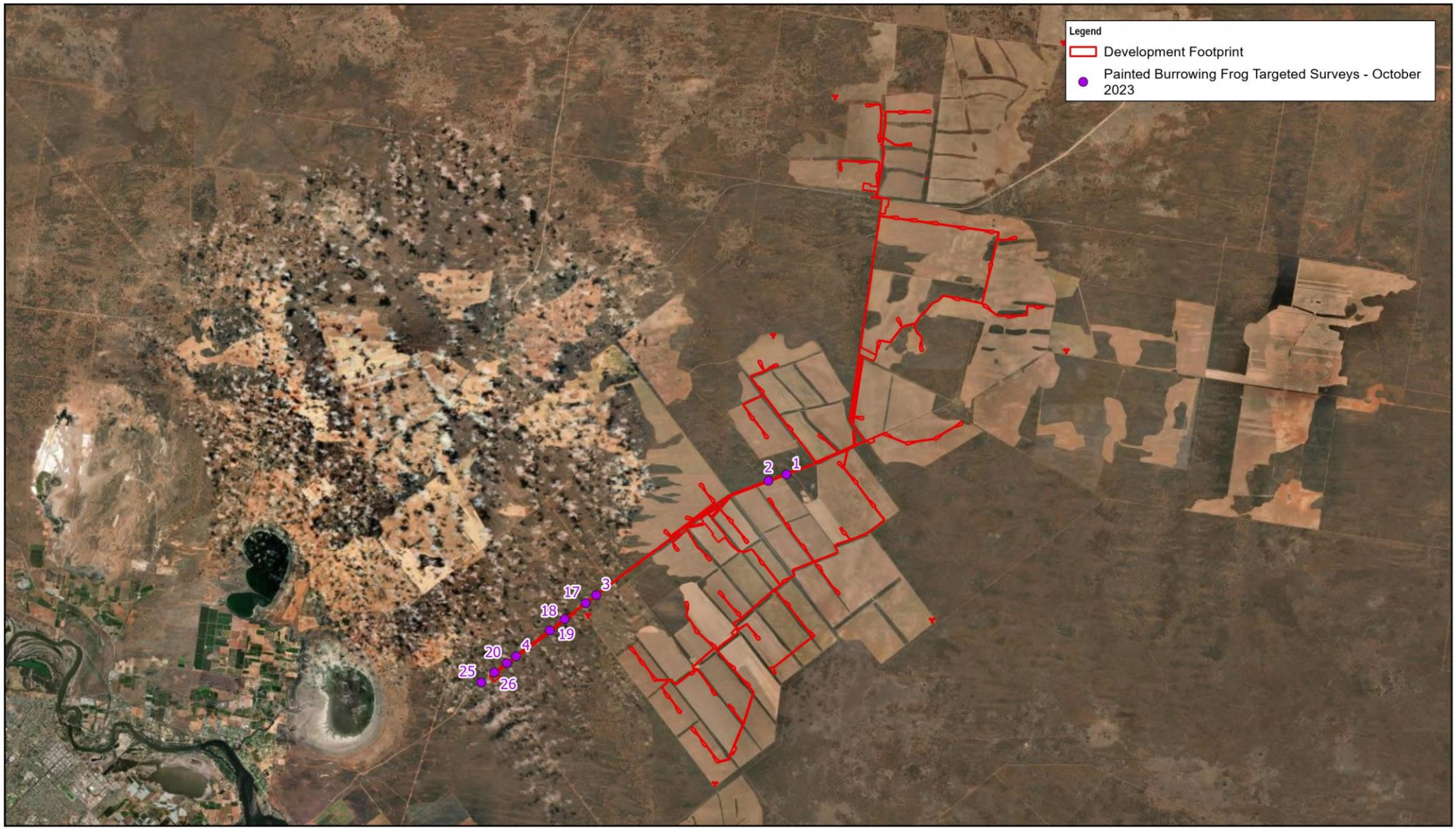
Previous work determined the likelihood of occurrence for the target species to be as follows: ***Table 4 Likelihood of occurrence table for target species***

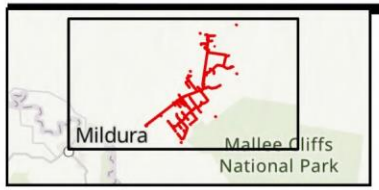
Common Name Scientific Name	BC Status	EPBC Status	Habitat association	Likelihood of occurrence

