Yathroo Wind Farm

Assessment of Impacts to Matters of National Environmental Significance

Final

September 2026

umwelt

Yathroo Wind Farm

Assessment of Impacts to Matters of National Environmental Significance

Final

Prepared by
Umwelt (Australia) Pty Limited

On behalf of
Neoen Australia Pty Ltd

Project Director: Cormac Collins
Project Manager: Thomas de Silva
Technical Director: Rob Karelse
Report No.: 24360/R17
Date: September 2026

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

Acknowledgement of Country



Disclaimer

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

©Umwelt (Australia) Pty Ltd

Document Status

Rev No.	Reviewer Name	Date	Approved for Issue Name	Date
V1	Thomas de Silva	17/11/2025	Rob Karelse	17/11/2025
V2	Thomas de Silva	24/11/2025	Cormac Collins	9/12/2025
V3	Thomas de Silva	10/12/2025	Cormac Collins	10/12/2025
V4	Megan Stalker	30/06/2026	Cormac Collins	30/06/2026
V5	Megan Stalker	17/09/2026	Cormac Collins	17/09/2026

Executive Summary

Neoen Australia Pty Ltd (Neoen) is proposing the construction and operation of up to 65 wind turbines, a battery energy storage system (BESS), transmission network connection, and associated infrastructure approximately 120 kilometres (km) north of Perth, in the Central Coast subregion of the Wheatbelt, in Western Australia. The Yathroo Wind Farm (the Project), is being assessed by preliminary documentation under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (2025/10390).

Pursuant to section 95A(3) of the EPBC Act, the public were invited to comment on the draft preliminary documentation, which was made available for public comment on Monday 10 August 2026 for a period of 20 business days, up to and including Friday 4 September 2026. The draft preliminary documentation was provided online, and hard copies were also made available to the public at the Dandaragan Community Resource Centre and the State Library of Western Australia.

The Project received one public submission during the notification period. The public submission received related specifically to the Environmental Offset Strategy that formed a component of the draft preliminary documentation. Since publication of the draft preliminary documentation, an Offset Management Plan (OMP) has been prepared to support the next stage of the assessment. The OMP supersedes the Environmental Offset Strategy and provides detailed offset calculations, baseline information, management actions, monitoring, completion criteria and adaptive management framework relevant to the proposed offset. Matters raised in the public submission are addressed through information now presented in the OMP. The full submission and response is provided in **Appendix O**.

This report has been prepared to support the EPBC assessment and incorporates the additional information requested by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under section 95A(2) of the EPBC Act in its letter dated 23 March 2026 (the RFI) (refer table ES1 for directory of where Table A RFI items are addressed in this report). This report documents the proposed action, characterises the Matters of National Environmental Significance (MNES) of the Project Area, presents the survey effort undertaken, sets out the avoidance, mitigation and management measures applied, and provides Significant Impact Assessments (SIAs) against the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment, 2013) for each relevant MNES with a moderate of greater likelihood of occurrence in the Project Area.

Baseline Information – MNES Recorded in the Project Area

Neoen has completed extensive baseline ecological surveys in accordance with relevant Commonwealth and State guidelines, including 27 months of quarterly Bird and Bat Utilisation Surveys (BBUS), seven monthly targeted shorebird surveys (September 2025 – March 2026), targeted Black-Cockatoo habitat and nest-tree assessments, and detailed and targeted flora and vegetation surveys. The MNES known to occur in the Project Area are:

- Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered) – 41.3 ha mapped across 13 patches. All patches are located outside the Indicative Project Footprint, with the exception of 0.11 ha of which is in 'Degraded' condition.
- Carnaby's Black-Cockatoo (*Zanda latirostris*) – Endangered; recorded on 101 occasions in flocks of up to 240 individuals.

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable; transient occurrence (flocks of 2–8 individuals).
- Eight EPBC listed migratory shorebird species (Curlew Sandpiper, Black-tailed Godwit, Bar-tailed Godwit (Northern Siberian), Common Greenshank, Sharp-tailed Sandpiper, Wood Sandpiper, Red-necked Stint and Ruff), all observed only at the wetlands west of Brand Highway, 3.5km from the nearest wind turbines, in low numbers and during the non-breeding season.
- *Grevillea curviloba* (Endangered) – 10 planted individuals outside the Indicative Project Footprint.

A further five migratory species (Common Sandpiper, Glossy Ibis, Pacific Golden Plover, Long-toed Stint and Fork-tailed Swift) were assessed as having a moderate or higher likelihood of occurrence.

Black-Cockatoo baseline information (RFI Item 1.1)

Black-Cockatoo habitat and nest-tree surveys were undertaken across the Project Area and Development Corridor (Targeted level survey).

A desktop assessment was undertaken of the 12 km foraging range buffer surrounding the Project Area. The following keystone habitat features were identified:

- Two confirmed Carnaby's Black-Cockatoo night-roost sites within the Project Area but outside the Development Corridor – Roost Site A (up to 8 birds) and Roost Site B (up to 200 birds, 4 km from the nearest proposed turbine).
- One Carnaby's Black-Cockatoo breeding tree (Breeding Site 1) recorded outside the Development Corridor but within the Project Area.
- One confirmed roost site at Regans Ford, ~7 km south of the Project Area, and confirmed breeding sites at Moore River (~9 km south) and Cataby (~6 km north-west).
- Approximately 40,010 ha of potentially suitable foraging habitat (of which ~12,592 ha is in conservation estate), 5,698 ha of potentially suitable breeding habitat, and 5,205 ha of potentially suitable roosting habitat is present within 12 km of the Project Area.

Of the 560 potential Black-Cockatoo nest-trees assessed in the Development Corridor, no Rank 1 or Rank 2 trees and a maximum of five Rank 3 trees (potentially suitable hollow visible but no chew marks present) are proposed for removal. All Rank 1 and Rank 2 trees, and the two known roost sites, are avoided. Flight-height data collected during 27 months of BBUS confirm that Black-Cockatoos consistently fly below the proposed minimum blade-tip height of 59 m AGL: 99% of Carnaby's flight time was below 30 m AGL, with no records within the Rotor Swept Area (RSA), and the single Forest Red-tailed record was at 8 m AGL.

Migratory species baseline information (RFI Item 1.2)

The Targeted Shorebird Survey Report (**Appendix K**) documents population status, site utilisation and habitat mapping for the ten migratory taxa identified in the RFI. Key findings are:

- Population status: all records were of small numbers of birds (≤12 individuals per species) during the non-breeding austral summer. No wetland in the Project Area or 5 km Regional Context Area approached the 0.1% East Asian–Australasian Flyway thresholds for nationally important habitat, the 2,000-bird threshold, or the 15-species threshold.
- Site utilisation: all 361 mapped geomorphic wetlands within the Regional Context Area were desktop assessed. Migratory shorebirds were known or considered likely to occur at 23 of these

wetlands (all within the wetland-rich Swan Coastal Plain subregion west of Brand Highway). Within the Project Area, four wetlands provide suitable habitat – three adjacent wetlands in the west (totaling 264 ha) and Lake Yangy in the east (14.5 ha).

- Flight characteristics and migratory flight paths: no migratory shorebirds were observed in flight during 140 person-days of BBUS over a 27-month period. Long-distance migratory flights occur at 1,000–5,000 m AGL (well above the RSA), and any local movements are most likely to occur north–south along the western wetland chain, not across the Project Area towards the SWA01 subregion in the east where turbines are located.
- Habitat mapping: detailed habitat suitability mapping is provided in **Appendix K** and identifies permanent and seasonal water bodies within and adjacent to the disturbance footprint.

Likely impacts on MNES (RFI Item 2.1)

An iterative design process has been applied to avoid and minimise impacts as far as practicable.

The Indicative Project Footprint will result in the disturbance of up to 10.28 ha of remnant native vegetation, 5.45 ha of isolated remnant trees, 5.05 ha of planted native vegetation and 2.28 ha of planted non-native trees and shrubs. Approximately 97% of Project infrastructure is located on cleared agricultural land. Specific avoidance outcomes include:

- Avoidance of all native vegetation in 'Very Good' or better condition and 99.86% of the highest-quality Black-Cockatoo foraging habitat (Site Condition 5–6) within the Project Area – only 0.65 ha (Carnaby's) and 0.03 ha (Forest Red-tailed) of moderate-to-high foraging value vegetation will be cleared.
- Avoidance of all Rank 1 and Rank 2 Black-Cockatoo nest-trees, with no more than five Rank 3 trees to be cleared.
- Setting turbines back 4 km from the principal Carnaby's roost (Roost B) and 3.5 km from all wetlands where EPBC listed migratory shorebirds have been recorded to date.
- Adoption of a minimum blade-tip height of 59 m AGL which is above the recorded and typical Black-Cockatoo flight heights.
- Avoidance of all Banksia Woodlands TEC in 'Good' or better condition; clearing limited to 0.11 ha of Degraded TEC required for the Brand Highway access.
- Avoidance of the area where *Grevillea curviloba* was recorded.

Collision risk has been assessed for all 15 EPBC-listed bird species known or likely to occur in the Project Area using BBUS data to BBUS07 (May 2026) and seven months of targeted shorebird surveys, and has considered seasonal exposure, proximity to keystone habitat features, known and likely flight pathways, local topography and vegetation height, turbine clustering, electrocution and updraft risks, vehicle strike, and cumulative impacts from existing and proposed wind farms in the region (Waddi, Yandin, Parron, Marri, Warradarge, Badgingarra). All species were assessed as having a Minor or Moderate pre-mitigation risk.

Other impacts considered for each MNES (movement-corridor disruption, alienation and landscape sterilisation; shadow flicker, blade glint, blade throw and night lighting; electrocution; updrafts; vehicle strikes; and cumulative impacts) are addressed individually in **Section 9.0** and **Appendix I**.

Clearing of Black-Cockatoo foraging habitat is not likely to materially impact the two known Carnaby's roost sites (Roost A and Roost B) or any other known roosting or breeding site within foraging range. The proposed clearing represents 0.34% (Roost A), 0.06% (Roost B), 0.38% (Breeding Site 1), 0.01% (Regans Ford), 0.01% (Moore River) and 0.04% (Cataby Breeding Site) of the potentially suitable foraging habitat within the 12 km foraging range of each site. This loss is small in extent, spatially dispersed, predominantly of low to moderate value, and well within the natural variability of foraging conditions experienced by Black-Cockatoos. Accordingly, the viability of nearby roosting and breeding sites, the success of fledgling rearing within foraging range, and established flight paths between foraging and roosting/breeding sites will be maintained.

Avoidance and mitigation (RFI Item 3.1)

The Project will be constructed and operated in accordance with the Preliminary Construction Environmental Management Plan (CEMP) (**Appendix G**) and the Preliminary Bird and Bat Adaptive Management Plan (BBAMP) (**Appendix D**), with the following key controls relevant to the RFI:

- Clearing limits demarcated prior to disturbance, with pre-clearance fauna spotter surveys and progressive directional clearing towards adjacent retained vegetation.
- Demarcation of all retained Rank 1 and Rank 2 nest-trees as 'No-go zones' and capping of Rank 3 tree clearance at five trees.
- No permanent loss of wetland habitat where migratory shorebirds forage; the only impact is 1 ha of degraded fringing vegetation which will be rehabilitated.
- Weed and Phytophthora dieback hygiene measures – inspection and wash-down of all plant and equipment on entry and prior to leaving weed-infested areas, certification of fill material.
- Dust suppression, erosion and sediment control, lighting design, vehicle speed limits, carrion-removal protocols and limited construction hours to manage indirect impacts.
- Trigger-based adaptive management of operational bird and bat collision risk as outlined in the BBAMP, including post-construction carcass searches.

Residual impacts and proposed offsets (RFI Items 4.1 and 5.1)

After application of the mitigation hierarchy, residual impacts are limited to:

- 0.11 ha of Degraded Banksia Woodlands TEC.
- Up to five Rank 3 potential Black-Cockatoo nest-trees.
- Clearance of Carnaby's Black-Cockatoo foraging habitat: 0.65 ha (moderate–high quality), 2.68 ha (moderate quality), 7.26 ha (low–moderate quality), 4.32 ha (low quality) and 6.72 ha (negligible to low quality).
- Clearance of Forest Red-tailed Black-Cockatoo foraging habitat: 0.03 ha (moderate–high quality), 3.27 ha (moderate quality), 3.08 ha (low–moderate quality), 2.76 ha (low quality) and 0.21 ha (negligible to low quality).

Assessment against the *Significant Impact Guidelines 1.1* indicates these residual impacts are unlikely to be significant for any MNES. No residual significant impacts are expected for migratory species. An OMP (**Appendix L**) has been prepared in accordance with the EPBC Act Environmental Offsets Policy and the Commonwealth Offset Assessment Guide. The OMP proposes a land-based direct offset comprising revegetation of cleared agricultural land, long-term protection and

management, and provision of artificial nest boxes, targeting residual impacts to Carnaby's and Forest Red-tailed Black-Cockatoo foraging and potential breeding habitat.

Plans (RFI Items 5.1, 5.2 and 5.3)

The following plans accompany the preliminary documentation and respond directly to the RFI:

- Offset Management Plan (**Appendix L**) – Addresses the Project's residual impacts to Carnaby's Black-cockatoo and Forest Red-tailed Black-cockatoo foraging and potential breeding habitat. The proposed offset comprises revegetation and long-term protection of 27.25 ha of cleared agricultural land. The OMP outlines management actions, implementation timing, monitoring, progressive performance indicators, completion criteria, trigger values, corrective actions, reporting and adaptive management.
- Preliminary Bird and Bat Adaptive Management Plan (BBAMP) (**Appendix D**) – outlines environmental outcomes and commitments to mitigate impacts on each Black-Cockatoo and migratory species, with strategies enabling a long-term, trigger-based, adaptive management approach informed by ongoing monitoring. Implementation of a final BBAMP, in consultation with DBCA, is a condition of the development approval granted in October 2025.
- Preliminary Decommissioning and Rehabilitation Management Plan (**Appendix M**) – describes how potential impacts on MNES will be managed during the end-of-life stage of the proposed action, including deconstruction, removal of infrastructure and proposed site restoration activities.
- Targeted Shorebird Survey Report (**Appendix K**) - documents the outcomes of a comprehensive survey program to address requirements under the Department of Energy and the Environment (2017) *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* and RFI items pertaining to migratory shorebirds.

Conclusion

The Yathroo Wind Farm has been designed and assessed in accordance with the EPBC Act and relevant guidelines, with a strong emphasis on avoiding and minimising impacts to Black-Cockatoos, migratory shorebirds, the Banksia Woodlands TEC and other MNES. The additional baseline information, impact assessments, avoidance and mitigation measures, residual impact analysis, and management plans presented in this revised preliminary documentation directly address each item raised by DCCEEW in the RFI of 23 March 2026. While some residual impacts will remain, assessment against the *Significant Impact Guidelines 1.1* indicates that these impacts are not likely to be significant, and any residual impacts to Black-Cockatoo habitat will be compensated through implementation of the OMP (**Appendix L**).

Table ES1 DCCEEW RFI Table A Response Directory

Regulator's Comment / Description		Response / Section Link*
Request for further information (Table A)		
1. Baseline information		
1.1 Black Cockatoos **Carnaby's Black Cockatoo** (*Zanda latirostris* listed as *Calyptorhynchus latirostris*) (CBC) – Endangered **Forest Red-tailed Black Cockatoo** (*Calyptorhynchus banksia naso*) (FRTBC) – Vulnerable	The referral document states that clearance will occur within the Development Corridor, affecting the foraging of both breeding and roosting individuals. The Department will therefore require the following: a. A statement addressing potential direct and indirect impacts of the proposed clearing, both within the Project Area and surrounding areas, on: i. The viability of nearby roosting and, if relevant, breeding sites ii. The success of raising fledglings at nesting sites within foraging range iii. Flight paths of individuals that fly over and forage within the area on the way to or returning from nesting seasons or the known roosting sites within the Project area. b. Clearly define the total number of Rank 3 trees to be removed.	**a.** (i) **Section 9.3.1.3** (ii) **Section 9.3.1.3** (iii) **Section 9.3.1.4** **b. Five. Updated throughout.**
1.2 Migratory Species **Australian Painted Snipe** (*Rostratula australis*) – Endangered **Common Greenshank** (*Tringa nebularia*) – Endangered **Curlew Sandpiper** (*Calidris ferruginea*) – Critically Endangered **Black-tailed Godwit** (*Limosa limosa*) – Endangered **Sharp-tailed Sandpiper** (*Calidris acuminata*) – Vulnerable **Fork-tailed Swift** (*Apus pacificus*) **Osprey** (*Pandion haliaetus*) **Wood Sandpiper** (*Tringa glareola*) **Red-necked Sting** (*Calidris ruficollis*)	Additional information on all listed, threatened and migratory bird species must include but may not be limited to: a. Population Status i. Identify and describe the abundance and status of species occurring within, adjacent to, or moving through/over the project area. Include all listed species that transit or overfly the area enroute to other locations. b. Site Utilisation by Bird Species i. Details of the flight characteristics and behaviours of the listed bird's species, specifically regarding occupying or overflying the project area within the rotor swept area and transmission lines. ii. Document migratory flight paths across the site, including frequency of use, timing (day/night), numbers, and seasonal patterns, especially for migratory overflying species. c. Habitat Mapping i. Provide detailed mapping of suitable habitat for all listed threatened or migratory bird species which: 1) Includes habitat that is within and adjacent to the project to provide regional context. 2) Identifies permanent or seasonal water bodies or watercourses within proximity of the disturbance footprint to demonstrate the	**a.** (i) **Section 6.3.6.1** **b.** (i) **Section 6.3.6.2** (ii) **Section 6.3.6.2** **c.** (i) – **1. Section 6.3.3, Figure 6.11, Figure 6.12 and Appendix K** **2. Table 6.14 and** Table 2.5 **of Appendix K**

Regulator's Comment / Description		Response / Section Link*
Ruff (*Calidris pugnax*)	use of different habitat features within and outside the project area. 3) Provides the images separately as attachments in JPEG format.	**3. Figure 6.11, Figure 6.12 and Appendix K**
	d. Where there is a lack of certainty, an assessment of the confidence with which any claims are made.	**d. Section 9.4.6**
2. Likely Impacts		
2.1 All MNES	The preliminary documentation must include a description of all the potential impacts, including direct, indirect, and offsite impacts as outlined in the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance which will or is likely to occur on the matters as listed (Table A, Section 3.1, 4.1 and 4.2), and as a result of the proposed action. The impacts of the proposed action on these MNES should be considered in the broadest scope, with all components considered, including any associated supporting infrastructure. For each species, identify and characterise the nature of all direct and indirect impacts, including timing and whether each impact is likely to be temporary or permanent. Include the following as it relates to the proposed action: Possible address this a. Provide a detailed assessment of the nature, extent, likelihood and consequence of the likely short-term and long-term impacts of the proposed Action on each MNES, which may include but not be limited to: i. Update the Collision Risk Assessment for all bird species listed in this letter using the most recent survey data and ensure that it includes the following relevant risk indicators: 1) seasonal exposure. 2) proximity to keystone habitat features (e.g. roost sites and potential/known nest trees). 3) known or likely flight pathways. 4) disruption of movement corridors following turbine operation. 5) local topography, and vegetation height. 6) the potential attribution of relative risk to individual turbines or cluster of turbines, and the variation in the risk of collision across the site. 7) risks of electrocution from transmission lines. 8) presence of potential updrafts/thermal wind currents relevant to the site.	**a.** (i) – **1. Section 5.2.2.2** and **Section 7.2.1** **2. Table 9.9 and Table 9.10** 3. **Table 9.9** and **Table 9.10** 4. **Table 9.9** and **Table 9.10** **5. Table 5.3 and Section 7.2.1** **6. Section 7.2.1** 7. **Table 9.9** and **Table 9.10** 8. **Table 9.9** and **Table 9.10**

Regulator's Comment / Description			Response / Section Link*
		9) vehicle or machinery strikes.	9. **Table 9.9** and **Table 9.10**
		10) clearly outline how potential cumulative impacts on the local and regional populations of black cockatoos as well as migratory species (associated with additional existing and proposed turbines of nearby wind farms) influence the Collision Risk Assessment.	10. **Table 9.9** and **Table 9.10**
		ii. Provide information on the transmission lines that will be used. This should include benefits of above ground, versus below ground, the upper- and lower-line height, clearance required under the lines, location of each component and any component that will be included to minimise strikes or electrocution.	(ii) **Section 2.5, Table 9.9, Table 9.10** and **Section 9.4.4.**
		iii. Alienation and landscape sterilisation (i.e. behavioural avoidance of species to habitat near turbines, at various temporal and spatial scales).	(iii) **Table 9.9 and Table 9.10.**
		iv. The impacts of shadow "flicker", blade "glint", blade throw and night lighting that may impact migratory flight patterns when dark.	(iv) **Table 9.10**
		v. Clarify how the clearance of foraging habitat within the DE will not indirectly impact the two CBC roosting sites	(v) **Section 9.3.1.3**
	b.	Provide an assessment of the acceptability of impacts (direct, indirect, and offsite) on listed threatened species, considering the proposed avoidance and mitigation measures (see section 3. Avoidance and mitigation of this table), against *the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* and the statutory documents for each matter (Table C, section 2.4). The assessment must demonstrate that the proposed action has had regard to the Conservation Advice for the relevant species and is not inconsistent with the Recovery Plan for the relevant matter.	**b. Section 9.0** and **Appendix J**
3. Avoidance and Mitigation Measures			
3.1 All MNES	a.	Detail, if any, further opportunities to avoid or mitigate impacts, including from weeds and/or Phytophthora.	**a. Section 8.2.2**
4. Residual Impacts and Proposed Offsets			
4.1 All MNES	a.	Describe the residual significant impacts on MNES that are likely to occur because of the proposed action in its entirety, after proposed avoidance and mitigation measures are considered. If applicable, this should include the reasons why avoidance or mitigation of impacts cannot be reasonably achieved.	**a. Section 10.1**

Regulator's Comment / Description			Response / Section Link*
	b.	b) Please provide an offset package to compensate for residual significant impacts to MNES. This should consist of an offset proposal and key commitments and management actions to deliver and implement a proposed offset (i.e. an Offset Management Plan) and align with the relevant Recovery Plans and Conservation Advice for the species.	**b. Section 10.2** and **Appendix L**
5. Plans			
5.1 Offset Management Plan (OMP)	a.	To support your offset strategy, an offset management plan must be provided to demonstrate how the proposed offset will meet the EPBC Act Offset Policy.	**a. Appendix L**
5.2 Bird and Bat Adaptive Management Plan (BBAMP)	a.	Outline environmental outcomes and commitments in the BBAMP to achieve mitigation for each black cockatoo species and Migratory species identified in the department's PMST report, with inclusion of any amendments required from updated surveys. At minimum, the BBAMP should include strategies that capture the following: i. Enable the success of a long-term approach to mitigating and managing potential impacts and potential changes to species' utilisation of the project site and its surrounds. ii. Include mitigation and management measures that assist the development and implementation of an adaptive management approach to the environmental outcome commitments in the BBAMP.	**a.** (i) – Section 7 of **Appendix D**. (ii) – Section 7 of **Appendix D**
5.3 Decommissioning Management Plan	a.	A decommissioning management plan must be prepared to support the end of life stage of the proposed Action. The plan should demonstrate how potential impacts on MNES will be managed during the deconstruction and removal of infrastructure and outline proposed site restoration activities.	**a. Appendix M**

The RFI indicates that no changes are required to address items listed in Table B as this Table sets out the information already submitted in the original referral application. Table C lists the departments content, style and formatting requirements. This has been reviewed by Umwelt with the following changes made:

- Table C, Item 1.1, Ecologically Sustainable Development: **Section 11.0** has been developed to address the five principles of ecologically sustainable development.
- Table C, Item 1.2, Economic and Social Matters: **Section 12.0** has been developed to provide additional information being sought on economic and social matters.

Abbreviations

Abbreviation	Definition
AGL	Above Ground Level
AHD	Australian Height Datum
AVW	Avon-Wheatbelt Bioregion
BAM Act	*Biosecurity and Agriculture Management Act 2007* (WA)
BBUS	Bird and Bat Utilisation Survey
BC Act	*Biodiversity Conservation Act 2016* (WA)
BCE	Bamford Consulting Ecologists (2020)
BESS	Battery Energy Storage System
CAMBA	China-Australia Migratory Bird Agreement
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environment Regulation
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GIS	Geographic Information Systems
IBRA	Interim Bio-Regionalisation of Australia Version 7
JAF	Jarrah-Forest Bioregion
JAMBA	Japan-Australia Migratory Bird Agreement
kV	Kilovolt
MNES	Matters of National Environmental Significance
MWh	Megawatt hour
MW	Megawatt
NVIS	National vegetation Information System
O&M	Operations and Maintenance
PD Act	*Planning and Development Act 2005* (WA)
PMST	Protected Matters Search Tool
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RCA	Regional Context Area; a 5 km buffer around the Project Area
RSA	Rotor Swept Area
SIA	Significant Impact Assessment
SM4	Songmeter 4
SWIS	Southwest Interconnected System
TEC	Threatened Ecological Community
VSA	Vegetation System Association
VT	Vegetation Type
WAPC	Western Australian Planning Commission

Contents

Executive Summary i

Abbreviations v

1.0 Introduction 1

1.1 Project Locality 1

1.2 Existing Land Uses and Tenures 1

1.3 Justification, Site Selection and Alternatives 4

1.3.1 Justification 4

1.3.2 Site Selection 4

1.3.3 Alternatives 5

1.4 Report Purpose 6

1.5 Ecological Assessment Boundaries 6

1.6 Report Contents 8

2.0 Project Description 10

2.1 Turbines 12

2.2 Turbine Foundations 12

2.3 Hardstands 13

2.4 Electrical Connections, Substations and Grid Connection 13

2.5 Transmission Lines 13

2.6 Underground Cabling 14

2.7 Battery Energy Storage System (BESS) 14

2.8 Operational and Maintenance Facility 15

2.9 Construction Compound, Concrete Batching Plant and Laydown Areas 15

2.10 Borrow Pits/Quarries 15

2.11 Meteorological Masts 16

2.12 Communication Towers 16

2.13 External Site Access 16

2.14 Internal Access Roads 16

2.15 Firewater Tanks 17

2.16 Utilities 17

2.18 Maintenance 18

3.0 Legislative and Regulatory Context 19

3.1 Commonwealth 19

3.1.1 Environment Protection and Biodiversity Conservation Act 1999 19

3.2 Relevant WA Legislation 21

3.2.1 Biodiversity Conservation Act 2016 21

3.2.2 Environmental Protection Act 1986 21

3.2.3 Environmental Offset Policy (2011) and Guidelines (2014) 22

3.2.4 Planning and Development Act 2005 22

3.2.5 Biosecurity and Agriculture Management Act 2007 22

4.0 Protected Matters Search Tool Results 23

4.1 Threatened Ecological Communities 24

4.2 Threatened Species 24

4.3 Migratory Species 26

5.0 Methods to Assess Impacts to MNES 28

5.1 Desktop Assessment 28

5.2 Field Surveys 28

5.2.1 Terrestrial Flora and Vegetation 28

5.2.2 Terrestrial Fauna 33

5.2.3 Survey Limitations 47

5.3 Likelihood of Occurrence Assessment 50

5.3.1 Flora and Vegetation 50

5.3.2 Fauna 50

5.4 Significant Impact Assessment 51

6.0 Description of Ecological Values 54

6.1 Biogeographic Description 54

6.1.1 Bioregion 54

6.1.2 Climate 54

6.1.3 Surface Water 55

6.1.5 Land Systems 56

6.2 Flora and Vegetation 57

6.2.1 Regional Vegetation 57

6.2.2 Vegetation Types 60

6.2.3 Vegetation Condition 65

6.2.4 Threatened Ecological Communities 67
6.2.5 Flora Diversity 69
6.2.6 Threatened Flora 69
6.2.7 Introduced Flora 69
6.3 Fauna 69
6.3.1 Fauna Habitat Types 69
6.3.2 Black-Cockatoo Habitat 73
6.3.3 Migratory Shorebird Habitat 87
6.3.4 Fauna Diversity 93
6.3.5 Threatened Fauna 93
6.3.6 Migratory Fauna 94
6.3.7 Bird and Bat Diversity 96
6.3.8 Introduced fauna 98
6.4 Connectivity 98
6.5 Likelihood of Occurrence 98
6.5.1 Threatened Flora 98
6.5.2 Threatened Ecological Communities 99
6.5.3 Threatened and Migratory Fauna 99
7.0 Potential Impacts 101
7.1 Construction Phase 101
7.1.1 Direct Impacts 101
7.1.2 Indirect Impacts 105
7.2 Operations and Maintenance Phase 107
7.2.1 Collisions 107
7.2.2 Vehicle Strikes 112
7.2.3 Barotrauma 113
7.2.4 Barrier Effects 113
8.0 Avoidance, Mitigation, and Management 114
8.1 Avoidance 114
8.1.1 Initial Ecological Constraints Analysis to Inform the Project Area and "Buildable Area" 114
8.1.2 Use of Baseline Ecology Data to Avoid Impacts 115
8.2 Mitigation and Management 116

8.2.1 Native Vegetation and Fauna Habitat Clearing 116
8.2.2 Biosecurity (Weed and Disease Risk Management) 117
8.2.3 Fauna Management 118
8.2.4 Erosion and Sediment Control 119
9.0 Impact Assessments 120
9.1 Significant Impact Assessment Methodology 120
9.2 Summary of TEC Significant Impact Assessment Findings 120
9.3 Summary of Black-Cockatoo Significant Impact Assessment Findings 121
9.3.1 Habitat Loss 121
9.3.2 Direct Mortality 129
9.3.3 Consideration of Other Impacts 129
9.4 Summary of Migratory Species Significant Impact Assessment Findings 134
9.4.1 Habitat Loss 135
9.4.2 Degradation of Habitat 137
9.4.3 Increased Disturbance 137
9.4.4 Direct Mortality 137
9.4.5 Consideration of Other Impacts 138
9.4.6 Assessment of Confidence 143
10.0 Residual Impacts and Environmental Offsets 145
10.1 Residual Impacts 145
10.2 Environmental Offset 146
11.0 Ecological Sustainable Development 147
11.1 Integration of economic, environmental, social and equitable considerations 147
11.2 Potential for threats of serious or irreversible environmental damage 148
11.3 Inter-generational equity 148
11.4 Biological diversity and ecological integrity 149
11.5 Improved Valuation, Pricing and Incentive Mechanisms 149
12.0 Economic and Social Matters 151
12.1 Economic and Social Impacts 151
12.1.1 Economic Costs and Benefits 151
12.1.2 Employment Opportunities 152
12.2 Public Consultation 152
12.3 Indigenous Engagement 153

12.3.1 Site Context 153
12.3.2 Indigenous Consultation 153
12.3.3 Alignment with best practice Indigenous engagement 153
12.3.4 State Requirements 154
13.0 References 155

Figures

Figure 1.1 Project Regional Context 3
Figure 1.2 Project Assessment Boundaries 7
Figure 2.1 Indicative Project Layout 11
Figure 2.2 Conceptual layout of OHL Transmission route and infrastructure 14
Figure 5.1 Flora and Vegetation Survey Areas 30
Figure 5.2 Terrestrial Fauna Survey Areas 34
Figure 5.3 Basic and Targeted Fauna Survey Locations 39
Figure 5.4 Bird and Bat Survey Locations 40
Figure 5.5 Wetlands Subject to Waterbird Surveys 46
Figure 6.1 Climate Statistics for Badgingarra Research Station (9037) (BOM, 2024) 55
Figure 6.2 Vegetation System Associations of the Project Area 59
Figure 6.3 Vegetation Types of the Project Area 63
Figure 6.4 Vegetation Condition of the Project Area 66
Figure 6.5 Threatened Ecological Communities of the Project Area 68
Figure 6.6 Fauna Habitat Types of the Project Area 71
Figure 6.7 Carnaby's Black-Cockatoo Known Breeding Areas 79
Figure 6.8 DBCA Black-Cockatoo Breeding and Confirmed Roosting Sites 80
Figure 6.9 Known Carnaby's Black-Cockatoo Night Roost Locations in the Project Area 85
Figure 6.10 Carnaby's Black-Cockatoo Night Roost Observation Locations (23 June 2025) 86
Figure 6.11 Geomorphic Wetlands Within the RCA and Project Area 91
Figure 6.12 Expected Occurrence of Migratory Shorebirds/Waterbirds at Wetlands Within the RCA and Project Area 92
Figure 6.13 Threatened and Migratory Fauna Recorded in the Project Area 97
Figure 7.1 Exposure Risk Models for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo 111

Figure 9.1 Extent of Proposed Temporary Clearing of Wetland Habitat 136

Tables

Table 1.1 Report Structure and Content 8
Table 2.1 Turbine Specifications 12
Table 4.1 PMST Database Results in the Desktop Study Area 23
Table 4.2 Threatened Ecological Communities Returned from the PMST Database 24
Table 4.3 Threatened Species Returned from the PMST Database 24
Table 4.4 Migratory Species Returned from the PMST Database 26
Table 5.1 Terrestrial Flora and Vegetation Surveys 31
Table 5.2 Terrestrial Fauna Surveys 35
Table 5.3 Fauna Survey Techniques and Effort 37
Table 5.4 Black-Cockatoo Survey Methodology 42
Table 5.5 Bamford (2020) Black-Cockatoo Nest-tree Ranks 44
Table 5.6 Migratory Shorebird Survey Methods 45
Table 5.7 Flora and Vegetation Survey Limitations 47
Table 5.8 Terrestrial Fauna Survey Limitations 49
Table 5.9 Flora: Likelihood of Occurrence Categories 50
Table 5.10 Fauna: Likelihood of Occurrence Categories 51
Table 5.11 Government Guidelines, Recovery Plans, Conservation Advice, and Species Profiles 52
Table 6.1 Biogeographic Subregions of the Project Area (DCCEEW, 2023a) 54
Table 6.2 Vegetation System Associations of the Project Area 58
Table 6.3 Vegetation Types of the Project Area 61
Table 6.4 Vegetation Condition of the Project Area 65
Table 6.5 Terrestrial Fauna Habitat Types within the Project Area 70
Table 6.6 Black-Cockatoo Habitat Values at Different Scales 74
Table 6.7 Potentially suitable foraging habitat within 12 km of the Project Area 75
Table 6.8 Foraging Habitats in the Fauna Survey Area 76
Table 6.9 Site Condition, Site Context, Density and overall Foraging Habitat Quality Scores for Forest Red-tailed Black-Cockatoo Carnaby's Black-Cockatoo within the Development Corridor 77
Table 6.10 Potentially Suitable Breeding Habitat within 12 km of the Project Area 81

Table 6.11	Number and Rank of Potential Black-Cockatoo Nest-trees Recorded	82
Table 6.12	Potentially Suitable Roosting Habitat within 12 Km of the Project Area	83
Table 6.13	Carnaby's Black-Cockatoo Night Roost Observations (23 June 2025)	84
Table 6.14	Geomorphic Wetland Categories (from Semeniuk & Semeniuk, 1995)	88
Table 6.15	Expected Occurrence of Migratory Shorebirds/Waterbirds at Wetlands Within the RCA	89
Table 6.16	Expected Occurrence of Migratory Shorebirds/Waterbirds at Wetlands Within the Project Area	90
Table 6.17	Threatened Fauna Recorded within the Project Area	93
Table 6.18	Migratory Fauna Recorded within the Project Area	94
Table 6.19	Threatened and Migratory Fauna Likelihood of Occurrence	99
Table 7.1	Key Potential Impacts to MNES with a moderate or higher likelihood of occurrence in the Project Area	101
Table 7.2	Vegetation Condition of the Indicative Project Footprint	102
Table 7.3	Carnaby's Black-Cockatoo Vegetation Foraging Value Scores	103
Table 7.4	Forest Red-tailed Black-Cockatoo Vegetation Foraging Value Scores	104
Table 7.5	Threatened and Migratory Bird Risk Assessment Results	108
Table 7.6	Risk Descriptors	108
Table 7.7	Conservation Significant Species Maximum Flight Height Records	110
Table 9.1	Carnaby's Black-Cockatoo Foraging Habitat Values within Indicative Project Footprint and Avoided	122
Table 9.2	Forest Red-tailed Black-Cockatoo Foraging Habitat Values of Vegetation within Indicative Project Footprint	123
Table 9.3	Potentially Suitable Foraging Habitat within 12 km of Roost Site A	124
Table 9.4	Potentially Suitable Foraging Habitat within 12 km of Roost Site B	125
Table 9.5	Potentially Suitable Foraging Habitat within 12 km of Breeding Site 1	125
Table 9.6	Potentially Suitable Foraging Habitat within 12 km of Regans Ford Roosting Site	126
Table 9.7	Potentially suitable foraging habitat within 12 km of Moore River Breeding Site	126
Table 9.8	Potentially suitable foraging habitat within 12 km of Cataby Breeding Site	127
Table 9.9	Consideration of Other Impacts to Black-Cockatoos	130
Table 9.10	Consideration of Other Impacts to Migratory Shorebirds	139
Table 10.1	Residual Impacts to MNES	145

Appendices

Appendix A Detailed and Targeted Flora and Vegetation Assessment

Appendix B Basic and Targeted Fauna Assessment

Appendix C Targeted Fauna Habitat Assessment

Appendix D Preliminary Bird and Bat Adaptive Management Plan

Appendix E Protected Matter Search Tool Results

Appendix F Likelihood of Occurrence Assessment

Appendix G Preliminary Construction Environmental Management Plan

Appendix H Bird and Bat Utilisation Summary Report

Appendix I Bird and Bat Utilisation Survey Year 2 Memos

Appendix J Significant Impact Assessments

Appendix K Targeted Shorebird Survey Report

Appendix L Offset Management Plan

Appendix M Preliminary Decommissioning and Rehabilitation Management Plan

Appendix N Bird and Bat Species Recorded (to May 2026)

Appendix O Response to Public Submissions

1.0 Introduction

The Yathroo Wind Farm Project (the Project) will involve the construction and operation of up to 65 wind turbines with a maximum production capacity of up to 500 MW, a Battery Energy Storage System (BESS) with a capacity of 400 MW/3,200 MWh, and associated infrastructure.

Umwelt has been commissioned by Neoen Australia Pty Ltd (Neoen) to undertake ecological surveys and an impact assessment for the Project, with particular focus on Matters of National Environmental Significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

The Project received development approval in October 2025 under the Western Australia *Planning and Development Act 2005*.

1.1 Project Locality

The Project is located within the Shire of Dandaragan and is within the Central Coast subregion of the Wheatbelt. It is approximately 5 km south of the town of Dandaragan, 6.3 km north of Regans Ford, and 120 km north of Perth, WA.

The Project is proposed to connect to an existing Western Power transmission line in the south-west and west of the Project Site that provides suitable network access with sufficient capacity to accommodate the Project. The required capacity will be provided by Western Power's Clean Energy Link North, a major transmission upgrade project designed to support the integration and transfer of renewable energy from the northern parts of the network. The Clean Energy Link North project is scheduled for completion in 2027.

1.2 Existing Land Uses and Tenures

The region in and around the Project Area is sparsely populated and many of the surrounding properties are large landholdings that are made up of many lots. These lots are primarily Freehold Land owned by private landholders, with some extents of public land comprised of road reserves managed by state and local government.

The Project Area covers 15,618 ha and predominantly consists of land cleared for agriculture and livestock grazing, with remnant native vegetation mainly limited to waterways, road corridors and scattered trees within rural properties. Land within the Project Area is characterised by gently undulating slopes over an open landscape with terrain that ranges between approximately 100–270 m Australian Height Datum (AHD) associated with Stockyard Hill and Walyer Walyer Hill.

Key environmental features in proximity to the Project Area are illustrated in **Figure 1.1** and include:

- Namming Nature Reserve, approximately 2 km west of the Project Area. This is protected for the purposes of flora and fauna conservation and is managed by Department of Biodiversity, Conservation and Attractions (DBCA).
- Moore River National Park situated approximately 10 km south of the Project Site.

- Bundarra, Eneminga, Jam Hill, Moochamulla and Quinns Hill Nature Reserves all located within 10 km of the Project Site.
- Guraga Lake, which is located approximately 1 km west of the Project Site.
- Badgingarra National Park located approximately 29 km northwest of the Project Site.

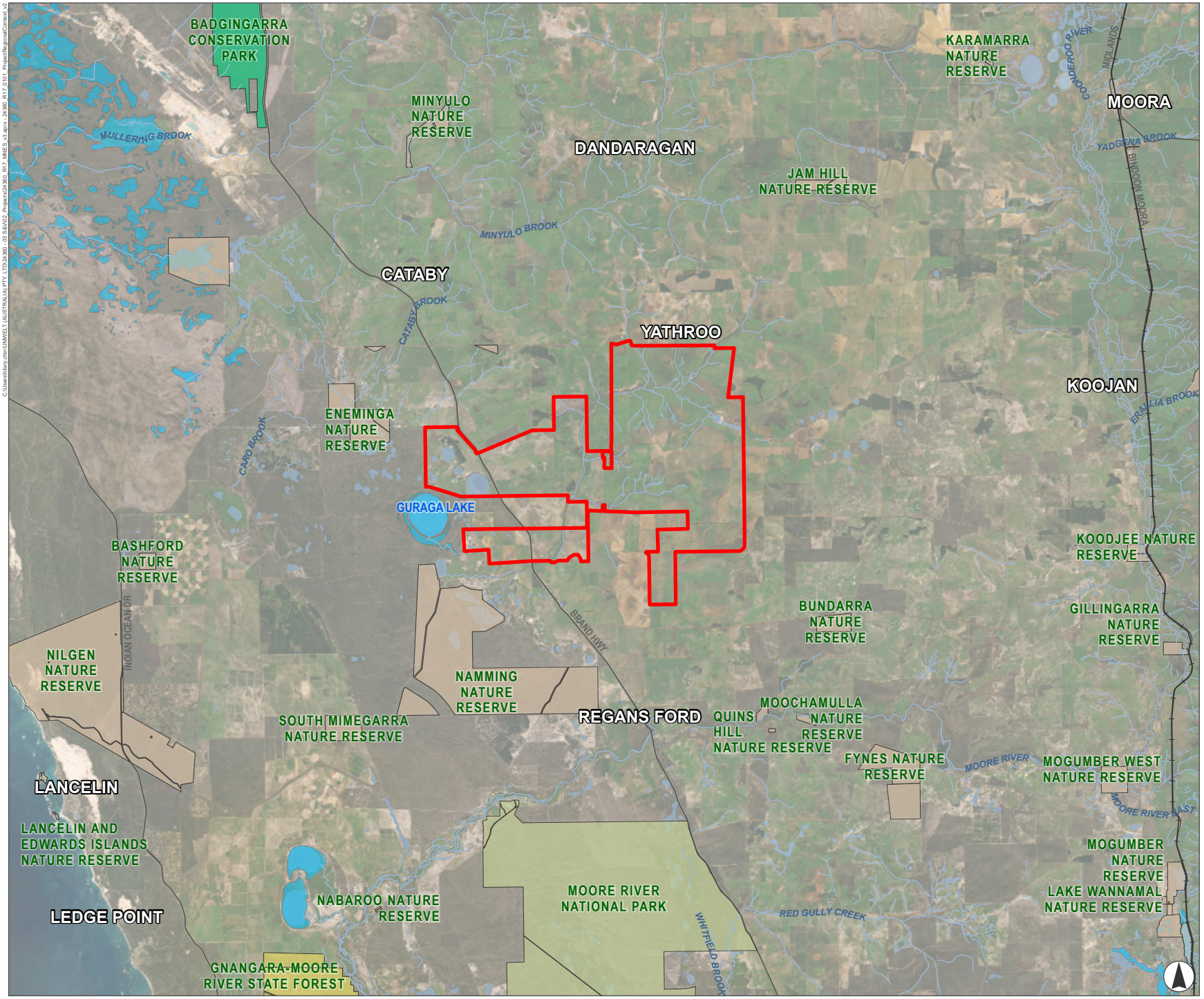


FIGURE 1.1

Project Regional Context

Legend

- Project Area
- Railway
- Road
- Watercourse
- Waterbody

DBCA - Legislated Lands and Waters

- National Park
- Nature Reserve
- Conservation Park
- Section 5(1)(g) Reserve
- Section 5(1)(h) Reserve
- State Forest
- Directory of Nationally Important Wetlands



0 2 4

Kilometres

Scale 1:320,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

1.3 Justification, Site Selection and Alternatives

1.3.1 Justification

The *Climate Change Act 2022* set Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and net zero by 2050. In Western Australia, the Government has committed to a whole-of-government 2030 greenhouse gas emissions reduction target of 80% below 2020 levels.

The Project aims to contribute to the National and State renewable energy targets by supplying green energy to the South West Interconnected System (SWIS) via the committed Clean Energy Link – North, to an existing 330 kV transmission line located within the Project Area. The Project will support an equivalent of over 360,000 households with green energy and will also create local employment and economic opportunities, and support the regional development and diversification of the Dandaragan area.

Climate change is a key threat to a number of environmental factors in Western Australia. With increased temperatures and declining rainfall identified as a threatening process for iconic threatened fauna species such as Carnaby's Black-Cockatoo. Renewable energy projects such as the Yathroo Wind Farm are vital to reduce carbon emissions and to contribute to mitigating impacts of climate change

1.3.2 Site Selection

The Project Area was selected for development for the following reasons:

- **Minimal additional transmission infrastructure required** - The presence of an existing Western Power transmission line in the south-west and west of the Project Area provides suitable network access with sufficient capacity to accommodate the Project, and as such the Project does not need new long-distance transmission corridors and lines. The required capacity will be provided by Western Power's Clean Energy Link North, a major transmission upgrade project designed to support the integration and transfer of renewable energy from the northern parts of the network. The Clean Energy Link North project is scheduled for completion in 2027. The cost of minimal amount of infrastructure required can therefore be borne by the proponent and does not rely on government funding to be able to connect, and does not require significant additional transmission infrastructure with associated impacts.
- **Minimal clearing required** - The Project Area contains 12,975 ha (83%) of cleared land which provides options for the siting of Project infrastructure in areas that minimise the clearing and disturbance of native vegetation.
- **Existing road network access** - The Project Area provides good access to existing road networks, including major roads and highways allowing Project infrastructure, plant and equipment to be transported to site with no significant upgrades outside of the existing road network.
- **Compatible land use** - The Project Area is primarily used for agricultural activities such as cropping which can be continued without significant loss of suitable land to Project infrastructure due to its relatively minor footprint, making both land uses compatible and maximising use of existing disturbed areas for economic activities.