Desert Mouse *Pseudomys desertor*	CE	-	Most records of the Desert Mouse come from sand dune or sand plain habitats dominated by Spinifex (Triodia spp.). Depends on a dense groundcover of grasses, sedges or shrubs; survives in small pockets of habitat and expands into other areas following rains and subsequent vegetation growth. Found to be most abundant in areas with the least historical grazing pressure and disturbance, including fire.	**Low:** Some potentially suitable habitat could occur in the Biodiversity Study Area. The species has not been previously recorded in the locality.
Painted Burrowing Frog *Neobatrachus pictus*	E	-	Widespread in southeastern South Australia and western Victoria but found at only two locations in NSW, in Scotia Sanctuary, adjacent to the South Australian border and in an area to the west of Pooncarie. Inhabit open grassland, mallee, woodland, farmland and cleared areas and are usually found in or around flooded areas after periods of heavy rainfall, including grassy marshes, lagoons, flooded claypans, temporary roadside pools, ditches, mallee swales and farm dams.	**Low:** Suitable habitat predicted to occur in the Biodiversity Study Area during flooding events

Additionally, this report determined from the BAM calculator that neither target species had relevant habitat constraints that would need further investigation.

After this preliminary biodiversity assessment two targeted species surveys were completed for the Painted
Burrowing Frog. Survey methods aligned with the specific requirements for Painted Burrowing Frog under NSW
Survey Guide for Threatened Frogs (NSW DPIE, 2020). Aural-visual surveys were completed over two separate non-consecutive nights following heavy rainfall (27mm). Surveys were completed around the edges of potential breeding habitat both known prior to survey and opportunistic additional areas that were temporarily inundated (NSW DPIE, 2020). Survey effort is displaying in Figure 5.





Paper Size ISO A4

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

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Umwelt (Australia) Pty Ltd
Mallee Windfarm advice on Desert Mouse and Painted Burrowing Frog

Painted Burrowing Frog Targeted Surveys - October 2023

Project No. **12618872**
Revision No. **0**
Date **9/08/2024**

FIGURE 5

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Data source: ACT, Seed,2024; UNMWELT, 2024; World Topographic Map: Vicmap, Esri, TomTom, Garmin, FAO, NOAA, USGS
World Hillshade: Esri, CGIAR
World Imagery: Earthstar Geographics. Created by: cjauniau

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Print date: 09 Aug 2024 - 14:39

This found all areas along the development footprint were heavily disturbed with no aquatic vegetation. There were no Painted Burrowing Frog detected across the sites despite some low quality suitable habitat being present. It was raining while conducting the first night of survey, there were no frogs within sites however, there were many *Limnodynastes tasmaniensis* and *Limnodynastes dumerilii* seen on the road. The results of the targeted surveys are summarised in Table 5.

Table 5 Results of Painted Burrowing Frog targeted survey

Site	Date & Time	Weather	Notes
Site 1	03/10/2023 N/A	27mm rain, 15 degrees	Site not accessible
Site 2	03/10/2023 N/A	27mm rain, 15 degrees	Site not accessible
Site 3	03/10/2023 21:15	27mm rain, 15 degrees	Water in site, no frog activity at all. Appears to be more disturbed than when previous photo taken.
Site 4	03/10/2023 22:25	27mm rain, 15 degrees	No frog activity.
Site 18	03/10/2023	27mm rain, 15 degrees	No frog activity.
Site 19	03/10/2023	27mm rain, 15 degrees	2 areas of water. No frog activity.
Site 20	03/10/2023	27mm rain, 15 degrees	No frog activity.
Site 1	11/10/2023 19:45	24 degrees, no wind	Two small 2x2m wet areas.
Site 2	11/10/2023 20:05	24 degrees, no wind	25x5m area of water
Site 3	11/10/2023	24 degrees, no wind	Dry. (PBF3b as was not marked right). Photo taken
Site 17	11/10/2023 20:30	24 degrees, no wind	2 wet areas 1x1m and 3x2m
Site 18	11/10/2023 20:55	24 degrees, no wind	Two large deep pools of water. 23x8m and 15x6m. *Limnodynastes tasmaniensis* x2 calling.
Site 19	11/10/2023 21:10	24 degrees, no wind	Four pools. 4x3m, 1x1m, 4x4m, 9x4m with 1x *Limnodynastes tasmaniensis* calling in bigger pond.
Site 4	11/10/2023 21:45	24 degrees, no wind	Site is now dry but damp. Two *Limnodynastes tasmaniensis* seen.
Site 20	11/10/2023 22:10	24 degrees, no wind	2x2m wet area.
Site 26	11/10/2023	24 degrees, no wind	Dry.
Site 25	11/10/2023 22:35	24 degrees, no wind	Wet area 8x6m. 1x *Limnodynastes tasmaniensis*.

Conclusion

Based upon the lack of historical records and lack of suitable habitat there is a low likelihood that the Painted Burrowing Frog (*Neobatrachus pictus*) is present within the development footprint provided. This species requires temporary pools of water, such as claypans or floodplains, to breed and burrow into moist soil during dry periods (ALA 2024a). The development footprint is dominated by dry sandy soils and lacks extensive surface water features that could support the Painted Burrowing Frog.

Despite potentially suitable habitat being present for the Desert Mouse (*Pseudomys desertor*), the sparse records accompanied with high predation pressure, overgrazing and disturbed vegetation within the development footprint, it is unlikely the species is present. The Desert Mouse is a small nocturnal rodent that inhabits semi-arid and arid areas with spinifex or hummock grasslands (ALA 2024b). The development footprint contains some patches of spinifex, but they are highly degraded and isolated by cleared areas. The high survey effort within the adjacent Mallee Cliffs National Park through the partnership with the Australian Wildlife Conservancy would be expected to detect the species if present. Previous survey effort completed by GHD did not detect the Painted Burrowing Frog and determined the likelihood for presence to be low due to lack of suitable habitat.

References

ALA (2024a) Atlas of Living Australia (ALA). (2024, July). *Neobatrachus pictus : Burrowing Frog*. Retrieved from https://bie.ala.org.au/species/https://biodiversity.org.au/afd/taxa/106c6003-61f4-4cda-8ade-ba64cfd0a16b

Atlas of Living Australia (ALA). (2024, July). *Pseudomys desertor : Desert Mouse*. Retrieved from https://bie.ala.org.au/species/https://biodiversity.org.au/afd/taxa/1c2e0a49-5530-48a2-83f3-2d853c89ab03 BOM. (2024, July). *Climate Data Online*. Retrieved from Bureau of Meterology: http://www.bom.gov.au/climate/data/index.shtml

Gordon Christopher E., F. A. (2015). Mesopredator suppression by an apex predator alleviates the risk of predation perceived by small prey. *Proc. R. Soc. B*, 282: 20142870.

NPWS. (2000). *'Painted Burrwoing Frog Recovery Plan'.* Sydney: NPWS.

NSW DPIE. (2020). *NSW Survey Guide for Threatened Frogs.* Parramatta: NSW DPIE.