- **Minimal amenity impacts** - There is a sufficiently large area of land to host a financially viable wind farm in an area with relatively low density of dwellings, allowing for adequate setbacks between turbines and existing neighbouring dwellings to meet noise compliance criteria.
- **Strong wind** - The Project Area is located in an area with a good wind resource.
- **Favourable construction conditions** - The topology and geology of the Project Area means that the amount of fill material to be imported and cut material to be exported is minimal. There is sand and aggregate material on site and nearby reducing the vehicle movements required to deliver the construction material to site and associated carbon emissions.

1.3.3 Alternatives

Alternatives considered for the Project included a larger Project Area, constructing an earlier iteration of the design with a larger number of turbines, or a "do nothing" alternative.

The Wheatbelt region of Western Australia, and particularly the location where the Project is located, is well suited to wind farms for the following reasons:

- Consistent and high wind speeds.
- Low vegetation coverage and minimal need for native vegetation clearing.
- A rural setting (minimal existing dwellings within close proximity to the Project).
- Access to a suitable transmission line within the Project Area.
- Reasonable road access is available.

Alternative areas for large-scale wind farms in the Wheatbelt to meet timelines for decarbonisation of the SWIS are limited due to the location of suitable or committed transmission infrastructure that does not require significant upgrades or long-distance transmission corridors to provide network access. These additional requirements may delay potential renewable projects by years and slow the overall transition of the State's energy network to green energy, particularly within the SWIS. A demand assessment undertaken for the SWIS found from initial modelling that the level of electricity required by 2042 could grow to five times that of 2022. This would necessitate almost ten times the amount of current generation capacity in the SWIS if electricity is to be generated primarily from renewable sources (DEMIRS, 2023). Therefore, it is critical that progress towards the transition is commenced as soon as possible to allow demand to be met.

The existing 132/330 kV transmission line in the west of the Project Area will enable the Project to connect to the SWIS with minimal additional infrastructure. The Project has been awarded critical project status with Western Power to enable a timely connection.

The "do nothing" alternative for the Project would further delay the clean energy transition and decarbonisation of energy networks in Western Australia which have been identified as key goals for the Western Australian government (Department of Treasury, 2019; DWER, 2020; Energy Transformation Taskforce, 2020; WAPC, 2021). A key threat for many ecosystems and species, but particularly the listed MNES species considered as part of this assessment, is climate change. Changes to rainfall, temperature extremes, and bushfires may accelerate the decline of these MNES species through a combination of range contractions in response to changing climatic conditions, impacts to suitable habitat from more intense and frequent bushfires, and effects on factors influencing breeding success and timing. Renewable energy projects are critical in addressing these challenges in the long-term by directly reducing emissions from energy production.

1.4 Report Purpose

The purpose of this report is to:

- detail the proposed action which has been referred to DCCEEW
- identify MNES which may be impacted by the proposed action
- provide information on the survey effort undertaken to date to verify the presence and extent of MNES
- summarise the proposed mitigation and management actions to address potential impacts to MNES
- undertake an assessment of significant impacts, in accordance with EPBC guidelines, for those MNES that have a potential to be impacted
- address additional information requested by the DCCEEW in its letter dated 23 March 2026
- respond to public submissions received following public review of the draft preliminary documentation.

1.5 Ecological Assessment Boundaries

For the purposes of this report and ecological assessment, the following distinct boundaries are discussed throughout the assessment and are illustrated in **Figure 1.2**:

- **Project Area**: refers to the boundaries of all involved land parcels where consent has been granted for development of the Project. The Project Area is 15,618 ha.
- **Indicative Project Footprint**: refers to the maximum area of land that will be cleared for installation of all Project infrastructure. It is based on the largest possible conceptual layout and has been used to calculate the maximum area of native vegetation clearing (10.28 ha of remnant native vegetation, 5.45 ha of isolated remnant trees and shrubs in cleared agricultural land, and 5.05 ha of planted native vegetation). Impact assessments within this document are based on the entire Indicative Project Footprint being cleared. The Indicative Project Footprint is 729 ha.
- **Development Corridor**: refers to the area within which all Project works and infrastructure will be confined. It encompasses the entire Indicative Project Footprint with buffers applied to provide the Project with a reasonable level of flexibility as it progresses into the detailed design phase. The Development Corridor is 3,443 ha.

The Development Corridor has been defined through an iterative design process, informed by a range of ecological, heritage, noise, landscape and visual, hydrological, aviation, and wind generation optimisation modelling studies. These studies have informed avoidance and mitigation of impacts to key ecological values through the iterative design process.

The Project will undergo a detailed design phase following a competitive tender and contract award for equipment supply and construction. The detailed design process will rely on future technical assessments, including geotechnical investigations, on-ground cultural heritage surveys, and additional targeted ecological surveys. This process will define the final positioning of Project infrastructure as well as the Final Project Footprint.

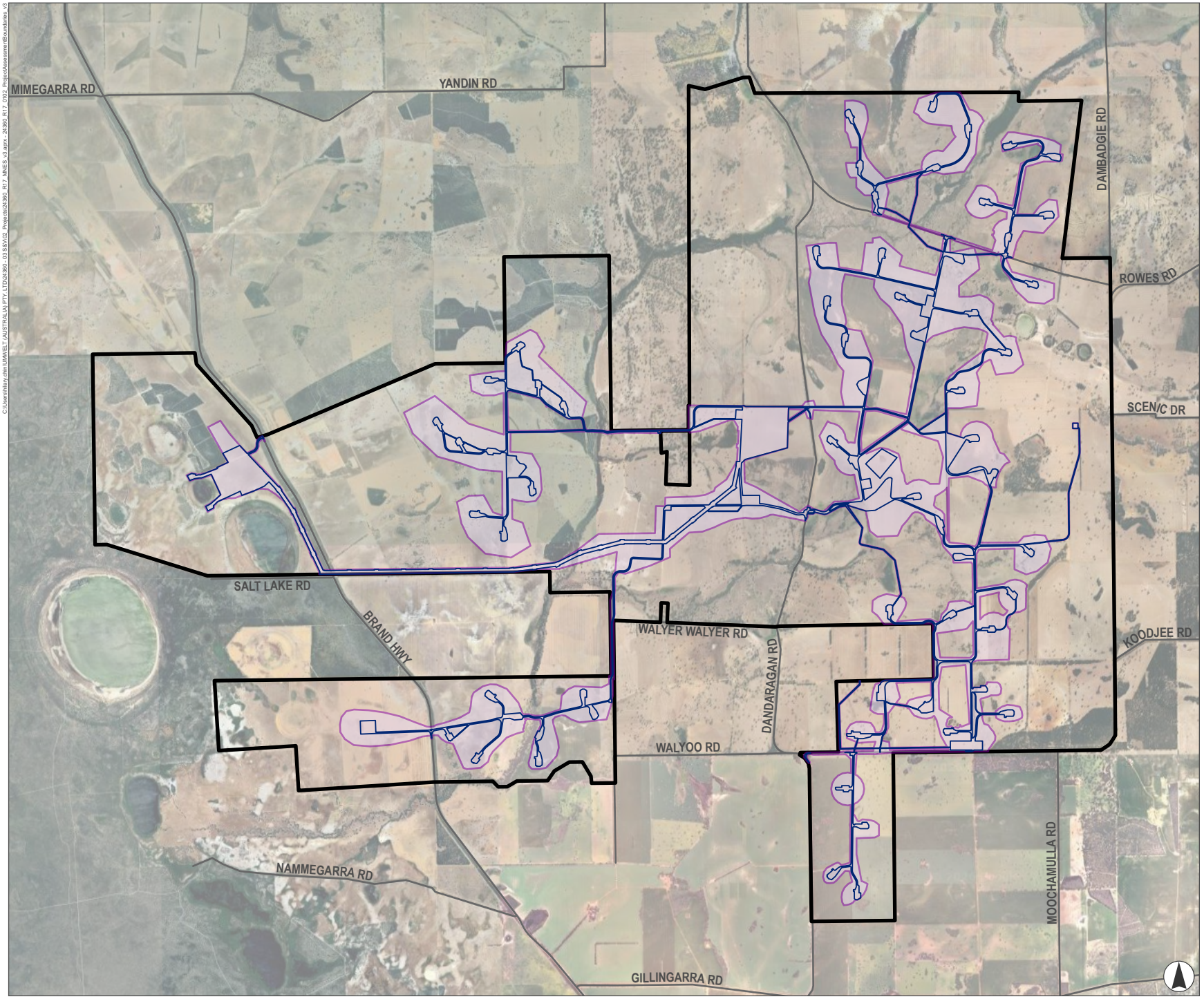


FIGURE 1.2

Project Assessment Boundaries

Legend

- Road
- Project Area
- Development Corridor
- Disturbance Footprint



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

1.6 Report Contents

The structure and content of this report which has been designed to address the purpose outlined above is summarised in **Table 1.1**.

Table 1.1 Report Structure and Content

Report Section	Information/Description
Section 1.0	Provides an introduction and background to the Project.
Section 2.0	Provides a description of the Project (proposed action) and those components relevant to the EPBC referral.
Section 3.0	Summarises the legislative frameworks relevant to the EPBC referral and assessment of Project impacts.
Section 4.0	Summarises the results of desktop searches undertaken using the DCCEEW Protected Matters Search Tool database.
Section 5.0	Provides a description of the methodology used to identify and characterise MNES that may be potentially impacted by the Project, and the methodology used to assess the extent and significance of these impacts.
Section 6.0	Describes the ecological values of the Project Area and broader region as determined through Project specific studies, particularly those relevant to MNES.
Section 7.0	Details the potential impacts from the Project to MNES, including both at the construction and operational phases.
Section 8.0	Provides a description of the avoidance, mitigation, and management measures proposed to address any potential impacts to MNES from the Project.
Section 9.0	Summarises the results of significant impact assessments undertaken for MNES within the Project Area in accordance with the EPBC Significant Impact Guidelines 1.1.
Section 9.4.6	Discusses assessment of offset requirements and potential requirements.
Section 13.0	Provides references for all citations included in this report.
Appendix A	Provides the Detailed and Targeted Flora and Vegetation Assessment for the Project.
Appendix B	Provides the Basic and Targeted Vertebrate Fauna Assessment for the Project.
Appendix C	Provides the Targeted Fauna Habitat Assessment for the Project.
Appendix D	Provides the Preliminary Bird and Bat Adaptive Management Plan for the Project.
Appendix E	Provides the Protected Matters Search Tool results for the Study Area including a 20 km buffer
Appendix F	Details the likelihood of occurrence assessment results for all conservation significant species and communities that may occur within the Project Area
Appendix G	Provides the Preliminary Construction Environmental Management Plan for the Project
Appendix H	Provides the Year 1 Bird and Bat Utilisation Summary Report for the Project
Appendix I	Provides summary results from the Spring 2025, Summer 2026 and Autumn 2026 BBUS

Report Section	Information/Description
Appendix J	Provides the Significant Impact Assessments for MNES species and communities relevant to the Project
Appendix K	Provides results of the monthly targeted shorebird surveys undertaken between September 2025 to March 2026. Also seeks to address DCCEEW RFI comments where relevant to migratory shorebirds.
Appendix L	Provides the Offset Management Plan as required by the DCCEEW RFI.
Appendix M	Provides the Preliminary Decommissioning and Rehabilitation Management Plan as required by the DCCEEW RFI.
Appendix N	Provides the full list of bird and bat species recorded during surveys up to May 2026.
Appendix O	Provides the response to the public submission and a redacted copy of the public submission.

2.0 Project Description

This section describes the key infrastructure elements that will make up the Project. The Project has been developed through an iterative design process which was informed by a combination of wind resource, economic, constructability, environmental, heritage, social, landowner, and network capacity considerations. The Project will include the following key infrastructure elements:

- turbines
- turbine foundations and hardstands
- electrical connections, substations, terminal and grid connection
- underground cabling
- Battery Energy Storage System (BESS)
- operational and maintenance facility
- construction compound, concrete batching plants and laydown areas
- borrow pits/quarries
- permanent meteorological masts
- communication towers
- external site access
- internal access roads
- firewater tanks
- utilities.

The total area of ground disturbance for the above infrastructure is expected to be approximately 729 ha, within the Development Corridor of 3,443 ha.

These elements are detailed in the sections below, with the indicative Project layout illustrated in Figure 2.1.

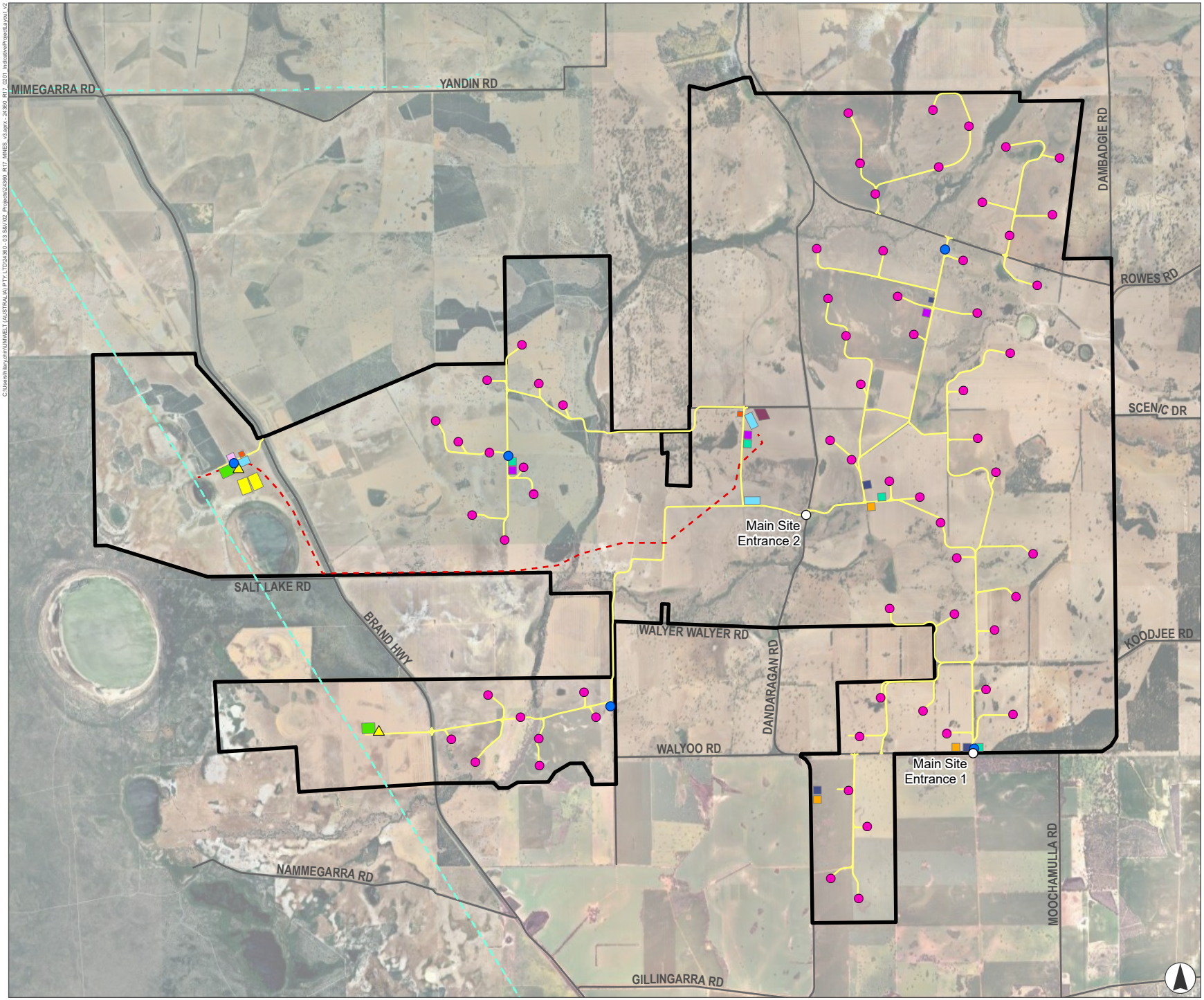


FIGURE 2.1

Indicative Project Layout

Legend

- Road
- Existing 132/330kv Transmission Line
- Project Area

Preliminary Layout

- Wind Turbine Generator (WTG)
- Firewater Tanks
- Communication Towers
- Site Access
- Internal Roads and underground Cabling (Permanent)
- Proposed 330kV transmission route - 13.21km
- BESS
- O&M Facility
- Substation
- Western Power Terminal
- Batch
- Batch Plant
- Main Compound
- Laydown
- Overhead Transmission Line Compound
- Satellite Compound



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

2.1 Turbines

Up to 65 wind turbines are proposed to be constructed. Each wind turbine will have a maximum hub height of 170 m above ground level (AGL), a maximum tip height of to up to 261 m and a minimum blade clearance from ground level of 59 m AGL. The maximum blade length will be 91 m with a maximum rotor diameter of 182 m. Each wind turbine will have a matte white, non-reflective finish.

The rotor swept area (RSA) refers to the physical area swept by the rotating blades during operation. For the purposes of this assessment, an inclusive "worst-case" RSA of 59 m AGL to 261 m AGL was considered to account for turbine models with hub heights as low as 150 m.

The mean distance between turbines is 757 m, with the shortest distance between turbines being 508 m.

The exact dimensions will be determined during detailed design of the Project depending upon selection of the turbine Original Equipment Manufacturer (OEM) and model.

These maximum specifications are summarised in **Table 2.1**.

Table 2.1 Turbine Specifications

Feature	Maximum Specifications
Project generation capacity	Up to 500 MW
Maximum number of turbines	65
Hub Height	Up to 170 m
Maximum Tip Height	Up to 261 m
Minimum Tip Height	59 m
Blade Length	Up to 91 m

* The specifications listed in the table are considered to be an upper limit and are intended to provide flexibility for any innovation in turbine design between now and the time of detailed design and construction.

2.2 Turbine Foundations

Each turbine foundation will comprise a reinforced concrete slab. The size of the turbine foundations may vary depending on imposed loadings, ground conditions, construction methodology and drainage design. Final design will account for geotechnical conditions identified through a detailed investigation.

Construction of the turbine foundations will require the excavation of surface organic soil/sub-soil and other soft overburden until either rock, or a firm stratum is found, with the excavation sides battered back to ensure stability. The excavated soil/sub-soil would be separated and stored safely near to the excavation in stockpiles. The surrounding ground around the turbine base would be restored to tie in with the original and existing surface levels by using the previously stored overburden. Any surplus material would be used for additional landscaping, concrete and surfacing reinstatement.

Concrete for the foundations will be mixed at concrete batching plants which are proposed to be part of the laydown areas within the Development Corridor. Concrete batching material may be sourced off-site.

2.3 Hardstands

Each turbine requires areas of hardstand to be constructed adjacent to the actual turbine foundation area. These provide stable and suitable areas for the turbine components to be stored and lifted into position by the required cranes.

The construction of each turbine will require a primary large sized crane and a secondary small sized crane. These cranes will require gravel capped hardstands to provide a stable and firm base during the installation of the turbines. The crane hardstands will remain in-situ for the lifetime of the wind farm, in case any cranes are required during the operational phase e.g., to change a blade, undertake any repairs. The pad for the primary crane is typically 100 m x 50 m and the turbine foundation falls within this area, while there can be up to an additional four secondary crane hardstands of 25 m x 15 m each. The area of the permanent handstands in total is approximately 0.65 ha per turbine.

In addition to the permanent hardstands there will be two temporary cleared and graded areas during the construction phase to support the construction of the crane boom and for the laydown of the blades prior to lifting into place. The area for the crane boom is 150 m x 15 m, while the laydown area is 95 m x 20 m. The temporary works areas will be reinstated following construction.

As with the turbine foundations there will be a requirement for the excavation of surface organic soil/sub-soil and other soft overburden. This material will be treated like the material from the turbine foundations and reused where possible.

2.4 Electrical Connections, Substations and Grid Connection

The Proposal includes two substations and two operations and maintenance (O&M) facilities – one for the wind farm and one for the BESS. The proposed area for the substations and O&M facilities will also include vehicle parking spaces, septic ablutions and wash down areas as appropriate and with alignment to the considerations for the Special Control Area 1 – Bassendean Sand (SCA1) with the Project Area.

Power and communication cables will be installed underground between the turbines and will connect back to the substations and the O&M facilities.

2.5 Transmission Lines

Up to 12 km of 330kV overhead transmission line will connect to one of two substations and then cut into the existing Western Power 132 / 330 kV double circuit transmission line located in the west of the Project Site. The overhead transmission line will be supported on either lattice and/or pole tower structures up to 60 m tall at 250 m to 500 m intervals (**Figure 2.2**). Reduced spans between towers may be required near crossings of rivers and roads, or where there is a change in direction. A 60–70 m wide corridor with no vegetation exceeding 3 m height will be required.

Transmission line height will be at its lowest at the midpoint between spans and this is known as the sag. The minimum sag for the Project will be approximately 10.3 mAGL(metres above ground level) and the maximum sag is expected to be approximately 27.3 mAGL.

Both overhead transmission lines and underground cabling were considered for the 330kV infrastructure. Overhead transmission lines were selected for the following key reasons:

- Overhead lines have a smaller construction footprint. For example, using overhead transmission lines to cross Brand Highway avoids the requirement to clear 0.5 ha of Good condition vegetation, which would be required to install underground cabling.
- Faults are typically easier to locate and repair on overhead transmission lines than underground cables. This would assist in reducing the duration of outages associated with rectification works.

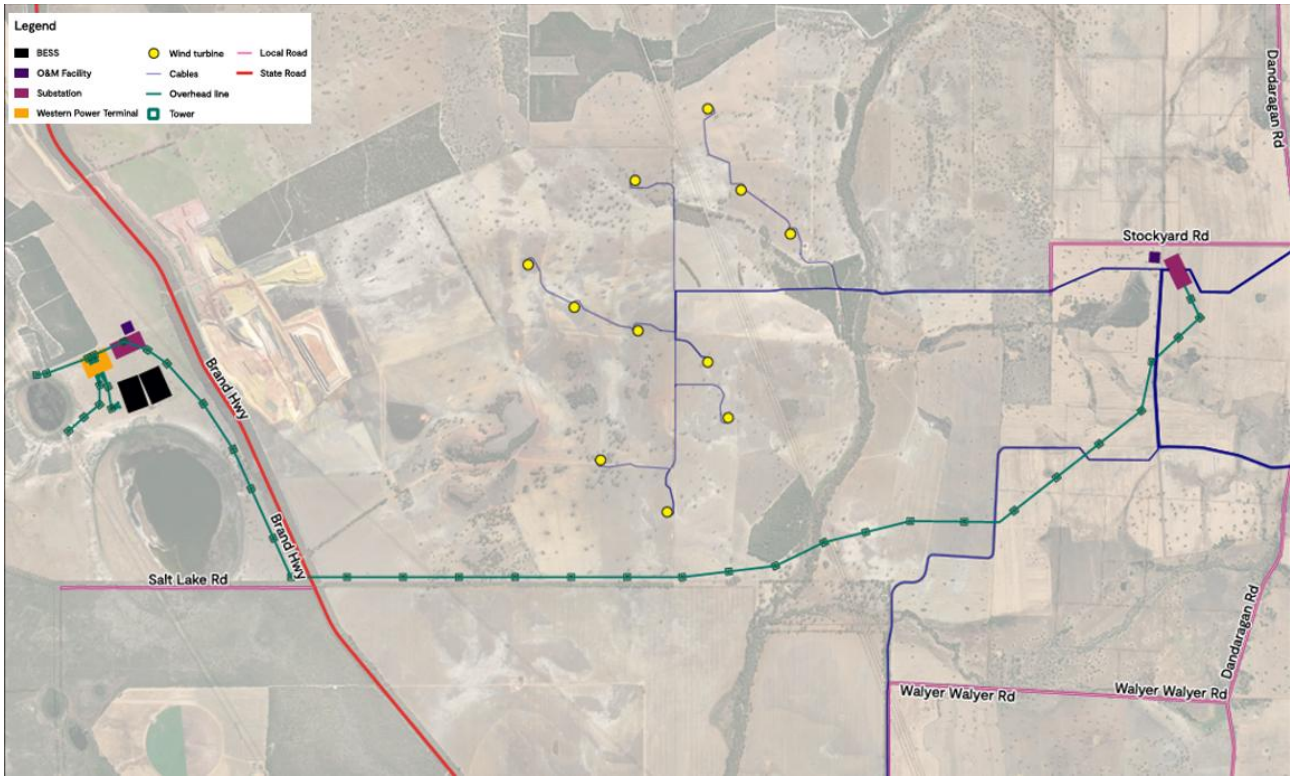


Figure 2.2 Conceptual layout of OHL Transmission route and infrastructure

2.6 Underground Cabling

Power and communication cables will be installed underground (up to 1,500 mm) between the turbines and will connect back to the substation in cable trenches to allow for continued agricultural activities. The total length of cable reticulation required is estimated to be 710 km but will depend on the final layout of the substation, turbines and O&M facilities. Once the trenched areas have been backfilled, the disturbed area will be reinstated.

2.7 Battery Energy Storage System (BESS)

The BESS will be adjacent to the proposed substation in that area. The specific BESS technology has yet to be selected. However, it will likely be made of lithium-ion and will have capacity to deliver up to 400 MW / 3,200 MWh of power that can be dispatched to the grid as required. The BESS will include battery containers, inverters, medium-voltage transformers as well as modular electrical buildings containing switchgear and control cabinets. Lightning protection masts and security fencing will also be installed.

All the equipment in the BESS area will be installed on a permanent hardstand with appropriate drainage and stormwater management and occupy an area of up to 24 ha. Underground cables will connect the BESS to the substation and export power to the South-West Interconnected System (SWIS) utilising the same transmission lines as the wind farm.

The BESS area will also include balance of plant including firewater tanks, a separate O&M building from the wind farm, a stores and security.

2.8 Operational and Maintenance Facility

A wind farm O&M facility area will be constructed near the Stockyard Road substation. The size of the facility area will be dependent on the connection voltage as determined by the final design of the Project. However, the facility area will be approximately 24 m x 9 m and include offices, IT servers, first aid room and facilities.

A BESS O&M facility will also be constructed for the Project. The facility will be approximately 50 m x 18 m and will be a mixed-use building will house spare equipment, workshop, showers, offices, locker room and facilities.

2.9 Construction Compound, Concrete Batching Plant and Laydown Areas

The construction compound areas will be used to manage construction activities. These compounds will likely include: portacabins (site offices, first aid facilities, canteen facilities, waste disposal and toilets); storage containers for tools and equipment; storage areas for plant, fuel storage, material and components; wash down facilities; and sufficient parking for the workforce, deliveries and visitors. Temporary offices, lunchrooms, and ablutions may also be established on turbine hardstands during the construction period.

These areas will also accommodate temporary storage of construction plant equipment, wind farm components and construction materials prior to moving to their ultimate destination. The areas may also be used for rock crushing and stockpiles, and concrete batching equipment.

The temporary construction compounds and laydown areas will be formed into a hardstand. Prior to forming the hardstand area, the topsoil will be removed and stockpiled adjacent to the hardstand area. The exact locations, nature and number of the temporary construction compounds and laydown areas will be established in consultation with the relevant landowners when a full construction methodology is determined.

Following the completion of the construction phase, these areas may be reinstated using the stockpiled topsoil depending on the landowner's requirements.

2.10 Borrow Pits/Quarries

Borrow pits and quarries may also be developed for the purposes of supplying fill and concrete batching material.

2.11 Meteorological Masts

Up to three Meteorological Masts may be installed to monitor the climatic conditions and wind speed throughout the life of the Project. The masts would be of triangular steel lattice construction, approximately 170 m in height and will be guy wired in three equilateral directions. The masts will be equipped with wind and weather sensors at various heights, allowing for the measurement of wind speed, wind direction, wind shear, wind turbulence and air density. The masts will be installed within or near to the Indicative Project Footprint and will not require clearing of any native vegetation.

2.12 Communication Towers

Up to two communication towers may be required for the Project. These towers will provide a secure and robust high-speed microwave radio link extending the existing Telco services. These towers will be up to 85 m tall, with microwave dishes and radio transmitter/receivers installed between 15 m and 85 m above ground level. Power for the towers will be supplied primarily from the adjacent facility, however, may also include a tower mounted solar panel and battery system as back-up.

2.13 External Site Access

The main site access points to the Project Area are proposed from Brand Highway, Dandaragan Road, Rowes Road, Bidgerabbie Road and Stockyard Road.

Existing property entrances will be utilised where possible to minimise the need for new site entrances and impact to native vegetation. However, some public roads and intersections will need to be created or upgraded to facilitate delivery of Over Size Over Mass (OSOM) Project components.

Appropriate signage will be installed on relevant roads during the construction period to comply with necessary health and safety requirements.

2.14 Internal Access Roads

Internal access roads will be required, and design criteria and mitigation measures were applied to the access track layout to mitigate potential impacts, such as:

- Access tracks will be typically 6.5 m wide and up to 10 m wide (widths will vary depending on various construction requirements [e.g. reinforcement batters] topography and cabling requirements).
- Tracks will not be sealed but will be constructed from gravel sourced primarily from on-site borrow locations to be determined in subsequent stages of the Project.
- Regular passing places and turning areas will be provided to assist in vehicle circulation on-site. The access tracks will only link to the identified site access and road crossing points, with no other connections to adjacent external roads provided.
- Regular passing places and turning areas will be instated.
- Watercourse crossings have been minimised as informed by hydraulic modelling and flood study.
- Clearing of native vegetation has been avoided as far as practicable.

The construction of access tracks will vary depending on localised ground conditions. Conditions impacting construction include the existing vegetation, nature of the topsoil, level of moisture in the ground, geotechnical base and localised topography.

Post construction, roads will be maintained as they need to remain passable for oversize over mass loads in the event of a blade replacement during operation.

2.15 Firewater Tanks

Firewater tanks providing readily available water supply for fire suppression will comprise of up to nine tanks with a height up to 4.5 m, diameter up to 13.0 m and each tank sizing will be determined as part of final design to ensure compliance with all applicable laws and guidelines.

2.16 Utilities

The utilities comprise of earth walled turkey nest dam with lining, created to provide onsite inventory and ensure security of supply with a capacity of up to 1,000 m^3 of water.

The turkey nest dam will be primarily used during the construction stage however may be left in place should a permanent beneficial use be identified for it.

2.17 Workforce

2.17.1 Construction Workforce

The Project is expected to generate multiple employment opportunities. However, it is estimated that the maximum (peak) workforce will comprise of up to 450 staff, throughout the 33 months construction period, with 15 permanent staff to be employed during operations.

It is expected that some of the workforce will commute from the wider local areas such as Moora, Dandaragan and Cataby, and will not require additional accommodation. Neoen is working with the Shire of Dandaragan on the accommodation options including temporary and permanent accommodation. The Project is not expected to construct permanent or temporary accommodation within the Project Area.

2.17.2 Operational Workforce

During operations, the Project will be managed by both on-site and off-site personnel, employed by, or contracted to Neoen. It is expected that the Project will generate up to 15 permanent, full-time jobs throughout its operational life. Neoen will focus first on hiring local people for the Project.

Aspects of the Project operation dealt with by on-site personnel include:

- maintenance of turbines and associated infrastructure
- safety management
- implementation of environmental conditions
- community liaison.

2.18 Maintenance

The chosen turbine manufacturer will be responsible for maintaining the turbines for a defined period of time following commissioning. Once the manufacturer's obligation expires, a suitably qualified contractor will be employed to visit the site and undertake regular inspection and maintenance activities. Ongoing maintenance of the access tracks will generally be undertaken to ensure safe access to all components requiring maintenance throughout the year.

In addition to regular maintenance activities there will be a need for unscheduled maintenance. Unscheduled maintenance is more likely to be required at the Project start up and towards the end of the operational period as the end of the design life is reached.

2.19 Decommissioning and Rehabilitation

The proposed technology is expected to have an economic life up to 30 years. The landowner agreements make provision for an initial lease term of 30 years as well as an additional term of 30 years. At the end of the current lease term, a decision would be made whether to either:

- Decommission the Project permanently; or
- Remove the old turbines and seek to replace them with new, upgraded models.

In the event that the Project is permanently decommissioned, Neoen would take full responsibility for decommissioning and rehabilitation works. A decommissioning plan would be prepared and submitted to the relevant authority.

Decommissioning would include the following:

- De-energising and disconnecting plant and equipment from the Projects internal network.
- Dismantling and removing turbines, BESS, ancillary electrical infrastructure and transmission lines, as well as all other aboveground buildings, foundations and equipment.
- Rehabilitation of disturbed land.
- Recycling of recyclable materials (including batteries).
- Decommissioning of some elements may be subject to the landowner's discretion (such as access tracks).

As per accepted industry practice, decommissioning does not include the removal of infrastructure that is located more than 300 mm below the surface, as the earthworks required cause considerable and unnecessary vegetation and soil disturbance, and this infrastructure, if left in place, causes no harm to the environment or disruption to agricultural practices.

A Preliminary Decommissioning and Rehabilitation Management Plan (**Appendix M**) provides an overview of how decommissioning and land rehabilitation activities will be undertaken and managed. An environmental management plan specific to decommissioning activities will be developed closer to the time of decommissioning, informed by the CEMP where relevant. The decommissioning EMP will outline management of potential impacts on MNES through deconstruction and removal of infrastructure.

3.0 Legislative and Regulatory Context

3.1 Commonwealth

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). Under the EPBC Act, if the Minister for the Environment determines that an action is a "controlled action" which would have or is likely to have a significant impact on Matters of National Environmental Significance (MNES) or Commonwealth land, then the action may not be undertaken without prior approval from the Minister. The EPBC Act identifies nine MNES:

- world heritage properties
- national heritage places
- Ramsar Wetlands of International Significance
- threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- water resources (in relation to coal seam gas development and large coal mining development).

Under the EPBC Act, any action that is likely to have a significant impact on these matters may be deemed a controlled action.

3.1.1.1 Significant Impact Guidelines 1.1 – Matters of National Environmental Significance

The MNES Guidelines (Department of the Environment, 2013b) provide overarching guidance on determining whether an action is likely to have a significant impact on a matter protected under the EPBC Act.

The significance of the proposed action on MNES can be determined through a self-assessment. The significant impact criteria set out in the guideline for each MNES are to assist in determining whether the impacts of the proposed action on any MNES are likely to be significant (e.g. as being important, notable or of consequence, or having regard to its context or intensity).

If after undertaking a self-assessment it is concluded that the action is likely to have a significant impact on any MNES, or if unsure, the action should be referred to the Minster. If the Minister decides that the action is likely to have a significant impact, then the action will be determined as a controlled action requiring approval under the EPBC Act.

3.1.1.2 Referral Guidelines for 3 WA Threatened Black-Cockatoo Species

The Guidelines for 3 WA Threatened Black-Cockatoo Species (DCCEEW, 2022b) adheres to the EPBC Act and is regulated by DCCEEW. The referral guidelines provide guidance to proponents on the need to refer an action that has the potential to affect any of the three species:

- Carnaby's Black-Cockatoo (*Zanda latirostris)*.
- Baudin's Cockatoo (*Zanda baudinii*).
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*).

This document distinguishes what actions are deemed likely (or unlikely) to require a referral to the Minister based on whether the action will have a significant impact on the species. Information on habitat quality, survey expectations, mitigation standards, as well as the aspects needing to be considered to determine whether referral is necessary, are also detailed in this document.

3.1.1.3 EPBC Act Policy Statement 3.21: Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. Commonwealth of Australia.

EPBC Act Policy Statement 3.21: Industry Guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebird Species (Commonwealth of Australia, 2017) adheres to the EPBC Act and provides guidance to proponents on when an action that may affect listed migratory shorebird species requires referral to the Minister. These guidelines apply to all migratory shorebirds listed as MNES under the Act, including those protected under international agreements such as JAMBA, CAMBA, ROKAMBA, and the Bonn Convention.

The guidelines outline the criteria for identifying important habitat for migratory shorebirds. Habitat is considered nationally important if it regularly supports:

- 0.1% of the East Asian-Australasian Flyway population.
- > 2,000 migratory shorebirds.
- > 15 migratory shorebird species.

This document distinguishes what types of actions are likely (or unlikely) to require referral, based on whether the action may result in a significant impact, such as reducing habitat availability, altering hydrological regimes, disturbing roosting/foraging behaviour, or interrupting migration patterns. Information on survey expectations (e.g., seasonal counts and habitat usage), habitat value assessment, and impact mitigation measures such as temporal avoidance, buffers, and habitat protection is also provided.

3.1.1.4 EPBC Act Biodiversity Offsets Policy

The EPBC Act Environmental Offsets Policy (EPBC Offset Policy) (Australian Government, 2012) outlines the approach for the use of environmental offsets under the EPBC Act.

Offsets are measures that compensate for the significant residual impacts of an action on the environment, after avoidance and mitigation measures are taken. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act. The suitability of a proposed offset is considered as part of the decision to approve or not approve a proposed action.

The EPBC Offset Policy provides guidance on how suitable offsets are determined while the quantum of impact and quantum of offset required to counterbalance this impact are calculated using the Commonwealth Offset Assessment Guide and corresponding guidance.

3.1.1.5 Weeds of National Significance

Under the Australian Weeds Strategy 2017–2027 (IPAC, 2017) 32 introduced plants are identified as Weeds of National Significance (WoNS). This list of species was developed with reference to several key criteria: invasive tendencies, impacts, potential for spread, and socioeconomic and environmental values. National management strategies and manuals have been published for all these species. The strategies aim to:

- improve prevention, detection and early intervention.
- minimise the impact of established weeds.
- enhance capacity and commitment to weed management.

3.2 Relevant WA Legislation

3.2.1 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (WA) (BC Act) seeks to 'conserve and protect biodiversity and biodiversity components in the State' and 'to promote the ecologically sustainable use of biodiversity components in the State'.

It not only provides for the formal listing of native flora, fauna, and ecological communities that are under threat and in need of protection but also regulates the taking, disturbing, supplying, possessing, dealing, importing, and exporting of all native flora and fauna.

Activities that involve the taking, disturbing, supplying, possessing, dealing, importing, or exporting of any native flora and fauna will require an appropriate licence issued by DBCA under the BC Act.

3.2.2 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (WA) (EP Act) provides the legal framework to prevent, control and abate pollution and environmental harm in WA, as well as the legal basis to conserve, preserve, protect, enhance, and manage the environment. The Environmental Protection Authority (EPA), the Department of Water and Environmental Regulation (DWER), and the Office of the Appeals Convenor are the government agencies that administer and have responsibilities under the EP Act.

Part IV of the EP Act requires projects that are likely to have a significant effect on the environment to be referred to the EPA to decide if an environmental impact assessment is required. The EPA considers significant impacts to fourteen environmental factors grouped under five themes. The commonly understood, everyday meaning of 'significant' impact or effect apply as these terms are not defined in the legislation. The EPA list the range of matters that may be included when considering the significance of proposed activities.

Part V of the EP Act regulates emissions and discharges to the environment through a works approval and licensing process and regulates the clearing of native vegetation through clearing permit applications. DWER is responsible for administering Part V of the EP Act. Applications to clear native vegetation are assessed and decided in accordance with the EP Act, in particular the Clearing Principles (under Schedule 5 of the EP Act).

The Project is being referred to the EPA under Part IV of the EP Act to determine whether formal assessment is required. Should the Project not require formal assessment under Part IV, a native vegetation clearing permit will be applied for under Part V of the EP Act.

3.2.3 Environmental Offset Policy (2011) and Guidelines (2014)

The 2011 Environmental Offset Policy and 2014 Guidelines provide the overarching framework for offset design, quantification, and implementation in Western Australia. Offsets are required to address residual significant impacts to protected State matters and may be implemented under the BC Act, or Part IV or V of the EP Act. Depending on the legislation under which the offsets are implemented, the regulating agency may be the EPA, DWER or DBCA. It is expected that offsets will be required to be implemented under the EP Act.

3.2.4 Planning and Development Act 2005

The WA *Planning and Development Act 2005* (PD Act) is the primary legislation under which development in WA is regulated. Under this Act, any development requires approval unless a range of exemptions apply. Decision makers for development applications under the PD Act are required to consider a range of factors, including potential environmental impacts.

Development approval was granted for the Project in October 2025. Development approval conditions include:

- Develop and implement a Surface Water Management Plan in consultation with the Department of Water and Environmental Regulation (Condition 21).
- Develop and implement a Bird and Bat Adaptive Management Plan in consultation with the Department of Biodiversity, Conservation and Attractions (Condition 22).

3.2.5 Biosecurity and Agriculture Management Act 2007

The *Biosecurity and Agriculture Management Act 2007* (WA) (BAM Act) provides the legal framework to:

- Address invasive, weeds and diseases (‘biosecurity’).
- Ensure agricultural and veterinary chemicals are used safely.
- Establish standards for safe and quality agricultural products.
- Raise funds for biosecurity-related purposes.

The BAM Act also supports biosecurity activities to detect, contain, manage or eradicate prohibited organisms/declared pests that enter the state. This can include the reporting of declared pests, restrictions on the rights to keep or breed pests, register the movement of pests, or assisting in efforts to aid in the containment, management, or eradication of pests.

4.0 Protected Matters Search Tool Results

A search of the Protected Matters Search Tool (PMST) for the Desktop Study Area was initially run on 10 April 2024 to inform ecological surveys and the likelihood of occurrence assessment. The Desktop Study Area comprises the Project Area plus a 20 km buffer. A search of the PMST was then re-run on 5 November 2025 to identify any changes to MNES that may occur in the Desktop Study Area.

There were some changes to the species returned from the two PMST searches. The reason for this may be due to the Project Area being reduced in size between the April 2024 search and the November 2025 search.

The following species were initially returned in the 10 April 2024 PMST results but were not returned in the 5 November 2025 results:

- Ghost Bat (*Macroderma gigas*).
- Northern Serrate Dryandra (*Banksia cirratulids'* subsp. *perissa*).
- Fine-leaved Darwinia (*Darwinia acerosa*).
- Mogumber Bell, Narrogin Bell (*Darwinia carnea*).
- Midlands Gum, Jingymia Gum (*Eucalyptus pruiniramis*).
- Christine's Grevillea (*Grevillea christineae*).

Conversely, the following species was returned in the 5 November 2025 PMST results, but was not returned in the 10 April 2024 results:

- Cadda Road Mallee, Cadda Mallee (*Eucalyptus* x *balanites*).

Results from the PMST database search run on 5 November 2025 are provided in **Appendix E**.
As identified in the PMST results, 65 MNES have the potential to occur within a Desktop Study Area as per the information presented in **Table 4.1**.

Table 4.1 PMST Database Results in the Desktop Study Area

Matter of National Environmental Significance	Potential Presence in Desktop Study Area
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	5
Listed Threatened Species	49
Listed Migratory Species	11

The results of the PMST database interrogation as they related to these MNES are discussed in **Section 4.1** to **Section 4.3**.

4.1 Threatened Ecological Communities

Five Threatened Ecological Communities (TEC) were identified in the PMST results as 'likely to occur' in the Desktop Study Area. These TEC's are detailed in **Table 4.2**.

Table 4.2 Threatened Ecological Communities Returned from the PMST Database

Threatened Ecological Community	EPBC Act Status (Cth)
Clay Pans of the Swan Coastal Plain	Critically Endangered
Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion	Critically Endangered
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered
Empodisma peatlands of southwestern Australia	Endangered
Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered

4.2 Threatened Species

A total of 31 Threatened flora species and 18 Threatened fauna species were identified in the PMST results as "likely", "may", or "known" to occur within the Desktop Study Area. These species are detailed in **Table 4.3**. These species were subsequently assessed for their Likelihood of Occurrence within the Project Area based on the assessments as described in **Section 5.0**, with results provided in **Appendix F**.

Table 4.3 Threatened Species Returned from the PMST Database

Scientific Name	Common Name	Threatened category (Cth)
Flora		
Acacia forrestiana	Forest's Wattle	Vulnerable
Acacia splendens	Splendid Wattle, Dandaragan Wattle	Endangered
Andersonia gracilis	Slender Andersonia	Endangered
Anigozanthos viridis subsp. *Terraspectans*	Dwarf Green Kangaroo Paw	Vulnerable
Asterolasia nivea	Bindoon Starbush	Vulnerable (listed as *Asterolasia grandiflora*)
Banksia fuscobractea	Dark-bract Banksia	Critically Endangered
Banksia mimica	Summer Honeypot	Endangered
Banksia serratuloides subsp. *serratuloides*	Southern Serrate Dryandra	Vulnerable
Caleana dixonii	Sandplain Duck Orchid	Endangered (listed as *Paracaleana dixonii*)

Chamelaucium lullfitzii	Gingin Wax	Endangered (listed as *Chamelaucium sp. Gingin (N.G.Marchant 6)*)
Chamelaucium sp. Cataby (G.J.Keighery 11009)	Griffin's Waxflower	Vulnerable
Conospermum densiflorum subsp. *unicephalatum*	One-headed Smokebush	Endangered
Daviesia dielsii	Diels' Daviesia	Endangered
Drakaea elastica	Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid	Endangered
Eleocharis keigheryi	Keighery's Eleocharis	Vulnerable
Eremophila scaberula	Rough Emu Bush	Endangered
Eucalyptus absita	Badgingarra Box	Endangered
Eucalyptus dolorosa	Dandaragan Mallee, Mount Misery Mallee	Endangered
Eucalyptus leprophloia	Scaly Butt Mallee	Endangered
Eucalyptus x *balanites*	Cadda Road Mallee, Cadda Mallee	Endangered
Goodenia arthrotricha	[12488]	Endangered
Grevillea calliantha	Foote's Grevillea, Cataby Grevillea, Black Magic Grevillea	Endangered
Grevillea curviloba subsp. *incurve*	Narrow curved-leaf Grevillea	Endangered
Hakea megalosperma	Lesueur Hakea	Vulnerable
Hemiandra gardneri	Red Snakebush	Endangered
Leucopogon obtectus	Hidden Beard-heath	Endangered (listed as *Styphelia obtecta)*
Macarthuria keigheryi	Keighery's Macarthuria	Endangered
Ptychosema pusillum	Dwarf Pea	Vulnerable
Spirogardnera rubescens	Spiral Bush	Endangered
Thelymitra dedmaniarum	Cinnamon Sun Orchid	Endangered
Thelymitra stellata	Star Sun-orchid	Endangered
Fauna		
Birds		
Aphelocephala leucopsis	Southern Whiteface	Vulnerable
Calidris acuminata	Sharp-tailed Sandpiper	Vulnerable
Calidris canutus	Red Knot, Knot	Vulnerable
Calidris ferruginea	Curlew Sandpiper	Critically Endangered
Falco hypoleucos	Grey Falcon	Vulnerable
Leipoa ocellata	Malleefowl	Vulnerable
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered

Rostratula australis	Australian Painted Snipe	Endangered
Sternula nereis nereis	Australian Fairy Tern	Vulnerable
Tringa nebularia	Common Greenshank, Greenshank	Endangered
Zanda latirostris	Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered (listed as *Calyptorhynchus latirostris*)
Fish		
Nannatherina balstoni	Balston's Pygmy Perch	Vulnerable
Mammals		
Dasyurus geoffroii	Chuditch, Western Quoll	Vulnerable
Parantechinus apicalis	Dibbler	Endangered
Reptiles		
Egernia stokesii badia	Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink	Endangered
Pseudemydura umbrina	Western Swamp Tortoise	Critically Endangered
Sharks		
Pristis pristis	Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish	Endangered
Invertebrates		
Idiosoma nigrum	Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider	Vulnerable

4.3 Migratory Species

A total of 11 Migratory species were identified in the PMST results as “may” or “likely” to occur within the Desktop Study Area. These species are detailed in **Table 4.4** and it should be noted that six of these species are threatened and also included in **Table 4.3.**

Table 4.4 Migratory Species Returned from the PMST Database

Scientific Name	Common Name	Threatened Category (Cth)	Migratory Category
Apus pacificus	Fork-tailed Swift		Migratory Marine Birds
Motacilla cinera	Grey Wagtail		Migratory Terrestrial Species
Actitis hypoleucos	Common Sandpiper		Migratory Wetlands Species
Calidris acuminata	Sharp-tailed Sandpiper	Vulnerable	Migratory Wetlands Species
Calidris canutus	Red Knot, Knot	Vulnerable	Migratory Wetlands Species

Calidris ferruginea	Curlew Sandpiper	Critically Endangered	Migratory Wetlands Species
Calidris melanotos	Pectoral Sandpiper		Migratory Wetlands Species
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered	Migratory Wetlands Species
Pandion haliaetus	Osprey		Migratory Wetlands Species
Tringa nebularia	Common Greenshank, Greenshank	Endangered and Migratory	Migratory Wetlands Species
Pristis pristis	Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish	Endangered	Migratory Marine Species

5.0 Methods to Assess Impacts to MNES

5.1 Desktop Assessment

A review of available ecological data and literature within the Desktop Study Area was first undertaken to characterise the ecological values and identify the potential presence of threatened species and vegetation communities within the Project Area.

The objectives of this desktop assessment included:

- a review of relevant biodiversity databases, government publications and published literature relevant to the Desktop Study Area.
- an assessment of the broad conservation values of vegetation communities and habitat present in the Desktop Study Area.
- identification of the potential presence of conservation significant species and habitat in the Desktop Study Area.

The desktop assessment included searches of the following databases:

- DCCEEW EPBC Protected Matters Search Tool (PMST) database (DCCEEW, 2025)
- DBCA Threatened and Priority Flora Database (DBCA, 2024b)
- DBCA Threatened and Priority Ecological Communities Database (DBCA, 2024b)
- DBCA Threatened and Priority Fauna Database (DBCA, 2024c)
- Dandjoo Database (DBCA, 2024a)
- DBCA NatureMap (DBCA, 2024e)
- DWER IBSA Database (DWER, 2024).

Desktop assessments are described in detail in the following reports:

- Reconnaissance and Targeted Flora and Vegetation Assessment (Umwelt, 2025b)
- Basic and Targeted Fauna Survey (Umwelt, 2025a)
- Bird and Bat Utilisation Survey (BBUS) Summary Report (Umwelt, 2025e)
- Bird and Bat Utilisation Assessment (BBUA) Report (Umwelt, 2025e).

5.2 Field Surveys

5.2.1 Terrestrial Flora and Vegetation

This section provides an overview of the survey effort and methodology employed for characterising terrestrial flora and vegetation values of the Project Area. A more detailed description of this methodology is presented in **Appendix A**.

In the context of flora and vegetation, the following survey areas are defined:

- The **F&V Survey Area** is 15,835 ha and refers to the area subject to flora and vegetation surveys. It is based on a previous larger Project Area. Approximately 1,167 ha of the Project Area were not included in the F&V Survey Area. These areas have been avoided and are not included in the Indicative Project Footprint.
- The **D&T Survey Area** is a subset of the F&V Survey Area within which detailed and targeted flora and vegetation surveys were undertaken. This was developed to encompass intact remnant vegetation that may be impacted by the Project. The D&T Survey Area is 130.5 ha.

These survey areas are presented in **Figure 5.1**.

All assessments and discussion of flora and vegetation values in this report in **Section 6.0** to **Section 9.0** are based on results from these survey areas that have been clipped to the Project Area.

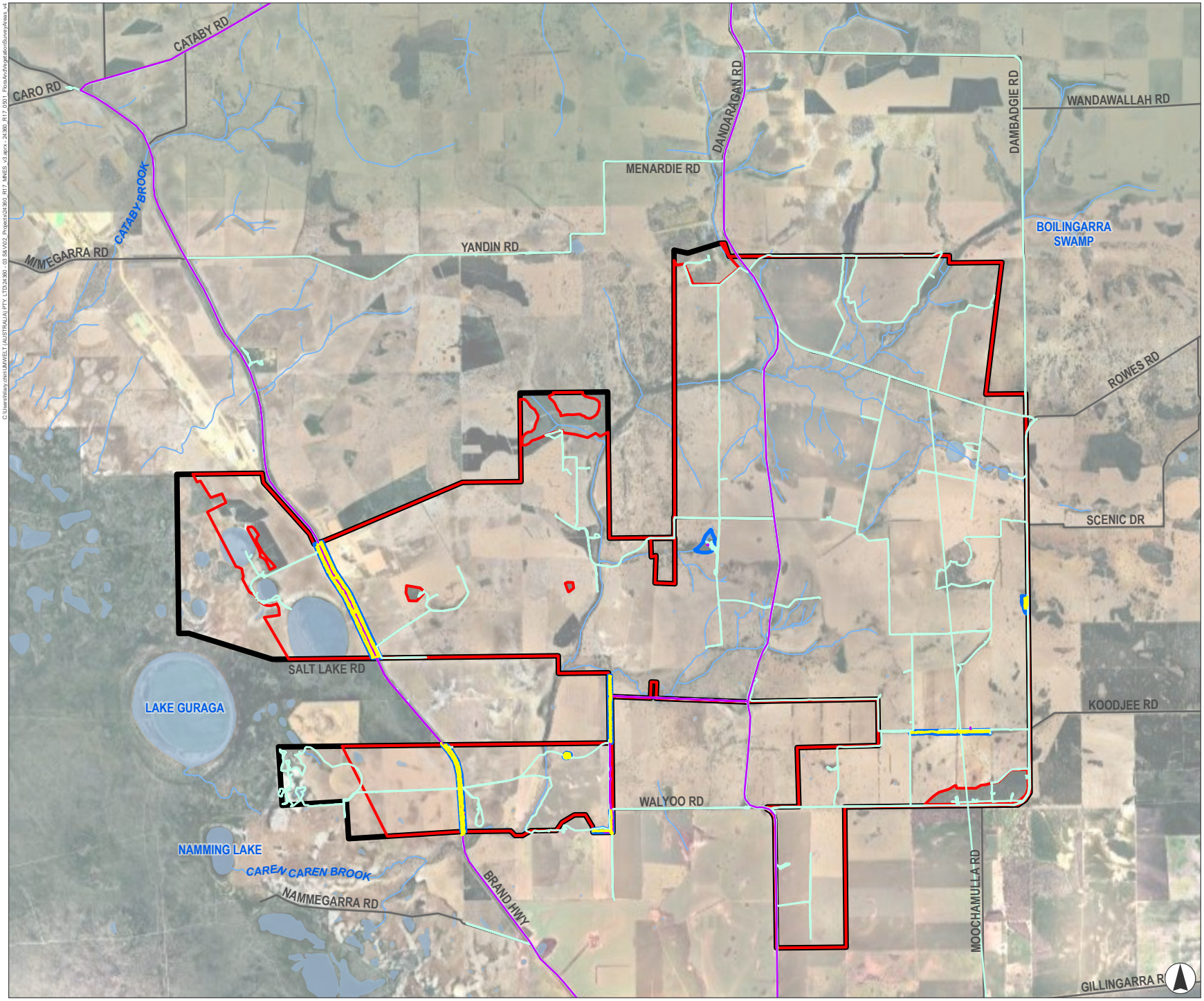
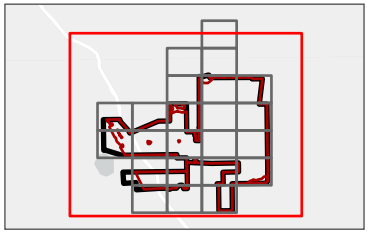


FIGURE 5.1

Flora and Vegetation Survey Areas

Legend

- Reconnaissance track logs
- Quadrat track logs
- Targeted Searching track logs
- Road
- Watercourse
- Waterbody
- F&V Survey Area
- D&T Survey Area
- Project Area



0 2 4

Kilometres

Scale 1:120,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

5.2.1.1 Survey Guidelines

Flora and vegetation surveys were undertaken in accordance with:

- Technical Guidance—Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016a).
- Methods for survey and identification of Western Australian threatened ecological communities (DBCA (2024d)).
- Department of the Environment (2013) Survey Guidelines for Australia's Threatened Orchids (DoE, 2013).
- Relevant referral guidelines or conservation and listing advice for threatened ecological communities.

5.2.1.2 Surveys Completed

Several surveys have been undertaken to determine the flora and vegetation values in the Project Area. The surveys have been used to inform Project design and provide suitable information for an environmental impact assessment. Details of surveys timings, effort and methodology are presented in **Table 5.1**.

Table 5.1 Terrestrial Flora and Vegetation Surveys

Field Survey	Survey Area	Survey Timing	Survey Methods and Effort
Flora and Vegetation Reconnaissance Survey (Umwelt, 2025b) (**Appendix A**)	F & V Survey Area (15,835 ha)	2–4 July 2024	Literature review and database searches 2 botanists over 3 days 6 relevés 143 vegetation mapping notes
Flora and Vegetation Detailed and Targeted Survey (Umwelt, 2025b) (**Appendix A**)	D&T Survey Area (130.5 ha)	24–27 September 2024	2 botanists over 4 days 3 relevés 3 quadrats 99 vegetation mapping notes
Flora and Vegetation Detailed Survey (Umwelt, 2025b) **(Appendix A)**	D&T Survey Area (130.5 ha)	1–4 October 2024	2 botanists over 4 days 1 relevé 14 quadrats 19 vegetation mapping notes
Flora and Vegetation Reconnaissance Survey (Umwelt, 2025b) (**Appendix A**)	North eastern area of F&V Survey Area (3,758 ha)	11 December 2024	1 botanist over 1 day No relevés 21 vegetation mapping notes

5.2.1.3 Vegetation Type

To characterise vegetation types (VTs) of the Project Area, floristic agglomerative hierarchical clustering analysis of data from the quadrats was performed to inform groupings. Following this process, floristic and structural data recorded at relevés was examined to determine whether vegetation sampled by such relevés, as in the case where vegetation condition may not support classification analysis, was analogous to any of the VTs defined by floristic composition classification. Any such vegetation that was not considered to be analogous with any of the VTs defined by floristic classification was considered to represent a discrete VT.

VT descriptions were adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual (NVIS Technical Working Group, 2017), with some modifications as considered appropriate (Umwelt, 2025b).

Locations of quadrats and/or relevés within each VT were used in conjunction with aerial photograph interpretation and vegetation mapping notes to develop VT mapping polygon boundaries. Mapping boundaries were then developed using aerial Light Detection and Ranging (LiDAR) imagery. Detections of vegetation were extracted from the LiDAR and converted into polygons using Geographic Information System (GIS) software.

Further details on the vegetation mapping methodology are presented in **Appendix A**.

5.2.1.4 Vegetation Condition

Vegetation condition was described using the vegetation condition scale presented for the South West and Interzone Botanical Provinces (as per Table 3.5 of (EPA, 2016a). Notes on vegetation condition were taken during the survey at all data point locations. Vegetation condition category polygon boundaries were developed using this information in conjunction with introduced flora taxa location data and were digitised using GIS software as for VT polygon boundaries.

5.2.1.5 Threatened Ecological Communities

All TECs identified by the desktop assessment were considered to be identifiable irrespective of time of survey and were targeted during field surveys.

The vegetation of the F&V Survey Area was manually compared to TEC descriptions, to determine whether any vegetation may represent a TEC. Specifically, comparisons of dominant taxa, soils, topography and geographical distribution of VTs were made to those of any TECs potentially occurring in the F&V Survey Area.

Determination of EPBC Act listed TECs was undertaken by review of the survey and comparisons made to the appropriate listing and conservation advice for any TECs potentially occurring in the Survey Area.

5.2.1.6 Threatened Flora

The majority of threatened flora taxa identified by the desktop assessment were considered to be theoretically identifiable during the detailed and targeted field surveys and were targeted during these surveys.

Systematic targeted survey was undertaken within the entirety of the D&T Survey Area, with the exception of the swamp vegetation located south of Stockyard Road. The D&T Survey Area was subjected to a targeted survey as it encompasses intact remnant vegetation that may be impacted by the Project.

Areas of Degraded or Completely Degraded condition vegetation were regarded as having low likelihood of presence of significant flora taxa due to the disturbed nature of the vegetation, as observed during the July 2024 field survey.

Targeted searching was generally conducted in a grid pattern at 20 m spacing which was considered appropriate based on vegetation density and taxa expected to occur (EPA, 2016b). Searching was also undertaken opportunistically while traversing the broader F&V Survey Area and information recorded at such locations was the same as that recorded during targeted searching.

All traverses made during the 2024 targeted survey are mapped as track logs in Figure 3.1 of **Appendix A**.

5.2.2 Terrestrial Fauna

This section provides an overview of the survey effort and methodology employed for characterising terrestrial fauna values of the Project Area. A more detailed description of the survey methodology is presented in **Appendix B** and **Appendix C**.

In the context of terrestrial fauna surveys, the following survey areas are defined:

- The **Fauna Survey Area** refers to the area subject to fauna surveys. It is based on a previous larger Project Area of 17,213 ha.
- The **Targeted Fauna Habitat Survey Area** refers to the area subject to targeted fauna surveys. This area is analogous to the Development Corridor and is 3,443 ha.
- The **Targeted Shorebird Survey Area** refers to the wetlands subject to monthly surveys for the presence and use by shorebird species.

These survey areas are depicted in **Figure 5.2**.

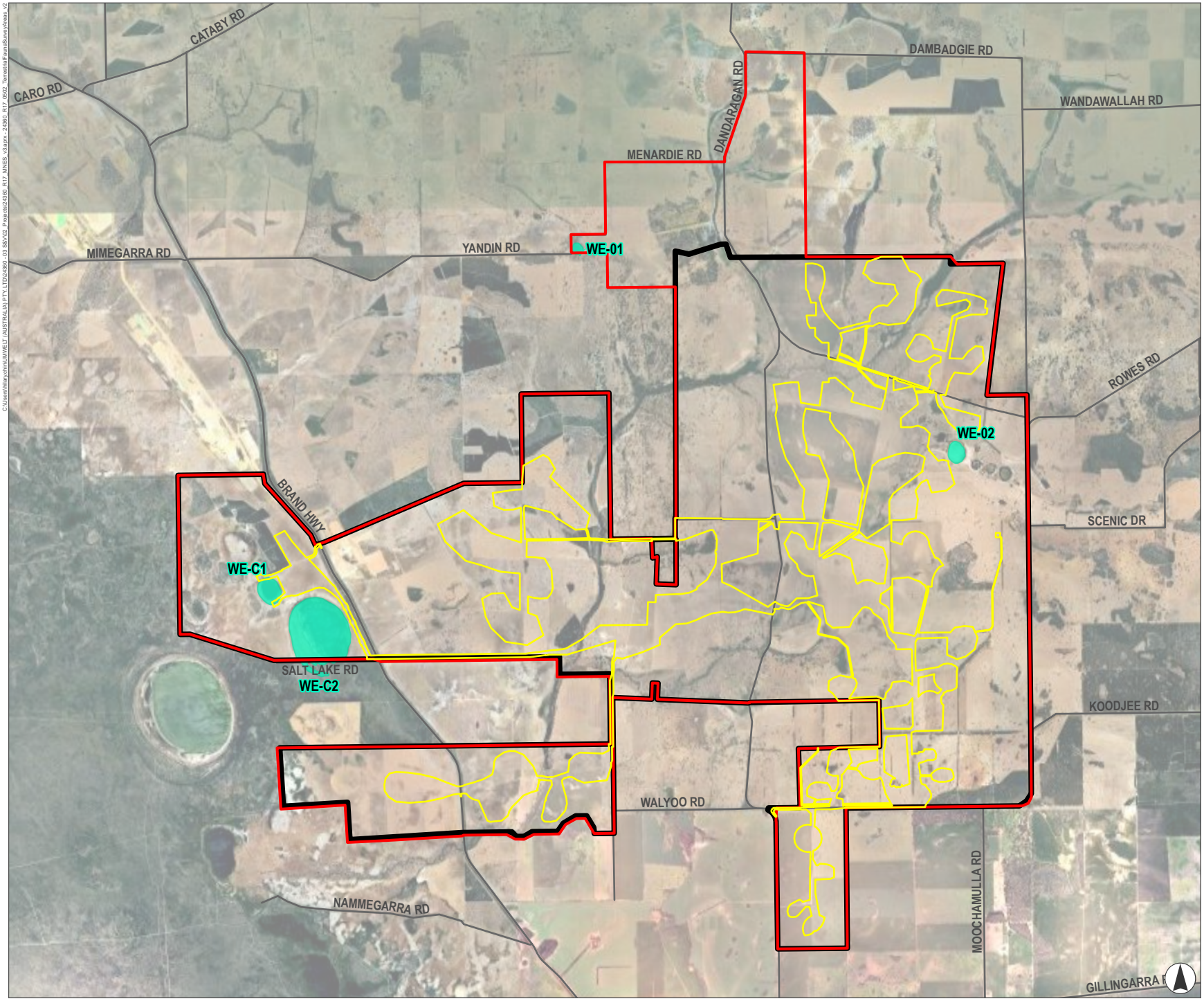


FIGURE 5.2

Terrestrial Fauna Survey Areas

Legend

- Road
- Project Area
- Fauna Survey Area
- Tageted Fauna Habitat Survey Area
- Targeted Shorebird Survey Area



0 2 4

Kilometres

Scale 1:120,000 at A4
GDA2020 MGA Zone 50

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

5.2.2.1 Survey Guidelines

Fauna surveys were conducted within representative locations of all fauna habitat types. Terrestrial fauna survey methods were developed and undertaken in accordance with:

- Technical Guidance—Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (2020).
- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2010).
- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act (DEWHA, 2011).
- Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act (DEWHA, 2010).
- Referral Guideline for 3 WA Threatened Black-Cockatoo Species (2022b).
- Bamford Consulting Ecologists (BCE) (Bamford, 2020) method for mapping and characterising foraging and breeding habitat.
- Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (2017).
- Referral Guideline for 14 Birds Listed as Migratory Species under the EPBC Act (2015).

5.2.2.2 Surveys Completed

Several surveys have been undertaken to determine the terrestrial fauna values in the Project Area. These surveys have been used to inform Project design and provide suitable information for an environmental impact assessment. To ensure any variability associated with seasonal exposure could be captured, BBUS were undertaken over a 27 month period. Details of these surveys are presented in **Table 5.2**.

Table 5.2 Terrestrial Fauna Surveys

Field Survey Type	Survey Dates
BBUS01 (Spring)	9–15 Sep 2024
BBUS02 (Summer)	13–17 Feb 2025
BBUS03 (Autumn)	4–8 May 2025
BBUS04 (Winter)	21–25 July 2025
BBUS05 (Spring)	13–17 Oct 2025
BBUS06 (Summer)	16–20 Feb 2026
BBUS07 (Autumn)	18-22 May 2026
Basic Fauna Survey	2–3 July 2024
Targeted Fauna Survey	29 Oct – 5 Nov 2024
Basic and Targeted Fauna Survey	10 Dec 2024
Targeted Fauna Habitat Assessment	23–27 June 2025

	21 July 2025 13–17 Oct 2025
Targeted Shorebird Surveys (September 2025)	23 Sep 2025
Targeted Shorebird Surveys (October 2025)	17 Oct 2025
Targeted Shorebird Surveys (November 2025)	2 Dec 2025
Targeted Shorebird Surveys (December 2025)	17 Dec 2025
Targeted Shorebird Surveys (January 2026)	28 Jan 2026
Targeted Shorebird Surveys (February 2026)	16 Feb 2026
Targeted Shorebird Surveys (March 2026)	12 Mar 2026

5.2.2.3 Sampling Method and Effort

Table 5.3 documents the sampling methodology and effort that was employed for the BBUS and terrestrial fauna surveys undertaken to support the Project referral.

Details of the sampling methodology and effort applied for conservation listed terrestrial fauna species is presented separately in **Section 5.2.2.4**.

Table 5.3 Fauna Survey Techniques and Effort

Survey	Survey Area	Timings	Survey Methods and Effort
Basic and targeted vertebrate fauna assessment (reference) (**Appendix B**)	Fauna Survey Area (17,213 ha)	Basic: 2–3 July 2024. Basic and targeted: 29 October – 5 November 2024 Supplementary Survey: 10 December 2024	A basic and targeted vertebrate fauna assessment, including desktop study, was undertaken to characterise fauna habitats and identify occurrence of terrestrial vertebrate fauna species. Survey methods and effort included: • 16 person days of survey • Habitat assessments (92 locations) and mapping • Camera trapping (54 trap nights) • Ultrasonic bat recorders; 3 nights at five sites (total 15 nights) • Incidental observations. Fauna habitat assessments were undertaken at selected sample points to delineate vertebrate fauna habitats. The information recorded at each sample point included: • Site information, photos and GPS location • Vegetation: dominant upper, mid and lower strata species and percentage cover • Substrate • Surface water presence • Habitat components (leaf litter, rocky outcrops, tree hollows etc.) • Disturbance signs • General habitat condition. Locations of habitat assessment points were used in conjunction with aerial imagery, digital elevation models, and soil mapping units to generate fauna habitat mapping across the Project Area. Further information on the survey methodology and effort applied for the Basic and Targeted Vertebrate Fauna Assessment is presented in Section 3.4 of **Appendix B**. Fauna survey locations are illustrated in **Figure 5.3**.
Bird and Bat Utilisation Surveys (BBUS)	Fauna Survey Area (17,213 ha)	BBUS01: 9–15 Sep 2024 (spring) BBUS02: 13–17 Feb 2025 (summer) BBUS03: 4–8 May 2025 (autumn) BBUS04: 21–25 July 2025 (winter)	The assessment was undertaken to determine utilisation of the Project Area by birds and bats, involving: • Desktop site characterisation and species likelihood of occurrence assessment.

Survey	Survey Area	Timings	Survey Methods and Effort
(reference) (**Appendix H**)		BBUS05: 13–17 October 2025 (spring) BBUS06: 16–20 February 2026 (summer) BBUS07: 18-22 May 2026 (autumn)	• BBUS comprising sampling at sites representative of habitat types in the Project Area. The number of sampling sites varied during each BBUS due to adjustments made to sampling design to accommodate Project Area changes and to ensure appropriate spatial distribution. Fifteen (15) sites were surveyed in BBUS01, and between 23 and 29 sites were surveyed during the remaining BBUS. All surveys involved sampling of fixed vantage points at each site for a 30-minute duration, three times a day. Methods were updated for BBUS02-07 to also include a timed 20-minute, 400 m transect survey, three times a day at each site. The total survey effort across all surveys was approximately 1,468 hours. Survey methods also included: • Ultrasonic bat recorders, 2 - 5 nights at between 9 and 12 sites during each BBUS (total 170 nights). • Incidental observations. • Wetland census. Further information on the survey methodology and effort applied is presented in Section 2.2 of **Appendix H**. BBUS locations are illustrated in **Figure 5.4**.

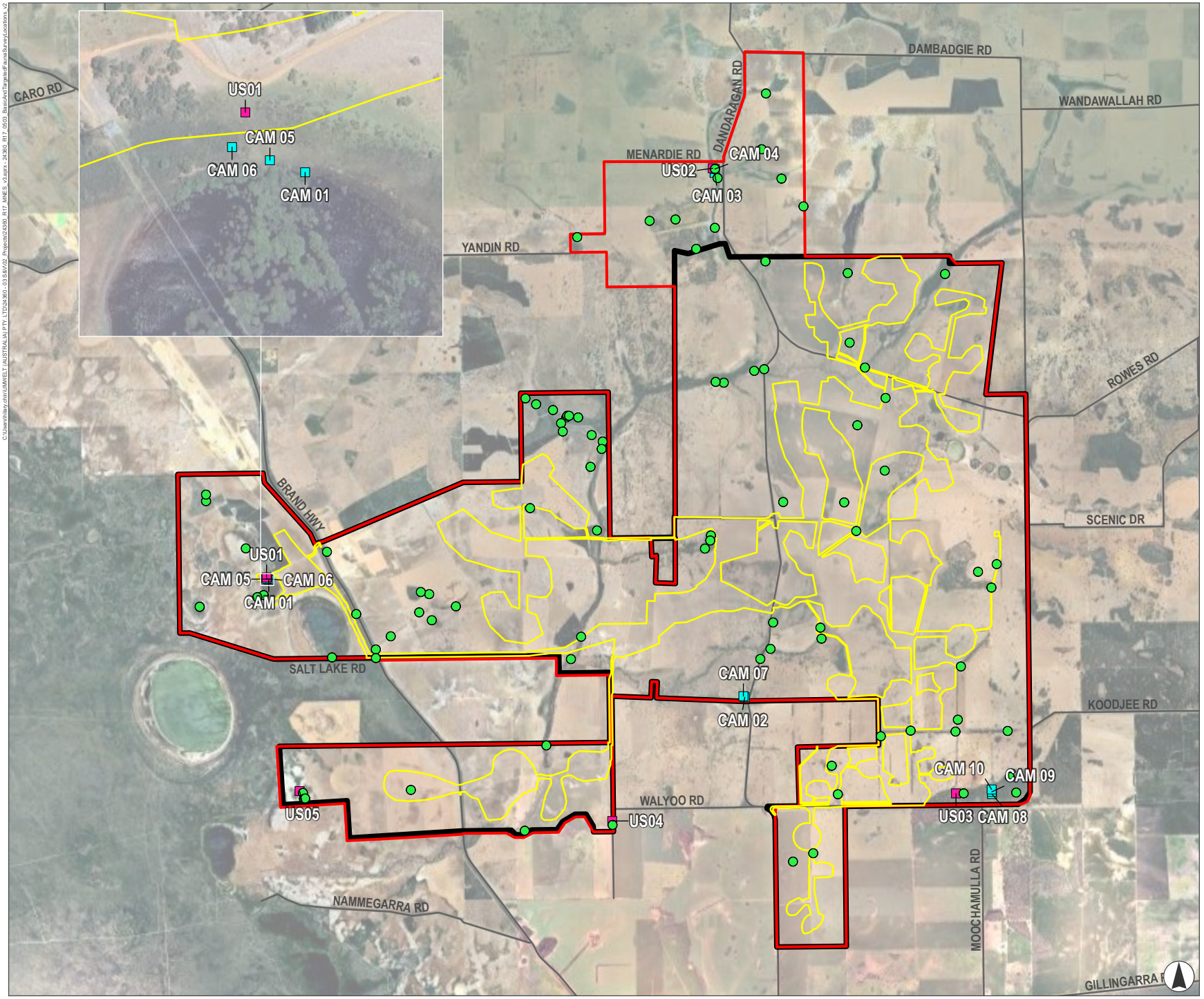


FIGURE 5.3

Basic and Targeted Fauna Survey Locations

Legend

- Fauna Habitat Points
- Camera location
- Ultrasonic location
- Road
- Project Area
- Fauna Survey Area
- Tageted Fauna Habitat Assessment Area



0 2 4

Kilometres

Scale 1:120,000 at A4
GDA2020 MGA Zone 50

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

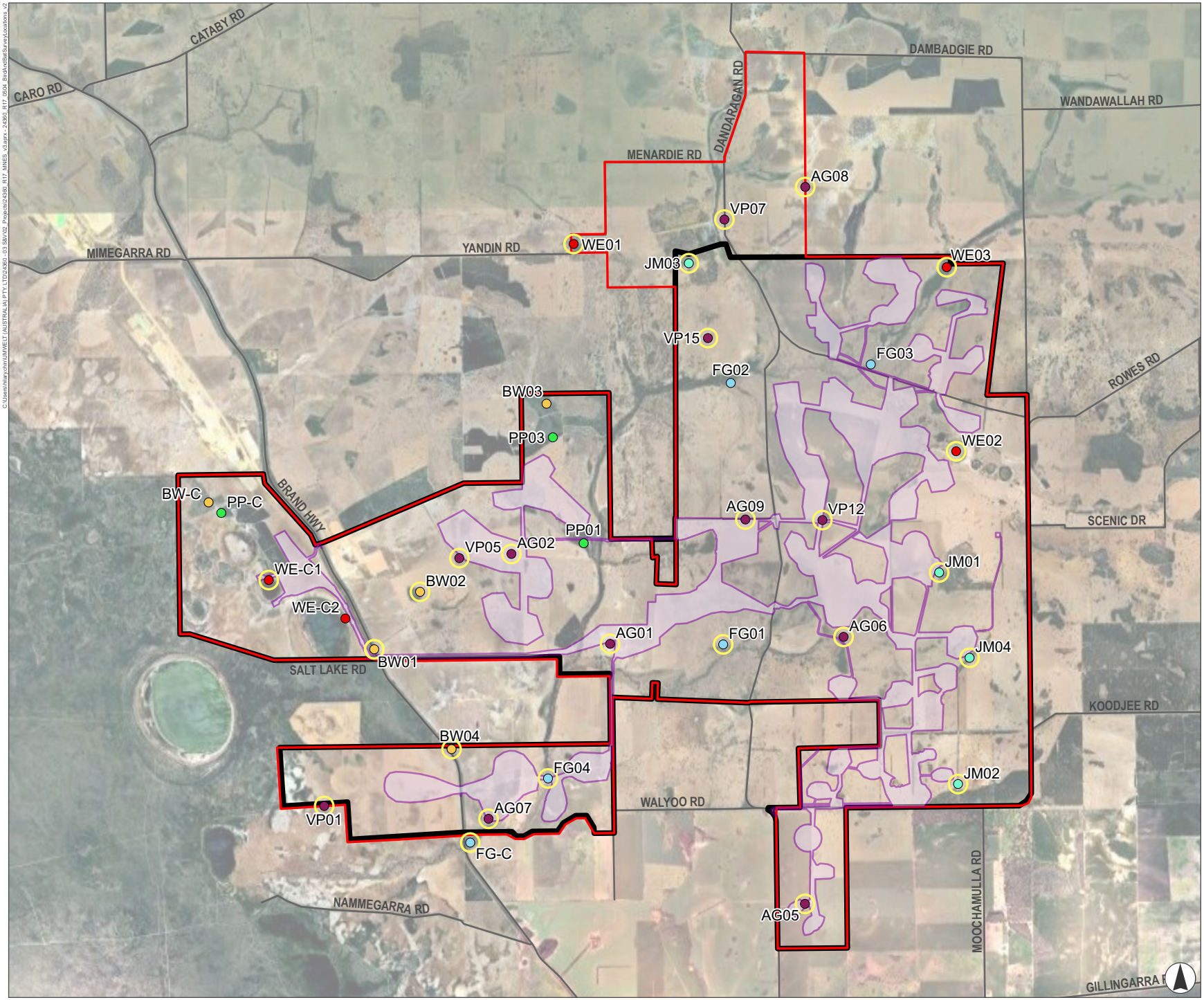


FIGURE 5.4

Bird and Bat Survey locations

Legend

- Ultrasonic Recording Sites
- Road
- Project Area
- Fauna Survey Area
- Development Corridor

Bird and Bat Utilisation Survey Locations

- Agriculture
- Flooded Gum Floodplain
- Jarrah Marri Forest
- Pine Plantation
- Banksia Woodland
- Wetland



0 2 4

Kilometres

Scale 1:120,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

5.2.2.4 Threatened and Migratory Fauna

Based on the desktop assessments and findings from the basic and targeted vertebrate fauna assessment and earlier BBUS (Spring 2024 and Summer 2025), it was determined that the following EPBC listed fauna species are known or have a moderate to high likelihood of occurrence in the Project Area:

- Carnaby's Black-Cockatoo (*Zanda latirostris*)
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)
- Migratory Shorebirds (including those with threatened status).

Black-Cockatoo

Targeted breeding, foraging and roosting habitat assessments for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo were undertaken across the Development Corridor.

The survey and assessments were conducted with strong reference to both the existing DCCEEW (2022b) and for the referral of actions that may result in impact to Black-Cockatoos. Survey methodology also followed the recommendations listed on the DCCEEW's Species Profile and Threats Database (DCCEEW, 2025a, 2025b; 2024a).

DBCA has indicated that the methodology developed and applied previously by Bamford (Bamford, 2020) is an acceptable approach to score breeding value and foraging habitat and, therefore, these methods were adopted.

Field investigations were undertaken across three survey events from June to October 2025. Survey details are summarised in **Table 5.4** and **Table 5.5** below with a detailed description provided in Section 2.3.2 of **Appendix C**.

Table 5.4 Black-Cockatoo Survey Methodology

Survey	Survey Area	Timings	Survey Methods and Effort
Targeted Fauna Habitat Assessment (Umwelt, 2025a) (**Appendix C**)	Development Corridor	23–27 June 2025 21 July 2025 13–17 October 2025	Targeted breeding, foraging and roosting habitat assessments were undertaken for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo. During these assessments, species presence was also recorded. **Breeding Habitat** The Bamford Consulting methodology (Bancroft & Bamford, 2023) was used to rank tree suitability for Black-Cockatoo breeding within the Development Corridor. The ranking applied and how they correlate to DCCEEW (2022b) categories are presented below in **Table 5.5**: 'Comprehensive' potential Black-Cockatoo nest-trees surveys were conducted across approximately 2,597 ha (75%) of the Development Corridor, with a 'partial' survey (comprehensively for the highest ranking trees, Rank 1 to 3 but only opportunistically surveyed for Rank 4 and 5 trees) conducted across 762 ha (22%), with the remaining 84 ha (3%) unassessed. Almost the entire Indicative Project Footprint was comprehensively surveyed for potential Black-Cockatoo nest-trees (698 ha) with the exception of 26.0 ha (3.6%) that was partially surveyed and 5.1 ha (0.7%) that remains unassessed. Figure 2.2 of **Appendix C** illustrates the extent of coverage. **Foraging Habitat** Foraging habitat values within the Project Area were assessed using the (Bamford, 2020) rationale for each vegetation patch within the Development Corridor. Mapping of foraging habitat quality within the Development Corridor was ranked and mapped using the following categories, which aligns with the site condition scoring as set out by (Bamford, 2020): • No foraging value (corresponding to a site condition score of 0) • Negligible to Low foraging value (1) • Low foraging value (2) • Low to Moderate foraging value (3) • Moderate foraging value (4) • Moderate to High foraging value (5) • High foraging value (6) A score out of 10 which considers context and species density was also calculated for the purposes of aiding offset calculations should they be required.

Foraging Evidence

Black-Cockatoo foraging signs were also recorded opportunistically as part of the field survey. When observed, the following was recorded:

- Location
- Black-Cockatoo species
- Forage plant species
- Approximate age of the foraging evidence
- Roosting Habitat.

A survey for Black-Cockatoo night-roost locations was undertaken by attempting to locate flocks of Black-Cockatoos in the late afternoon and, where practicable, following them to their roost site(s). This survey was conducted on the afternoon and evening of the 23 June 2025.

As per the guidance of DCCEEW (2022b), areas likely to be used as night-roosting sites were noted based on the topographical, physical and vegetation characteristics present (such as sites adjacent to watercourses with large trees) and/or indirect evidence of roosting (e.g. guano deposits, discarded feathers, tree clippings).

Table 5.5 Bamford (2020) Black-Cockatoo Nest-tree Ranks

DCCEEW (2022b) Category	Bamford (2020) Rank	Description of Tree and Hollows/Activity
Known nesting tree	**1**	Activity at hollow observed; adult (or immature) bird seen entering or emerging from hollow. Can also be used for a known nest-tree active in the previous 12 months (although this should be noted in the description). Note that activity at a hollow does not absolutely mean that breeding is occurring unless a young bird in hollow is observed.
Suitable nesting tree	**2**	Hollow of suitable size visible with chew marks around entrance. Record if chew-marks are recent or old.
	3	Potentially suitable hollow visible but no chew marks present at entrance; or potentially suitable hollow suspected to be present - as suggested by structure of tree, such as large, vertical trunk broken off at a height of >8 m; but note that hollow height is contextual. Carnaby's Black-Cockatoo will nest in hollows <5 m so in a Wheatbelt breeding site a lower criterion may be more appropriate.
Potential nesting tree	**4**	Tree with large hollows or broken branches that might contain large hollows, but hollows or potential hollows (nest chamber) are not vertical or near-vertical; thus a tree with or likely to have hollows of sufficient size but not to have hollows of the angle preferred by Black-Cockatoos. Trees with low but otherwise suitable hollows can also be assigned a rank or 4, depending on the species of Black-Cockatoo likely to be present.
	5	Tree lacking large hollows or broken branches that might have large hollows; a tree with more or less intact branches and a spreading crown.

Migratory Shorebirds

The Project Area contains a number of waterbodies and wetlands that may provide suitable habitat for migratory shorebirds listed under the EPBC Act.

Using the geomorphic wetlands of the Swan Coastal Plain (DBCA, (2025) mapping, in conjunction with in-field assessments (of wetland features and bird presence) and existing data (i.e. database searches), wetlands WE-C1, WE-C2, WE-01 and WE-02 within and adjacent to the Project Area were identified as being the most likely to support migratory shorebirds (**Figure 5.5**).

Monthly targeted migratory shorebird surveys were undertaken from September 2025 to March 2026 (non-breeding season) at the wetlands illustrated in **Figure 5.5** when shorebird species are expected to occur within the Project region.

Details of the targeted migratory shorebird surveys are summarised in **Table 5.6**, with additional information provided in Section 2.3.3 of **Appendix C** and **Appendix K**.

It should be noted that migratory shorebird observations were also captured as part of the quarterly BBUS as described in **Section 5.2.2.2**.

Table 5.6 Migratory Shorebird Survey Methods

Survey	Survey Area	Timings	Survey Methods and Effort
Targeted Shorebird Surveys	Selected wetlands (**Figure 5.5**)	Monthly from September 2025 to March 2026. Shorebird information was also gathered as part of other terrestrial fauna surveys.	• These wetlands were surveyed using binoculars and a telescope to gather information on species presence, abundance, behaviour, and site utilisation. • Surveys were undertaken monthly from September 2025 to March 2026 and comprise one day for two personnel each month (seven survey events total). Flight height data was also gathered on species of interest, whenever possible, to supplement analysis of flight behaviours.

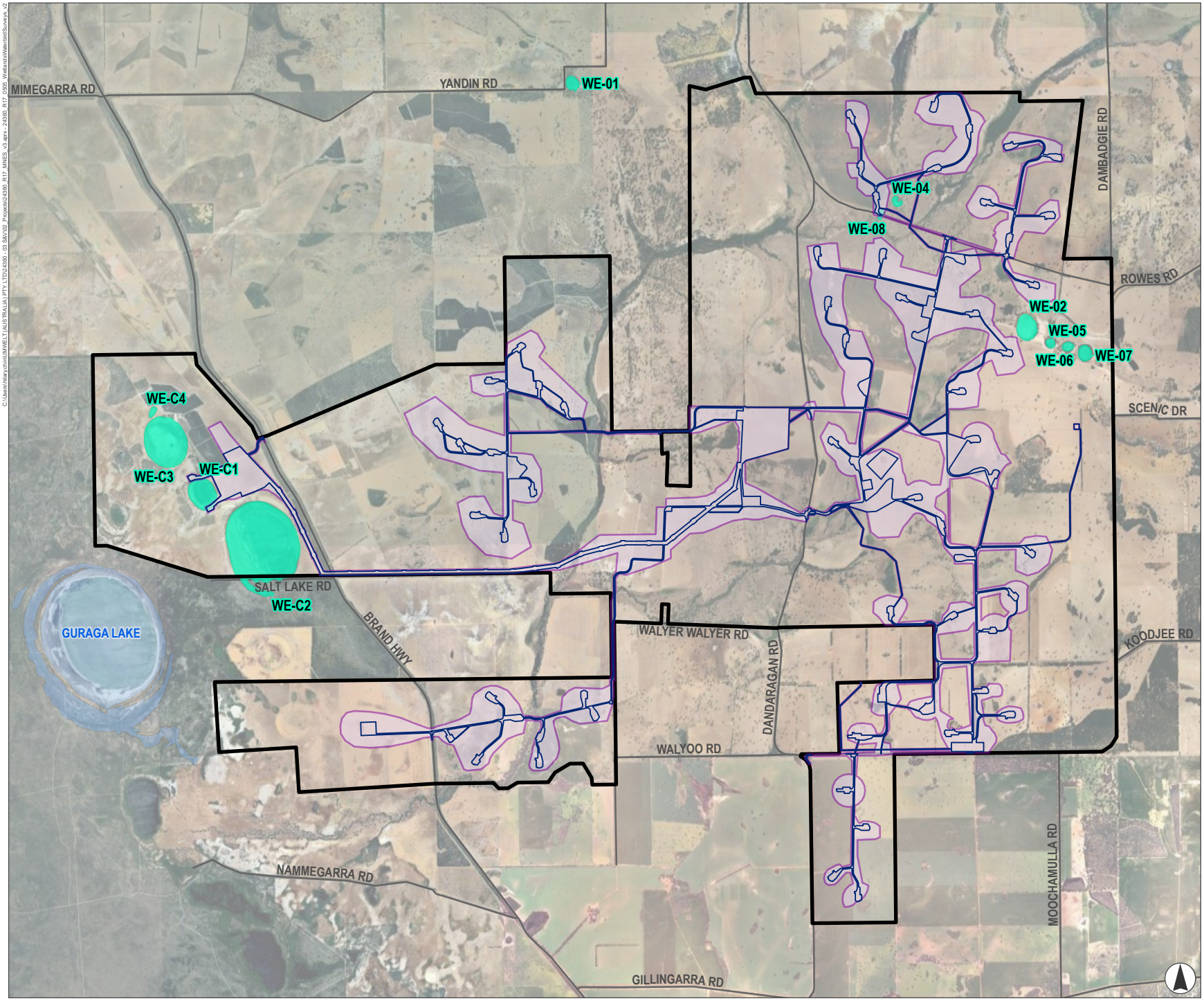


FIGURE 5.5

Wetlands Subject to Waterbird Surveys

Legend

- Road
- Project Area
- Development Corridor
- Disturbance Footprint
- Directory of Nationally Important Wetlands
- Surveyed Wetlands



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

5.2.3 Survey Limitations

5.2.3.1 Flora and Vegetation

Table 5.7 presents an assessment of the potential limitations of the flora and vegetation field survey program.

Table 5.7 Flora and Vegetation Survey Limitations

Limitation	Comment	Outcome
Effort and Extent	A Reconnaissance, Detailed and Targeted survey was undertaken across the Survey Area over a combined 12 days. A Detailed and Targeted survey was undertaken across the D&T Survey Area. Seventeen quadrats and fifteen relevés were recorded within the broader Survey Area. Mapping of vegetation boundaries was undertaken within the broader Survey Area using a combination of aerial photography and information collected at relevés and vegetation observation points. No constraints prevented appropriate sampling techniques (quadrat and relevé establishment, foot traverses) being employed. All areas were easy to access using roads and tracks. Data reliability is therefore considered to be relatively high.	Not a limitation
Competency/experience of the team carrying out the survey	The field team leader for the Reconnaissance field survey has >18 years' experience conducting flora and vegetation surveys in the region and the field team leader of the Detailed and Targeted field survey has >3 years' experience in conducting flora and vegetation surveys in the region. Senior personnel provided guidance to less experienced botanists throughout the survey where necessary. Information relating to identifying characteristics of both significant flora taxa and vegetation identified by the desktop assessment as potentially occurring in the Survey Area was provided to all field team members prior to undertaking the field survey. The plant identifications were undertaken by Principal Botanists with >15 years' experience in plant identification for flora of the region.	Not a limitation
Proportion of flora identified, recorded and/or collected	All vascular groups that were present in the sample sites (quadrats, relevés and vegetation mapping notes) within the Survey Area were sampled. A high proportion of perennial vascular taxa were recorded based on the intensity and method of survey. The majority of annual vascular taxa that were sampled were identifiable, as the survey was conducted in Spring; it is considered likely that the majority of annual flora taxa that would be present in the Survey Area were recorded by the survey. Any unknown vascular taxa were collected and identified by a Principal Botanist.	Not a limitation

Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	Good contextual information for the Survey Area was available prior to the survey. Sources of information used included government databases (DBCA, DCCEEW), flora and vegetation surveys previously conducted in the Desktop Study Area, as well as numerous general sources pertaining to the climate, geomorphology, flora and vegetation of the region.	Not a limitation
Timing/weather/ season/cycle	The Detailed and Targeted field survey was conducted in September and early October 2024. This corresponds with the optimum time to undertake a Primary survey in the Swan Coastal Plain (SCP) bioregion (Spring), and the flowering period of most taxa in the region. The total rainfall received in the year of survey (2024) was below average overall (473.6 mm in comparison to long-term average of 517.7 mm); however, the total rainfall received from January–August 2024 (the months prior to the Detailed and Targeted survey) was higher than average (417.7 mm in comparison to average of 403.0 mm).	Not a limitation
Disturbances (e.g. fire, flood, accidental human intervention etc.), which affected results of survey	There was evidence of significant impacts to vegetation composition and structure in the majority of the Survey Area as a result of human activities, including clearing for agriculture and very high levels of introduced (weed) taxa. However, this is a reflection of the land use history in the region and is not specific to the Survey Area; consequently, this is not considered to be a limitation of the survey. These disturbances did not affect the results of the survey, with the vegetation able to be confidently described and mapped, and flora taxa mature enough to be easily identified or collected. No areas impacted by recent fire were observed.	Not a limitation
Remoteness and/or access problems	The Survey Area was accessed either via publicly accessible roads or farm tracks, and on foot. Appropriate landowner permissions were obtained prior to survey, and there were no access issues. This allowed high intensity of sampling across the Survey Area. Therefore, this is not a limitation of this assessment.	Not a limitation

5.2.3.2 Terrestrial Fauna

Table 5.8 presents an assessment of the potential limitations of the terrestrial fauna field survey program.

Table 5.8 Terrestrial Fauna Survey Limitations

Limitation	Comment	Outcome
Availability of data and information	Good contextual information for the Survey Area was available prior to the survey. Sources of information used included government databases (DBCA, DCCEEW), as well as numerous general sources pertaining to the climate, geomorphology, vegetation and fauna of the region, and fauna surveys previously conducted in the Desktop Study Area.	Not a limitation
Competency/experience of team carrying out the survey	The fauna field team was led by Senior Zoologist Dr. Jeremy Ringma who has >16 years fauna survey experience with >5 years' experience surveying for Black-Cockatoo. Technical personnel with relevant expertise assisted with analysis of ultrasonic recordings (Robert Bullen).	Not a limitation
Scope of the survey, e.g. where fauna groups were excluded from the survey	The scope was a basic level vertebrate fauna survey with targeted sampling components. This was conducted within the EPA framework and relevant species-specific survey guidelines (EPA, 2020).	Not a limitation
Timing/weather/season cycle	The field survey was conducted in October/November and December 2024. This is considered optimal timing to survey reptiles, amphibians, birds and mammals in the Southern Climatic Region (EPA, 2020). The October/November survey is within recommended survey timing for Carnaby's Black-Cockatoo breeding habitat (DCCEEW, 2022b). Rainfall within the year proceeding survey was 52 mm lower than the long-term average which resulted in dryer than usual conditions. However, this is not considered to be a limitation. Shorebird surveys are being conducted monthly during the period where migratory shorebirds may occur within the Project Area (October to March).	Not a limitation
Disturbances (e.g. fire, flood etc.), which may have affected results	There was evidence of impact to vegetation composition and structure throughout the Survey Area as a result of human activities, including clearing and moderate levels of introduced (weed) taxa. However, the fauna investigations were unimpacted by disturbance.	Not a limitation
Proportion of fauna identified, recorded and/or collected	The basic fauna survey was undertaken to identify broad fauna and fauna habitat information. As such, the Survey Area was sampled opportunistically and via low-intensity sampling using cameras and remote recording devices. The survey likely detected a representative proportion of the vertebrate fauna assemblage, particularly birds, mammals, and reptiles based on habitat suitability and survey techniques. Targeted species were actively searched for using species-specific methods as part of the targeted component of the survey, increasing detection probability for those of conservation interest. All fauna recorded via incidental observations were identified in the field at the time of the survey.	Not a limitation

Adequacy of survey intensity and proportion of survey achieved	A basic and targeted survey was undertaken across the Survey Area to assist with decisions on future environmental approvals. The sampling methods and survey intensity was considered adequate for the level of survey and focused on the significant species.	Not a limitation
Access problems	The Survey Area was accessed either via roads or on foot. Most areas of the Survey Area were able to be accessed, however due to cropping, some habitat assessments were completed using binoculars from the closest access point.	Not a limitation
Problems with data and analysis, including sampling bias	Limited access to properties resulted in one camera being left on site for 4 months. However, this did not impact the data collection and is not considered a limitation. No other constraints were encountered during data collection in the field or during subsequent analysis.	Not a limitation

5.3 Likelihood of Occurrence Assessment

5.3.1 Flora and Vegetation

The likelihood of occurrence for significant flora taxa and significant vegetation in the Project Area was classified based on the categories presented in **Table 5.9**.

Table 5.9 Flora: Likelihood of Occurrence Categories

Category	Description
Known	Species or community known to occur in the Project Area, either through historical records or through the findings of this survey.
Possible	Suitable habitat present in the Survey Area; known locations in close proximity to Project Area (< 10 km); not recorded during the Survey, however survey intensity not sufficient to reduce likelihood of occurrence to Unlikely.
Potential	Suitable habitat present in the Survey Area; no known locations in proximity to Project Area (> 10 km); not recorded during the Survey, however survey intensity not sufficient to reduce likelihood of occurrence to Unlikely.
Unlikely	Species or community unlikely to occur in the Project Area due to lack of suitable preferred habitat; or combination of survey undertaken during correct survey period for identification, adequate survey intensity and/or vegetation condition deemed insufficient for species or community to occur.

5.3.2 Fauna

The likelihood of occurrence for threatened and migratory fauna in the Project Area was classified based on the categories presented in **Table 5.10**.

Table 5.10 Fauna: Likelihood of Occurrence Categories

Category	Description
Known	The species has been recorded during the field survey or from recent, reliable records within the Project Area.
High	The Project Area contains suitable habitat and there are recent records of the species occurring in close proximity to the Project Area. OR Species known distribution overlaps the Project Area which contains suitable habitat.
Moderate	The species is known from the Desktop Study Area and some preferred habitat is present within the Project Area. Aerial foragers and other migratory birds that may overfly the survey area are also included in this category.
Low	The species has been recorded within the Desktop Study Area however, there is limited habitat (i.e. quantity, type and quality) within the Project Area. This may include marginal and isolated habitat with limited ability for the species to access. The species may disperse through the Project Area infrequently and is unlikely to depend on the habitat for survival.
Very Low	The Project Area offers limited to no potential habitat for the species, is outside its known range, and/or is lacking broader habitat requirements.

5.4 Significant Impact Assessment

The potential impacts associated with MNES were assessed with reference to the Significant Impact Guidelines – MNES (Department of the Environment, 2013b). Specifically, the significant impact criteria were used to assess the significance of potential impacts according to each MNES' conservation status (Vulnerable, Endangered, Critically Endangered, and Migratory).

Threatened flora species and ecological communities recorded within the Project Area were assessed.

Threatened fauna species with a likelihood of occurrence of Moderate, High or Known were assessed.

Commonwealth or State government guidelines, recovery plans, conservation advice, and species profiles were utilised wherever relevant when undertaking these assessments and are summarised in Table 5.11.This information was supplemented with publicly available literature where suitable, with citations provided where utilised.

Table 5.11 Government Guidelines, Recovery Plans, Conservation Advice, and Species Profiles

Matter of National Environmental Significance	Guidelines, recovery plans, conservation advice or species profile
Banksia Woodlands of the Swan Coastal Plain ecological community	• Referral Guideline for the Banksia Woodlands of the Swan Coastal Plain ecological community (DoEE, 2016a) • Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community (TSSC, 2016)
Forest Red-tailed Black-Cockatoo	• Referral Guideline for 3 WA Threatened Black-Cockatoo Species (DCCEEW, 2022b) • Approved Conservation Advice for *Calyptorhynchus banksii naso* (Forest Red-tailed Black-Cockatoo) (DEWHA, 2009) • Forest Black-Cockatoo (Baudin's Cockatoo *Calyptorhynchus baudinii* and Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan (DEC, 2008) • *Calyptorhynchus banksii naso* — Forest Red-tailed Black-Cockatoo, Karrak SPRAT Profile (DCCEEW, 2024a)
Carnaby's Black-Cockatoo	• Referral Guideline for 3 WA Threatened Black-Cockatoo Species (DCCEEW, 2022b) • Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan (DPAW, 2013) • EPA Advice: Carnaby's Black-Cockatoo in Environmental Impact Assessment in the Perth and Peel Region (EPA, 2019) • *Zanda latirostris* — Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo SPRAT Profile (DCCEEW, 2024b)
Migratory Shorebirds	• Draft Referral Guideline for 14 Birds Listed as Migratory Species Under the EPBC Act (Department of the Environment, 2015) • Department of the Environment Referral Guideline for 14 Birds Listed as Migratory Species under the EPBC Act • Australian National Directory of Important Migratory Shorebird Habitat (Driessen et al, 2025)
Fork-tailed Swift	• *Apus pacificus* — Fork-tailed Swift SPRAT Profile (DCCEEW, 2015)
Black-tailed Godwit	• *Limosa limosa* — Black-tailed Godwit SPRAT Profile (DCCEEW, 2015) • *Conservation Advice for Limosa limosa (black-tailed godwit) (DCCEEW, 2024)*.
Bar-tailed Godwit (Northern Siberian)	• *Limosa lapponica menzbieri* — Bar-tailed Godwit SPRAT Profile (DCCEEW, 2015) • *Conservation Advice for Limosa lapponica menzbieri (Yakutian bar-tailed Godwit)* (DCCEEW, 2024)
Common Greenshank	• *Tringa nebularia* — Common Greenshank SPRAT Profile (DCCEEW, 2015) • *Conservation Advice for Tringa nebularia (common greenshank)* (DCCEEW, 2024)
Red-necked Stint	• *Calidris ruficollis* — Red-necked Stint SPRAT Profile (DCCEEW, 2015)

Ruff	• *Calidris pugnax* — Ruff SPRAT Profile (DCCEEW, 2015)
Sharp-tailed Sandpiper	• *Calidris acuminata* — Sharp-tailed Sandpiper SPRAT Profile (DCCEEW, 2015) • *Conservation Advice for Calidris acuminata (sharp-tailed sandpiper)* (DCCEEW, 2024)
Wood Sandpiper	• *Tringa glareola* — Wood Sandpiper SPRAT Profile (DCCEEW, 2015)
Common Sandpiper	• *Actitis hypoleucos* — Common Sandpiper SPRAT Profile (DCCEEW, 2015)
Curlew Sandpiper	• *Calidris ferruginea* — Curlew Sandpiper SPRAT Profile (DCCEEW, 2015) • *Conservation Advice for Calidris ferruginea (curlew sandpiper)* (DCCEEW, 2023)
Glossy Ibis	• *Plegadis falcinellus* — Glossy Ibis SPRAT Profile (DCCEEW, 2015)
Pacific Golden Plover	• *Pluvialis fulva* — Pacific Golden Plover SPRAT Profile (DCCEEW, 2015)
Long-toed Stint	• *Calidris subminuta* — Long-toed Stint SPRAT Profile (DCCEEW, 2015)

6.0 Description of Ecological Values

6.1 Biogeographic Description

6.1.1 Bioregion

The Project Area is bisected by the boundary of two Interim Biogeographic Regionalisation of Australia (IBRA) bioregions and three subregions as summarised in **Table 6.1.**

Table 6.1 Biogeographic Subregions of the Project Area (DCCEEW, 2023a)

Bioregion	Subregion	Summary	Area and % within the Project Area
Swan Coastal Plain (SWA)	Dandaragan Plateau (SWA01)	The plateau is bordered by Derby and Dandaragan Faults. Cretaceous marine sediments are mantled by sands and laterites. Characterised by Banksia low woodland, Jarrah - Marri woodland, Marri woodland, and by scrub-heaths on laterite pavement and on gravelly sandplains.	3,996 ha comprising the eastern portion (25.59%)
	Perth (SWA02)	The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats, coastal limestone. Heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials. Includes a complex series of seasonal wetlands and also includes Rottnest, Carnac and Garden Islands etc.	11,511 ha comprising the western portion (73.71%)
Geraldton Sandplains (GS)	Lesueur Sandplain (GS2)	The Lesueur Sandplain (GS3) comprises coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily lateritised) of central Perth Basin. Alluvials are associated with drainage systems. There are extensive yellow sandplains in south-eastern parts, especially where the subregions overlaps the western edge of the Pilbara Craton. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. Heath on lateritised sandplains along the subregions north-eastern margins.	109 ha comprising the northwest portion (0.70%))

6.1.2 Climate

The Bureau of Meteorology (BoM) monitors precipitation and temperature at the Badgingarra station (station number 9037) (BOM, 2024) which is located approximately 46 km northwest of the Project Area. **Figure 6.1** resents the monthly precipitation totals and monthly maximum temperature statistics for 2024, as well as long-term average monthly precipitation and maximum temperature data recorded at this station

Throughout 2024, when ecological studies were undertaken to support this referral, the maximum temperatures were slightly higher than the average maximum temperature for each month (**Figure 6.1**). The total rainfall of 2024 of 473.6 mm was below the long-term average of 517.7 mm. However, the total rainfall in the months before the Detailed and Targeted surveys (January–August 2024) was 417.7 mm, slightly above the long-term average (for this period of 403.0 mm). Thus, the spring months (September - December) were drier than average having received 53 mm, which is 30 mm less than the long-term average (83mm).

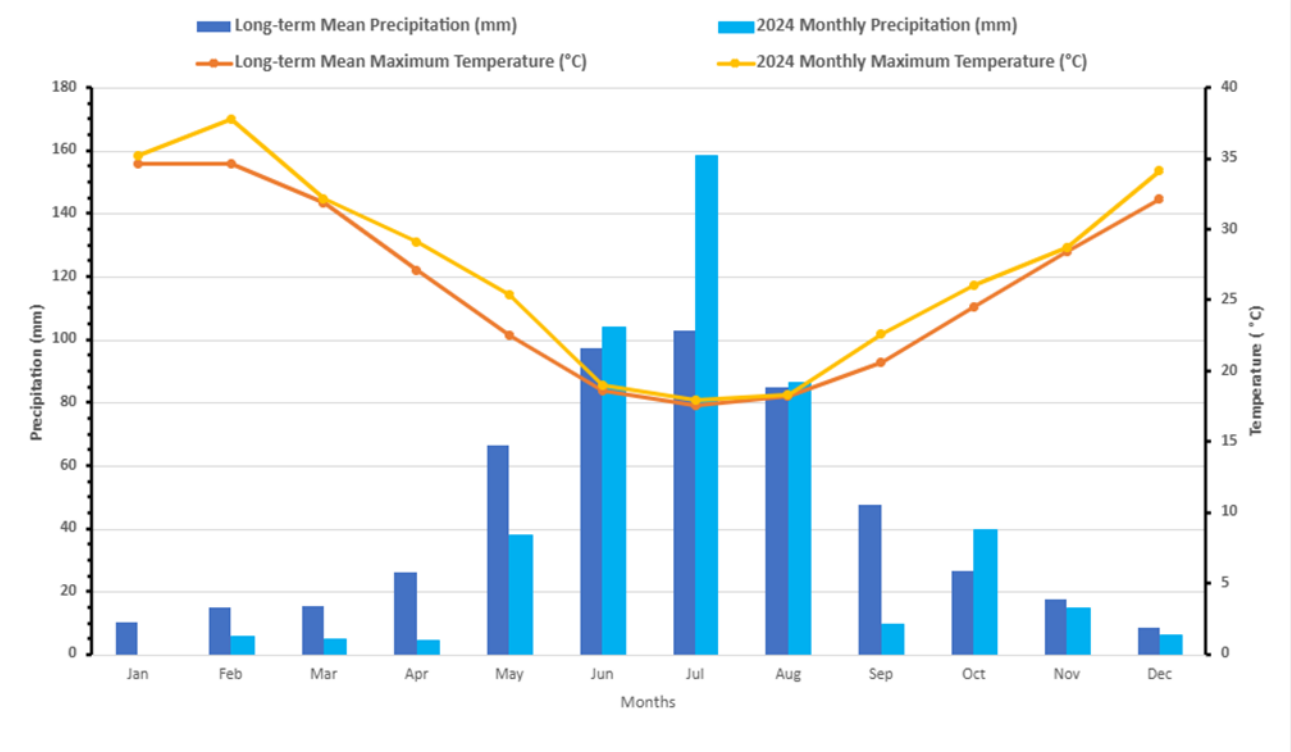


Figure 6.1 Climate Statistics for Badgingarra Research Station (9037) (BOM, 2024)

6.1.3 Surface Water

The Project Area is located within the Moore–Hill Rivers Basin and the Minyulo–Caren Caren catchment.

The Minyulo-Caren Caren catchment comprises Lake Guraga, a large saline/brackish lake, and a second saline lake, Namming Lake is located 1.5 km south of Lake Guraga. Water recharge occurs through direct precipitation, ongoing waterflow from the Caren Caren Brook system, originating 25 km north-east of Lake Guraga and, connecting streams, also passing through Crackers Swamp.

The Moore River catchment of the basin flows southward from Perenjari, Carnamah and Dalwllinu shires through to the Coorow, Dandaragan and Moora Shires, meeting the Gingin Brook where the catchment flows out to the Indian Ocean via Guilderton (Moore River Catchment Council, 2020).

The Caren Caren Brook traverses the central portion of the Project Area in a north–south direction. It is a non-perennial drainage line and is classified as a minor river.

There are no Ramsar sites located within the Desktop Study Area (DBCA, 2017).

Guraga Lake, which is listed on the Directory of Important Wetlands (DBCA-045) (DBCA, 2018b), is located approximately 700 m west of the Project Area. Guraga Lake, and numerous other wetlands present on the Lesueur Sandplains, may provide suitable habitat for migratory shorebirds and other waterbirds that occur within the region. The Project Area includes Lake Yangy, which lies within the Dandaragan Plateau and feeds into the Caren Caren Brook.

6.1.4 Groundwater

The Project Area is located within the Gingin Proclaimed Groundwater Area, and the majority intersects the Moore River and Certain Tributaries Proclaimed Surface Water Area.

There are a number of bores, wells and other groundwater sampling sites within a 10 km radius of the Project Area (DPIRD, 2024a), which were installed for water sampling or water supply purposes (Department of Water and Environmental Regulation 2024a). These include bores identified as potential water supply for the Project and which connect to the Leederville aquifer which is a confined aquifer and sits below the Parmelia aquifer.

6.1.5 Land Systems

Land systems are broad descriptions of landform, geology and soils. The Project Area intersects five land systems which are characterised as follows (DPIRD, 2024b):

- Dandaragan System: subdued dissected lateritic plateau, undulating low hills and rises with narrow alluvial plains. Variable deep sands and sandy gravels plus minor earths, duplexes and clays. Marri Woodlands and shrublands. This system intersects approximately 65% of the Project Area.
- Rowes System: Plateau residuals, hillcrests and very gently to gently inclined hillslopes; sandy gravels, gravelly pale deep sand, some duricrust. This system intersects approximately 19% of the Project Area.
- Bassendean System: Low to very low relief Pleistocene sand dunes, intervening swamps and gently undulating sand plain. Within the dunes, deep grey sands may become pale yellow with depth (usually < 1.5 m). In the low lying areas adjacent to swamps the water table is relatively shallow in winter being between only one to two m of the surface. Drainage here is often restricted by an iron/organic hardpan. The scattered rounded shallow lakes and swamps contain water, coloured brown by organic material, of low salinity and high acidity.(DPIRD, 1986). This system intersects approximately 11% of the Project Area.
- Capitella System: Subdued stripped lateritic plateau, undulating to gently undulating low rises with gently undulating plain including dunes; pale and yellow deep sands, sandy gravels, some duplex; from sandstones plus alluvial and Aeolian deposits (DPIRD, 2024b). This system intersects less than 3% of the Project Area.
- Boothendarra System: Subdued, stripped lateritic plateau with undulating rises to gently undulating plains on laterite, siltstone and sandstone in the west Midlands area. Sandy duplexes, Pale deep sand, sandy and loamy gravels and minor clays. Vegetation is wandoo woodland, *Eucalyptus todtiana* and banksia low open woodland, scrub heath and some mallee (DPIRD, 2024b). This system intersects approximately 2% of the Project Area.

6.1.6 National Parks, State Forests and Reserves

The Project Area predominantly comprises land cleared for agriculture and livestock grazing, with interspersed patches of remnant woodland. Key environmental features in proximity to the Project Area are shown in **Figure 1.1**, and include:

- Namming Nature Reserve, approximately 2 km west of the Project Area. This is protected for the purposes of flora and fauna conservation and is managed by DBCA.
- Moore River National Park situated approximately 10 km south of the Project Area.
- Bundarra, Eneminga, Jam Hill, Moochamulla and Quinns Hill Nature Reserves all located within 10 km of the Project Area.
- Guraga Lake, which is located approximately 1 km west of the Project Area within Namming Nature Reserve.
- Badgingarra National Park located approximately 29 km northwest of the Project Area.

6.2 Flora and Vegetation

The following sections summarise the flora and vegetation recorded in the Project Area from the desktop assessment and field surveys.

For the purposes of this report, likelihood of occurrence results discussed in this section are presented for ecological communities “Known” and flora species with “Potential” to occur in the Project Area. The complete likelihood of occurrence assessment is presented in **Appendix F.**

6.2.1 Regional Vegetation

The Project Area occurs across seven vegetation system associations (VSAs), with Dandaragan_999 being the most prominent. Details of the VSA’s mapped within Project Area, and their extents remaining regionally are presented in **Table 6.2** and illustrated in **Figure 6.2**.

Table 6.2 Vegetation System Associations of the Project Area

IBRA Subregion	VSA	Description	Area and Proportion of VSA Mapped in Project Area (ha/%)	Current Extent (ha)	Pre-European Extent Remaining (%)	Current Extent Protected for Conservation (%)
Swan Coastal Plain	BASSENDEAN_1030	Low woodland; *Banksia attenuata* & *Banksia menziesii*	1,862.3 (11.9%)	79,560.9	69.7	13.9
	BASSENDEAN_1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	1,876.3 (12%)	3,94.9	8.6	0
	BASSENDEAN_125	Bare areas; salt lakes	257.3 (1.6%)	355.3	23.1	5.0
Dandaragan Plateau	DANDARAGAN_1030	Low woodland; *Banksia attenuata* & *Banksia menziesii*	130.5 (0.8%)	570.5	41.2	0
	DANDARAGAN_1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	19 (0.1%)	339.8	10.1	0
	DANDARAGAN_999	Medium woodland; marri	11,362.5 (72.8%)	8,477.4	9.4	1.2
Lesueur Sandplains	LESUEUR_1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	109.7 (0.7%)	73,457.3	32.7	37.8

Note: Current extent protected for conservation is considered to be any areas within International Union for Conservation of Nature (IUCN) categories I to IV (DPIRD, 2019)

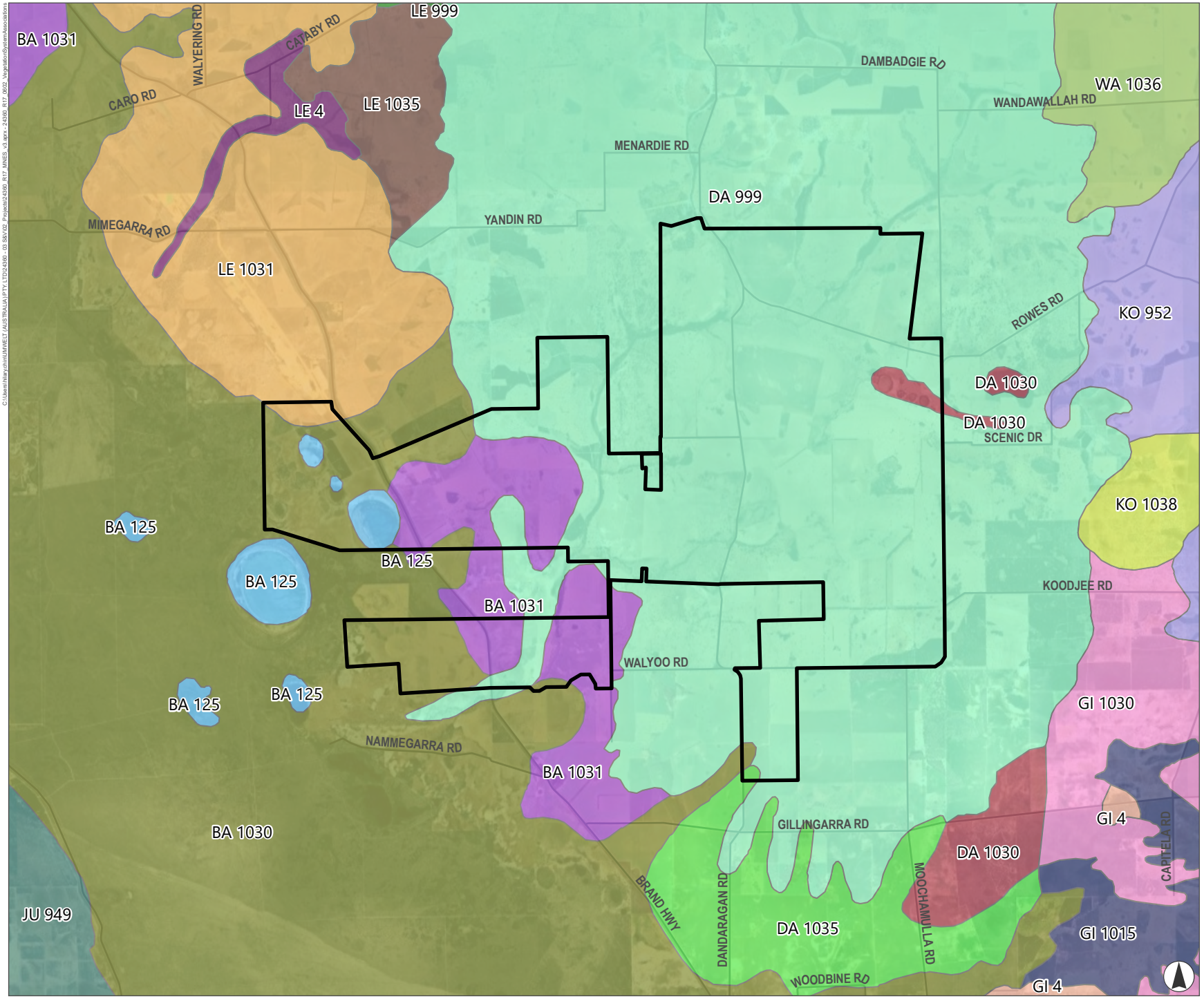


FIGURE 6.2

Vegetation System Associations of the Project Area

Legend

- Road
- Project Area

Pre-European Vegetation (DPIRD 2019)

- BASSENDEAN_1030
- BASSENDEAN_1031
- BASSENDEAN_125
- DANDARAGAN_1030
- DANDARAGAN_1035
- DANDARAGAN_999
- GINGIN_1015
- GINGIN_1030
- GINGIN_4
- JURIEN_949
- KOOJAN_1038
- KOOJAN_952
- LE SUEUR_1031
- LE SUEUR_1035
- LE SUEUR_4
- LE SUEUR_999
- WARRO_1036



0 2 4

Kilometres

Scale 1:150,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

6.2.2 Vegetation Types

Eight native vegetation types (VT) were identified and mapped within the F&V Survey Area through floristic composition classification. Several Highly Modified Areas (HMAs) were also mapped, being areas where natural vegetation has been almost or entirely removed, cleared, or replaced with introduced or non-endemic taxa. These VTs and HMAs are all present in the Project Area.

Blocks of native vegetation likely to be in good condition or better that the Project will avoid were not surveyed. This area totalled 1,167.9 ha of the Project Area. It also includes the western portion of the Project Area (likely to be in 'Completely Degraded' and 'Degraded' condition) that will be avoided. The full extent of the Development Corridor and Indicative Project Footprint have been surveyed.

Further details on the VTs and HMAs identified within the Project Area are presented in **Table 6.3** and illustrated in **Figure 6.3**. More detailed mapping is presented in Figures 5.4.1 to 5.4.23 of **Appendix A**. Representative photos of the various vegetation types are also provided in **Appendix A**.

Table 6.3 Vegetation Types of the Project Area

Code	Brief Description	Area (ha/%) in Project Area
VT1	Low isolated trees to open woodland of *Corymbia calophylla*, occasionally with *Eucalyptus todtiana*, occasionally with a tall shrubland of *Banksia hewardiana* over mid open shrubland of *Hakea trifurcata*, *Xanthorrhoea preissii*, *Allocasuarina humilis*, and *Calothamnus sanguineus*	218.67 (1.40%)
VT2	Occasional low woodland of *Banksia prionotes*, sometimes with *Eucalyptus todtiana*, over tall open shrubland to shrubland of *Acacia blakelyi* over mid sparse shrubland of *Allocasuarina humilis*, *Calothamnus quadrifidus* subsp. *quadrifidus* and *Xanthorrhoea preissii* over low sparse shrubland of *Dianella revoluta* and *Conostylis aculeata* subsp. *aculeata*	15.97 (0.10%)
VT3	Occasional low open woodland of *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia menziesii*, sometimes with *Banksia prionotes*, occasionally with a mid-shrubland of *Leptospermopsis erubescens*, over mid sparse shrubland of *Xanthorrhoea preissii* and *Jacksonia floribunda*	79.26 (0.51%)
VT4	Low open woodland of *Eucalyptus rudis* subsp. *rudis* over tall open shrubland of *Melaleuca rhaphiophylla* over mid closed rushland of *Lepidosperma longitudinale* and *Machaerina preissii*, on drainage lines and open depressions with brown loam.	418.79 (2.68%)
VT5	Low woodland of *Melaleuca preissiana* and/or *Melaleuca rhaphiophylla* occasionally over low isolated sedges of *Schoenus subfascularis* over low closed grassland of pasture weeds, on open depressions, sometimes with standing water, with brown loam.	26.42 (0.17%)
VT6	Low isolated trees to low open woodland of *Eucalyptus loxophleba* subsp. *loxophleba* over low closed grassland of pasture weeds, on plains or slopes with grey/brown loam.	5.35 (0.03%)
VT7	Isolated low trees to low open woodland of *Eucalyptus todtiana* over low closed grassland of pasture weeds, on plains and slopes or grey/brown sand or loam.	3.60 (0.02%)
VT8	Isolated mid shrubland of *Xanthorrhoea ?drummondii* over low open shrubland of *Acacia pulchella* and *Hibbertia hypericoides* subsp. h*ypericoides* over low open sedgeland of *Mesomelaena pseudostygia*, *Schoenus brevisetis*, *Schoenus clandestinus* and *Morelotia octandra*, over isolated low tussock grasses of *Amphipogon turbinatus*, on slopes of yellow-grey sand or red-brown clay loam with laterite.	0.26 (<0.01%)
IT	Isolated remnant trees, largely consisting of native remnant paddock and road verge trees and shrubs	166.38 (1.07%)
PD	Paddocks and Infrastructure; areas where natural vegetation has been completely and apparently permanently removed, with either no or very scattered native taxa (trees) remaining, such as paddocks, infrastructure, tracks and firebreaks.	12,975.02 (83.08%)

JD	Mid to tall sedgeland to open sedgeland of **Juncus acutus* over low closed grasslands of pasture weeds, on drainage lines and sump areas.	179.95 (1.15%)
PP	Planted vegetation, where the natural vegetation has been cleared and replaced by plantations of **Pinus* sp.	167.96 (1.08%)
PE	Planted vegetation, where the natural vegetation has been cleared and replaced by plantations of native or exotic *Eucalyptus* spp.	44.32 (0.28%)
TP	Planted vegetation, where the natural vegetation has been cleared and replaced by plantations of **Chamaecytisus palmensis* or **Vitis vinifera* (Tagasaste).	51.82 (0.33%)
WB	Artificial dams and natural or artificial lakes and pooling water (water bodies).	96.00 (0.61%)
Unassessed	*Areas unassessed and will be avoided*	1,167.86 (7.48%)
	Total	**15,617.63**

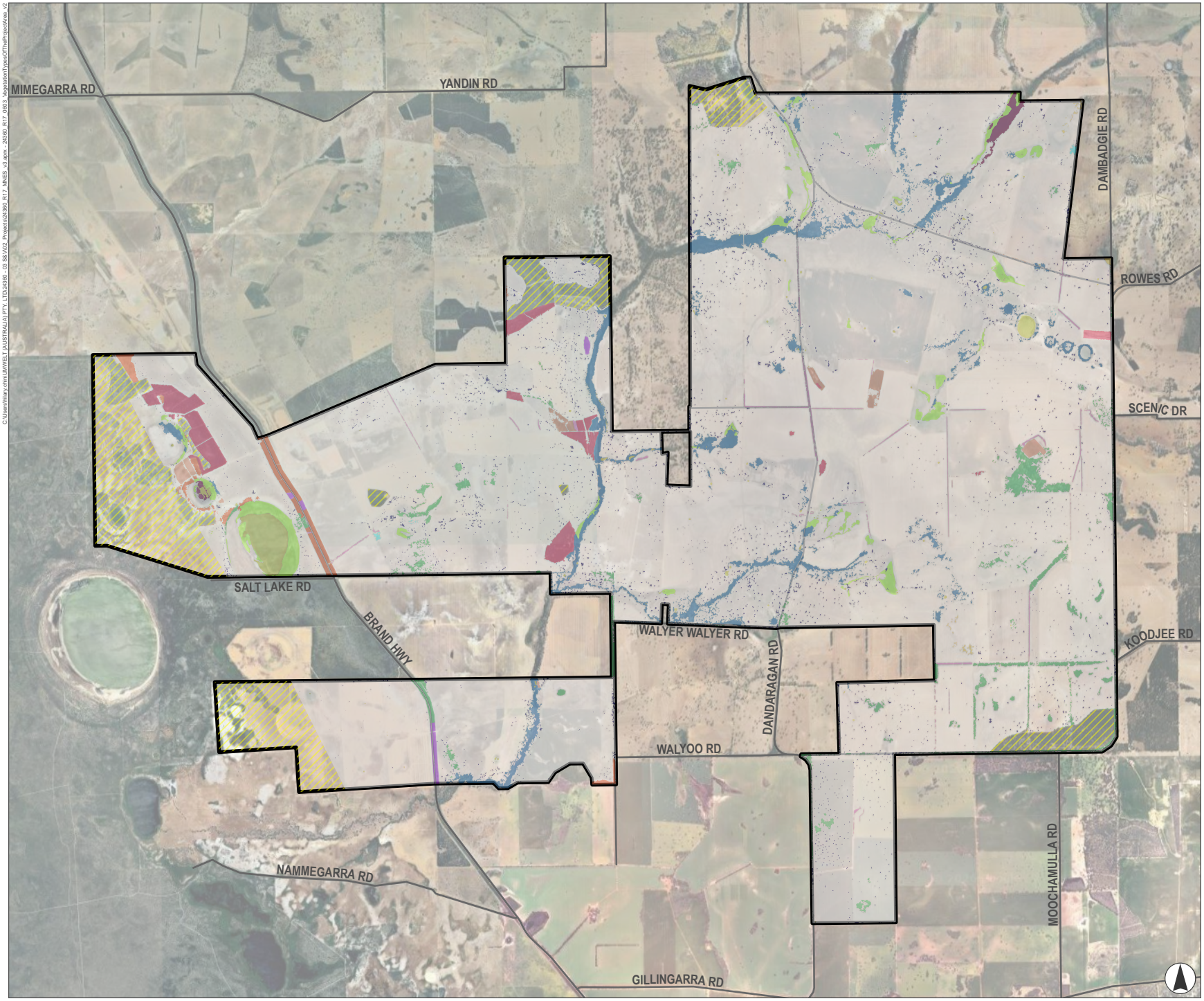


FIGURE 6.3

Vegetation Types of the Project Area

Legend

- Road
- Project Area

Vegetation Types

- VT1
- VT2
- VT3
- VT4
- VT5
- VT6
- VT7
- VT8

Highly Modified Areas

- IT
- PP
- PE
- TP
- JD
- PD
- WB
- Unsurveyed



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

C:\Users\Hilary.chin\UMWELT (AUSTRALIA) PTY. LTD\24360 - 03 SkV02_Projects\24360_R17_MNES_v3.aprx - 24360_R17_0603_VegetationTypesOfTheProjectArea_Legend_V2

Legend

Vegetation Types

VT1	Low isolated trees to open woodland of *Corymbia calophylla*, occasionally with *Eucalyptus todtiana*, occasionally with a tall shrubland of *Banksia hewardiana* over mid open shrubland of *Hakea trifurcata*, *Xanthorrhoea preissii*, *Allocasuarina humilis*, and *Calothamnus sanguineus* over low isolated shrubs of *Babingtonia grandiflora* and *Hibbertia hypericoides* subsp. *hypericoides* over low isolated tussock grasses of *Austrostipa elegantissima* and occasionally *Neurachne alophecuroidea* over low isolated sedges of *Morelotia octandra* occasionally over low open rushland of *Lepidosperma* cf. *pubisquameum* or *Lepidosperma apricola* and/or *Desmocladus asper* over low isolated clumps of forbs of *Opercularia vaginata*, occasionally with *Chamaescilla corymbosa*, *Trachymene pilosa* and *Podotheca gnaphaloides*; on undulating plains with grey/yellow/white sand-sandy loam or on slopes with red/brown clay loam and laterite pebbles.
VT2	Occasional low woodland of *Banksia prionotes*, sometimes with *Eucalyptus todtiana*, over tall open shrubland to shrubland of *Acacia blakelyi* over mid sparse shrubland of *Allocasuarina humilis*, *Calothamnus quadrifidus* subsp. *quadrifidus* and *Xanthorrhoea preissii* over low sparse shrubland of *Dianella revoluta* and *Conostylis aculeata* subsp. *aculeata* over low isolated grasses of *Austrostipa macalpinei* over low clumps of sedges of *Mesomelaena pseudostygia* over low isolated forbs of *Calandrinia corriguloides*, *Centrolepis drummondiana*, *Drosera erythrorhiza*, *Poranthera microphylla* and *Trachymene pilosa*; on sand plains with grey/yellow/brown sand.
VT3	Occasional low open woodland of *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia menziesii*, sometimes with *Banksia prionotes*, occasionally with a mid shrubland of *Leptospermopsis erubescens*, over mid sparse shrubland of *Xanthorrhoea preissii* and *Jacksonia floribunda* over low sparse shrubland of *Banksia dallanneyi* subsp. *dallanneyi* var. *dallanneyi*, *Hibbertia hypericoides* subsp. *hypericoides*, *Melaleuca ciliosa* and *Petrophile macrostachya* over low isolated clumps of grasses of *Austrostipa elgantissima* and *Austrostipa macalpinei* over low sparse sedgeland to isolated clumps of sedges of *Mesomelaena pseudostygia*, *Schoenus clandestinus* and *Schoenus nanus* over isolated clumps of rushes of *Lepidobolus preissianus* subsp. *preissianus* and *Caustis dioica* over low isolated clumps of forbs of *Burchardia congesta*, *Drosera erythrorhiza*, *Phyllangium divergens*, *Podotheca gnaphaloides* and *Trachymene pilosa*, on sand plains with white/ grey/yellow sand.
VT4	Low open woodland of *Eucalyptus rudis* subsp. *rudis* over tall open shrubland of *Melaleuca rhaphiophylla* over mid closed rushland of *Lepidosperma longitudinale* and *Machaerina preissii*, on drainage lines and open depressions with brown loam.
VT5	Low woodland of *Melaleuca preissiana* and/or *Melaleuca rhaphiophylla* occasionally over low isolated sedges of *Schoenus subfascularis* over low closed grassland of pasture weeds, on open depressions, sometimes with standing water, with brown loam.
VT6	Low isolated trees to low open woodland of *Eucalyptus loxophleba* subsp. *loxophleba* over low closed grassland of pasture weeds, on plains or slopes with grey/ brown loam.
VT7	Isolated low trees to low open woodland of *Eucalyptus todtiana* over low closed grassland of pasture weeds, on plains and slopes or grey/brown sand or loam.
VT8	Isolated mid shrubland of *Xanthorrhoea* ?*drummondii* over low open shrubland of *Acacia pulchella* and *Hibbertia hypericoides* subsp. *hypericoides* over low open sedgeland of *Mesomelaena pseudostygia*, *Schoenus brevisetis*, *Schoenus clandestinus* and *Morelotia octandra*, over isolated low tussock grasses of *Amphipogon turbinatus*, on slopes of yellow-grey sand or red-brown clay loam with laterite.

Highly Modified Areas

IT	Isolated remnant trees and shrubs, sometimes low open woodlands, typically *Corymbia calophylla*, *Eucalyptus rudis* subsp. *rudis*, *Eucalyptus todtiana*, *Jacksonia sternbergiana* and *Acacia saligna*.
PP	Plantations of *Pinus* sp.
PE	Planted trees of *Eucalyptus*, of either native or exotic taxa.
TP	Plantations of **Chamaecytisus palmensis* or **Vitis vinifera*.
JD	Mid to tall sedgeland to open sedgeland of **Juncus acutus* over low closed grasslands of pasture weeds, on drainage lines and sump areas.
PD	Paddocks and Infrastructure, cleared land.
WB	Water Bodies and Artificial Dams.
Unsurveyed	

FIGURE 6.3

Vegetation Types of the Project Area

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

6.2.3 Vegetation Condition

The majority of the Project Area subject to the flora and vegetation assessment has been mapped as 'Completely Degraded' (13,585 ha, 87%). This largely consists of HMAs mapped as PD, PE, PP, TP, IT and JD, where the land has been cleared for pasture or cropping. Little to no native vegetation remains in these areas, although isolated remnant trees may occur. A total of 4.3% of the assessed Project Area was mapped as being in 'Degraded' condition (677.61 ha); these areas predominately consisted of native trees over no or very little understorey taxa, and high levels of introduced (weed) taxa.

A small portion of the assessed Project Area was mapped as being in 'Good' condition (63.7 ha, 0.4%). This comprised the majority of the D&T Survey Area, along Brand Highway, Walyer Walyer Road and Walyoo Road, with some small portions occurring within the remnant vegetation within the Project Area. A smaller portion of the assessed Project Area was mapped as being in 'Very Good' condition (26.9 ha, 0.2%). This condition rating was given to portions of the Brand Highway road verge in the northern section, as well as a small portion of VT4, located south of Stockyard Road.

No vegetation was mapped in 'Pristine' or 'Excellent' condition.

The area of each VT and corresponding condition rating (as per EPA (EPA, 2016b)) mapped in the Project Area is presented in **Table 6.4**. Vegetation condition mapping is provided in **Figure 6.4**.

Table 6.4 Vegetation Condition of the Project Area

VT / HMA	Vegetation Condition					Total
	Completely Degraded	Degraded	Good	Very Good	Not Applicable	
VT1		197.75	19.35	1.57		218.67
VT2		6.59	7.87	1.52		15.97
VT3		33.11	36.27	9.87		79.26
VT4		404.79		14.00		418.79
VT5		26.42				26.42
VT6		5.35				5.35
VT7		3.60				3.60
VT8			0.26			0.26
IT	166.38					166.38
JD	179.95					179.95
PD	12975.02					12,975.02
PE	44.32					44.32
PP	167.96					167.96
TP	51.82					51.82
WB					96.00	96.00
Unsurveyed						1,167.86
Total	**13,585.46**	**677.61**	**63.75**	**26.95**	**96.00**	**15,617.63**

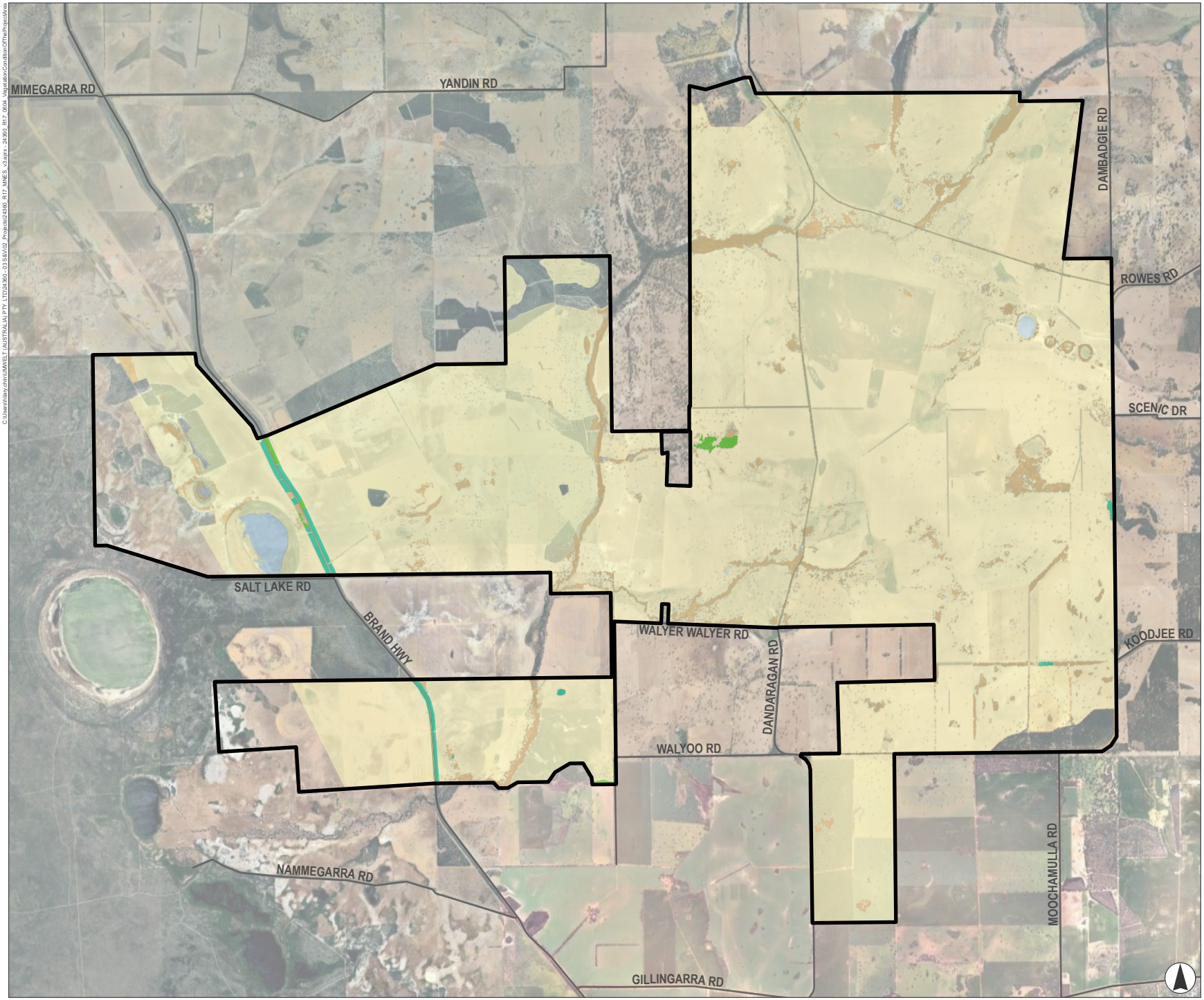


FIGURE 6.4

Vegetation Condition of the Project Area

Legend

- Road
- Project Area

Vegetation Condition

- Very Good
- Good
- Degraded
- Completely Degraded
- NA



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

6.2.4 Threatened Ecological Communities

The desktop assessment identified five listed significant vegetation communities that have records (or could potentially occur) within the Desktop Study Area. Of these, the 'Banksia Woodlands of the Swan Coastal Plain' TEC is considered to occur within the Project Area. Identifying the occurrence of the TEC was undertaken in accordance with the stepwise process outlined in the Approved Conservation Advice for this community (DoEE, 2016b). This process is outlined in Section 5.2.9.1 of **Appendix A.**

None of the remaining significant ecological communities were recorded or are considered to occur in the Project Area, as described in **Appendix A**.

6.2.4.1 Banksia Woodlands of the Swan Coastal Plain

The 'Banksia Woodland of the Swan Coastal Plain' TEC is an ecological community largely confined to the Perth and Dandaragan Plateau IBRA subregions of the SCP IBRA region. The TEC is mainly located on the deep Bassendean and Spearwood sands, and occasionally Quindalup sands (typically on the eastern edge), on shallow sands overlying more complex stratigraphic sequences on the foothills of the Ridge Hill Shelf, Whicher Scarp and Gingin/Dandaragan Scarp. This TEC occurs within an annual rainfall band of approximately 535 to 900 mm, often with summer droughts and high temperatures. This strong seasonal variation in climate, results in the TEC being a fire-prone environment, and therefore supports species with a range of life history traits that allow them to persist in fire-prone environments (DoEE, 2016a).

The Approved Conservation Advice for this TEC (DoEE, 2016a) stipulates a stepwise process for identifying occurrences of the TEC community. These steps were followed in the context of identifying whether vegetation of the F&V Survey Area represents this TEC.

Twenty-seven (27) potential patches of the Banksia Woodlands of the Swan Coastal Plain TEC in the F&V Survey Area were assessed by Umwelt (2025b) against the key diagnostic characteristics (DBCA, 2024b) and in accordance with the process outlined in the Approved Conservation Advice for the TEC (DoEE, 2016a). Detailed results from this assessment can be found in **Appendix A**. The assessment determined that 14 patches do not meet the patch size criteria, and are not considered to contribute significantly to the overall function of the ecological community; they are therefore not considered to be patches of the TEC.

Three patches located inside the F&V Survey Area met both the patch size and vegetation condition criteria of Good or better. Ten patches did not meet the patch size criteria and/or the vegetation condition criteria for their mapped extents in the F&V Survey Area, but they represent vegetation that is contiguous with the occurrence of the TEC immediately outside the F&V Survey Area, which in some cases are unsurveyed blocks of native vegetation within the Project Area. These 13 patches of the TEC comprise a total area of 41.3 ha within the F&V Survey Area and are illustrated in **Figure 6.5**. No patches (either wholly or partially) of the TEC were in 'Pristine' or 'Excellent' condition.

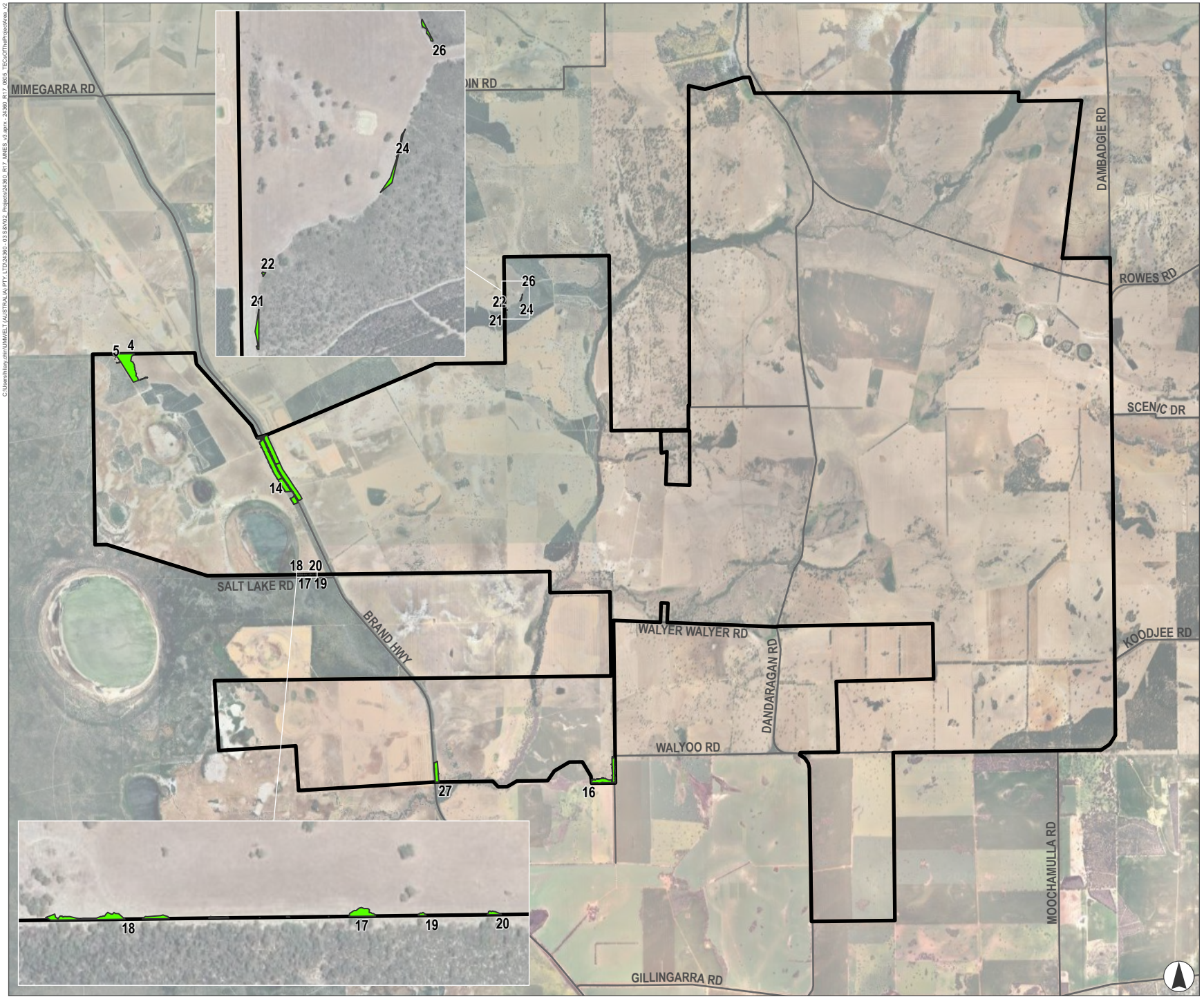


FIGURE 6.5

Threatened Ecological Communities of the Project Area

Legend

- Road
- Project Area
- Banksia Woodlands of the Swan Coastal Plain ecological community (TEC – Endangered)



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

6.2.5 Flora Diversity

A total of 248 discrete flora taxa, including 45 introduced taxa were recorded in the F&V Survey Area as part of the Project specific flora and vegetation surveys. The 248 flora taxa represent a total of 53 families and 146 genera. The most well-represented families were Myrtaceae (36 taxa), Fabaceae (24 taxa), Proteaceae (23 taxa), Poaceae (17 taxa) and Asteraceae (16 taxa). A full list of vascular flora taxa recorded in the F&V Survey Area is presented in **Appendix A**.

6.2.6 Threatened Flora

Ten (10) individuals of one Threatened taxon listed under the EPBC Act (*Grevillea curviloba*) were recorded in an area of planted vegetation outside its natural range. *Grevillea curviloba* (T) has a restricted distribution, with the northernmost records located along the entrance road to RAAF Gingin (located over 60km to the south of the Project Area), and the southernmost records located in Ellenbrook (located over 95km to the south of the Project Area). It has a very narrow east-west distribution, occurring in a line between Gingin and Ellenbrook (Western Australian Herbarium, 1998). This taxon is a common cultivar and is often planted outside of its range throughout Perth and the southwest. It is likely that the 10 individuals recorded were either planted or are a garden escape. All recorded individuals are located outside the Development Corridor and Indicative Project Footprint.

No other listed flora species under the EPBC Act were recorded.

Further information on threatened flora can be found in Section 5.1.2 of **Appendix A**.

6.2.7 Introduced Flora

Forty-five introduced taxa (18.1% of all taxa recorded) were recorded in the F&V Survey Area during Project specific flora and vegetation surveys. Nine of these are taxa are native to Australia, but planted outside their natural range, and thus are classified as introduced in this context.

One Declared Pest listed under the BAM Act (Arum lily (*Zantedeschia aethiopica*)) was recorded in the F&V Survey Area. No Weeds of National Significance were recorded.

6.3 Fauna

6.3.1 Fauna Habitat Types

Twelve broad fauna habitat types were identified within the Project Area, with the majority (11,014.3 ha, 70.5%) being categorised as 'Cleared', mainly consisting of paddocks and areas of infrastructure. The second largest habitat type extent in the Project Area is 'Scattered Trees' (2,281.9 ha, 14.6%), noting that a large proportion of this mapped habitat type comprises bare paddock in between isolated trees.

Table 6.7 summarises the broad fauna habitat types in the Project Area, and their suitability for conservation significant fauna. Detailed fauna habitat type descriptions are provided in the Basic and Targeted Fauna Survey Report (Umwelt, 2025a) (**Appendix B**). Fauna habitat types across the Fauna Survey Area are shown in **Figure 6.6.**

The habitat types of Marri Jarrah Forest, Banksia Woodland, Low Shrubland and Flooded Gum Forest are of the highest value to Black-Cockatoos, while Wetlands and Water Bodies are of the most value for Migratory Shorebirds.

Table 6.5 Terrestrial Fauna Habitat Types within the Project Area

Fauna Habitat Type	Suitability for Conservation Significant Terrestrial Fauna	Area (ha) and Proportion (%) of Project Area
Wetlands (WET)	Suitable habitat for migratory shorebirds and waterbirds. Important watering points with some associated vegetation that may provide some foraging value.	404.5 ha (2.6%)
Water Bodies (WB)	Suitable habitat for migratory shorebirds and waterbirds. Important watering point for Black-Cockatoos.	93.7 ha (0.6%)
Paperbark Dampland (MEL)	Important watering points and some foraging value for Black-Cockatoos.	39.8 ha (0.3%)
Flooded Gum Forest (FG)	May provide some nesting and roosting habitat for Black-Cockatoo species if present.	356.3 ha (2.3%)
Marri Jarrah Forest (MJ)	Foraging habitat for Black-Cockatoo species if present.	114.9 ha (0.7%)
Disturbed Woodland (DW)	Potentially some foraging habitat for Black-Cockatoos depending on flora species presence.	766.9 ha (4.9%)
Scattered Trees (ST)	Potential foraging and breeding habitat for Black-Cockatoo species.	2,281.9 ha (14.6%)
Banksia Woodland (BW)	Foraging habitat for Black-Cockatoo species.	165.8 ha (1.1%)
Low Shrubland (LS)	Potential foraging habitat for Black-Cockatoo species.	186.8 ha (1.2%)
Pine Plantation (PP)	May provide suitable foraging and/or roosting (where near a water source) habitat for Black-Cockatoos.	169.4 ha (1.1%)
Other (OTHER)	Mostly regrowth comprising weeds, with little habitat value.	23.3 ha (0.1%)
Cleared (CL)	Occasional paddock trees may provide some foraging habitat for Black-Cockatoos.	11.014.3 ha (70.5%)
	Total	**15,618 ha**

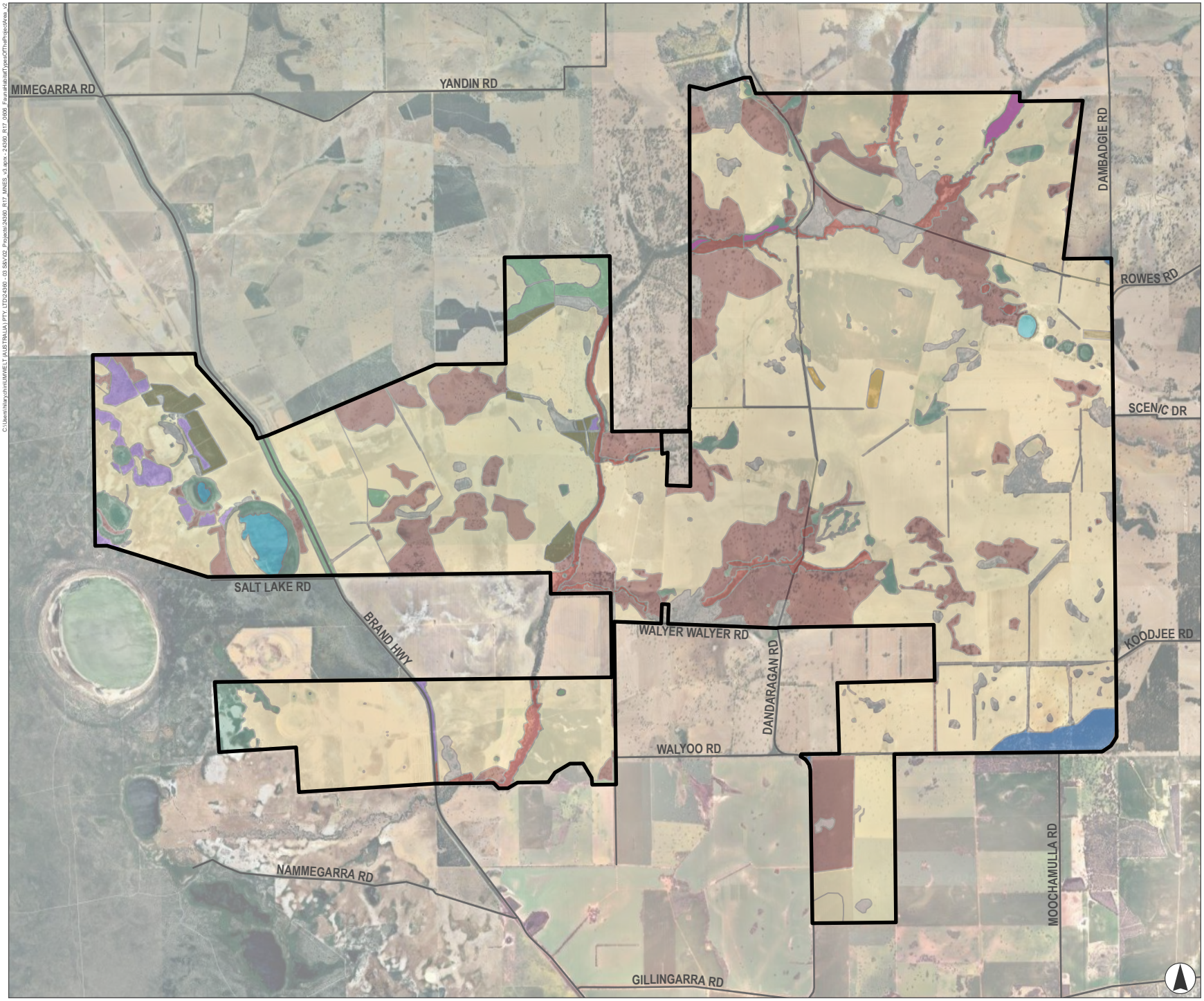


FIGURE 6.6

Fauna Habitat Types of the Project Area

Legend

- Road
- Project Area

Fauna Habitat

- Banksia Woodland
- Flooded Gum Forest
- Low Shrubland
- Paperbark Dampland
- Marri Jarrah Forest
- Disturbed Woodland
- Scattered Trees
- Other
- Pine Plantation
- Cleared
- Water Bodies
- Wetlands



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

C:\Users\hillarynzhin\UMWELT (AUSTRALIA) PTY LTD\24360 - 03 S&V\02_Projects\24360_R17_MINES_v3.aprx - 24360_R17_0606_FaunaHabitatTypesOfTheProjectArea_Legend

Legend

Fauna Habitat

- Banksia Woodland: Open Proteaceae woodland with shrubby understorey. High species diversity of Banksia, Hakea, Grevillea and other native shrubs, Sandy soils.
- Flooded Gum Forest: Stands of Eucalyptus rudis. Grassy and weedy understory with grazing from cattle. Old, mature forest contains hollows suitable for nesting birds, Associated with drainages and low-lying plains, Small, ephemeral pools creating habitat for native frogs and
- Low Shrubland : Dense Proteaceae shrubland with high species diversity of Banksia, Hakea, Grevillea and other native shrubs. Occurs on sandy soils and laterite jump ups.
- Paperbark Dampland: Dense stands of tall *Melaleuca* associated with drainages and damplands. Understory of grass sedges and non-native *Juncus acutus*. Often adjacent to *Eucalyptus rudis* forest , Fallen timber, Small, ephemeral pools creating h
- Marri Jarrah Forest: Marri (*Corymbia calophylla*) Jarrah (*Eucalyptus marginata*) forest.Mature forest with hollows, Largely intact understorey providing dense cover, Proteaceae species in understorey provides high value foraging habitat for Carnaby's Bl
- Disturbed Woodland: Eucalyptus woodland with high grazing pressure resulting in little to no understorey species. Includes planted avenue trees and wind breaks.Grassy understory containing few native species of shrubs, Fallen logs and coarse woody debris, Lower quality fora
- Scattered Trees: Cleared pasture and crop with scattered paddock trees. Paddock trees mostly *E. rudis* and *C. calophylla* provide low level foraging value to Carnaby's Black-Cockatoo and potential nest hollows, Lacks logs and coarse woody debris.
- Other: Highly disturbed, weedy regrowth and cultivated shrubs.
- Pine plantation: Understorey consisting of grass and pine needles.
- Cleared: Cleared, open paddocks with very few remaining paddock trees. Highly disturbed, Combination of grain and canola crops, Open pasture for sheep and cattle grazing.
- Waterbodies: Large, permanent/semi-permanent water bodies.
- Wetlands, damplands and farm dams. Often integrated with other habitat types such as Waterbodies, Paperbark Dampland and Flooded Gum. May be ephemeral in nature, often degraded, weedy and heavily browsed by cattle. Natural, remnant wetlands contain nativ

FIGURE 6.6

Fauna Habitat Types of the Project Area

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

6.3.2 Black-Cockatoo Habitat

The Basic and Target Fauna Assessment (**Appendix B**) broadly assessed the potential value of habitat types for Black-Cockatoos across the Project Area. Habitat values and suitability was then later refined and mapped within the Development Corridor with the outcomes from the more detailed assessment provided in **Appendix C**.

6.3.2.1 Summary of Black-Cockatoo Habitat at Different Scales

Table 6.6 below provides a summary of Black-Cockatoo foraging, breeding and roosting habitat values in the Indicative Project Footprint, the Development Corridor, the Project Area, and within 12 km of the Project Area.

Table 6.6 Black-Cockatoo Habitat Values at Different Scales

Habitat Type	Indicative Project Footprint	Development Corridor	Project Area	Within 12 km of the Project Area
Foraging	Foraging habitat assessment for vegetation within Indicative Project Footprint based on targeted assessment (see **Section 5.2.2.4**). <u>Carnaby's Black-Cockatoo:</u> • 2.68 ha provides moderate value • 0.65 ha provides moderate to high value • Remaining disturbance areas have negligible to low value • No high value habitat within Indicative Project Footprint. <u>Forest Red-Tailed Cockatoo:</u> • 3.27 ha provides moderate value • 0.03 provides moderate to high value • Remaining disturbance areas have negligible to low value • No high value habitat within Indicative Project Footprint.	Foraging habitat assessment for vegetation within Development Corridor based on targeted assessment (see **Section 5.2.2.4**). <u>Carnaby's Black-Cockatoo:</u> • 3.08 ha No value • 21.16 ha Negligible to low • 19.35 ha Low • 27.35 ha Low to moderate • 10.44 ha Moderate • 6.35 ha Moderate to high • 0 ha High value. <u>Forest Red-Tailed Cockatoo:</u> • 35.57 ha No value • 1.26 ha Negligible to low • 14.22 ha Low • 20.03 ha Low to moderate • 15.73 ha Moderate • 0.91 ha Moderate to high • 0 ha High [1]	Foraging habitat assessment for Project Area based on broad-scale assessment (see **Appendix B**). Moderate to high or high value: • 114.9 ha Marri Jarrah Forest • 165.8 ha Banksia Woodland • 186.8 ha Low Shrubland Low, Low to moderate, and moderate value: • 457 ha Wetlands • 47 ha Paperbark Dampland • 383 ha Flooded Gum Forest • 124 ha Disturbed Woodland • 2,508 ha Scattered Trees • 169 ha Pine Plantation Remaining Project Area assessed as predominantly No or Negligible to low value There is ~1,169 ha of potentially suitable foraging habitat in the Project Area based on Vegetation Associations (DPIRD-005) and Native Vegetation Extent (DPIRD-006) mapping.	There is ~40,010 ha of potentially suitable foraging habitat within 12km of the Project Area based on Vegetation Associations (DPIRD-005) and Native Vegetation Extent (DPIRD-006) mapping. Vegetation associations with potentially suitable foraging habitat include 4, 949, 952, 999, 1009, 1015, 1030, 1031, 1035, 1036, and 1038. Of these areas, approximately 12,592 ha is within conservation estate. Proposed clearing of remnant vegetation and planted trees in the Indicative Project Footprint represents approximately 0.05% of potentially suitable foraging habitat within 12km of the Project Area.
Breeding	A total of 112 potential Black-Cockatoo nest-trees (DBH>500 mm) were recorded within the Indicative Project Footprint. This includes: • 0 rank 1 trees • 0 rank 2 trees • 5 rank 3 trees • 7 rank 4 trees • 100 rank 5 trees Made up of the following species: • Marri (79.5%), • Flooded Gum (9.8%), • Coastal Blackbutt (8%) • Wandoo (2.7%).	A total of 560 potential Black-Cockatoo nest-trees (DBH>500 mm) were recorded within the Development Corridor. This includes: • 0 rank 1 trees • 6 rank 2 trees • 19 rank 3 trees • 25 rank 4 trees • 510 rank 5 trees.	Opportunistic sampling identified a total of 610 potential nest-trees in the Project Area (including those in the Development Corridor), as part of a broad-scale assessment rather than a full census of trees. There is likely a significantly larger number of potential nest-trees in the Project Area. The highest suitability breeding habitat in the Survey Area occurs in tracts of mature Flooded Gum habitat and the single 124 ha tract of Marri Jarrah Forest in the south-east of the Survey Area. There is ~832 ha of potentially suitable breeding habitat in the Project Area based on Vegetation Associations (DPIRD-005) and Native Vegetation Extent (DPIRD-006) mapping. Vegetation associations with potentially suitable breeding habitat include 4, 999, 1009, 1035 and 1038.	• There is ~5,698 ha of potentially suitable breeding habitat within 12km of the Project Area based on Vegetation Associations (DPIRD-005) and Native Vegetation Extent (DPIRD-006) mapping. Vegetation associations with potentially suitable breeding habitat include 4, 999, 1009, 1035, and 1038. Of these areas, ~348 ha is within conservation estate.
Roosting	There are no roost sites in the Indicative Project Footprint.	There are no roost sites in the Development Corridor.	There are two confirmed night-roost sites within the Project Area: • Roost A: Used by up to 8 birds on 1 and 2 November 2024. • Roost B: Used by up to 110 birds on 6–7 May 2025, and up to 200 birds on 23 June 2025.	There is one confirmed roost site within 12 km of the Project Area, approximately 7km to the south. There is ~5,205 ha of potentially suitable roosting habitat within 12 km of the Project Area based on Vegetation Associations (DPIRD-005) and Native Vegetation Extent (DPIRD-006) mapping. Vegetation associations with potentially suitable breeding habitat include 4, 999, 1009, and 1038. Of these areas, approximately 348 ha is within conservation estate.

[1] Note this only includes areas of native vegetation and does not include cleared or pasture areas.

6.3.2.2 Foraging Habitat

Local and Regional Context

An assessment of government-mapped Native Vegetation Extent (DPIRD-005) intersected with Vegetation Associations (DPIRD-006) (DBCA, 2019) provides a general indication of suitable foraging habitat for Black-Cockatoos across the broader regional area. While vegetation association mapping and native vegetation data suggest potential foraging habitats based on likely presence of plant species with preferred food resources, these areas have not been specifically surveyed for foraging values.

Table 6.7 summarises the vegetation associations that provide potentially suitable foraging habitat for Black-Cockatoos and the remaining native vegetation extent of each vegetation association within 12 km of the Project Area.

Table 6.7 Potentially suitable foraging habitat within 12 km of the Project Area

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12km of Project Area (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	537
949	Low woodland; banksia	High	Low	1,047
952	Shrublands; dryandra heath	High	Low	883
999	Medium woodland; marri	High	High	3,930
1009	Medium woodland; marri & river gum	High	High	363
1015	Mosaic: Mixed scrub-heath / Shrublands; dryandra thicket	High	Low	963
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	30,245
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	866
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	493
1036	Low woodland; Banksia prionotes	High	Low	308
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii	High	Low	375
			Total Area	**40,010**

There is approximately 40,010 ha of government mapped Native Vegetation Extent (DPIRD-005) intersected by Vegetation Associations 4, 949, 952, 999, 1009, 1015, 1030, 1031, 1035, 1036, and 1038 (DPIRD-006) within 12 km of the Project Area. Most of the vegetation associations provides higher potential foraging habitat for Carnaby's Black-Cockatoo relative to Forest Red-Tailed Cockatoo.

There is approximately 12,592 ha of potential Black-Cockatoo foraging habitat within Nature Reserves identified within 12 km of the Project Area, including Namming (~10,366 ha), Eneminga (~1,401ha), Bundarra (~419ha), Jam Hill (~306 ha), Moochamulla (~82 ha), Quins Hill Nature Reserve (~17 ha), and South Mimegarra (~1 ha) Nature Reserves. Other significant Nature Reserves slightly beyond 12 km from the Project Area include Moore River National Park and Fynes Nature Reserve.

Project Area

As part of the basic and targeted terrestrial fauna assessment (**Appendix B**), Black-Cockatoo foraging habitat values were assessed at a high level using the BCE (Bamford, 2020) methodology for the various fauna habitats mapped within the Fauna Survey Area. Marri Jarrah Forest, Banksia Woodland and Low Shrubland habitat types were the highest ranked. Habitat mapped as Other, Cleared and Water Bodies were the lowest ranked. The areas of different habitats are shown in **Table 6.8**, with further detail provided in **Appendix B**.

Table 6.8 Foraging Habitats in the Fauna Survey Area

Foraging Value Score out of 6 based on Site Condition (BCE, 2020)	Habitat descriptions	Area* (ha)
1	Other	67
1-2	Water Bodies	99
1-2	Cleared	12,007
1-3	Scattered Trees	2,508
2-3	Wetlands	457
2-3	Paperbark Dampland	47
2-3	Flooded Gum Forest	383
2-4	Disturbed Woodland	124
3-4	Pine Plantation	169
5-6	Marri Jarrah Forest	124
5-6	Banksia Woodland	166
5-6	Low Shrubland	201

* Areas based on Fauna Survey Area of 17,213 ha as described in **Section 5.2.2**

Following on from the above high level assessment, a refined targeted Black-Cockatoo foraging habitat assessment was undertaken across the Development Corridor utilising the BCE (Bamford, 2020) methodology with the resultant mapping presented in **Appendix C**. The BCE scores are provided for impact assessment purposes and context/density for reference in case there is need for offsets.

Almost 93% of the Development Corridor was assessed as having Low, Negligible to low or No foraging value for Black-Cockatoos. Areas of Moderate or better foraging value were isolated and mostly occurred in the south-east of the Development Corridor. There were also narrow areas of higher-quality foraging along Walyer Walyer Road in the central-south area of the Development Corridor.

The site condition, site context, density and overall foraging habitat quality scores within the Development Corridor for the Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo and are presented in **Table 6.9** and further details provided in **Appendix C**.

Table 6.9 Site Condition, Site Context, Density and overall Foraging Habitat Quality Scores for Forest Red-tailed Black-Cockatoo Carnaby's Black-Cockatoo within the Development Corridor

Vegetation Score	Forest Red-tailed Black-Cockatoo		Carnaby's Black-Cockatoo	
6: High	0	0	0	0
5: Moderate to High	1.44	0	8.93	0.3
4: Moderate	34.96	1.0	27.68	0.8
3: Low to Moderate	202.91	5.9	212.33	6.2
2: Low	821.74	23.9	848.95	24.7
1: Negligible to low	77.52	2.3	2316.25	67.3
0: Nil	2304.32	66.9	28.75	0.8
Total	**3442.89**	**100**	**3442.88**	**100**
Context Score	0 (where VS ≤ 2)		0 (where VS ≤ 2)	
	1 (where VS ≥ 3)		1 (where VS ≥ 3)	
Species Density Score	0 (where VS ≤ 2)		0 (where VS ≤ 2)	
	1 (where VS ≥ 3)		1 (where VS ≥ 3)	
Foraging Score	**Area (ha)**	**%**	**Area (ha)**	**%**
10: Pristine	0	0	0	0
9: Very high	0	0	0	0
8: High	0	0	0	0
7: Moderate to High	1.44	0	8.93	0.3
6: Moderate	34.96	1.0	27.68	0.8
5: Moderate	202.91	5.9	212.38	6.2
4: Low to Moderate	0	0	0	0
3: Low	0	0	0	0
2: Very low	821.74	23.9	848.95	24.7
1: Negligible to low	77.52	2.3	2316.25	67.3
0: Nil	2304.32	66.9	28.75	0.8
Total	**3442.89**	**100**	**3442.89**	**100**

6.3.2.3 Breeding Habitat

Local and Regional Context

Black-Cockatoo breeding habitat can comprise any eucalypt species (dead or alive) supporting suitable hollows and is most often Wandoo (*Eucalyptus wandoo*), Salmon Gum (*Eucalyptus salmonophila*), and Marri (*Corymbia calophylla*); however, breeding has been recorded in a range of other species.

The following publicly available spatial datasets of Black-Cockatoo breeding sites are available:

- Carnaby's Black-Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054). This dataset shows the confirmed breeding areas where chicks or eggs of CBC have been observed of the Carnaby's Black Cockatoo (CBC) within the Swan Coastal Plain and the Jarrah Forest IBRA regions (DBCA, (2018a). The sites are buffered by 6 km, and the Project Area intersects the buffers for two confirmed breeding areas shown in this dataset as illustrated in **Figure 6.7**. The nearest Carnaby's Black-Cockatoo confirmed breeding areas mapped by DBCA are located approximately six km northeast of the Project Area in Cataby and six kilometres southeast of the Project Area.
- Black-Cockatoo breeding sites (buffered) (DBCA-063), provides sites where breeding is inferred based on surveys that have recorded either birds entering/leaving the next or the inside of the next has been viewed with eggs or chicks. These records represent breeding attempts rather than confirmed fledging success, and have been collected intermittently since 2003, mainly during the peak breeding season (September-January). Breeding sites are buffered to 2 km, and there is one confirmed breeding site located approximately six kilometres southeast of the Project Area. This confirmed breeding site is shown on **Figure 6.8** along with roosting sites.

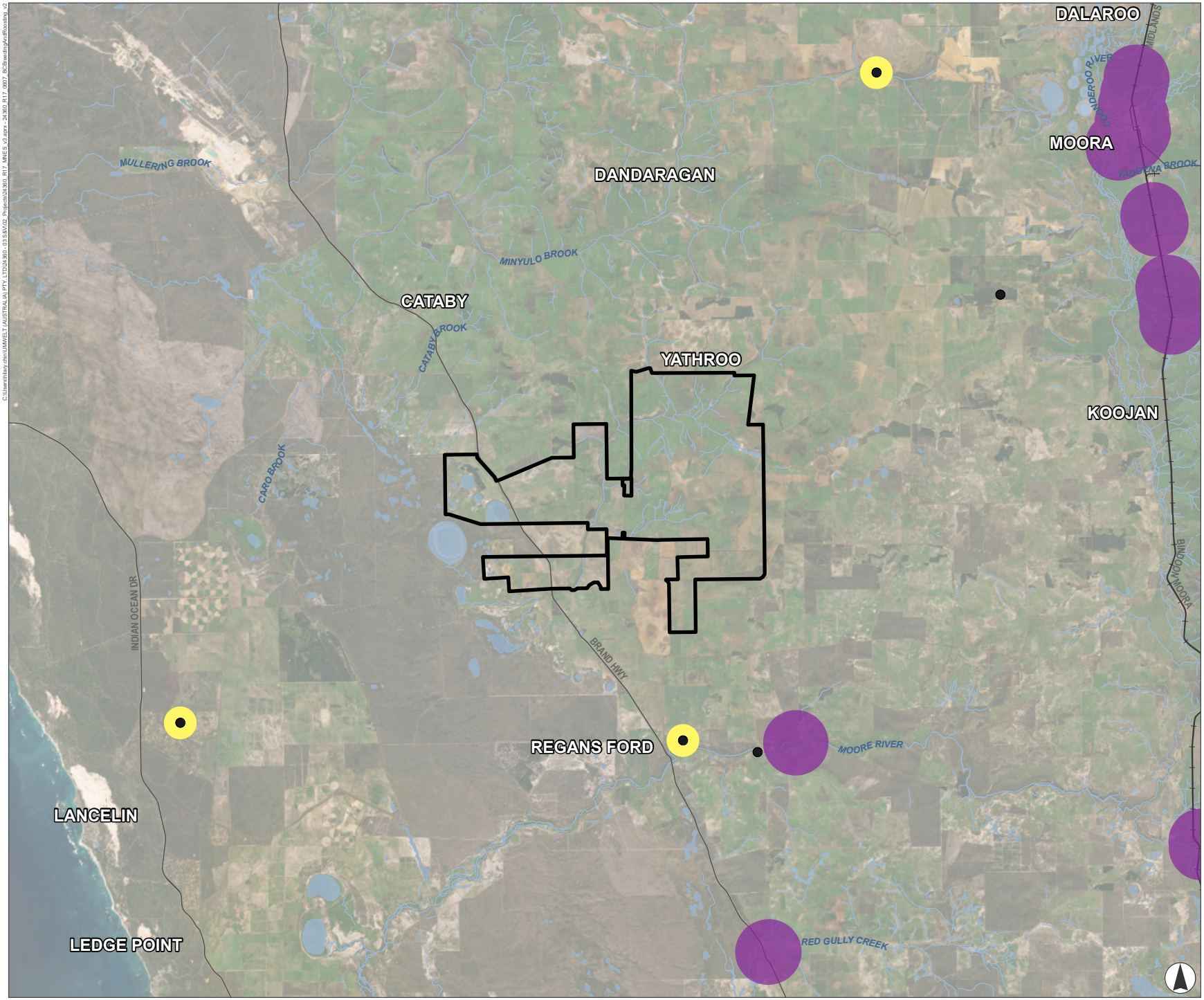


FIGURE 6.7

DBCA Black-Cockatoo Breeding and Roosting Sites

Legend

- Great Cocky Count
- Road
- Railway
- Watercourse
- Waterbody
- Project Area
- Roosting Sites
- Breeding Sites



0 5 10

Kilometres

Scale 1:320,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

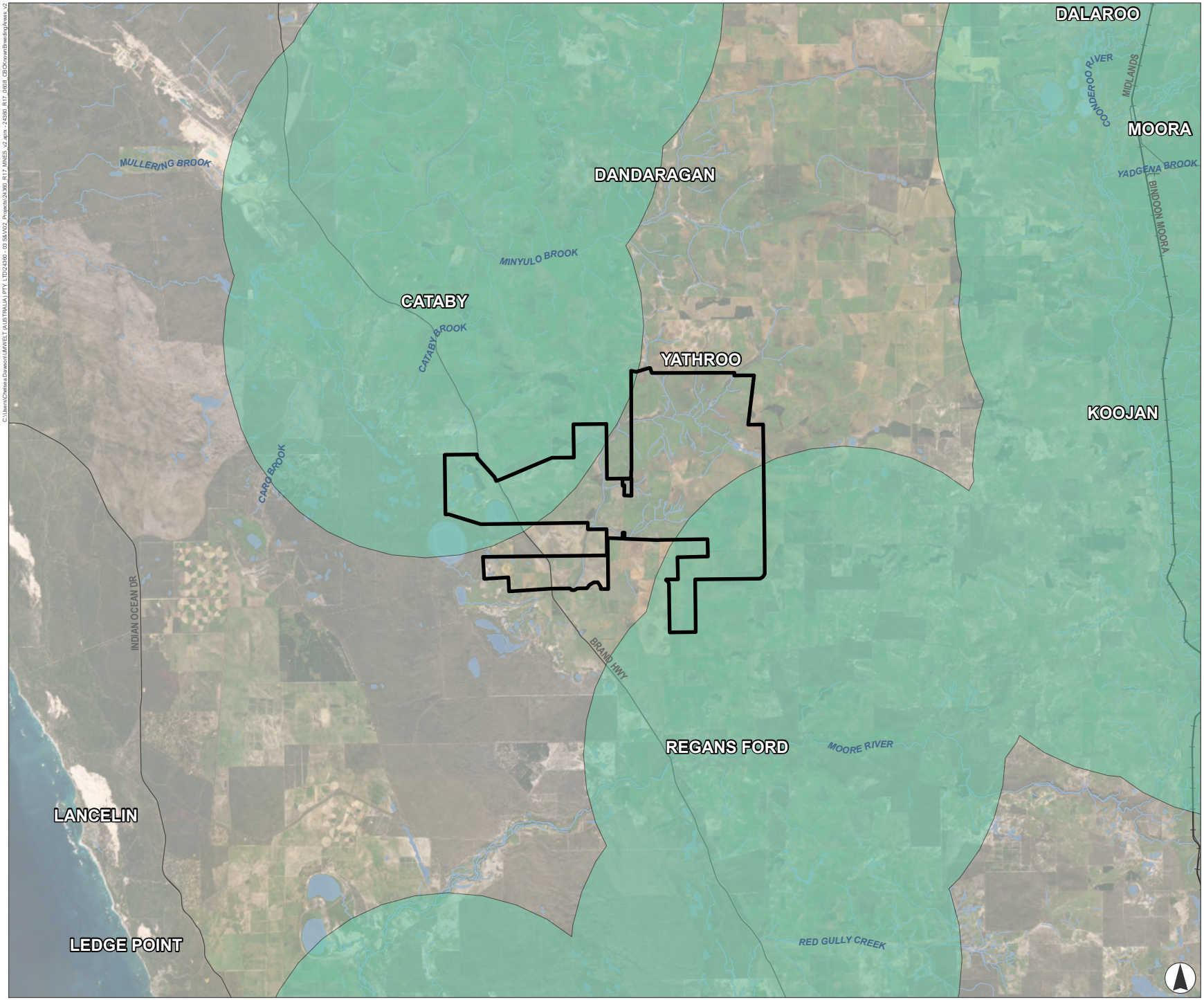


FIGURE 6.8

Carnaby's Black-Cockatoo Known Breeding Areas

Legend

- Road
- Railway
- Watercourse
- Waterbody
- Project Area
- Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)



0 2 4

Kilometres

Scale 1:320,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

An assessment of government-mapped Native Vegetation Extent (DPIRD-005) intersected with Vegetation Associations (DPIRD-006) (DBCA, 2019) provides a general indication of suitable breeding habitat for Black-Cockatoos across the broader area.

Table 6.10 summarises the vegetation associations that provide potentially suitable breeding habitat for Black-Cockatoos and the remaining native vegetation extent of each vegetation association within 12 km of the Project Area.

Table 6.10 Potentially Suitable Breeding Habitat within 12 km of the Project Area

Vegetation Association	Description (DBCA, 2019)	Area within 12km of Project Area (ha)
4	Medium woodland; marri & wandoo	537
999	Medium woodland; marri	3,930
1009	Medium woodland; marri & river gum	363
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	493
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii	375
	Total Area (ha)	**5,698**

This indicates that there is approximately 5,698 ha of remnant vegetation within 12 km of the Project Area which is likely to contain vegetation that can support Black-Cockatoo breeding trees. Breeding potential within these vegetation associations is likely to be similar for both species of Black-Cockatoo that are known to occur in the Project Area. Of these areas, approximately 348 ha is within conservation estate.

Project Area

Black-Cockatoo breeding habitat was assessed at a broad-scale and potential nest-trees were recorded opportunistically in the Fauna Survey Area as part of the Basic and Targeted vertebrate fauna assessment. Potential breeding habitat was identified to potentially be present within older stands of *Eucalyptus rudis* in Flooded Gum Forest and mature *C. calophylla* in woodland habitats and as isolated paddock trees. The highest suitability breeding habitat in the Project Area occurs in tracts of mature Flooded Gum habitat and the single ~115 ha tract of Marri Jarrah Forest in the south-east of the Project Area.

A total of 66 potential nest-trees with a DBH above 500 mm were recorded in the Fauna Survey Area during the initial Basic and Targeted survey. This was based on opportunistic sampling rather than a full census and there is likely to be a significantly larger number of potential nest-trees in the Project Area.

There is 832 ha of potentially suitable breeding habitat in the Project Area based on Vegetation Associations (DPIRD-005) and Native Vegetation Extent (DPIRD-006) mapping. Vegetation associations with potentially suitable breeding habitat include 4, 999, 1009, 1035 and 1038.

A full census survey of potential Black-Cockatoo nest-trees (Rank 1 – 5) was conducted across 697.9 ha (95.7%) of the Indicative Project Footprint utilising the BCE (Bamford, 2020) methodology.

A 'partial' survey (all Rank 1 – 3 trees, but only opportunistically surveyed for Rank 4 and 5 trees) was undertaken across 26 ha (3.6) of the Indicative Project Footprint, with the remaining 5.1 ha (0.7%) not assessed. The unassessed areas are primarily cleared land devoid of trees, however any trees with a DBH in excess of 500 mm within the Indicative Project Footprint will be assessed prior to clearing.

A complete assessment of Rank 1–5 trees was completed over 2,596.6 ha (75.4%) of the Development Corridor, with 762.3 ha (22.1%) subject to a 'partial' survey. Eight-four (84) ha (2.5%) of the Development Corridor has not been assessed.

Opportunistic inspection of trees outside the Development Corridor was also completed.

In total, 560 potential Black-Cockatoo nest-trees were assessed in the Development Corridor and 112 in the Indicative Project Footprint, with the results presented in **Table 6.11**. A series of maps showing the locations of all trees assessed is provided in **Appendix C**.

No active nest-trees (Rank 1) were recorded in the Development Corridor, however one Black-Cockatoo nest tree (herein after referred to as Breeding Site 1) was recorded outside the Development Corridor but within the Project Area on 16 October 2025 as part of the Spring 2025 BBUS (**Figure 6.9**).

Table 6.11 Number and Rank of Potential Black-Cockatoo Nest-trees Recorded

Rank (BCE, 2020)	Number of Potential Black-Cockatoo Nest-trees	
	Development Corridor	Indicative Project Footprint
1	0	0
2	6	0
3	19	5
4	25	7
5	510	100
Total	**560**	**112**

6.3.2.4 Roosting Habitat

Local and Regional Context

Within 12 km of the Project Area there is one confirmed roost site, approximately 7 km south of the Project Area near Regans Ford (see **Figure 6.8**).

An assessment of government-mapped Native Vegetation Extent (DPIRD-005) intersected with Vegetation Associations (DPIRD-006) (DBCA, 2019) provides a general indication of suitable roosting habitat for Black-Cockatoos across the broader area. Table 6.12 summarises the vegetation associations that potentially provide suitable roosting habitat for Black-Cockatoos and the remaining native vegetation extent of each vegetation association within 12 km of the Project Area.

Table 6.12 Potentially Suitable Roosting Habitat within 12 Km of the Project Area

Vegetation Association	Description (DBCA, 2019)	Area within 12 km of Project Area (ha)
4	Medium woodland; marri & wandoo	537
999	Medium woodland; marri	3,930
1009	Medium woodland; marri & river gum	363
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii	375
	Total Area (ha)	**5,205**

This indicates that there is approximately 5,205 ha of remnant vegetation within 12 km of the Project Area which is likely to contain vegetation that can support Black-Cockatoo roosting trees. Roosting potential within these vegetation associations is likely to be similar for both species of Black-Cockatoo that are known to occur in the Project Area. Of these areas, approximately 348 ha is within conservation estate.

Project Area

Suitable roosting habitat for Black-Cockatoos includes tall trees in proximity to water sources. Within the Project Area, this includes Flooded Gum Forest, Jarrah-Marri Forest and Pine Plantation Fauna habitat types

Roost watches were undertaken as part of the basic and targeted survey in November 2024, the Autumn 2025 BBUS and the targeted fauna habitat assessment in June 2025.

On the evenings of 1 and 2 November 2024, Carnaby's Black-Cockatoo roosting was observed in a section of Flooded Gum Forest habitat with a flowing watercourse (refer Roost A, **Figure 6.9**). Up to eight individuals were recorded at once, and it was assessed that it is likely roosting also occurs opportunistically in other similar habitat throughout the Project Area. It was also noted that Pine Plantations may provide potential roosting habitat, particularly in the west of the Project Area where Pine Plantation abuts permanent water and other foraging habitat.

On the nights of 6 and 7 May 2025, up to 110 Carnaby's Black-Cockatoo were observed coming in to roost at the western edge of the Project Area adjacent to the wetlands (Roost B, **Figure 6.9**).

On the night of 23 June 2025, a flock of approximately 150 to 200 Carnaby's Black-Cockatoo were tracked with observations noted in **Table 6.13** and illustrated in **Figure 6.10**.

Table 6.13 Carnaby's Black-Cockatoo Night Roost Observations (23 June 2025)

Observation ID	Easting	Northing	Date	Time	Notes
BCRW01	366271.839	6587551.903	23/06/2025	16:50	40+ Carnaby's Black-Cockatoos located foraging alongside Brand Highway in trees and shrubs. Mostly feeding on *Banksia attenuata* but some on *Eucalyptus todtiana*.
BCRW02	366324.548	6587551.676	23/06/2025	17:01	Birds shifting between trees/shrubs but same general area. More heard to the south.
BCRW03	366364.406	6587545.004	23/06/2025	17:07	Majority of flock moved into the edge of the paddock/mine area to forage on grasses.
BCRW04	366477.255	6587411.753	23/06/2025	17:09	Flock now 50-70+ birds, moved to feed on edge of bund (on ground).
BCRW05	366627.082	6587493.999	23/06/2025	17:17	Most birds flew into mine workings - presumably to drink.
BCRW06	366327.902	6587268.26	23/06/2025	17:21	Flock congregated around dampland area. A total of 140+ birds seen.
BCRW07	366283.436	6587262.563	23/06/2025	17:28	150+ birds departed across paddocks to the north-west.
BCRW08	365156.861	6587806.405	23/06/2025	17:30	150-200 birds arrived at edge of pine plantation. Began taking up roosting positions amongst the pines.
BCRW09	365066.085	6587870.887	23/06/2025	17:42	Birds settling down at roost in pines for the night.

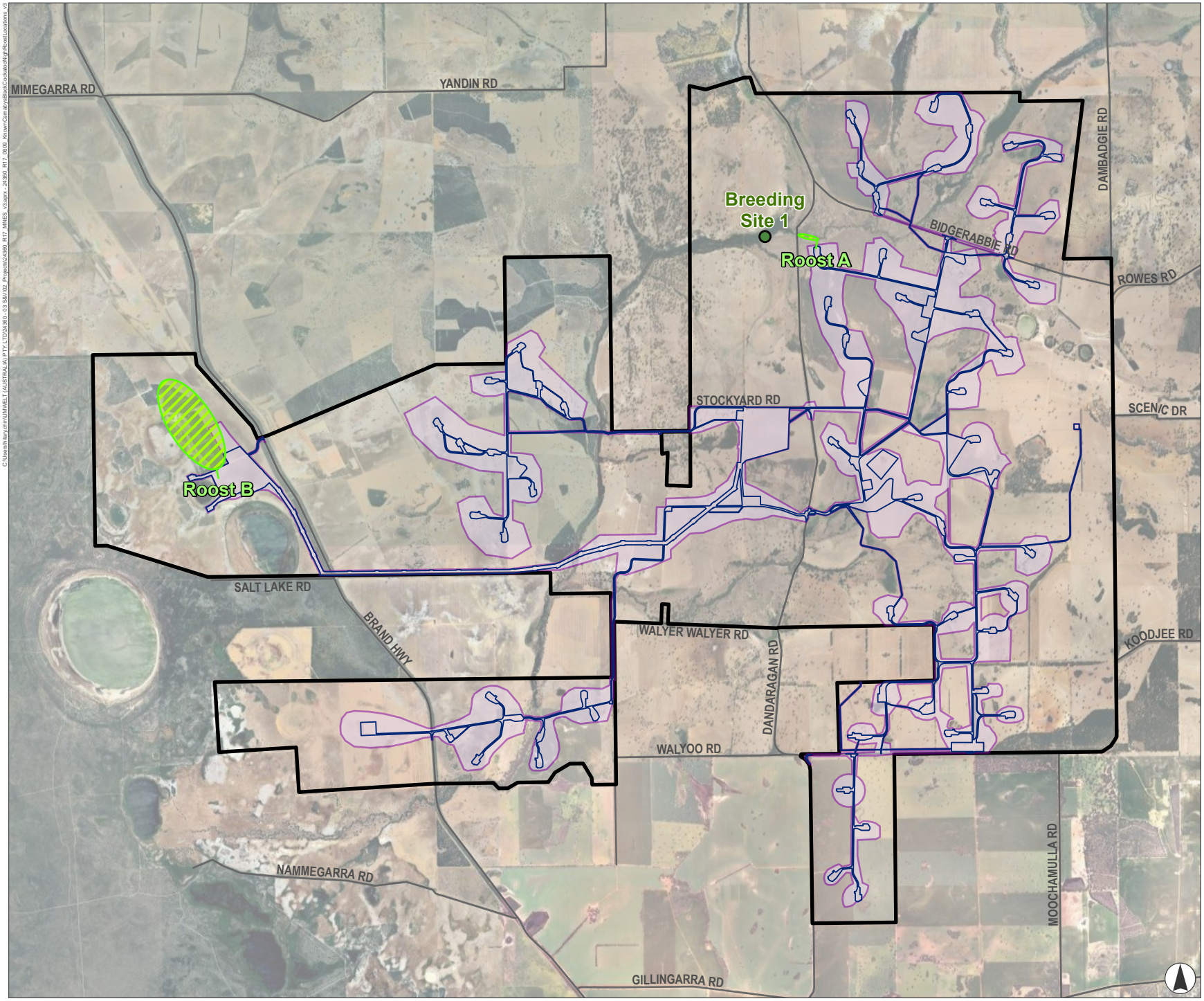


FIGURE 6.9

Known Carnaby's Black-Cockatoo Breeding Site and Night Roost Locations in the Project Area

Legend

- Road
- Project Area
- Development Corridor
- Disturbance Footprint
- Known Night Roost Locations



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

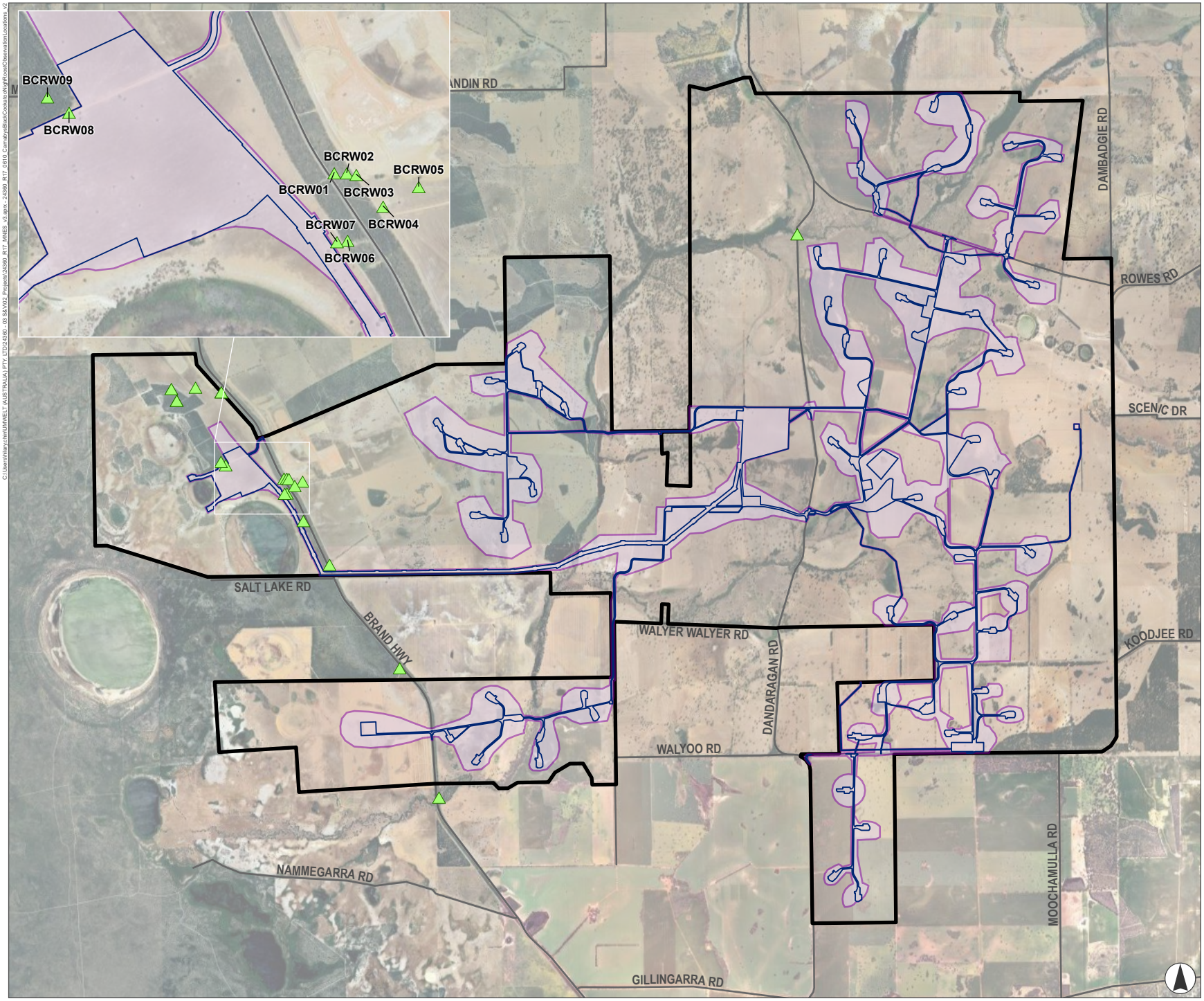


FIGURE 6.10

Carnaby's Black-Cockatoo Night Roost Observation Locations (23 June 2025)

Legend

- Carnaby's Black-Cockatoo Night Roost Observation Location
- Road
- Project Area
- Development Corridor
- Disturbance Footprint



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

6.3.3 Migratory Shorebird Habitat

A Targeted Shorebird Survey Report (**Appendix K**) was developed to document the outcomes of a comprehensive program to address requirements under the Department of Energy and the Environment (2017) *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* and the RFI issued by DCCEEW.

The report comprises of a desktop assessment, habitat mapping and field surveys, with the primary objective being to determine the occurrence, abundance, behaviour and habitat utilisation by conservation significant wetland-dependent bird taxa, and to evaluate the potential risk of impacts associated with the construction and operation of the Project. A copy of the report is provided in **Appendix K** and has been used to inform the following sections.

6.3.3.1 State Context

The most important sites for migratory shorebirds in Western Australia are located along the north-west coast. Eighty Mile Beach and Roebuck Bay are internationally significant for 16 and 18 species respectively and regularly support some of the highest shorebird numbers recorded in the country (Driessen et al, 2025).

In the south-west of Western Australia, regionally important habitat occurs at Peel-Harvey Estuary, Wilson Inlet, and Albany Harbour, with shorebirds also using coastal lakes and estuaries as seasonal water levels recede (Driessen et al, 2025). The closest of these to the Project Area is Peel-Harvey, which is 180 km south of the Project Area.

Lancelin is the closest nationally important site for migratory shorebirds as identified by Driessen et al (2025) and is located 30km west of the Project Area.

6.3.3.2 Regional Context

An assessment of wetlands within a Regional Context Area (RCA; a 5 km buffer around the Project Area) indicates a clear distinction between wetlands located on the Dandaragan Plateau approximately east of Brand Hwy and those on the Swan Coastal Plain approximately west of Brant Hwy.

There are 360 wetlands mapped by DBCA (2025) within RCA. Semeniuk and Semeniuk (1995) have developed a wetland classification system based on landform (e.g. basin, flat or slope) and water permanence. Wetlands present within the RCA are distributed across the following geomorphic wetland categories: ten lakes, 110 sumplands, 224 damplands, five floodplains, four palusplains and seven paluslopes. A description of these wetland categories, including water permanence, is provided in **Table 6.14**. A map of the wetlands within the RCA boundary is provided in **Figure 6.11**.

Table 6.14 Geomorphic Wetland Categories (from Semeniuk & Semeniuk, 1995)

Wetland Category	Description
Lake	Permanently inundated basin. A large, often deep depression that holds permanent or semi-permanent water, typically supporting aquatic vegetation and open water habitats.
Sumpland	Seasonally inundated basin. A low-lying depression that fills with water seasonally, often forming shallow wetlands that dry out in summer.
Dampland	Seasonally waterlogged basin. A seasonally waterlogged area that rarely floods, typically supporting sedgelands or woodlands adapted to moist but not inundated conditions.
Floodplain	Seasonally inundated flat. A flat area adjacent to rivers or creeks that is periodically inundated during high flows, supporting riparian and flood-tolerant vegetation.
Palusplain	Seasonally waterlogged flat. A broad, flat landscape that becomes seasonally waterlogged, often supporting dampland or sumpland vegetation communities.
Paluslope	Seasonally waterlogged slope. A gently sloping area on the margins of palusplains that experiences seasonal waterlogging and supports transitional wetland vegetation.

The RCA and Project Area are located at the interface of three IBRA subregions: SWA01 (Dandaragan Plateau) and SWA02 (Perth) within the Swan Coastal Plain bioregion, and GES02 (Lesueur Sandplains) within the Geraldton Sandplains bioregion. The majority of the RCA and Project Area is within either SWA01 or SWA02 (refer **Figure 6.11**). By definition, the underlying geology of these subregions differs, and this has a direct influence on the type and prevalence of surface wetlands within their bounds (Desmond, 2001; Hill et al., 1996; Mitchell et al., 2002):

- SWA01 is a well-drained, elevated lateritic plateau system, characterised by indurated substrates and generally efficient drainage, resulting in limited, localised wetland expression. Wetlands are typically restricted to drainage lines, valley floors and minor depressions, are often ephemeral and rainfall-driven, and lack the spatial extent, connectivity and groundwater dependence that typify the Swan Coastal Plain.
- SWA02 is a wetland-rich, low-lying sandplain system, where Quaternary dune–swale geomorphology and shallow groundwater tables drive the development of widespread, diverse wetland complexes (e.g. lakes, sumplands, damplands, peat swamps and claypans). Wetlands are typically interconnected and groundwater-influenced, occurring at high frequency across interdunal depressions and alluvial flats, and form a continuous hydrological mosaic across much of the landscape.

This is supported visually in **Figure 6.11** where it can be seen that the majority of geomorphic wetlands in the RCA are located to the west, in the SWA02 subregion, with much fewer wetlands within SWA01 to the east.

6.3.3.3 Project Area

A total of 76 wetlands mapped by DBCA (2025) are within the Project Area and these fall into the following Semeniuk and Semeniuk (1995) geomorphic wetland categories: three lakes, 43 sumplands, 21 damplands, one floodplain, four palusplains and four paluslopes.

A map of the wetlands within the Project Area is provided in **Figure 6.11**, and includes one additional wetland adjacent to Lake Yangy that was not captured by the DBCA mapping.

The proportional representation of the six geomorphic wetland types is similar across the Project Area and RCA, with most wetlands being sumplands and damplands (and relatively few lakes, floodplains, palusplains and paluslopes). The key difference noted is that sumplands and damplands represent approximately 57% and 27%, respectively, of the wetlands in the Project Area but these proportions are roughly reversed for the RCA (31% and 62%, respectively). It is not expected, however, that this creates a substantial functional difference for conservation significant wetland-dependent birds in this instance.

6.3.3.4 Wetland Suitability for Migratory Shorebirds

Where applicable, field observations (of wetland features and wetland-dependent bird presence), database searches and the wetland characteristics provided by DBCA (2025) were used in conjunction with the group- or taxon-specific information to assess the likelihood of each of the 361 wetlands within the RCA and Project Area to support one or more of the migratory shorebird taxa likely to occur within the Project Area.

Regional Context Area

Migratory shorebird taxa of interest are known or are considered likely to occur at 23 (6.4%) of the RCA wetlands as detailed in **Table 6.15**. As illustrated in **Figure 6.11**, almost all the more suitable wetlands (21) occur along the western edge of the RCA/Project Area (in the SWA02 subregion), with only two potentially suitable wetlands located in the central and eastern RCA/Project Area (in the SWA01 subregion).

Migratory shorebird taxa of interest are not reasonably expected at most geomorphic wetlands (89.2% of wetlands were considered 'unlikely' to support these taxa) primarily due to a lack of suitable habitat (surface water, mudflats etc.). The remaining 4.4% of wetlands ('possible') may occasionally provide suitable habitat for migratory shorebirds as seasonal or interannual conditions change.

Table 6.15 Expected Occurrence of Migratory Shorebirds/Waterbirds at Wetlands Within the RCA

Geomorphic Wetland Type	Likelihood of Supporting Migrant Shorebirds					
	Known	Likely	Possible	Unlikely	Total	Percentage
Lake	4	4	0	2	**10**	2.8%
Sumpland	1	11	9	90	**111**	30.7%
Dampland	0	3	7	214	**224**	62%
Floodplain	0	0	0	5	**5**	1.4%
Palusplain	0	0	0	4	**4**	1.1%
Paluslope	0	0	0	7	**7**	1.9%
Total	**5**	**18**	**16**	**322**	**361**	**100%**
Percentage	1.4%	5.0%	4.4%	89.2%	**100%**	

Project Area

Migratory shorebirds are known or considered likely to occur at four of the Project Area wetlands (two lakes and two sumplands), as summarised in **Table 6.16** and mapped in **Figure 6.12**. Three of these sites are located adjacent to one another in the west of the Project Area, with the remaining site, Lake Yangy, in the east. Whilst Lake Yangy was selected as a wetland where migratory shorebirds are likely to occur, due to its smaller size, higher pH [2], and lower habitat suitability in comparison to the other three wetlands, any presence of migratory shorebirds at this site would be expected to be of lower density and shorter durations.

Shorebirds are not reasonably expected at most geomorphic wetlands (68 of the 77 were considered 'unlikely' to support these taxa) primarily due to a lack of suitable habitat (surface water, mudflats etc.). The remaining five wetlands ('possible') may occasionally provide suitable habitat for this group of taxa (as seasonal or interannual conditions change).

Table 6.16 Expected Occurrence of Migratory Shorebirds/Waterbirds at Wetlands Within the Project Area

Geomorphic Wetland Type	Likelihood of Supporting Migrant Shorebirds					
	Known	Likely	Possible	Unlikely	Total	Percentage
Lake	1	1	0	1	3	3.9%
Sumpland	1	1	4	38	44	57.1%
Dampland	0	0	1	20	21	27.3%
Floodplain	0	0	0	1	1	1.3%
Palusplain	0	0	0	4	4	5.2%
Paluslope	0	0	0	4	4	5.2%
Total	**2**	**2**	**5**	**68**	**77**	**100%**
Percentage	2.6%	2.6%	6.5%	88.3%	**100%**	

[2] In situ water quality results were taken on the 23rd of September 2025 for salinity and pH for the four wetlands described, with the three western wetlands recording pH values ranging from 8.38 to 8.74 and Lake Yangy recording a pH of 11.54.

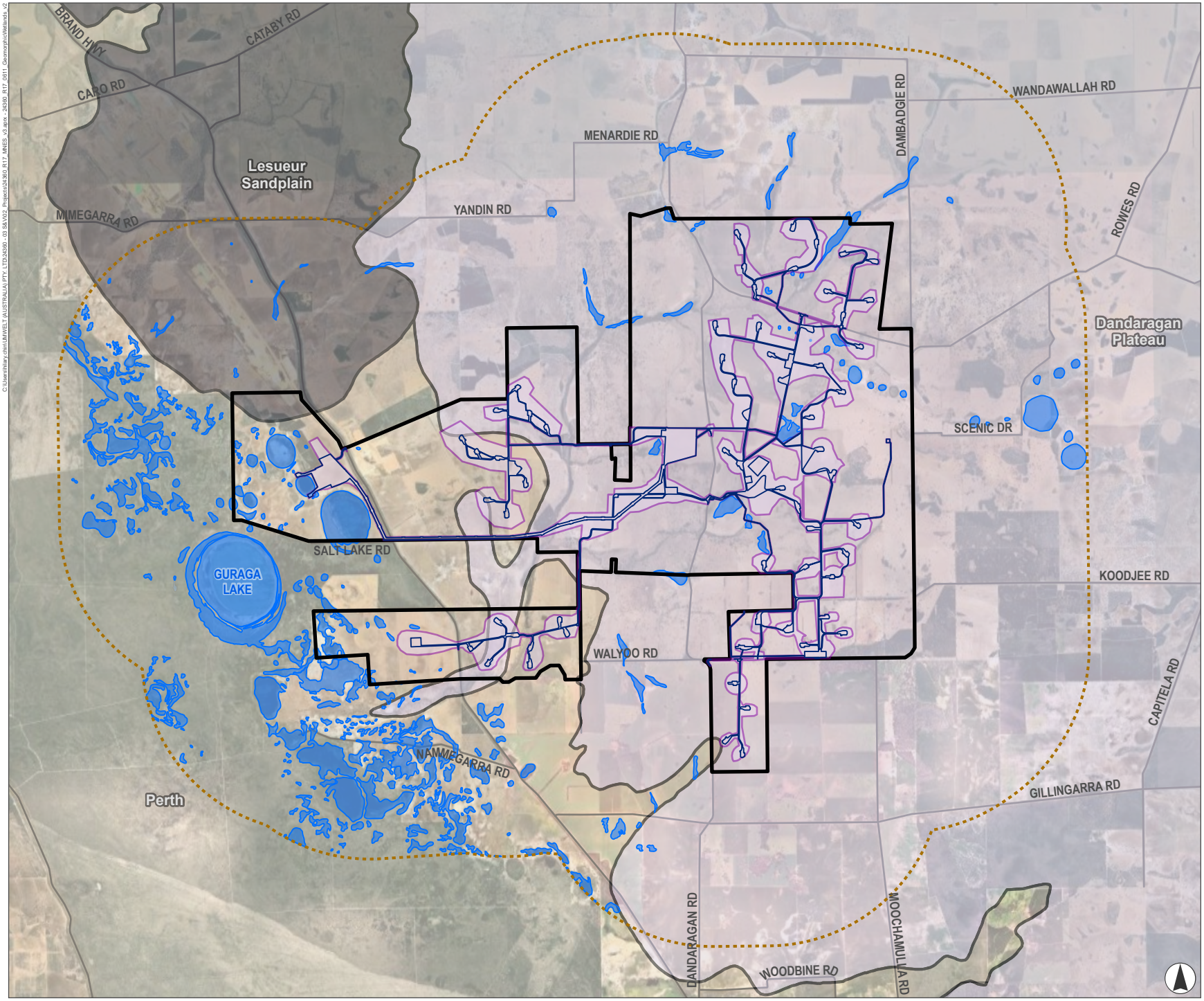


FIGURE 6.11

Geomorphic Wetlands Within the RCA and Project Area

Legend

- Road
- Regional Context Area
- Project Area
- Development Corridor
- Disturbance Footprint
- Geomorphic Wetlands
- Nature Reserve

IBRA Subregions (DCCEEW 2026)

- Dandaragan Plateau (SWA01)
- Lesueur Sandplain (GES02)
- Perth (SWA02)



0 2 4

Kilometres

Scale 1:150,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

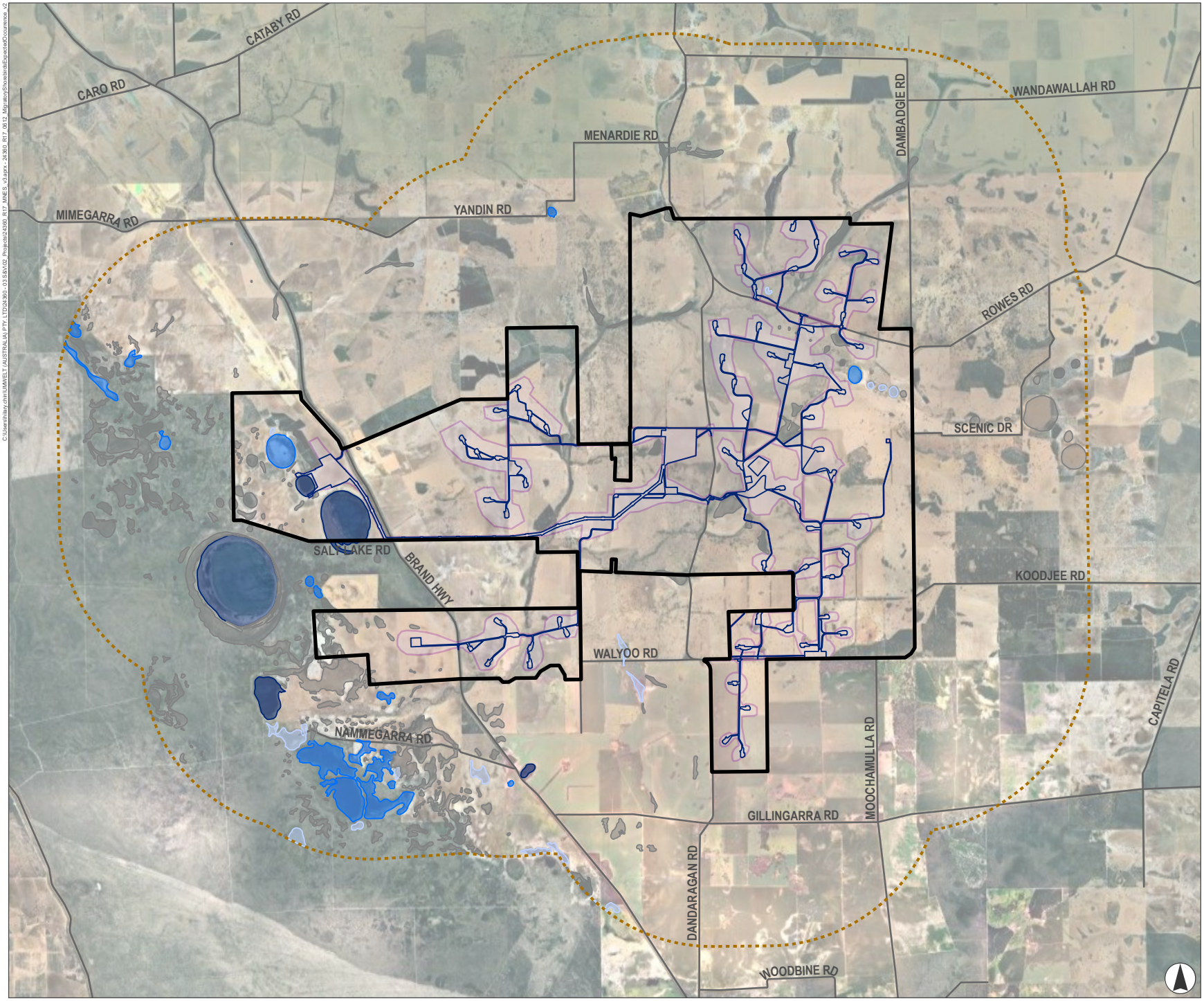


FIGURE 6.12

Expected Occurrence of Migratory Shorebirds/ Waterbirds at Wetlands Within the RCA and Project Area

Legend

- Road
- Regional Context Area
- Project Area
- Development Corridor
- Disturbance Footprint

Migratory Shorebird Suitability

- Known
- Likely
- Possible
- Unlikely



0 2 4

Kilometres

Scale 1:150,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

6.3.4 Fauna Diversity

During the basic and targeted terrestrial fauna surveys (Umwelt, 2025a), a total of 94 vertebrate fauna species were recorded in the Fauna Survey Area across 46 families. This includes three species of amphibian, four reptiles, 75 birds and 12 mammals. The full species list is provided in **Appendix B**.

An additional 76 new bird and bat species were identified during the subsequent BBUS and targeted migratory shorebird surveys, resulting in an overall total of 155 bird and bat species being recorded. The full list of species recorded up to May 2026 is provided in **Appendix N**.

6.3.5 Threatened Fauna

Seven threatened fauna species (all birds) were recorded within the Project Area during the various BBUS and terrestrial fauna surveys completed to date. These are listed below in **Table 6.17** and locations of their records illustrated in **Figure 6.13**.

Table 6.17 Threatened Fauna Recorded within the Project Area

Common Name	Scientific Name	EPBC Act Status	Notes
Carnaby's Black-Cockatoo	*Zanda latirostris*	EN	Recorded on 79 occasions during all seven BBUS with flocks of up to 240 individuals. Recorded on 14 occasions during the basic and targeted surveys. Recorded during targeted habitat survey in June 2025. Occurs in uncleared or remnant native eucalypt woodlands and remnant patches of native vegetation on land otherwise cleared for agriculture where it forages on eucalypt species and proteaceous shrubs. The species also forages seasonally in non-native pine plantations (*Pinus radiata* and *Pinus pinaster*) which provide a supplementary food source in areas where native vegetation has undergone extensive clearing.
Forest Red-tailed Black-Cockatoo	*Calyptorhynchus banksii naso*	VU	Recorded on four occasions during the Winter 2025 BBUS. Recorded on one occasion during the targeted habitat survey in June 2025. The Project Area falls outside of the currently modelled distributions for both this and the next closest subspecies (Western Red-tailed Black-Cockatoo [*C. banksii escondidus*]); however, the Forest Red-tailed Black-Cockatoo formerly had a distribution extending to Dandaragan (Johnstone & Storr, 1998a). After a review of secondary evidence (foraging material), the records were determined to most likely be the Forest Red-tailed Black-Cockatoo.
Sharp-tailed Sandpiper	*Calidris acuminata*	VU, MI	Recorded on three occasions from a single wetland west of Brand Highway. Records were observed in February 2025, January 2026 and February 2026; all of which are in the non-breeding season. Up to eight individuals recorded.

Common Greenshank	*Tringa nebularia*	EN, MI	Recorded on four occasions from a single wetland west of Barnd Highway. Records were observed once in February 2025, twice in January 2026 and once in February 2026; all of which are in the non-breeding season. Up to six individuals recorded.
Black-tailed Godwit	*Limosa limosa*	EN, MI	Recorded on one occasion during Summer 2025 BBUS. One individual was recorded in a single wetland west of Brand Highway.
Bar-tailed Godwit (Northern Siberian)	*Limosa lapponica menzbieri*	EN, MI	Recorded on one occasion during the December 2025 targeted shorebird survey. Three individuals recorded in a single wetland west of Brand Highway.
Curlew Sandpiper	*Calidris ferruginea*	CR, MI	Recorded on one occasion during the February 2026 targeted shorebird survey. One individual recorded in a single wetland west of Brand Highway.

6.3.6 Migratory Fauna

6.3.6.1 Population Status

Eight migratory species (all birds) were recorded within the Project Area during the various BBUS, terrestrial fauna surveys and targeted migratory shorebird surveys completed to date. These are listed below in **Table 6.18** and locations of their records illustrated in **Figure 6.13**. All observations were on the wetlands located on the Western boundary of the site, west of Brand Highway, and over 3.5 km away from the nearest turbines.

Table 6.18 Migratory Fauna Recorded within the Project Area

Common Name	Scientific Name	EPBC Act Status	Notes
Ruff	*Calidris pugnax*	MI	Recorded on one occasion during Summer 2025 BBUS. Three individuals were recorded.
Red-necked Stint	*Calidris ruficollis*	MI	Recorded on four occasions from a single wetland west of Brand Highway. Records were observed in February 2025, January 2026, February 2026 and March 2026; all of which are in the non-breeding season. Up to 12 individuals recorded.
Wood Sandpiper	*Tringa glareola*	MI	Recorded on two occasions during the basic and targeted fauna survey. Fifteen individuals were recorded from a single wetland west of Brand Highway.
Sharp-tailed Sandpiper*	*Calidris acuminata*	VU, MI	Recorded on three occasions from a single wetland west of Brand Highway. Records were observed in February 2025, January 2026 and February 2026; all of which are in the non-breeding season. Up to eight individuals recorded.
Common Greenshank*	*Tringa nebularia*	EN, MI	Recorded on four occasions from a single wetland west of Brand Highway. Records were observed once in February 2025, twice in January 2026 and once in

			February 2026; all of which are in the non-breeding season. Up to six individuals recorded.
Black-tailed Godwit*	*Limosa limosa*	EN, MI	Recorded on one occasion during Summer 2025 BBUS. One individual was recorded from a single wetland west of Brand Highway.
Bar-tailed Godwit (Northern Siberian)	*Limosa lapponica menzbieri*	EN, MI	Recorded on one occasion during the December 2025 targeted shorebird survey. Three individuals recorded from a single wetland west of Brand Highway.
Curlew Sandpiper	*Calidris ferruginea*	CR, MI	Recorded on one occasion during the February 2026 targeted shorebird survey. One individual recorded from a single wetland west of Brand Highway.

* Also listed in **Table 6.17**

All migratory shorebirds listed in **Table 6.18** are non-breeding visitors to Australia. These species are only likely to occur within the Project Area from early spring to late summer with presence heavily influenced by the availability of suitable habitat. Their preferred foraging habitat in freshwater systems is large ephemeral or permanent water bodies which retract during summer, leaving an exposed, muddy bank. **Figure 6.12** illustrates the wetlands where migratory shorebirds have been known or are more likely to occur within the RCA and Project Area.

6.3.6.2 Site Utilisation

While the Project Area supports multiple taxa of migratory shorebirds, the field studies undertaken for the Project indicate that occurrence is generally sporadic and abundances are very low. In no case was a nationally or internationally significant number of birds recorded (for any taxon).

Based on suitability analysis and field surveys, a strong spatial pattern in habitat suitability is clear. The highest quality wetlands were concentrated in the west of the Project Area within the Swan Coastal Plain (SWA02) IBRA subregion, whereas the majority of the Indicative Project Footprint, and all wind turbine infrastructure, is situated within the Dandaragan Plateau (SWA01) subregion in the east of the Project Area (which is also comparatively depauperate in suitable wetlands). This spatial separation trend is especially true for conservation significant shorebirds noting all records were restricted to the wetlands in the west of the Project Area (within the SWA02 IBRA subregion), indicating they are unlikely to fly across the Project Area to forage in wetlands to the east, within the SWA01 IBRA subregion.

Flight Characteristics

There have been seven BBUS undertaken to date across the Project Area, and while migratory shorebirds have been recorded within wetlands surveyed, none have been observed in flight during approximately 140 person-days of BBUS across a 27-month period. This indicates that the migratory shorebirds in question primarily occupy their time foraging in suitable wetlands when conditions are favourable, with no passage between wetlands observed during surveys undertaken.

Migratory Flight Paths

According to literature sources (Dokter et al., 2011; Galtbalt et al., 2025; Lilleyman et al., 2021; Senner et al., 2018; Watts et al., 2021), shorebirds are expected to fly very high when they traverse long distances for true 'migration' flights (above RSA height; at altitudes in the hundreds of metres to kilometres). They are likely to fly at lower heights for local movements, such as those between local wetlands (at altitudes of tens to low-hundreds of metres, including below, within and, possibly, above RSA height).

Migration flights for *shorebirds* are more likely to occur at night, with local movements often dictated by tidal patterns (not relevant to the Project in this case) and, therefore, may occur at any time of the day.

Whilst no flight data was captured to describe migratory shorebird movement corridors or pathways (should they even exist), the survey data collected as part of the field investigations do not provide any evidence to suggest that migratory shorebirds fly across (in a west-east direction) the Project Area. Based on available habitat in the region, and the ecology of migratory shorebirds recorded, they are much more likely to move north-south along the wetland chains of the SWA02 IBRA subregion, or west to the coast, and not in a west-east orientation between wetlands of SWA02 (west) and SWA01 (east).

6.3.7 Bird and Bat Diversity

A total of 155 bird and bat species were recorded during the numerous field survey program. Of these, ten are listed under the EPBC Act (refer **Table 6.17** and **Table 6.18**).

The most frequently observed bird species across the BBUS program were Australian Ringneck (*Barnardius zonarius*), Galah (*Eolophus roseicapilla*), and Australian Raven (*Corvus coronoides*), none of which are recognised as threatened species.

Carnaby's Black-Cockatoo was the most frequently recorded EPBC Act listed species (approximately 101 records) with flocks of up to 240 individuals recorded.

Seven (7) bat species were detected via passive ultrasonic recorders in the Project Area. No EPBC Act listed bat species were recorded.

The full list of bird and bat species identified during the Year 1 field surveys are presented and discussed in detail in the Year 1 BBUS report, a copy of which is provided in **Appendix H**. Findings from the Spring 2025. Summer 2026 and Autumn 2026 BBUS are provided in **Appendix I**. A full list of all bird and bat species recorded up to May 2026 is provided in **Appendix N**.

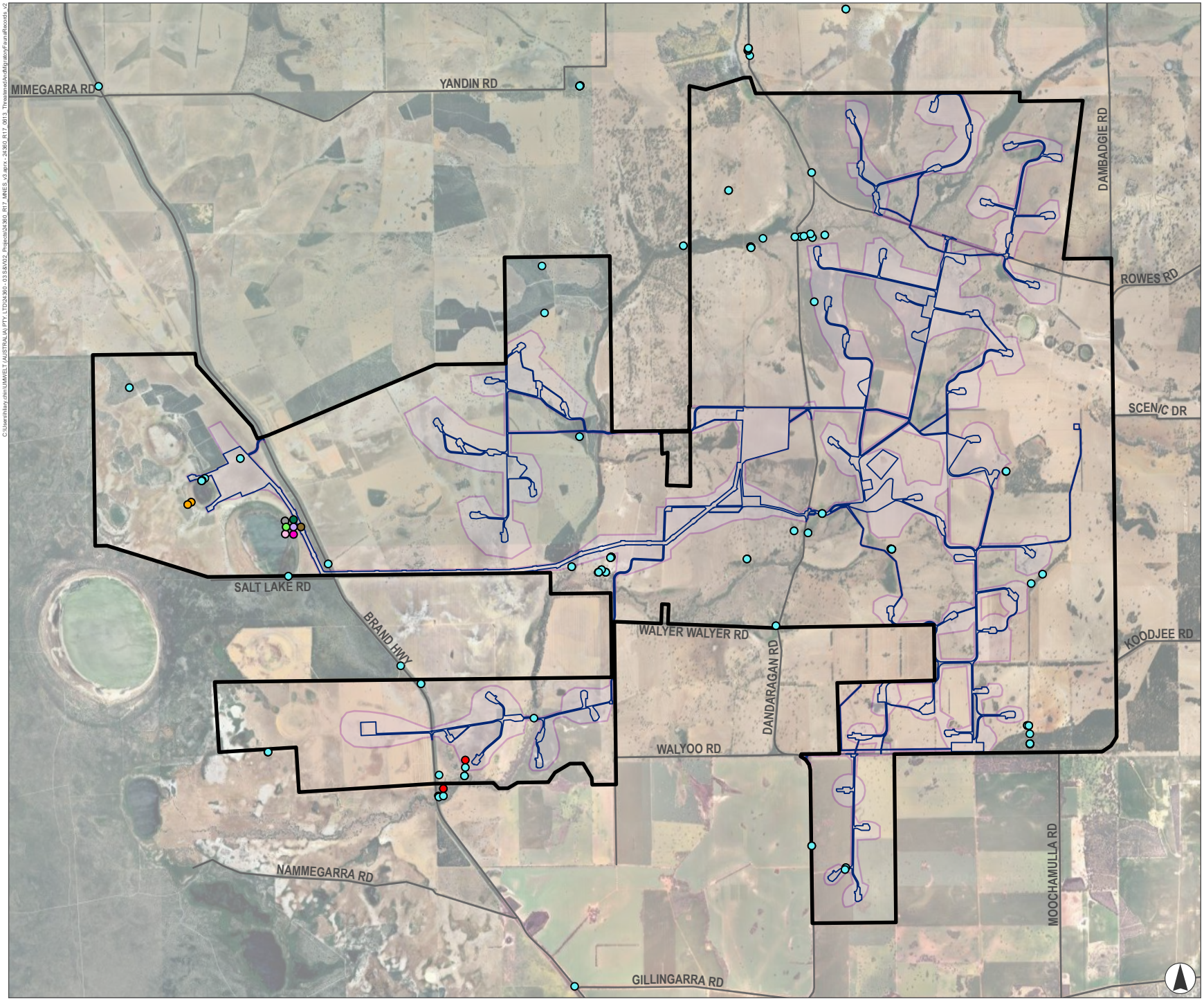


FIGURE 6.13

Threatened and Migratory Fauna Recorded in the Project Area

Legend

- Road
- Project Area
- Development Corridor
- Disturbance Footprint

Conservation Significant Species' Records

- Bar-tailed Godwit (*Limosa lapponica menzbieri*)
- Black-tailed Godwit (*Limosa limosa*)
- Carnaby's Black-Cockatoo (*Zanda latirostris*)
- Common Greenshank (*Tringa nebularia*)
- Curlew Sandpiper (*Calidris ferruginea*)
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)
- Red-necked Stint (*Calidris ruficollis*)
- Ruff (*Calidris pugnax*)
- Sharp-tailed Sandpiper (*Calidris acuminata*)
- Wood Sandpiper (*Tringa glareola*)



0 2 4

Kilometres

Scale 1:100,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

6.3.8 Introduced fauna

Five introduced fauna species were recorded during the survey program:

- Red fox (Vulpes vulpes)
- Cattle (Bos taurus)
- Sheep (Ovis aries)
- House mouse (*Mus musculus*)
- Laughing kookaburra (*Dacelo novaeguineae*).

6.4 Connectivity

The Project Area comprises a complex mosaic of remnant native vegetation patches, plantations, planted windbreaks and agricultural lands. Some of the patches to the west are contiguous with larger, adjacent areas of native vegetation. The Project Area has been subject to considerable disturbance and development with many parts still subject to these pressures.

Connectivity of the remnant vegetation (for most terrestrial vertebrate fauna) is present, although tenuous in most places. The western parts of the Project Area directly abut other existing remnants, namely Eneminga and Namming Nature Reserves. There is very limited connectivity to the north, south and east of the Project Area, with surrounding lands largely consisting of agricultural lands. It is expected that there may be barriers to the movement of some fauna (especially the smaller, nonvolant taxa such as frogs and most reptiles) to and from the Project Area but that other, more mobile taxa (such as birds, bats and larger non-volant mammals) are unlikely to be significantly inhibited.

6.5 Likelihood of Occurrence

A likelihood of occurrence assessment was undertaken for threatened flora, TECs, threatened fauna and migratory species. The results of this assessment are presented below.

6.5.1 Threatened Flora

The flora and vegetation assessment included an assessment of the likelihood of threatened flora occurring in the F&V Survey Area. The assessment considered the threatened flora recorded from desktop assessments, whether suitable habitat is likely to be present, distance of closest record, and currency of records.

Thirty-one (31) threatened flora species were identified in the PMST report (**Appendix E**) as “likely”, “may”, or “known” to occur within the Desktop Study Area. Of these, one EPBC listed threatened flora species was recorded in the Project Area and as such is assigned a likelihood of occurrence as “known”. This is the *Grevillea curviloba* (T), which is considered to be planted outside of its range as described in **Section 6.2.6**. This species was recorded in the D&T area, however is considered unlikely to occur across the broader Project Area, and the Indicative Project Footprint has avoided the area these specimens were recorded.

The remaining 30 threatened flora species identified from the PMST report (**Appendix E**) were subject to a likelihood of occurrence assessment (**Appendix F**) and it was determined that all are 'Unlikely' to occur in the D&T Survey Area. Within the Project Area, 22 species are considered 'unlikely' to occur and eight species are considered 'possible' to occur (**Appendix A**). It should be noted however that the vegetation of the Indicative Project Footprint outside of the D&T Survey Area is Degraded or Completely Degraded, and there is a low likelihood of significant flora taxa being present in these areas due to the disturbed nature of the vegetation.

A detailed likelihood of occurrence for threatened EPBC listed flora species is provided in **Appendix F** and BC Act listed species provided in **Appendix A**.

6.5.2 Threatened Ecological Communities

A desktop assessment identified five threatened ecological communities (TECs) that have records (or could potentially occur) within the Desktop Study Area. Of these, the 'Banksia Woodlands of the Swan Coastal Plain' TEC was recorded within the Project Area as part of field surveys.

The Flora and Vegetation Assessment (**Appendix A**) assessed the potential for the remaining four TECs to occur in the in the F&V Survey Area. The assessment found that none of these are considered to occur in the F&V Survey Area, however, two communities were unable to be assessed for presence. Full details of the assessment can be found in Table 5.10 of **Appendix A**.

6.5.3 Threatened and Migratory Fauna

Based on field surveys, database searches and literature reviews, 15 threatened and migratory fauna species were determined to have a moderate or greater likelihood of occurrence in the Project Area. All species are birds with ten species having a known record in the Project Area, three having a high likelihood of occurrence and two having a moderate likelihood of occurrence. Details of these species and their assessed likelihood of occurrence are presented below in **Table 6.19**.

Table 6.19 Threatened and Migratory Fauna Likelihood of Occurrence

Common Name	Scientific Name	Cth Status	Likelihood of Occurrence
Black-tailed Godwit	*Limosa limosa*	EN & MI	Known
Bar-tailed Godwit (Northern Siberian)	*Limosa lapponica menzbieri*	EN & MI	Known
Carnaby's Black-Cockatoo	*Zanda latirostris*	EN	Known
Common Greenshank	*Tringa nebularia*	EN & MI	Known
Forest Red-tailed Black-Cockatoo	*Calyptorhynchus banksii naso*	VU	Known
Red-necked Stint	*Calidris ruficollis*	MI	Known
Ruff	*Calidris pugnax*	MI	Known
Sharp-tailed Sandpiper	*Calidris acuminata*	VU & MI	Known
Wood Sandpiper	*Tringa glareola*	MI	Known
Common Sandpiper	*Actitis hypoleucos*	MI	High
Curlew Sandpiper	*Calidris ferruginea*	CR & MI	Known
Glossy Ibis	*Plegadis falcinellus*	MI	High
Pacific Golden Plover	*Pluvialis fulva*	MI	High
Long-toed Stint	*Calidris subminuta*	MI	Moderate
Fork-tailed Swift	*Apus pacificus*	MI	Moderate

The Osprey (*Pandion haliaetus*) was detected from the Atlas of Living Australia, BirdLife, NatureMap and PMST databases. However, the detailed Likelihood of Occurrence assessment which also considered field survey results and literature review, determined that the Project Area may only provide scattered marginal habitat for the species and is considered unlikely to regularly support the species. As a result of this, the likelihood of the Osprey occurring within the Project Area was deemed to be Low, and therefore it is not considered further in this assessment.

Similarly, the likelihood of the Australian Painted Snipe (*Rostratula australis*) occurring within the Project Area was deemed to be Low, considering density of regional records, given it was not recorded during field surveys and that the Project Area falls outside the known distribution of the taxon.

7.0 Potential Impacts

Potential impacts to MNES may occur during construction, operation and maintenance of the Project, including direct impacts (such as vegetation clearing, habitat removal or blade strike) and indirect effects (such as weed introduction or spread).

Impact assessments are based on the entire Indicative Project Footprint (729 ha) being cleared and assumes no more than 10.28 ha of remnant native vegetation, 5.45 ha of isolated remnant trees and 5.05 ha of planted native vegetation, as well as clearing of planted non-native vegetation. All ground disturbance will be within the Development Corridor which covers approximately 3,443 ha (**Figure 1.2)**.

Key potential impacts to MNES are identified in **Table 7.1**, with additional detail on these contained in the proceeding sections. Impact avoidance, mitigation, and management measures are described in **Section 8.0**. Detailed Significant Impact Assessments are presented in **Section 9.0** for ecological communities known in the Project Area and MNES fauna species with a Moderate or higher likelihood of occurrence in the Project Area.

Table 7.1 Key Potential Impacts to MNES with a moderate or higher likelihood of occurrence in the Project Area

MNES	Potential Impact	Timing
TEC	Loss of TEC	Construction
Threatened Flora	Loss of Threatened Flora	Construction
Black-Cockatoos	Loss of foraging habitat	Construction
	Loss of breeding sites	Construction
	Loss of roosting sites	Construction
	Direct mortality due to blade strike	Operation
Migratory Shorebirds	Loss of foraging habitat	Construction
	Direct mortality due to blade strike and transmission line strike	Operation

7.1 Construction Phase

The construction phase of the Project will consist of installing wind turbines, BESS, substations, access tracks, underground and overhead cabling, and other ancillary infrastructure. The sections below outline potential direct and indirect impacts associated with construction. Many of these impacts are expected to be temporary and localised, occurring in specific areas as work progresses through the Development Corridor.

7.1.1 Direct Impacts

7.1.1.1 Native Vegetation Clearing

Based on the current Indicative Project Footprint within the Development Corridor, the Project may result in the disturbance of up to 10.28 ha of remnant native vegetation, 5.45 ha of isolated remnant trees in cleared agricultural land and 5.05 ha of planted native vegetation.

This area of disturbance has been materially reduced through the iterative project design and has the potential to be further reduced as the Project progresses through detailed design stages.

Project infrastructure has sought to avoid where possible clearing of vegetation that meets the 'Banksia Woodland of the Swan Coastal Plain' TEC. However, to gain access and deliver infrastructure to the Project Area west of Brand Highway, a section of TEC is required to be cleared. The access point has been selected to avoid clearing of TEC in Good condition or better, and an area where the TEC has been mapped as Degraded has been selected as the access location. The access point has been minimised as far as possible resulting in the proposed overall disturbance of 0.11 ha of Degraded 'Banksia Woodland of the Swan Coastal Plain' TEC.

One Threatened flora species (*Grevillea curviloba*) was recorded during the survey. However, it was found to be planted outside of its natural range, in an area of disturbed, revegetated bushland along Brand Highway. This taxon is also a common cultivar and is often planted outside of its range throughout Perth and the southwest. Ten (10) individuals of the species were recorded and it is likely these were either planted or are a garden escape. The location of these species lies outside the Development Corridor and Indicative Project Footprint.

The likelihood of occurrence assessment determined that no threatened flora species are likely to occur in Indicative Project Footprint (**Section 6.5.1**) and therefore are not expected to be cleared.

Significant effort has been made to avoid and minimise native vegetation clearing within the Development Corridor, with most clearing involving fringe patches of degraded vegetation or isolated trees in areas with completely degraded vegetation. Clearing of Good condition vegetation has been minimised as far as practicable and there will be no clearing of vegetation in 'Very Good' condition or better. **Table 7.2** presents the condition of the vegetation in the Indicative Project Footprint. Clearing of 'Good' condition vegetation will be limited to 2.23 ha.

Table 7.2 Vegetation Condition of the Indicative Project Footprint

Vegetation Condition (EPA, 2016b)	Area (ha)
Completely Degraded	12.77
Degraded	8.05
Good	2.23
Very Good	-
Pristine	-
Total	**23.05**

Mitigation measures addressing the impacts of clearing will be included in the Construction Environmental Management Plan (CEMP) as outlined in **Section 8.2.1**. The Preliminary CEMP can be found in **Appendix G**.

7.1.1.2 Fauna Habitat Loss

Vegetation clearing during the construction phase presents potential impacts to fauna, such as:

- direct displacement of fauna within the Indicative Project Footprint
- fragmentation of populations

- reduced availability of important habitat and features (e.g. tree hollows or foraging habitat) for Threatened and Migratory species which rely on the availability of nesting, breeding, foraging, and shelter habitat for survival.

Following the completion of the construction phase, existing populations are likely to continue to disperse and access resources within and beyond the Project Area, due to the limited additional habitat loss and lack of fencing that could prohibit dispersal of identified MNES species.

Black-Cockatoo Habitat

Foraging

Table 7.3 **and**

Table 7.4 present the site condition foraging value scores of vegetation (remnant native vegetation and planted vegetation) proposed to be cleared within the Indicative Project Footprint for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo respectively. A score out of 10 is also presented for the purposes of aiding offset calculations should they be required.

Table 7.3 Carnaby's Black-Cockatoo Vegetation Foraging Value Scores

Foraging Value Score out of 6 based on Site Condition (BCE, 2020)	Foraging Value Score out of 10 (BCE, 2020)*	Native Vegetation (ha) within Indicative Project Footprint	Isolated Remnant Trees (ha) within Indicative Project Footprint	Planted Vegetation (ha) within Indicative Project Footprint	Total Vegetation (ha/%) within Indicative Project Footprint
0: No foraging value	0	0.29	0.13	1.00	1.42 (6%)
1: Negligible to low foraging value	1	1.33	1.66	3.73	6.72 (29%)
2: Low foraging value	2	1.83	1.72	0.78	4.32 (19%)
3: Low to moderate foraging value	5*	4.17	1.50	1.59	7.26 (31%)
4: Moderate foraging value	6*	2.01	0.44	0.23	2.68 (12%)
5: Moderate to high foraging value	7*	0.65			0.65 (3%)
6: High foraging value	8*				0.00 (0%)
Total		**10.28**	**5.45**	**7.33**	**23.05**

*Context score = 1. Species density score = 1

Table 7.4 Forest Red-tailed Black-Cockatoo Vegetation Foraging Value Scores

Foraging Value (Site Condition)	Foraging Value Score out of 10 (BCE, 2020)*	Native Vegetation (ha) within Indicative Project Footprint	Isolated Remnant Trees (ha) within Indicative Project Footprint	Planted Vegetation (ha) within Indicative Project Footprint	Total Vegetation (ha/%) within Indicative Project Footprint
0: No foraging value	0	5.28	1.80	6.62	13.70 (59%)
1: Negligible to low foraging value	1	0.04	0.15	0.02	0.21 (1%)
2: Low foraging value	2	0.83	1.56	0.37	2.76 (12%)
3: Low to moderate foraging value	5*	1.50	1.50	0.09	3.08 (13%)
4: Moderate foraging value	6*	2.60	0.44	0.23	3.27 (14%)
5: Moderate to high foraging value	7*	0.03			0.03 (<0%)
6: High foraging value	8*				0.00 (0%)
Total		**10.28**	**5.45**	**7.33**	**23.05**

*Context score = 1. Species density score = 1

Breeding

As discussed in **Section 6.3.2.3**, the targeted fauna habitat assessment identified 112 potential Black-Cockatoo nest-trees within the Indicative Project Footprint, with the breakdown presented in **Table 6.11**. No Rank 1 (trees with activity at hollow observed) and Rank 2 (trees with hollows of suitable size with chew marks visible) trees are located within the Indicative Project Footprint, and only five Rank 3 (hollow-entrances that were of suitable size, height and orientation to support Black-Cockatoo breeding) trees were identified. Accordingly, the Project commits to avoiding clearing all Rank 1 and Rank 2 trees, and not clearing more than five Rank 3 trees.

Roosting

Two Black-Cockatoo roost sites were identified during field surveys and both are located outside the Indicative Project Footprint.

Migratory Shorebird Habitat

The most suitable and preferred migratory shorebird habitat within the Project Area is limited to four wetlands totalling 278 ha **(Figure 6.12**).

Direct habitat loss will be limited to 1 ha of degraded vegetation on the edge of one of the wetlands to the west, that will be rehabilitated at the end of construction. Although this area is within the area mapped as wetlands based on DBCA geomorphic wetlands spatial data, it is fringing vegetation adjacent to the wetland and is unlikely to contain foraging habitat.

No breeding habitat is located within the Project Area as the migratory shorebirds do not breed in Australia.

7.1.1.3 Fauna Injury and Mortality

Activities during the construction phase of the Project that have the potential to directly injure or kill threatened fauna include:

- vegetation clearing
- vehicle and other construction equipment strike
- earthworks.

Proposed mitigation measures to address fauna injury and mortality during construction are presented in **Section 8.2.3**.

7.1.1.4 Impacts to Fauna Habitat Connectivity

Connectivity of remnant vegetation (for most terrestrial vertebrate fauna) is present, although tenuous in most places. The western parts of the Project Area directly abut an area of extensive remnant native vegetation and fauna habitat, however there is very limited connectivity to the north, south and east of the Project Area, with surrounding lands largely consisting of agricultural lands. Creekline vegetation appears to offer the greatest opportunity for habitat connectivity across the site.

Vegetation clearing is primarily limited to the removal of isolated remnant trees in cleared paddocks, and the fringes of degraded patches of native vegetation. Bisecting of larger vegetation patches has been avoided where possible. Noting the importance of creekline vegetation for habitat connectivity, existing creek crossings have been used where practicable and the number of new creekline crossings has been minimised.

Given the linear configuration of the Project, the typically narrow width of access tracks, the general absence of fauna-proof fencing (except potentially around the BESS), and the nature of the proposed vegetation clearing, it is unlikely that faunal dispersal within the Project Area will be significantly affected.

7.1.2 Indirect Impacts

7.1.2.1 Introduction and Spread of Weeds, Phytophthora and Pest Fauna

The introduction and spread of weeds and Phytophthora can indirectly impact remnant native vegetation, alter fire regimes, and impact threatened species utilisation of the site. Within the Project Area, weed species are prevalent, largely due to a long history of agricultural land use, with 45 introduced taxa recorded during the surveys. One Declared Pest listed under the BAM Act (Arum lily (*Zantedeschia aethiopica*)) was recorded in the F&V Survey Area. No Weeds of National Significance were recorded.

Several introduced fauna species were also identified in the Fauna Survey Area, including Laughing Kookaburra (*Dacelo novaeguineae*), House Mouse (*Mus musculus*), Red Fox (*Vulpes vulpes*), Cattle (*Bos taurus*) and Sheep (*Ovis aries*). Given the current distribution of pest fauna, it is unlikely that the proposed works will introduce new pest species. However, if not sufficiently managed, construction activities that modify or degrade fauna habitat values may enable populations of existing pest species to grow or move into higher quality habitats.

Management measures to address potential impacts from weeds and pest fauna are outlined in **Section 8.2.**

7.1.2.2 Edge Effects

Edge effects in ecology are identified as any difference in environment between the edge and interior of a particular vegetation patch. Environmental characteristics which differ across edges cover many components of the environment including vegetation (e.g., structure, composition, functioning), fauna and their habitat, and soil (Murcia, 1995).

Edges and their effects can be created through clearing of vegetation, such as new edges created by roads. The distance the effect spreads from the edge, known as edge permeability, can be highly variable and depends upon many factors such as vulnerability of the ecosystems, degree of change in land use, intensity of this use and chance events (Murcia, 1995).

Given the degraded nature of the remnant vegetation patches within the Indicative Project Footprint, which are also currently impacted by livestock and introduced flora, any edge effects that do occur are unlikely to result in significant impacts to the integrity of these patches.

The potential for residual impact as a result of edge effects is considered low.

Potential environmental impacts including introduction of weeds and physical disturbance to vegetation can be managed through good site practices, vehicle restrictions and implementation of the CEMP (**Appendix G**).

7.1.2.3 Soil Erosion and Sedimentation

The removal of vegetation and disturbance of the soil profile as a result of native vegetation clearing and construction activities may contribute to soil erosion, subsequently increasing sediment load in watercourses and wetlands. Elevated sediment levels can cause siltation in watercourses and degrade the water quality of downstream creeks, rivers, wetlands, and other drainage systems. Erosion may also result in the loss of valuable topsoil, exposing subsoil layers that typically possess inferior physical and chemical characteristics.

The potential for soil erosion and sedimentation as a result of the Project will be managed through the implementation of the CEMP (refer **Appendix G**) and as outlined **in Section 8.2.4**.

7.1.2.4 Dust Impacts

Ground disturbance can result in elevated dust levels that can settle on adjacent vegetation. The impacts of this on the adjacent vegetation can vary depending on vegetation type, dust characteristics (such as chemical composition and grain size), and the overall quantity of dust deposition.

Dust impacts associated with the Project are anticipated to be limited to vegetation immediately adjacent to access tracks and areas near stockpiles where soil is exposed and susceptible to disturbance by vehicle movement and wind erosion. The dust generated will be chemically inert; therefore, any potential impacts will be physical, including blockage of plant stomata and reduced light penetration to leaf surfaces, which may decrease photosynthetic capacity. These factors could adversely impact the health of vegetation located directly alongside tracks, stockpiles and other unsealed areas.

To mitigate these impacts, dust will be managed during the construction phase through implementation of dust management measures, as outlined in the CEMP (refer **Appendix G**).

7.2 Operations and Maintenance Phase

7.2.1 Collisions

Fauna mortality and injury at wind farms can result from birds or bats colliding with wind turbine blades, towers, nacelles, guy cables, power lines and meteorological masts. There are a range of factors that influence risk of collisions with such infrastructure (Drewitt & Langston, 2008) including:

- Physical attributes of a wind turbine generator (i.e. turbine dimensions, lighting).
    a. This factor was considered by basing the risk assessment on the largest possible Rotor Swept Area (RSA).
- Species-specific variables (i.e. abundance, flight behaviour, turbine avoidance capacity).
    a. These factors were considered by:
        i. Undertaking BBUS across a 27 month period to capture seasonal variability.
        ii. Recording a variety of flight behaviour details as described in **Table 5.3**.
- Biophysical attributes (i.e. landscape position, topography, vegetation type).
    a. These factors were considered when determining the locations of habitat assessment points and BBUS Vantage Points as further described in **Table 5.3**.

A bird and bat utilisation (BBUA) was undertaken to assess the pre-mitigation collision risk for Threatened and Migratory bird and bat species that are present or that may occur in the vicinity of wind turbines in the Project Area based on occurrence and flight data gathered from completed surveys and published literature. This assists in identifying what species may require further consideration for impact assessment, mitigation and collision risk modelling. The BBUA also summarises potential impacts to bird and bat species documented in published literature and outlines potential mitigation and management measures to be considered as part of the Project.

All turbines were considered to provide the same risk for collision as no individual turbine or cluster of turbines were determined to offer a higher level of risk for the following reasons:

- Turbines are setback 4 km from the main black-cockatoo roost site (Roost Site B) where there would be a greater concentration of the species.
- Turbines are setback 3.5 km from wetlands where migratory shorebirds have been recorded.

The methodology used for the risk assessment was adapted from Lumsden et al. (2019) and the full risk assessment is provided in Appendix A of the Preliminary Bird and Bat Adaptive Management Plan (refer **Appendix D**).

The pre-mitigation risk of collision was assessed for 50 species, which included 15 threatened and migratory birds. The risk assessment results for the threatened and migratory birds assessed are provided in Table 7.5**.** Table 7.6 describes the assessed risk and required response actions.

Table 7.5 Threatened and Migratory Bird Risk Assessment Results

Common Name	Scientific Name	Likelihood of Collision	Consequence of Collision	Overall Risk Rating
Threatened				
Carnaby's Black-Cockatoo	*Zanda latirostris*	Unlikely	High	**Moderate**
Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*	Unlikely	Moderate	**Minor**
Migratory				
Common Greenshank*	*Tringa nebularia*	Possible	Moderate	**Moderate**
Sharp-tailed Sandpiper*	*Calidris acuminata*	Possible	Moderate	**Moderate**
Black-tailed Godwit*	*Limosa limosa*	Possible	Moderate	**Moderate**
Bar-tailed Godwit++ (Northern Siberian)	*Limosa lapponica menzbieri*	Possible	Moderate	**Moderate**
Curlew Sandpiper*++	*Calidris ferruginea*	Possible	Moderate	**Moderate**
Red-necked Stint	*Calidris ruficollis*	Possible	Low	**Minor**
Wood Sandpiper	*Tringa glareola*	Possible	Low	**Minor**
Common Sandpiper	*Actitis hypoleucos*	Possible	Low	**Minor**
Long-toed Stint	*Calidris subminuta*	Possible	Low	**Minor**
Pacific Golden Plover	*Pluvialis fulva*	Possible	Low	**Minor**
Ruff	*Calidris pugnax*	Possible	Low	**Minor**
Fork tailed Swift	*Apus pacificus*	Likely	Low	**Moderate**
Glossy Ibis	*Plegadis falcinellus*	Possible	Low	**Minor**

* Listed as Threatened and Migratory.

++ The collision risk as presented in **Appendix D** was reassessed due to a change in the likelihood of occurrence for the species.

Table 7.6 Risk Descriptors

Risk	Description	Response
Very High	• The species is **likely** to be involved in collisions within the Project Area, and a collision would have a **high consequence** for the species.	A Collision Risk Model (CRM) should be considered to be undertaken for the species if sufficient data is available. If data is insufficient, using a surrogate species may be appropriate if a suitable surrogate species is available. The species will require consideration for collision impacts as part of an impact assessment to identify suitable mitigation measures and will need to be addressed in the Project BBAMP.
High	• The species is **likely** to be involved in collisions within the Project Area, and a	The species will require consideration for collision impacts as part of an impact assessment to identify suitable mitigation measures and a CRM or alternative method to

	collision would have a **moderate consequence** for the species, **OR** • it is **possible** the species would be involved in collisions within the Project Area, and a collision would have a **high consequence** for the species.	quantify collision risk may be required. The species may also need to be addressed in the Project BBAMP.
Moderate	• The species is **likely** to be involved in collisions within the Project Area, and a collision would have a **low consequence** for the species OR • It is **possible** the species would be involved in collisions within the Project Area, and a collision would have a **moderate consequence** to the species OR • The species is **unlikely** to be involved in collisions within the Project Area, but there would be a **high consequence** to the species.	Conservation significant species will require consideration for collision impacts as part of an impact assessment and may require mitigation measures.
Minor	• The species is **unlikely** to Project involved in collisions within the Project Area, and a collision would have a **moderate consequence** for the species OR • It is **possible** the species would be involved in collisions within the Project Area, but a collision would have a **low consequence** to the species.	Conservation significant species may require some considerations for collision impacts as part of an impact assessment.
Negligible	• The species is **unlikely** to be involved in collisions within the Project Area, and any collision would have a **low consequence** to the species.	The species is unlikely to require consideration for collision impacts as part of an impact assessment.

Per the response actions listed in **Table 7.6** collision impacts have been assessed and mitigation measures proposed (where required) for species assessed as moderate risk. For the remaining species assessed as minor risk, collision impacts have been considered. A summary of these assessments are provided below, with additional information provided in **Section 9.0** and in the preliminary BBAMP (**Appendix D**).

7.2.1.1 Black-Cockatoos

Although the BBUA conservatively assessed Carnaby's Black-Cockatoos as having a "moderate" potential for impacts due to turbine collision, the risk was highly influenced by the threatened status of the species, i.e. consequence of a collision rather than likelihood.

Flight heights for both Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo were recorded as part of the BBUS with the results presented in **Table 7.7**. Note that numbers represent records rather than individuals, i.e. 1 record might represent a flock of birds.

Neither of the species were recorded flying within the RSA, with one to two individuals of Carnaby's Black-Cockatoo being recorded at a maximum flight height of 50 m AGL on three occasions. The Forest Red-tailed Black-Cockatoo was recorded flying at a maximum height of 8 m AGL.

Table 7.7 Conservation Significant Species Maximum Flight Height Records

Common Name	Taxon	<50 m	50–59 m	>60 m	Total
Forest Red-tailed Black-Cockatoo	*Calyptorhynchus banksii naso*	1	-	-	**1**
Carnaby's Black-Cockatoo	*Zanda latirostris*	62	3	-	**65**

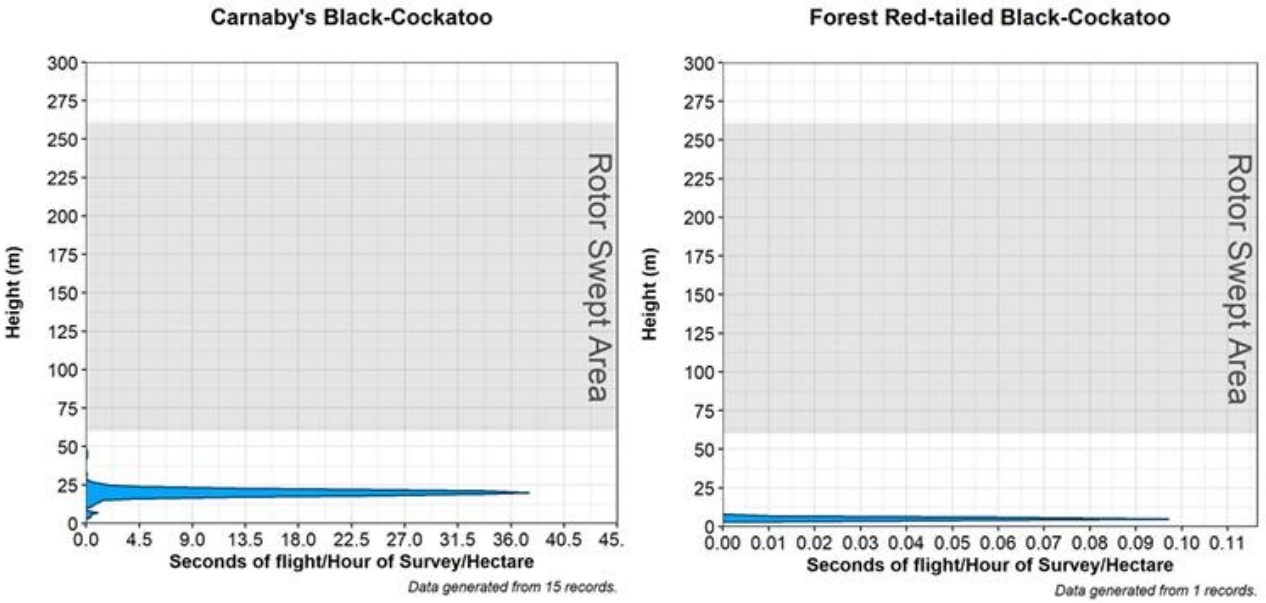
Note. Species without flight observations are excluded.

Exposure Risk Models (ERMs) based on data collected during the field survey program up to BBUS04[3] were generated for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo, with the outputs presented in **Figure 7.1**. As none of these species were observed flying within RSA during the BBUS program, 0 seconds of observed flight were within the RSA height range. Due to the small sample size of flight observations for the Forest Red-tailed Black-Cockatoo, conclusions that can be drawn for these species are limited. However, the Carnaby's Black-Cockatoo was observed on 42 instances, all of which were below RSA. A majority of this flight time occurred below 30 m AGL (99%) which is significantly below the RSA. The ERM (**Figure 7.1**a) for Carnaby's Black-Cockatoo was based on 15 records with a mean convergence of 0.93 meaning the flight behaviour for the species is approaching the significance threshold of 0.95. Based on similar flight behaviours, this generalisation can likely be applied to the Forest Red-tailed Black-Cockatoo as well.

It should be noted that 27 Carnaby's Black-Cockatoo flight heights were recorded in BBUS 01 but not in a manner that allowed the data to be used in the ERM. The methodology for capturing flight height was amended after BBUS 01 to ensure it could be used to inform ERMs.

Neoen is also collecting Black-Cockatoo flight height data for other potential wind farm projects in the Wheatbelt region. As of November 2025, flight data has been recorded for 80 Carnaby's Black-Cockatoo flights with the maximum height observed being 50 m AGL. For the Forest Red-tailed Black-Cockatoo, data has been recorded for 16 flight heights, with the maximum flight height recorded being 40 m AGL.

[3] The ERMs were not updated beyond BBUS04 as the results from the proceeding surveys did not record a flight height within the RSA or provide data that would change the overall findings of the ERM.



a) Exposure risk model for Carnaby's Black-cockatoo (*Zanda latirostris*, EN) built from 15 flight records. The mean convergence of new data is 0.93+/-SD0.19. This ERM is approaching the our significance threshold of 0.95-1, however, the high variance in flights indicates more records will need to be collected.

b) Exposure risk model for Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*, VU) built from a single flight record. This ERM should not be considered a complete, representative sampling of the species' flight behaviour.

Figure 7.1 Exposure Risk Models for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo

Black-cockatoo studies or assessments have been completed for other wind farms in the Dandaragan region with relevant information as related to potential collision risk for these species, summarised below:

- Between August 2024 and March 2025, Bamford Consulting Ecologists (BCE) conducted BBUS across four wind farm sites located between Perth and Eneabba. Similar to the Yathroo Project Area, all sites were situated in agricultural landscapes with remnant native vegetation, and contained habitats known to support Carnaby's Black-Cockatoo. The four BBUS yielded 3,772 records over 224 hours of observation. Except for one, all flight heights were found to range between 0–50 m AGL, with group sizes varying from 1 to 400 individuals. Several flocks were observed to exhibit "vortexing" behaviour in response to disturbances such as vehicles or raptors. Despite this, only one flight height was recorded above 50 m AGL, and consisted of two birds that briefly rose to an estimated height of 60 m before descending (Bamford, 2025).
- RPS (2010) found during field surveys that Carnaby's Black-Cockatoo tend to frequent low-lying areas of the landscape with flight movements following valleys with woodland vegetation, with 88% of species observed as flying below 40 m (n=100 observations), while Ecoscape (2019) found 80% of flocks flying <20 m AGL (n=25 observations). EPA (2019) also noted that the Carnaby's Black-Cockatoo tends to follow vegetation corridors, actively avoiding cleared and open areas, which is likely applicable to all Black-Cockatoo species found in south-west WA. When crossing areas of expansive open ground (or low vegetation such as heaths) Black-Cockatoos tend to fly close to the ground surface. In circumstances where birds are passing across less-expansive cleared areas between patches of remnant trees or isolated individual trees (as is present throughout much of the Project Area) they usually maintain a 'canopy height' flight path (Umwelt, 2025d).

Instances where Black-Cockatoos may otherwise exceed 50 m AGL in flight height are likely restricted to evading large predatory raptors such as eagles or when congregating in large numbers.

- Further, post-commissioning monitoring for the Carnaby's Black-Cockatoo at Badgingarra wind farm in 2019 which has a minimum tip height of 20 m AGL recorded no collisions with turbines (Ecoscape, 2019), and none were reported at the Warradarge Wind Farm Perth during monitoring from 2020 to 2022 (Bright Energy Investments, n.d.). The search method for carcasses as Warradarge Wind Farm is not publicly available and Badgingarra wind farm undertook a total of six surveys in 2019 at eight reference turbine sites and eight randomised turbine sites using a search area of 250 m x 250 m.

7.2.1.2 Migratory Shorebirds

A total of 13 EPBC listed migratory shorebird species were found to have a likelihood of occurrence of moderate or higher, and these were given a risk rating for collisions (**Table 7.5**). All are non-breeding migrants to Australia during the austral summer, mainly from Europe and Russia, typically favouring coastal and near-shore wetland habitats. Eight of these EPBC listed migratory shorebird species were recorded in low numbers within the Project Area, with all observations recorded at the wetlands west of Brand Highway, which provide the most suitable habitat locally. These low numbers suggest opportunistic and low-density use of these wetlands.

Of the 13migratory shorebirds assessed, seven were given a pre-mitigation risk rating of "minor" due to the likelihood of collision being "possible" and consequence of collision being "low". The remaining six species were given a "moderate" pre-mitigation risk rating, due to the likelihood of collision being "possible" and consequence of collision being "moderate".

Significant direct mortality is unlikely due to the Project. Migratory shorebirds typically migrate at the 1,000–5,000 m altitude, well above turbine height, making blade strike during migration improbable. No migratory shorebirds have been observed in flight across approximately 140 person-days of BBUS over a 27-month period. This indicates that the migratory shorebirds primarily occupy their time foraging in suitable wetlands when conditions are favourable, with no local passage between wetlands observed or no migratory shorebirds recorded in the wetlands west of Brand Highway. This, in conjunction with the very low numbers of migratory shorebirds recorded, indicate that significant impacts to migratory shorebirds as a result of collision is unlikely.

7.2.1.3 Fork-tailed swift

The Fork-tailed Swift was assigned a "moderate" pre-mitigation risk rating due to the likelihood of collision being "likely" and consequence of collision being "low".

There are 3 published reports of Fork-tailed Swift strikes with wind turbines at Australian wind farms within the species' range (Moloney et al., 2019; Nature Advisory, 2025).

7.2.2 Vehicle Strikes

During Project operations, the movement of light vehicles, large trucks and maintenance equipment will occur on the access tracks within the Project Area. Although operational traffic movement numbers are expected to be low, there is some risk of vehicle strike to terrestrial fauna species including medium to large mammals, birds, and reptiles.

The new tracks will largely follow existing farm tracks that will be of much higher quality. As a result, the sight lines will be improved reducing the risk of vehicle strikes compared to those associated with the existing farming vehicles.

7.2.3 Barotrauma

Barotrauma is a phenomenon in which rapid air pressure changes from rotating turbine blades are hypothesised to cause tissue damage to air-containing structures, most notably the lungs of bats (Baerwald et al., 2008). It has also been hypothesised that barotrauma can result in non-lethal injuries, such as hearing impairments and other internal injuries that may result in bats succumbing to their injuries away from turbines (Lawson et al., 2020). Due to the unique respiratory anatomy of birds, they are considered less susceptible to barotrauma than that of mammals, specifically bats (Baerwald et al., 2008) however it is possible.

Research conducted in North America on the relative risk of barotrauma compared with direct collisions has resulted in mixed findings regarding the proportion of deaths that have been attributed to each factor (Ellison, 2012), though it appears the majority of fatalities are due to collisions (Grodsky et al., 2011; Rollins et al., 2012). Baerwald et al. (2008) found that barotrauma to the lungs and possibly other organs accounted for 46% of bats killed at turbines with 92% of the barotrauma in those bats displaying as haemorrhaging in the thoracic and/or abdominal cavities. However, Rollins et al. (2012) found that only 6% (5/81) of bats collected at a wind farm in Illinois had lesions possibly consistent with causation by barotrauma, leading the authors to conclude that “traumatic injury is the major cause of bat mortality at wind farms, and, at best, barotrauma is a minor etiology”. Lawson (2020) used computational fluid-dynamics to model changes in air pressure around moving turbine blades to assess the likelihood of bats occurring within areas of extremely high or lower pressure. The modelled air pressures were also compared to those associated with mortality in rats to assess the likelihood of barotrauma resulting in lethal or sub-lethal injuries to bats. Barotrauma was determined unlikely to be a leading cause of death supporting the alternative hypothesis that collisions are more likely to be the predominant pathway for bat mortalities from operating turbines.

Due to the difficulty in diagnosing barotrauma unless the carcass is examined immediately after death, it is possible that cases attributed to barotrauma have been confused with traumatic injury associated with direct collisions. There is currently no published information on barotrauma in Australia.

7.2.4 Barrier Effects

Barrier effects can be caused by wind turbines disrupting links between feeding, roosting and/or nesting areas, or diverting flights (including migratory flights) around a wind farm.

Species that pass wind farms frequently on migration appear to be of higher concern than other species (Hötker et al., 2006). However, these effects on birds, possibly resulting in higher energy consumption or injuries as a result of collision, are not yet well known.

There is currently no published information on barrier effects from wind farms in Australia.

8.0 Avoidance, Mitigation, and Management

The hierarchy of avoid, minimise, and mitigate has been applied to the design process for the Project, with the field survey findings incorporated into the Development Corridor, the Indicative Project Footprint, and the turbine specifications.

These principles and the order in which they have been applied are as follows.

1. Avoid: Avoiding the highest quality vegetation and habitat, locating turbines over 3.5km away from wetlands where migratory shorebirds were recorded, and setting a minimum turbine tip height above maximum typical flight height for Black-Cockatoos.
2. Mitigate: implementing mitigation and management measures to reduce direct, indirect and cumulative impacts
3. Repair: actively repair temporary impacted areas to promote long-term recovery
4. Offset (where necessary): provide suitable offsets for activities that result in significant residual impacts to MNES even with the implementation of the above principles.

This section provides further details on the avoidance and mitigation measures that have been applied to date and that are proposed to reduce the potential Project impacts on flora, vegetation and fauna values. Offsets are described in **Section 9.4.6**.

8.1 Avoidance

8.1.1 Initial Ecological Constraints Analysis to Inform the Project Area and "Buildable Area"

The Project Area was subject to an initial ecological constraints analysis, the purpose of which was to identify flora, vegetation and fauna values with varying sensitivity levels and environmental significance and to determine surveys to be completed to better understand biodiversity values. Potentially significant flora, vegetation, and fauna habitat types identified as part of the initial constraints analysis, along with other project constraints, informed a "buildable area" for the preliminary design stage of the Project. Early avoidance and minimisation measured considered as part of the early Project design included:

- Early identification and avoidance of some key blocks of native remnant vegetation (300ha) presumed to be in good condition or better, thus providing greater habitat values.
- Utilising existing cleared land and reducing native vegetation clearing as much as possible.
- Setting turbines back from Lake Guraga by 5 km (which is outside the Project Area) as an initial setback prior to completion of survey in consideration of potential migratory bird presence.

8.1.2 Use of Baseline Ecology Data to Avoid Impacts

Flora and fauna surveys in accordance with relevant guidelines (described in **Section 5.0**) were completed to provide a robust understanding of ecological values in the Project Area. Information from the surveys was then used as part of several design iterations to create an Indicative Project Footprint and turbine specifications with impacts to MNES and other values reduced to as low as possible.

The Project design and Indicative Project Layout:

- Has a minimum turbine tip height of 59 m, which is above the recorded and typical flight height of Black-Cockatoos, which reduces the potential for Black-Cockatoo collision with turbines.
- Significantly avoids areas with the highest Black-Cockatoo foraging habitat value (**Table 6.6**) based on (Bamford, 2020) site condition scoring, as follows:
    - Avoids all areas assessed as having high-quality foraging habitat (Site condition score of 6).
    - Avoids 466.85 ha (or 99.86%) of the highest quality foraging habitat in the Project Area. Of the 467.5 ha of habitat mapped with a foraging condition score of moderate to high or high (Site condition score of 5-6) in the Project Area, only 0.65 ha of moderate to high quality foraging habitat (Site condition score of 5) for Carnaby's Black-Cockatoo is proposed to be cleared. The proposed clearing of moderate to high quality Forest Red-tailed Cockatoo foraging habitat is lower at 0.03 ha.
    - As a specific example, relocated the proposed 330kV transmission line from Walyer Walyer Rd to an area with much lower foraging values, resulting in 1 ha of Black-Cockatoo foraging habitat with a site condition score of 5 being avoided.
- Avoids all Rank 1 (trees with activity at hollow observed) and Rank 2 (trees with hollows of suitable size with chew marks visible) Black-Cockatoo nest-trees. Three Rank 2 and eight Rank 3 trees were recorded in an earlier iteration of the Indicative Project Footprint, and the Project design was subsequently readjusted to avoid clearing all of the Rank 2 trees and three of the Rank 3 trees, with no more than five Rank 3 trees to be cleared.
- Avoids known Black-Cockatoo roosting sites and sets turbines back 4 km from the main observed roosting site (Roost B per **Figure 6.10**).
- Avoids placement of turbines within 3.5 km of wetlands where migratory shorebirds were recorded in the western side of the Project Area
- Avoids placement of permanent infrastructure in wetland habitat where migratory species have been found to forage during the non-breeding season (Sept–March).
- Avoids all TEC in Good condition or better. The access route from Brand Highway to the proposed BESS site was relocated from its original planned location within a patch of TEC in Good condition, to a location comprising existing cleared tracks and Degraded vegetation. As a result of the relocation, TEC clearing has reduced from 0.25 ha (which included Good condition TEC), to 0.11 of solely Degraded TEC.
- Avoids all native vegetation mapped as 'Very Good' condition or better.
- Significantly minimises clearing of native vegetation mapped as 'Good. The Project sought to avoid clearing native vegetation in 'Good' condition, however 'Good' condition vegetation has been

found in many of the road reserves that infrastructure will need to traverse. At these locations, clearing widths have been minimised and infrastructure will seek to cross in a perpendicular fashion where practicable. As such, the total unavoidable area of 'Good' condition vegetation proposed to be cleared is 2.23 ha.

- Avoids larger areas of intact native vegetation.
- Avoids the area where *Grevillea curviloba* was recorded.

The final Project footprint will occupy a much smaller footprint than that represented by the Development Corridor (approximately 21%). As the Project will seek to avoid and minimise clearing impacts to all habitat types during the detailed design phase of the Project, the infrastructure layout within the Development Corridor will be further refined to:

- Clear no more than five Rank 3 (Potentially suitable hollow visible but no chew marks present at entrance; or potentially suitable hollow suspected to be present) Black-Cockatoo breeding trees
- Minimise clearing of vegetation with moderate to high Black-Cockatoo foraging value (Bamford, 2020) site condition score of 5. The current Indicative Project Footprint intersects 0.65 ha of vegetation with moderate to high foraging value. A particular focus of the micro-siting work will be to reduce this as much as practicable.
- Minimise clearing of riparian vegetation. This has been achieved by setting turbines back from riparian vegetation and utilising existing creek crossings where possible.
- Minimise the construction of new creek crossings, by using existing creek crossings where practicable.
- Minimise the bisecting of larger patches of vegetation in order to maintain landscape connectivity.

8.2 Mitigation and Management

Works will be undertaken in accordance with a Project CEMP which will include a management approach and actions to limit and reduce potential impacts to flora, vegetation and fauna, including threatened species. A copy of the Preliminary CEMP is provided in **Appendix G**. Operational impacts to birds and bats will be managed through a Bird and Bat Adaptive Management Plan (BBAMP). A Preliminary BBAMP has been developed to support this referral, and a copy is provided in **Appendix D**.

8.2.1 Native Vegetation and Fauna Habitat Clearing

The Project CEMP will include provisions to limit and reduce potential impacts to vegetation during clearing and other activities. Vegetation management measures will include:

- Personnel involved in native vegetation clearing activities will be required to undertake internal Project specific land clearing training which will outline regulatory requirements, management actions or controls to be implemented, and weed and pest management.
- Approved native vegetation clearing area boundaries will be demarcated prior to clearing, and clearing of remnant native vegetation will not exceed 10.28 ha of remnant native vegetation, 5.45 ha of isolated remnant trees in a cleared agricultural landscape and 5.05 ha of planted native vegetation.

- There will be no clearing of TEC with the exception of 0.11 ha of degraded TEC adjacent to Brand Highway for the purposes of accessing the western part of the Project Area.
- No permanent removal of wetland habitat where migratory species have been found to forage West of Brand Highway.
- Known Rank 1 and Rank 2 Black-Cockatoo nesting trees within 50 m of clearing boundaries will be clearly tagged as “No-go zone” prior to clearing. This could be in the form of flagging or fencing.
- Clearing of no more than five Rank 3 (potentially suitable hollow visible but no chew marks present at entrance; or potentially suitable hollow suspected to be present) Black-Cockatoo nesting trees.
- Micro-siting of Project infrastructure will aim to retain habitat trees where possible.
- Habitat trees that can be safely retained will be marked with flagging tape and avoided.
- Areas planned for native vegetation clearing will be inspected for native fauna immediately prior to undertaking land clearing by a suitably qualified fauna spotter. This will include ensuring that no trees being removed are housing Black-Cockatoos, chicks, or eggs. Where conservation listed fauna are encountered during clearing, these will be reported to the Senior Environmental Advisor immediately.
- Where trees are authorised to be cleared, they will be felled away from areas of retained native vegetation as safe and practicable. Where trees unavoidably fall into retained areas, they will be left in-situ.
- Vegetation clearing will be undertaken progressively and in stages so that only a small subset of the Project footprint is impacted at any one time. The clearing will be undertaken towards adjacent native vegetation to allow fauna to move into adjacent native vegetation ahead of the clearing activity.
- Following the completion of each clearing event, the location and extent of areas cleared will be recorded via GPS / survey and reported within a centralised dataset.

8.2.2 Biosecurity (Weed and Disease Risk Management)

The Project has the potential to spread or introduce weeds and *Phytophthora* dieback to the Project Area, which can impact the integrity and longevity of vegetation communities, ecological communities and Threatened species. This risk can be appropriately mitigated and managed through appropriate site management practices.

Weed and disease management measures will be outlined in the CEMP and will include the following measures:

- All ground disturbing plant and equipment will enter and leave the site clean and free of weeds and *Phytophthora* dieback.
- Upon arrival to site, ground disturbing plant and equipment will be subject to a weed and seed inspection prior to entry. A record of the inspection details and whether the plant / equipment has been deemed to be weed and seed free will be retained.
- Where plant and equipment does not pass the weed and seed inspection, the plant / equipment shall be further cleaned at a dedicated wash down area and re-inspected.
- Weed infested areas that are identified will be avoided where practicable.

- Prior to leaving weed infested areas, the plant and equipment will be brushed down.
- Prior to entering the Project Area, the origin of fill material will be determined and certified where applicable. Where practicable, the fill should be from a quarry (i.e. not reused from another site) that has a Dieback Management Plan in place.

8.2.3 Fauna Management

The Project CEMP will include provisions to limit and reduce potential impacts on fauna, particularly by implementing measures that prevent injury or mortality to fauna during all Project phases.

The following measures will be implemented to limit impacts on threatened and migratory fauna species:

- The minimum blade tip height to be adopted will be 59 m AGL.
- Turbines will not be constructed within 3.5km of the wetlands West of Brand Highway.
- Consideration of the use of line markers and/or flapper diverters on overhead transmission lines west of Brand Highway should migratory shorebird carcass numbers as a result of collision with transmission line infrastructure exceed the triggers identified in the BBAMP.
- The Project BBAMP will be implemented throughout operations.
- Preclearance searches will be undertaken by a licenced fauna spotter prior to and during clearing activities within remnant vegetation types.
- Where threatened or migratory species are encountered during construction, any activities in proximity (<10 m) to their location will cease until they are no longer present. Handling of such fauna is not permitted unless a Section 40 approval has been granted from DBCA.
- Fauna spotters will be present during all native vegetation clearing to ensure that no potential Black-Cockatoo nest-trees being removed are housing Black-Cockatoos, chicks, or eggs.
- Vegetation clearing will be halted in areas where threatened and migratory species are located, and clearing will not resume until the species leaves the location on its own accord.
- Where injured fauna is encountered, the Wildcare Helpline (08 9474 9055) will be immediately contacted, and the Work Area Supervisor notified.

The following additional mitigation measures will be implemented to limit and reduce indirect impacts (noise, dust, light emissions and traffic) to threatened and migratory fauna:

- restriction of construction hours to daylight periods where possible
- consideration of plant and equipment types, including muffler design and the use of alarms
- dust suppression techniques to minimise generation of dust (e.g., watering access roads)
- speed limits on access roads, informed by appropriate signage as required
- the inclusion of points of egress in any excavation areas that are left open for more than one night
- consideration to the type and use of lighting (e.g., shielded lights on buildings, directing lighting away from habitat)

The following general measures to limit and reduce the potential for introduction or spread of invasive pest species will be implemented:

- all waste storage containing food waste will have closeable lids that can be secured shut to avoid attracting fauna
- a carrion removal program will be implemented to minimise the attraction of scavenging fauna should any turbine collision with a bird or bat occur
- site induction training will highlight the importance of pest management
- the site will be kept in a general tidy and clean condition during construction.

8.2.3.1 Bird and Bat Adaptive Management Plan

Monitoring and management activities concerning bird and bat populations will be conducted in accordance with the Project BBAMP. The BBAMP strategy focuses on monitoring and mitigating potential turbine strike impacts on birds and bats through the implementation of trigger-based, adaptive management measures. Comprehensive monitoring of bird and bat activity, including flight behaviours, both prior to and following Project commissioning, is an essential component of the plan and serves to inform risk profiles for each turbine. Site context and risk profile have been strongly considered when developing the trigger criteria and adaptive management measures nominated in the BBAMP.

Further details are outlined in the Preliminary BBAMP (**Appendix D**), which will be finalised as a Project BBAMP prior to Project commissioning. Approval and execution of the BBAMP, in consultation with DBCA, is a condition of the development approval granted on 23 October 2025 under the *Planning and Development Act 2005*.

8.2.4 Erosion and Sediment Control

The potential impacts of erosion and sedimentation will be mitigated and managed through the measures listed in the Project CEMP (**Appendix G**). This will include the establishment of temporary erosion and sediment control measures during construction such as silt fences, diversion bunds, rock check dams and sedimentation ponds.

9.0 Impact Assessments

9.1 Significant Impact Assessment Methodology

Significant Impact Assessments (SIA) have been undertaken for the TEC known to occur in the Project Area and the 15 other MNES fauna species determined to have a Moderate or greater likelihood of occurrence within the Project Area. The assessments were undertaken in accordance with the *Matters of National Environmental Significant: Significant Impact Guidelines 1.1* (Department of the Environment, 2013b).

The SIAs have been structured to provide information on the following aspects:

- Species description, including:
    - General species profile
    - Occurrence and habitat in the Project Area
- Assessment against the relevant *Matters of National Environmental Significant: Significant Impact Guidelines 1.1* (Department of the Environment, 2013b).

Individual assessments have been undertaken for species listed as Vulnerable, Endangered and Critical under the EPBC Act. For species listed solely as Migratory, a single grouped assessment has been undertaken noting the assessment criteria and likely impacts are common.

The SIAs for the 16 MNES are presented in **Appendix J**, with a summary of key impacts provided below for the TEC, two species of Black-Cockatoos and 13 species of migratory species (five of which also have a Threatened status).

9.2 Summary of TEC Significant Impact Assessment Findings

Thirteen (13) patches of the 'Banksia Woodland of the Swan Coastal Plain' TEC comprising a total area of 41.3 ha occur within the Project Area. No patches (either wholly or partially) of the TEC were in 'Pristine', 'Excellent', or 'Very Good' condition.

The Referral Guideline for the Banksia Woodlands of the Swan Coastal Plain ecological community (DoEE, 2016a) identifies seven criteria to be assessed to determine if the Project will have a significant impact on the TEC. Assessments against each of these criteria has been provided in **Appendix J**, and based on the outcomes from this assessment it is unlikely the Project will have a significant impact on the TEC for the following reasons:

- Clearing will not exceed 0.11 ha of TEC removal.
- Clearing is restricted to an area of Degraded TEC.
- The adjacent Good and Very Good condition TEC patches will be avoided and indirect impacts managed via implementation of the Project CEMP.
- The Project is highly unlikely to modify or destroy abiotic factors necessary for the TECs survival.
- No land use alterations are proposed that would modify water quality or availability, or nutrient balances necessary to the survival of the TEC.

9.3 Summary of Black-Cockatoo Significant Impact Assessment Findings

Surveys have been completed to understand Black-Cockatoo habitat values (foraging, breeding, and roosting), site utilisation, and flight characteristics in the Project Area as described in **Section 5.2.2**. An assessment of habitat in the broader area around the Project Area has also been undertaken. A summary of habitat values from these assessments at different scales is provided in **Table 6.6** and **Section 6.3.2**.

Two species of threatened Black-Cockatoos have been recorded within the Project Area during the field survey program; the Carnaby's Black-Cockatoo and the Forest Red-tailed Black-Cockatoo.

The Carnaby's Black-Cockatoo has been recorded on 101 occasions to date during the field survey program, with a maximum flock size of approximately 240 recorded. Two active roost sites have also been identified within the Project Area, but outside the extents of the Development Corridor (refer **Section 6.3.2.4**).

The Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) was recorded during the Winter 2025 BBUS and also during the targeted fauna habitat assessment undertaken in June 2025 (Umwelt, 2025c). Flock sizes ranged from two to eight individuals. The species was not recorded during the Spring 2024, Summer 2025, Autumn 2025, Spring 2025, Summer 2026 and Autumn 2026 BBUS, indicating that it is an intermittent and transient visitor to the Project Area that occurs in small numbers when present. This is supported by the fact that the Project Area lies approximately 40km north of its documented range of distribution.

The *Matters of National Environmental Significant: Significant Impact Guidelines 1.1* criteria used to assess significant impacts to listed threatened species refer to 'populations' and 'important populations' (Department of the Environment, 2013b). These terms have not been defined for Black-Cockatoos, due to the mobile and widely dispersed nature of these species, and the variation in flock compositions. For Black-Cockatoos, DCCEEW (2022b) notes it is more appropriate to consider the likelihood of a significant impact from impacts on habitat and individuals rather than a population.

Based on the summary below, residual impacts to Black-Cockatoos is unlikely to result in a significant impact to either Carnaby's Black-Cockatoo or Forest Red-Tailed Black Cockatoo. A detailed assessment against *Significant Impact Guidelines 1.1* criteria is provided in **Appendix J**.

9.3.1 Habitat Loss

9.3.1.1 Impact on Foraging Habitat

Habitat loss as a result of the Project is unlikely to result in a significant impact to Black-Cockatoos. The area and quality of habitat proposed to be impacted in the Indicative Project Footprint is low through avoidance of impacts through Project design. This includes avoiding:

- All high-quality foraging value habitat (Site condition score of 6).
- Clearing of 5.70 ha of Carnaby's Black-Cockatoo moderate to high foraging value habitat (Site condition score of 5) mapped in the Development Corridor, with clearing of moderate to high foraging habitat limited to 0.65 ha.

- Clearing of 0.91 ha of Forest Red-tail Black-Cockatoo moderate to high foraging value habitat (Site condition score of 5) mapped in the Development Corridor, with clearing of moderate to high foraging habitat limited to 0.03 ha.
- Clearing of 466.85 ha (or 99.86%) of moderate to high and high quality foraging habitat (Site condition score of 5 or 6) mapped in the Project Area based on broader scale habitat mapping (see **Section 6.3.2.2** for areas of foraging habitat assessed in the Project Area).
- Clearing Rank 1 and Rank 2 potential Black-Cockatoo nest-trees.
- Known roost sites within the Project Area.

The Project has sought to minimise the clearing of native vegetation as far as practicable, culminating in clearing limits of 10.28 ha of remnant native vegetation, 5.45 ha of isolated remnant trees in cleared agricultural land and 7.33 ha of planted vegetation (native and non-native). The foraging values of this vegetation to both species of Black-Cockatoos are presented in **Table 9.1**, along with the foraging value of vegetation in the Development Corridor and the area of this vegetation avoided. This demonstrates that the Project has been designed to avoid and minimise direct impacts to Black-Cockatoo habitat of moderate and higher value.

Table 9.1 Carnaby's Black-Cockatoo Foraging Habitat Values within Indicative Project Footprint and Avoided

Foraging Value Score out of 6 based on Site Condition (BCE, 2020)	Foraging Value Score out of 10 (BCE, 2020)*	Development Corridor (ha)	Indicative Project Footprint (ha)	Area Avoided (ha)
0: No foraging value	0	3.08	1.42	1.66
1: Negligible to low foraging value	1	21.16	6.72	14.44
2: Low foraging value	2	19.34	4.32	15.02
3: Low to moderate foraging value	5*	27.35	7.26	20.09
4: Moderate foraging value	6*	10.44	2.68	7.76
5: Moderate to high foraging value	7*	6.35	0.65	5.70
6: High foraging value	8*	0.00	0.00	0.00
Total		**87.72**	**23.05**	**64.67**

*Context score=1, Species density score=1

Table 9.2 Forest Red-tailed Black-Cockatoo Foraging Habitat Values of Vegetation within Indicative Project Footprint

Foraging Value Score out of 6 based on Site Condition (BCE, 2020)	Foraging Value Score out of 10 (BCE, 2020)*	Development Corridor (ha)	Indicative Project Footprint (ha)	Area Avoided (ha)
0: No foraging value	0	35.57	13.70	21.87
1: Negligible to low foraging value	1	1.26	0.21	1.05
2: Low foraging value	2	14.21	2.76	11.45
3: Low to moderate foraging value	5*	20.03	3.08	16.95
4: Moderate foraging value	6*	15.74	3.27	12.47
5: Moderate to high foraging value	7*	0.91	0.03	0.88
6: High foraging value	8*	0.00	0.00	0.00
Total		**87.72**	**23.05**	**64.67**

*Context score=1, Species density score=1

The proposed clearing of Black-Cockatoo foraging habitat of any value by the Project represents approximately 0.05% of the potentially suitable foraging habitat in remnant vegetation within 12km of the Project Area (see **Section 6.3.2.1**).

9.3.1.2 Impact on Breeding and Roosting Habitat within Project Area

A potential Black-Cockatoo nest assessment recorded 560 potential nest-trees (DBH > 500 mm) within the Development Corridor, 112 of which lie in the Indicative Project Footprint. No active nests (Rank 1) were recorded within the Development Corridor, and although three Rank 2 and eight Rank 3 trees were recorded in the Indicative Project Footprint at the time of survey, Project design was readjusted to avoid clearing all of the Rank 2 trees and three of the Rank 3 trees, with no more than five Rank 3 trees to be cleared

Two roosting sites have been identified during the field survey program both of which lie outside the Development Corridor.

9.3.1.3 Impact of Habitat Loss on Viability of Nearby Roosting and Breeding Sites

The clearing of foraging habitat is unlikely to impact on the viability of nearby roosting and breeding sites due to the minor loss of foraging habitat in comparison to what is available within foraging range (12 km) of these sites. Similarly, the success of raising fledglings at nesting sites within foraging range is not expected to be impacted as a result of the proposed clearing of foraging habitat.

The known breeding and roosting sites located within 12 km of the Project Area are:

- Roost Site A – Located within Project Area (**Figure 6.9**).
- Roost Site B – Located within Project Area (**Figure 6.9**).
- Breeding Site 1 – Located within Project Area (**Figure 6.9**).
- Regans Ford Roosting Site – Located 7 km South of Project Area (**Figure 6.7**).
- Moore River Breeding Site – Located 9 km South of Project Area (**Figure 6.7**).
- Cataby Breeding Area – Located 6km North-West of Project Area (**Figure 6.8**).

To understand the impact of the proposed loss of foraging habitat on the above sites, the vegetation associations that provide potentially high foraging habitat suitability and their remaining native vegetation was calculated within a 12 km range of each. The results for these are presented below and demonstrate that the Project will not likely materially impact on the viability of nearby roosting and breeding sites and the success of raising fledglings.

Roost Site A

Table 9.3 Potentially Suitable Foraging Habitat within 12 km of Roost Site A

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12 km of Roost Site A (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	4
952	Shrublands; dryandra heath	High	Low	170
999	Medium woodland; marri	High	High	2,970
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	441
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	392
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	103
1036	Low woodland; Banksia prionotes	High	High	12
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii	High	Low	28
			Total Area	**4,118**

Of the 4,118 ha of potential suitable foraging habitat present within the foraging range of Roost Site A, the Project will clear 14.14 ha of native vegetation, accounting for 0.34% of the total potentially suitable foraging habitat. This minor reduction is not likely to impact on the viability of Roost Site A.

Roost Site B

Table 9.4 Potentially Suitable Foraging Habitat within 12 km of Roost Site B

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12km of Roost Site B (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	67
125	Bare areas; salt lakes	Low	Low	287
999	Medium woodland; marri	High	High	1231
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	16960
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	801
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	124
			Total Area	**19,183**

Of the 19,183 ha of potential suitable foraging habitat present within the foraging range of Roost Site B, the Project will clear 12.48 ha, accounting for 0.06% of the total potentially suitable foraging habitat. This minor reduction is not likely to impact on the viability of Roost Site B.

Breeding Site 1

Table 9.5 Potentially Suitable Foraging Habitat within 12 km of Breeding Site 1

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12 km of Breeding Site 1 (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	17
952	Shrublands; dryandra heath	High	Low	116
999	Medium woodland; marri	High	High	2,938
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	559
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	418
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	115
1036	Low woodland; Banksia prionotes	High	High	6
			Total Area	**4,169**

Of the 4,169 ha of potential suitable foraging habitat present within the foraging range of Breeding Site 1, the Project will clear 15.65 ha of native vegetation, accounting for 0.38% of the total potentially suitable foraging habitat. This minor reduction is not likely to impact on the viability of Breeding Site 1.

Regans Ford Roosting Site

Table 9.6 Potentially Suitable Foraging Habitat within 12 km of Regans Ford Roosting Site

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12km of Regans Ford Roosting Site (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	516
949	Low woodland; banksia	High	Low	9,399
999	Medium woodland; marri	High	High	888
1008	Medium open woodland; marri	High	High	85
1009	Medium woodland; marri & river gum	High	High	629
1015	Mosaic: Mixed scrub-heath / Shrublands; dryandra thicket	High	Low	2,413
1016	Mosaic: Low woodland; banksia / Shrublands; dryandra heath	High	Low	429
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	8,735
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	79
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	360
			Total Area	**23,533**

Of the 23,533 ha of potential suitable foraging habitat present within the foraging range of the Regans Ford Roosting Site, the Project will clear 2.99 ha, accounting for 0.01% of the potentially suitable foraging habitat. This minor reduction is not likely to impact on the viability of Regans Ford Roosting Site.

Moore River Breeding Site

Table 9.7 Potentially suitable foraging habitat within 12 km of Moore River Breeding Site

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12km of Moore River Breeding Site (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	617
949	Low woodland; banksia	High	Low	6,481
952	Shrublands; dryandra heath	High	Low	99
999	Medium woodland; marri	High	High	957
1008	Medium open woodland; marri	High	High	191
1009	Medium woodland; marri & river gum	High	High	388

1015	Mosaic: Mixed scrub-heath / Shrublands; dryandra thicket	High	Low	4,721
1016	Mosaic: Low woodland; banksia / Shrublands; dryandra heath	High	Low	435
1017	Medium open woodland; jarrah & marri, with low woodland; banksia	High	High	5
1027	Mosaic: Medium open woodland; jarrah & marri, with low woodland; banksia / Medium sparse woodland; jarrah & marri	High	Low	172
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	6,765
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	11
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	360
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii	High	Low	7
			Total Area	**21,208**

Of the 21,208 ha of potential suitable foraging habitat present within the foraging range of the Moore River Breeding Site, the Project will clear 1.71 ha, accounting for 0.01% of the total potentially suitable foraging habitat. This minor reduction is not likely to impact on the viability of the Moore River Breeding Site.

Cataby Breeding Site

Table 9.8 Potentially suitable foraging habitat within 12 km of Cataby Breeding Site

Vegetation Association	Description (DBCA, 2019)	Potential Foraging Suitability		Area within 12km of Cataby Breeding Site (ha)
		Carnaby's	Forest Red-Tail	
4	Medium woodland; marri & wandoo	High	High	67
999	Medium woodland; marri	High	High	1,138
1030	Low woodland; Banksia attenuata & B. menziesii	High	Low	10,609
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	High	Low	1,153
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	High	Low	143
			Total Area	**13,110**

Of the 13,110 ha of potential suitable foraging habitat present within the foraging range of the Cataby Breeding Site, the Project will clear 5.65 ha, accounting for 0.04% of the total potentially suitable foraging habitat. This minor reduction is not likely to impact on the viability of the Cataby Breeding Site.

9.3.1.4 Impact of Habitat Loss on Flight Paths between Foraging Sites and Known Roosting and Breeding sites.

Two known roosting sites and one known breeding site are located within the Project Area. A further two known roosting sites and one known breeding site are located outside the Project Area but partly within typical Black-Cockatoo foraging range (12 km).

Habitat loss as a result of the Project is unlikely to impact on the flight paths of Black-Cockatoo individuals that fly over and forage within the Project Area on the way to or returning from known nesting and roosting sites for the following reasons:

- The proposed clearing of Black-Cockatoo foraging habitat of any value by the Project represents approximately 0.05% of the potentially suitable foraging habitat in remnant vegetation within 12 km of the Project Area. At a regional scale, this extent of loss is not considered to be a limiting ecological factor within a 12 km range of the Project Area or known breeding and roosting sites. There is extensive availability of suitable and alternative foraging resources within and surrounding the Project Area, providing substantial redundancy in habitat availability. As such, any localised minor loss of foraging habitat is unlikely to constrain movement behaviour or necessitate changes to established flight paths.
- Foraging habitat loss as a result of the Project is distributed intermittently throughout the Indicative Project Footprint and often along the edges of degraded patches of vegetation, with large areas of high quality foraging habitat avoided. This intermittent distribution of foraging habitat loss is unlikely to impact on the flight paths of Black-Cockatoo individuals that fly over and forage within the Project Area
- Black-Cockatoo species are highly mobile and during the non-breeding period will mainly forage in areas up to 20 km from known night roosting habitat, though in some cases, foraging distances can be greater (DCCEEW, 2022). This inherent mobility provides a high degree of behavioural flexibility, allowing individuals to respond to spatial and temporal variability in food resource availability. The extent of habitat loss associated with the Project (23.05 ha, of which a large proportion is low quality habitat) could be considered to fall within the normal range of variability in foraging conditions experienced by individuals and is unlikely to result in detectable changes to movement patterns or flight pathways.
- There is sufficient availability of equivalent or higher quality foraging habitat in adjacent areas. Evidence from comparable situations (e.g. loss of pine plantations, seasonal variability in food resources, or fire-affected landscapes) demonstrates that Black-Cockatoos readily adapt to changes in resource distribution by utilising alternative foraging sites or plant species. It is therefore highly likely that any minor displacement from locally preferred feeding areas would be readily accommodated within the broader landscape without altering movement corridors.
- The loss of foraging habitat is small in extent and spatially dispersed, and will not materially alter landscape permeability. The removal of this foraging habitat is not expected to increase flight distances, travel times or energy expenditure for individuals moving between breeding, roosting and foraging areas. As such, functional connectivity across the landscape will be maintained, and no disruption to established or potential flight paths is anticipated.

9.3.2 Direct Mortality

Direct mortality as a result of the Project will not have a significant impact on Black-Cockatoos through the adoption of a minimum blade tip height of 59 m AGL and through implementing the Project BBAMP.

Collision with turbines and turbine blades poses a direct mortality risk to Black-Cockatoos. Flight heights for both Carnaby's Black-Cockatoo (65 records) and Forest Red-tailed Black-Cockatoo (1 record) were recorded as part of BBUS completed to date with the results presented in **Table 7.7**. Neither of the species were recorded flying within the RSA, with one to two individuals of Carnaby's Black-Cockatoo being recorded at a maximum flight height of 50 m AGL on three occasions. The ERM developed for the species shows that the majority (99%) of flight time for the species occurred below 30 m AGL.

The Forest Red-tailed Black-Cockatoo was recorded flying at a maximum height of 8 m AGL, however this is based on a single flight observation recorded during the BBUS. It should be noted however that both Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo exhibit similar flight behaviours.

Neoen is also collecting Black-Cockatoo flight height data for other potential wind farm projects in the Wheatbelt region. As of November 2025, flight data has been recorded for 80 Carnaby's Black-Cockatoo flights with the maximum height observed being 50 m AGL. For the Forest Red-tailed Black-Cockatoo, data has been recorded for 16 flight heights, with the maximum flight height recorded being 40 m AGL.

Between August 2024 and March 2025, Bamford Consulting Ecologists (BCE) conducted BBUS across four wind farm sites located between Perth and Eneabba. Similar to the Project Area, all sites were situated in agricultural landscapes with remnant native vegetation, and contained habitats known to support Carnaby's Black-Cockatoo. The four BBUS yielded 3,772 records over 224 hours of observation. With the exception of one, all flight heights were found to range between 0–50 m AGL, with group sizes varying from 1 to 400 individuals. Several flocks were observed to exhibit "vortexing" behaviour in response to disturbances such as vehicles or raptors. Only one flight height was recorded above 50 m AGL, and consisted of two birds that briefly rose to an estimated 60 m before descending (Bamford, 2025).

Based on the above understanding of Black-Cockatoo flight height, and through the adoption of a minimum blade tip-height of 59m AGL and measures in the BBAMP, direct mortality to Black-Cockatoos as a result of turbine and blade strike is unlikely to contribute to a decline in the population of either Carnaby's Black-Cockatoo or Forest Red-Tailed Black Cockatoo. A detailed assessment against all *Significant Impact Guidelines 1.1* criteria is provided in **Appendix J**.

9.3.3 Consideration of Other Impacts

An assessment of other potential impacts to Black-Cockatoos as identified by DCCEEW in the RFI dated 23 March 2026 is provided in Table 9.9 below.

Table 9.9 Consideration of Other Impacts to Black-Cockatoos

Potential Impact	Consideration of Impact	Impact Assessment
Impact on keystone habitat features	The proximity of the following keystone habitat features were considered for Black-Cockatoos: • The proximity of known breeding and roosting sites within 12km of the Project Area (refer **Figure 6.7**and **Figure 6.8**). • The area of potentially suitable foraging and breeding habitat within 12km of the Project Area (refer Table 6.6) • The number and rank of Black-Cockatoo nest trees (DBH>500 mm) within the Development Corridor and Indicative Project Footprint (refer Table 6.6). • The foraging habitat quality score of vegetation within the Development Corridor and Indicative Project Footprint (refer (Table 6.6). • The presence of roost sites within the Project Area. • The area of potentially suitable foraging habitat within 12km of known roosting and breeding sites that are located within foraging range of the Project Area (**Section 9.3.1.3**).	The Project will not impact on keystone habitat features through avoidance of: • Known Black-Cockatoo roosting or breeding sites. • All high-quality Black-Cockatoo foraging habitat (Site condition score of 6) • Rank 1 and Rank 2 potential Black-Cockatoo nest trees. Residual impacts to habitat features as a result of the Project are listed below, and are not likely to be significant: • Clearing of five Rank 3 potential Black-Cockatoo nest trees. • Clearing of Carnaby's Black-Cockatoo foraging vegetation with the following site condition scores out of 6: ○ 0.65 ha of moderate to high value (5/6), ○ 2.68 ha of moderate value (4/6), ○ 7.26 ha of low to moderate value (3/6) ○ 4.32 ha of low value (2) ○ 6.72 ha of negligible to low value (1) • Clearing of Forest Red-tailed Black-Cockatoo foraging vegetation with the following site condition scores out of 6: ○ 0.03 ha of moderate to high value (5/6), ○ 3.27 ha of moderate value (4/6), ○ 3.08 ha of low to moderate value (3/6) ○ 2.76 ha of low value (2) ○ 0.21 ha of negligible to low value (1)
Impact on known or likely flight paths	Flight pathways were considered by ensuring the following flight details were captured for Black-Cockatoos during BBUS: • minimum, maximum, and modal flight height AGL of the observed bird/s (to the nearest metre beneath 100 m and in 10 m increments thereafter)	The Project is unlikely to impact on known or likely flight paths of Black-Cockatoos for the following reasons: • Black-Cockatoos typically fly at or below canopy height within this type of landscape, which is well below the minimum RSA being adopted for the Project (59 mAGL). • Flight height data has been collected for Carnaby's Black-Cockatoo (65 records) and Forest Red-tailed Black-Cockatoo (1 record) with the results presented in **Table 7.7**. Neither of the species were recorded flying within the RSA.

	• flight duration • distance and direction from the observer (to the nearest 10 m and 10°, respectively) • direction of flight (to the nearest 10°) • flight pattern (i.e. not flying, local movement, directional flight, circling, swooping, varied, or other) • behaviour (i.e. flight, foraging, perching, mating, aggressive interactions, hollow inspection, nesting, or on station). Where sufficient flight data was captured for conservation significant bird species, it was used to develop Exposure Risk Models (ERMs). ERMs assess the relative risk of rotor strike at different heights and determine whether data collected for a given species adequately captures the variation and general patterns of flight behaviour. Further information is provided in Section 2.2.4.4 of **Appendix H**.	• The ERM developed for the Carnaby's Black-Cockatoo shows that the majority (99%) of flight time for the species occurred below 30 mAGL. • The Forest Red-tailed Black-Cockatoo was recorded flying at a maximum height of 8 mAGL, however this is based on a single flight observation recorded during the BBUS. • The scale, quality, ecological context and intermittent distribution of foraging habitat loss will not materially affect the habitat available to Black-Cockatoo individuals flying over or foraging within the Project Area (refer **Section 9.3.1**)
Disruption to movement corridors following turbine operation	Flight data captured as outlined above assisted in understanding movement corridors for Black-Cockatoos across the Project Area. A night-roost watch was also undertaken for Carnaby's Black-Cockatoo, with a flock of approximately 150 to 200 birds tracked to their roost location with behaviours and further details presented in Section 3.2.3 and Table 3.3 of **Appendix C**.	Turbine operation is unlikely to disrupt Black-Cockatoo movement corridors for the following reasons. • When crossing partially cleared agricultural landscapes, Black-Cockatoos typically move between scattered tree patches at or below canopy height. This flight height is well below the minimum RSA height. • The distribution of native vegetation within the Project Area will continue to provide movement and foraging opportunities if Black-Cockatoo flocks were to move through the landscape between known roosting or breeding sites. Refer Section **9.3.1.3** which details the minimal impact clearing will have on foraging resources available within range of nearby known breeding and roosting sites.

Impact of electrocution from transmission lines	Electrocution by transmission lines is a threat posed to birds perching on (or contacting) lines and coincidentally touching a grounded object or another line. Bird size and perching behaviour has been considered when assessing this potential impact.	Although Black-Cockatoos are susceptible to electrocution by transmission lines due to their relatively large body size and wingspan, the likelihood of electrocution is considered low for the following reasons: • Black-cockatoos preferentially utilise natural perches (e.g. trees within foraging and roosting habitat), and use of transmission infrastructure is expected to be opportunistic and transient. The Project Area does not support a high density of key habitat features (e.g. breeding sites or high-value roosting areas) that would increase the likelihood of frequent interaction with overhead assets. As such, exposure to electrocution risk is expected to be limited. • The design of modern transmission infrastructure incorporates separation distances between conductors and components that substantially reduce the likelihood of birds bridging energised elements.
Impact of potential updrafts/thermal wind currents relevant to the site	Topographic relief and presence of larger waterbodies were considered in determining the potential for updrafts/thermal wind currents to occur within the Project Area.	The likelihood of updrafts/thermal wind currents occurring, and therefore their associated impact, is expected to be low for the following reasons: • The Project Area is typically of low topographic relief without specific landscape features that would be expected to concentrate thermal updrafts in any one area. • Whilst larger waterbodies have the potential to generate thermal updrafts, these larger water bodies are located in the western side of the Project Area and over 3.5 km from the nearest turbines.
Impact of vehicle or machinery strikes	Black-Cockatoo mobility and the extent of vehicle, plant and equipment movements was considered when assessing the impact of vehicle and machinery strikes.	The risk of vehicle or machinery strikes to Black-Cockatoos are expected to be low for the following reasons: • Pre-clearance surveys will be undertaken in accordance with the CEMP to identify and relocate any fauna present prior to disturbance. This process ensures that individuals are not present within active work areas at the time of clearing, substantially reducing the likelihood of direct strikes. • The majority of construction disturbance is located in areas of low suitability for Black-Cockatoos (e.g. cleared agricultural land, reducing the likelihood of interaction. • Vehicle speed limits will be implemented throughout construction and operation. • Vehicles will use designated access tracks.
Cumulative impacts on local	Cumulative impacts on the local and regional populations of black cockatoos	Cumulative impacts on Black-Cockatoos are not expected to be significant at the local or regional scale, and are not expected to influence the collision risk assessment.

and regional populations	were considered through a review of publicly available literature on existing and proposed wind farms in the region.	The region surrounding the Project has been extensively cleared, primarily for agricultural purposes but also for renewable energy and mining activities, with remaining patches of remnant vegetation providing limited but valuable fauna habitat and ecological connectivity. While future renewable energy projects in the region may result in additional localised vegetation clearing or habitat disturbance, cumulative impacts are expected to remain low. This is primarily due to the design flexibility of renewable energy projects, which typically prioritise cleared agricultural land and avoid areas of high environmental value. For wind farms such as Waddi, Yandin, Parron, and Marri, vegetation clearing is generally small in scale and mostly of degraded vegetation, and fauna impacts, such as potential bird collisions or habitat loss, are managed through avoidance, targeted design (eg RSA typically above the typical flight height of Black-Cockatoos), monitoring, and offset measures. Collectively, these projects are: • unlikely to result in a substantial reduction in habitat, fragmentation of important populations, or disruption to movement or lifecycle processes for Black-Cockatoos • Increase the potential of significant impact as a result of collision, noting the adopted minimum blade tip height for modern turbines is above typical Black-Cockatoo flight heights.
Impact of alienation and landscape sterilisation	Species behaviour and availability of suitable foraging, roosting and breeding habitat in the Project Area and surrounds were considered when assessing the impact of alienation and landscape sterilisation	Impacts associated with habitat alienation and landscape sterilisation are unlikely to be significant for the following reason. • Black-cockatoos are highly mobile and regularly utilise fragmented agricultural landscapes, indicating a high degree of behavioural flexibility in response to disturbance. Although some localised avoidance of turbine infrastructure may occur, this is expected to be restricted to a small zone of influence around individual turbines and access tracks. At the scale of the Project Area and broader landscape, this would not result in a substantial reduction in the area or quality of foraging habitat available to the species. Extensive areas of equivalent or higher quality habitat occur beyond the Indicative Project Footprint, and the Project will not fragment habitat to the extent that an important population would be isolated or that movement between foraging, roosting and breeding areas would be restricted.

9.4 Summary of Migratory Species Significant Impact Assessment Findings

Eight migratory species have been recorded within the Project Area as part of the field survey program to date, with a further five having a moderate or high likelihood of occurring in the Project Area. All 13 of these species are non-breeding migrant visitors to Australia during the austral summer, with the majority migrating from Europe and Russia. Twelve (12) of the 13 species are migratory shorebirds, most of which have a preference for coastal environments with some utilising near-shore wetlands and other water bodies. The fork-tailed swift is not a shorebird and is almost exclusively aerial. As a result of this, habitat impacts are not relevant or discussed for the fork-tailed swift.

All records of migratory shorebirds have been in the wetlands west of Brand Highway. These wetlands are considered to provide the most suitable habitat for migratory shorebirds in the Project Area. Findings from the Targeted Shorebird Survey Report (Umwelt, 2026) (**Appendix K**) indicate that the Project is located in a landscape where high-quality habitat for conservation significant wetland-dependent birds is limited and largely occurs outside the Indicative Project Footprint. The recorded presence of these taxa within the Project Area is infrequent and at low abundance, and there is no evidence of regular movement or utilisation of airspace that would increase susceptibility to turbine collision.

In developing the SIAs for migratory species, it is noted that many of the Conservation Advice Notes for migratory species define habitat critical to the survival of the species as those that exceed the thresholds used to determine internationally or nationally important habitat. For the purposes of the migratory SIAs in this document, this has been used to determine habitat critical to the survival of the species.

EPBC guidelines (Department of the Environment, 2013a) note that wetland habitat should be considered internationally important if it regularly supports:

- 1 percent of the individuals in a population of one species or subspecies of waterbird or
- A total abundance of at least 20,000 water birds.

It further notes that habitat should be considered nationally important for migratory shorebirds if it regularly supports:

- 0.1 percent of the flyway population of a single species of migratory shorebird.
- 2,000 migratory shorebirds.
- 15 migratory shorebird species.

In further support of this, the recent *Australian National Directory of Important Migratory Shorebird Habitat* (Driessen, J et al., 2025) notes that for a site to be classed as internationally important, 1% of a species' flyway population had to use that site, and for a site to be considered nationally important, 0.1% of a species' flyway population had to use the site.

To date, water birds recorded in the Project Area have not exceeded 20,000, migratory shorebirds have not exceeded 2,000 and eight migratory shorebirds have been recorded on site. As a result of this, the 1% and 0.1% flyway populations will be used to define if wetlands on site can be considered internationally or nationally important, and thereby habitat critical to the survival of the species.

DCCEEW *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment, 2015) provides guidance on what is considered an ecologically significant proportion of a population for migratory birds. These guidelines indicate that 1% of the population is considered internationally important and 0.1% is considered nationally important. These thresholds have been considered as part of the impact assessment for each species and in developing criteria for the Preliminary BBAMP.

EPBC Act Policy Statement 3.21: *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE, 2017) identifies loss of habitat, degradation of habitat, increased disturbance and direct mortality as the primary significant impacts on migratory birds. A brief assessment against these is provided below, with a more detailed assessment against the *MNES Significant Impact Guidelines 1.1* (Department of the Environment, 2013b) provided in **Appendix J**.

9.4.1 Habitat Loss

Habitat loss as a result of the Project will not have a significant impact on migratory shorebirds.

The most suitable and preferred migratory shorebird habitat within the Project Area is limited to three wetlands west of Brand Highway totalling 264 ha. The much smaller Lake Yangy (14.5 ha) to the east has the potential to support migratory shorebirds, however is likely not as suitable or preferred as the wetlands to the west of Brand Highway. The locations of these wetlands are presented in **Figure 6.12**.

Direct habitat loss will be limited to 1 ha of degraded vegetation on the edge of one of the wetlands to the west, that will be rehabilitated at the end of construction (**Figure 9.1**). Although this area is within the area mapped as wetlands based on DBCA geomorphic wetlands spatial data, it is fringing vegetation adjacent to the wetland and is unlikely to contain foraging habitat. The clearing of this degraded habitat is required to connect to existing transmission line and is already subject to agricultural activities.



FIGURE 9.1

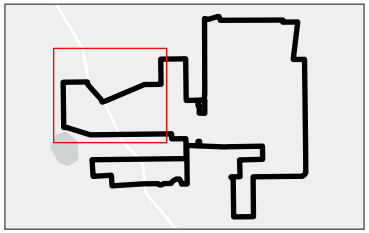
Extent of Proposed Temporary Clearing of Wetland Habitat

Legend

- Project Area
- Disturbance Footprint
- Road

Preliminary Layout

- Firewater Tanks
- Communication Towers
- Wind Turbine Generator (WTG)
- Internal Roads and underground Cabling (Permanent)
- Proposed 330kV transmission route - 13.21km
- BESS
- O&M Facility
- Substation
- Western Power Terminal
- Batch
- Batch Plant
- Satellite Compound



0 1 2

Kilometres

Scale 1:40,000 at A4
GDA2020 MGA Zone 50

umwelt

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.
APPROVED FOR AND ON BEHALF OF Umwelt

Image Source: ESRI Basemap (2023) | **Data Source:** Landgate (2024) Umwelt (2025)

9.4.2 Degradation of Habitat

Habitat degradation as a result of the Project will not have a significant impact on migratory shorebirds.

The wetlands west of Brand Highway where migratory shorebirds have been recorded are currently subjected to agricultural pressures, and the vegetation surrounding the wetlands has been mapped as being in Degraded and Completely Degraded condition.

The main ancillary infrastructure to be constructed west of Brand Highway are the BESS, substation and Western Power terminal. Construction of these facilities will be undertaken in accordance with the Project CEMP (**Appendix G**) which sets out management measures to be implemented to protect the key environmental values of the area such as surface water, vegetation and fauna habitat. Through site design and implementation of the CEMP, wetland hydrology and ecological function is expected to remain unaffected as a result of construction and operation activities.

9.4.3 Increased Disturbance

The Project will not result in a level of disturbance that will significantly impact migratory shorebirds.

The migratory shorebirds recorded in the Project Area to date are mobile non-breeding species that use a wide network of coastal environments and inland wetlands across Australia during the austral summer. Turbines have been setback more than 3.5 km from wetlands in the west, within the Project Area, where migratory shorebirds have been recorded. Other ancillary infrastructure such as the BESS, substation and Western Power terminal have been set back over 175 m from the closest edge of these wetlands which is more than the minimum 165 m buffer recommended in EPBC Act Policy Statement 3.21 (DoEE, 2017).

Whilst there is the potential for temporary disturbance to migratory shorebirds during construction of the BESS, substation and Western Power terminal, this will be limited to approximately 24 – 30 months and to the edges of the wetlands closest to the construction footprint. Adjacent wetlands, and the edges of wetlands set further back from the construction footprint can still be utilised by migratory shorebirds if required.

9.4.4 Direct Mortality

Direct mortality as a result of the Project is unlikely to have a significant impact on migratory species.

Collision with turbines and turbine blades during flight pose the key direct mortality risk to migratory species. Generally, migratory species are known to undertake two flight types within Australia:

- Biannual long-distance flights when travelling from their breeding sites in the Northern hemisphere, to non-breeding sites in Australia.
- Local flights between foraging areas and to favoured roosting locations.

During biannual long distance migration flights, migratory species inhabiting Australia typically fly at altitudes of 1,000–5,000 m (Geering et al., 2007). This far exceeds the RSA and therefore blade strike during migration flights is highly unlikely.

The key factor likely to influence local flight heights is the geographical distribution of suitable foraging and roosting sites. Migratory shorebirds are known or considered likely to occur at four of the Project Area wetlands as mapped in **Figure 6.12**. Three of these wetlands are adjacent to one another in the west of the Project Area and are located 3.5 km from the nearest turbine. The pH of these wetlands was measured on 23 September 2025 with their values ranging 8.38 to 8.74. A pH in the range of 6.5 to 9.0 is considered ideal for freshwater aquatic organisms which the shorebirds may feed on (Alabaster, 1982; ANZECC & ARMCANZ, 2000; CCME, 1991; USEPA, 1986). The fourth wetland is Lake Yangy found in the eastern part of the Project Area. Due to its smaller size, higher pH of 11.54 (measured on 2 September 2025) which is unlikely to provide favourable foraging resources, and lower habitat suitability, it is therefore less likely to attract notable numbers of migratory shorebirds, with any presence also expected to be of shorter duration.

No migratory shorebirds have been observed in flight across approximately 140 person-days of BBUS over a 27-month period, with no local passage between wetlands observed and no migratory shorebirds recorded in the wetlands east of Brand Highway. This indicates that the migratory shorebirds primarily occupy their time foraging in suitable wetlands when conditions are favourable. This, in conjunction with the very low numbers of migratory shorebirds recorded, indicates that significant impacts to migratory shorebirds as a result of turbine collision is unlikely.

There is also the potential for migratory shorebirds to collide with existing and proposed overhead transmission lines in the vicinity of the wetlands west of Brand Highway. As above, time in flight is expected to be very low thereby reducing the risk. Furthermore, carcass searches will be undertaken at numerous locations beneath the overhead transmission line (refer **Appendix D**) to determine if management measures such as line markers and/or bird diverters should be installed as an adaptive measure should trigger levels as identified in the Preliminary BBAMP be exceeded.

The significant impact assessments of threatened ecological communities and threatened fauna are explained in detail in **Appendix J**.

9.4.5 Consideration of Other Impacts

An assessment of other potential impacts to migratory shorebirds as identified by DCCEEW in the RFI dated 23 March 2026 is provided in **Table 9.10** below.

Table 9.10 Consideration of Other Impacts to Migratory Shorebirds

Potential Impact	Consideration of Impact	Impact Assessment
Impact on keystone habitat features	The proximity of the following keystone habitat features were considered for migratory shorebirds: • The proximity of internationally significant, nationally important and regionally important habitats as identified by Driessen et al (2005). Refer **Appendix J** where distance from internationally and nationally important sites is identified for each migratory shorebird species. Refer Section **6.3.3.1** where distance from regionally important habitats is identified. • The proximity and suitability of all (76) DBCA recognised geomorphic wetlands within the Project Area (refer **Table 6.16**, **Figure 6.11** and **Figure 6.12**). • The proximity and suitability of all (361) wetlands within the RCA (Refer **Table 6.15** and **Figure 6.12**)	The project will not impact on keystone habitat features for migratory shorebirds as the impact will be confined to the temporary clearing of 1ha of migratory shorebird habitat comprising of degraded vegetation on the edge of a wetland. This will be rehabilitated at the end of construction.
Impact on known or likely flight paths	Flight pathways were considered by ensuring the following flight details were captured for migratory shorebirds during BBUS: • minimum, maximum, and modal flight height AGL of the observed bird/s (to the nearest metre beneath 100 m and in 10 m increments thereafter) • flight duration • distance and direction from the observer (to the nearest 10 m and 10°, respectively) • direction of flight (to the nearest 10°)	The Project is unlikely to impact on known or likely flight paths of migratory shorebirds for the following reasons: • No migratory shorebirds have been observed in flight during approximately 140 person-days of BBUS across a 27-month period. This indicates that they primarily occupy their time foraging in suitable wetlands when conditions are favourable, with no passage between wetlands observed during surveys undertaken. • Migratory shorebirds have only been recorded in the wetlands West of Brand Highway. These wetlands are setback over 3.5km from the nearest turbine. • There will be no permanent loss of wetland habitat that is most suited to migratory shorebirds.

	• flight pattern (i.e. not flying, local movement, directional flight, circling, swooping, varied, or other) • behaviour (i.e. flight, foraging, perching, mating, aggressive interactions, hollow inspection, nesting, or on station). A wetland habitat suitability assessment was also undertaken to determine what wetlands may be used by migratory shorebirds in and around the Project Area and to understand if they may fly between these. Further details are provided in Section **6.3.3.4**, Section **6.3.6** and**Appendix K**.	
Disruption to movement corridors following turbine operation	Flight data captured as outlined above assisted in understanding movement corridors for migratory shorebirds across the Project Area.	Turbine operation is unlikely to disrupt migratory shorebird movement corridors. Migratory species are generally known to undertake two flight types within Australia: • Biannual long-distance flights when travelling from their breeding sites in the Northern hemisphere, to non-breeding sites in Australia. • Local flights between foraging areas and to favoured roosting locations. During biannual long distance migration flights, migratory species typically fly at altitudes of 1,000–5,000 m (Geering et al., 2007). This far exceeds the RSA, and therefore disruption to long distance migration flights is highly unlikely. The key factor likely to influence local flight heights is the geographical distribution of suitable foraging sites. All records of migratory shorebirds have been in the wetlands on the Western side of the Project Area which are setback 3.5km from the nearest turbine. No migratory shorebirds have been recorded east of these wetlands, indicating the Project Area is not a movement corridor for migratory shorebirds.
Impact of electrocution from transmission lines	Electrocution by transmission lines is a threat posed to birds perching on (or contacting) lines and coincidentally touching a grounded object or another line. Bird size and perching behaviour has been considered when assessing this potential impact.	The migratory shorebird species known or likely to occur within the Project Area are not expected to utilise any wires or lines for perching, and the wingspans of these taxa make any electrocution by contact highly improbable.

Impact of potential updrafts/thermal wind currents relevant to the site	Topographic relief and presence of larger waterbodies were considered in determining the potential for updrafts/thermal wind currents to occur within the Project Area.	The likelihood of updrafts/thermal wind currents occurring, and therefore their associated impact, is expected to be low for the following reasons: • The Project Area is typically of low topographic relief without specific landscape features that would be expected to concentrate thermal updrafts in any one area. • Whilst larger waterbodies have the potential to generate thermal updrafts, these larger water bodies are located in the western side of the Project Area and over 3.5 km from the nearest turbines.
Impact of vehicle or machinery strikes	Migratory shorebird movements, location of records and the extent of vehicle, plant and equipment movements was considered when assessing the impact of vehicle and machinery strikes.	The risk of vehicle or machinery strikes to migratory shorebirds are expected to be low for the following reasons: • Pre-clearance surveys will be undertaken in accordance with the CEMP to identify and relocate any fauna present prior to disturbance. This process ensures that individuals are not present within active work areas at the time of clearing, substantially reducing the likelihood of direct strikes. • The majority of construction disturbance is located in areas of low suitability for migratory shorebirds. • Vehicle speed limits will be implemented throughout construction and operation. • Vehicles will use designated access tracks.
Cumulative impacts on the local and regional populations	Cumulative impacts on the local and regional populations of migratory shorebirds were considered through a review of publicly available literature on existing and proposed wind farms in the region.	Cumulative impacts on migratory shorebirds are not expected to be significant at the local or regional scale, and are not expected to influence the collision risk assessment for the following reasons: • The areas within the local region most suitable for wind farm development occur within the SWA01 subregion, which is generally not characterised by wetlands of sufficient quality to support regular use by migratory shorebirds. • Migratory shorebird occurrence in and around the Project Area is generally sporadic and abundances are very low. In no case was a nationally or internationally significant number of birds recorded. • No migratory shorebirds have been observed in flight over approximately 140 person-days of BBUS.

Impact of alienation and landscape sterilisation	Species behaviour and availability of suitable foraging, roosting and breeding habitat in the Project Area and surrounds were considered when assessing the impact of alienation and landscape sterilisation	Impacts associated with habitat alienation and landscape sterilisation are unlikely to be significant for the following reason. • Migratory shorebirds recorded within the Project Area occur sporadically, in low numbers and have only been recorded in wetlands located over 3.5 km from turbines. This separation ensures that these wetland habitats remain fully available for foraging, and current usage patterns are not expected to be altered. Due to the closer proximity of the BESS and associated infrastructure, migratory shorebirds may exhibit short-term behavioural avoidance during construction, however this is expected to be confined to a minor proportion of the available wetland habitat, with the majority of wetland areas remaining unaffected and accessible.
Impact of shadow flicker, blade glint, blade throw and night lighting on migratory flight patterns	Location of species observations, understanding of migratory flight patterns and location of turbine infrastructure were considered when assessing potential impacts.	The potential for shadow flicker, blade glint, blade throw and night lighting to affect migratory flight patterns is considered to be low. Migratory species are generally understood to undertake two primary types of flight within Australia: biannual long-distance migrations between Northern Hemisphere breeding grounds and Australian non-breeding areas, and shorter, localised movements between foraging and roosting habitats. During long-distance migration, shorebirds typically travel at altitudes of approximately 1,000–5,000 m (Geering et al., 2007), which is well above the turbines which have a maximum tip height of 261 mAGL. As such, the potential for shadow flicker, blade glint, blade throw or lighting to influence these high-altitude movements is negligible. At a local scale, flight behavior is primarily influenced by the spatial distribution of suitable foraging and roosting habitat. Within the Project Area, all records of migratory shorebirds are confined to wetlands located to the west of the Project Area, with these habitats situated at least 3.5 km from the nearest turbine. No migratory shorebirds have been recorded east of these wetlands despite 140 days of targeted surveys, indicating that the Project Area does not function as a movement corridor for local flights. Noting the 3.5 km separation distance from known migratory shorebird records, and the lack of local flights through the Project Area, impacts associated with shadow flicker, blade glint, blade throw and night lighting are expected to be low.

9.4.6 Assessment of Confidence

The potential impact of the Project on migratory shorebirds has been assessed with a high degree of confidence and was supported by:

- Historical datasets, including the DBCA Threatened and Priority Fauna database and Altas of Living Australia records (that incorporate BirdLife Australia's Birdata and the Cornell Lab of Ornithology's Ebird's database).
- Relevant 'local' studies or reports.
- A working knowledge of the ecology and behaviours of expected taxa (drawn from literature and/or the experience or knowledge of the consultant ecologists that undertook the assessment).
- An assessment of the type and suitability of potential migratory shorebird habitats that was supported by on-ground observations.
- An eighteen-month field program that specifically monitored the occurrence of migratory shorebirds within and adjacent to the Project Area (noting that this targeted study was also supplemented by broader-scope BBUS, habitat and opportunistic surveys).

The following key aspects of migratory shorebird ecology were a key focus:

1. Recorded (and likely) Assemblage. Extensive survey effort, including targeted studies, and the use of expert ecologists with a high level of shorebird experience have provided excellent data to ensure that there is a high degree of certainty and confidence in the known and expected migratory shorebird assemblage.
2. Wetland Use (spatial patterns). Survey sites were deliberately positioned to be geographically spread and representative of available habitats on site and this, combined with the extensive survey effort, afford a high degree of certainty and confidence in the spatial interpretations made here.
3. Seasonality (temporal patterns). Survey events were deliberately timed to cover all ecologically relevant 'seasons' (for shorebirds) and survey effort was apportioned accordingly. Therefore, there is a high degree of certainty and confidence in the temporal interpretations made here.
4. Flight heights. A vast survey effort was undertaken across seven BBUS but no flights of shorebirds were observed. This is almost certainly due to the very low number and erratic presence of these taxa in the Project Area. In the absence of site-specific data, generally accepted patterns of flight behaviour of shorebirds (drawn from reliable and accepted literature sources) were applied to the Project context and there is a high degree of confidence that this is reasonable and appliable to reach impact conclusions without further investigation or research being warranted.
5. Flight paths. A vast survey effort was undertaken across the BBUS and targeted surveys but no flight path observations of shorebirds were made. While this may be due to the very low number and erratic presence of these taxa in the Project Area (as for flight heights, above), it may also reflect an existing avoidance of using the airspace above the Project Area for passage (reflecting limited availability of suitable habitat beneath). In the absence of strong site-specific data, it is considered that any application of 'general' principles (other than at a very basic level) would not provide additional value, not be worth undertaking and would not affect the overall assessment of impact.

Therefore, while not addressed in the detail of the other factors, there is still a high level of confidence in reaching impact conclusions without further investigation or research being warranted.

10.0 Residual Impacts and Environmental Offsets

10.1 Residual Impacts

Following implementation of the mitigation hierarchy described in **Section 8.0**, residual impacts will for remain for 'Banksia Woodland of the Swan Coastal Plain' TEC, Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo. There are unlikely to be any residual impacts to migratory species.

The residual impacts to each of these are presented in **Table 10.1**.

Table 10.1 Residual Impacts to MNES

MNES	Residual Impact
'Banksia Woodland of the Swan Coastal Plain' TEC	• Permanent loss of up to 0.11 ha of Degraded TEC
Carnaby's Black-Cockatoo	• Permanent loss of up to five Rank 3 potential Black-Cockatoo nest trees. • Permanent loss of Carnaby's Black-Cockatoo foraging vegetation with the following site condition scores out of 6: 0.65 ha of moderate to high value (5/6), 2.68 ha of moderate value (4/6), 7.26 ha of low to moderate value (3/6) 4.32 ha of low value (2) 6.72 ha of negligible to low value (1)
Forest Red-tailed Black-Cockatoo	• Permanent loss of up to five Rank 3 potential Black-Cockatoo nest trees. • Permanent loss of Forest Red-tailed Black-Cockatoo foraging vegetation with the following site condition scores out of 6: 0.03 ha of moderate to high value (5/6), 3.27 ha of moderate value (4/6), 3.08 ha of low to moderate value (3/6) 2.76 ha of low value (2) 0.21 ha of negligible to low value (1)

When these residual impacts are evaluated against the criteria set out in the Significant Impact Guidelines 1.1 (refer Section **9.2**, Section **9.3** and **Appendix J**) they are unlikely to be significant for the following key reasons:

- Banksia Woodlands TEC – negligible and low-quality impact: The permanent loss is very small in extent (0.11 ha) and confined to vegetation in Degraded condition, meaning it does not represent a substantial reduction in the extent or integrity of the ecological community, nor affect areas in Good or better condition.

- Black-Cockatoo foraging habitat – minimal loss of higher value foraging habitat: Only 0.65 ha of moderate–high quality habitat is impacted, with the majority of clearing occurring in low to negligible foraging value vegetation. This scale of impact is unlikely to substantially reduce foraging resources or fragment important habitat for the species.
- Black-Cockatoo breeding habitat – no impact to important breeding habitat: The loss is limited to five Rank 3 potential nest trees, with all confirmed or high-quality potential nesting trees (Rank 1 and 2) avoided. As such, the impact does not interfere with breeding, an important population, or critical life cycle stages. The minor clearing of foraging habitat is highly unlikely to indirectly impact the viability breeding or the success of raising fledglings at nesting sites within foraging range.
- Black-Cockatoo roosting habitat – no impact to known roosting sites. Known Black-Cockatoo roosting sites have been avoided through Project design and turbine setbacks, ensuring that important roosting behaviour is maintained and the Project does not disrupt a key ecological function relevant to population persistence. The minor clearing of foraging habitat is highly unlikely to