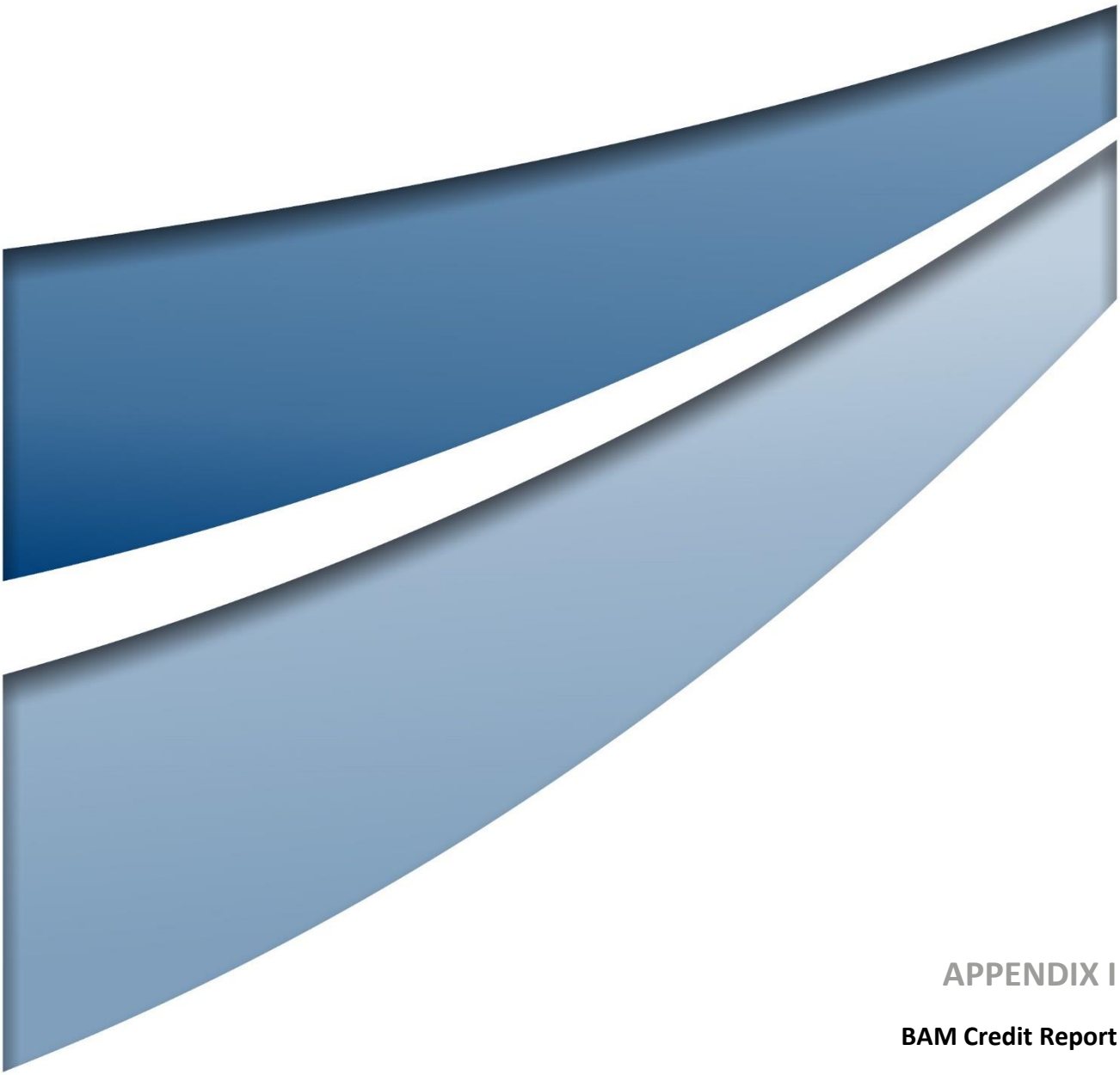
NSW Environment and Heritage. (2024, July). *Desert Mouse (Pseudomys desertor) - crticially endangered species listing*. Retrieved from https://www.environment.nsw.gov.au/topics/animals-and-plants/threatenedspecies/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/desert-mouse-pseudomys-desertor-critically-endangered-species-listing#:~:text=The%20D

GHD (2022) *Mallee Wind Biodiversity Constraints April 2022*. Prepared for Sparks Renewables



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APPENDIX I

BAM Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id
00049809/BAAS19021/24/00049811

Proposal Name
Mallee Wind Farm 2024

BAM data last updated *
28/10/2024

Assessor Name
James Ian Garnham

Report Created
05/11/2024

BAM Data version *
Current classification (live - default) (80)

Assessor Number
BAAS19021

BAM Case Status
Finalised

Date Finalised
05/11/2024

Assessment Revision
3

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion												
1	58_mod_good	Not a TEC	79.4	79.4	26.8	PCT Cleared - 50%	Low Sensitivity to Gain			1.25		665

2	58_derived_weedy	Not a TEC	35.9	35.9	3.4	PCT Cleared - 50%	Low Sensitivity to Gain			1.25		38
3	58_weedy_understory	Not a TEC	75.2	75.2	0.17	PCT Cleared - 50%	Low Sensitivity to Gain			1.25		4
											Subtotal	**707**
Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones												
4	170_mod_good	Not a TEC	61.9	61.9	3.8	PCT Cleared - 41%	Low Sensitivity to Gain			1.00		59
5	170_derived_native	Not a TEC	38.3	38.3	1.2	PCT Cleared - 41%	Low Sensitivity to Gain			1.00		11
6	170_derived_weedy	Not a TEC	44	44.0	0.06	PCT Cleared - 41%	Low Sensitivity to Gain			1.00		1
											Subtotal	**71**
Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion												
7	171_mod_good	Not a TEC	74.5	74.5	19	PCT Cleared - 19%	Low Sensitivity to Gain			1.00		353
											Subtotal	**353**
											Total	**1131**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits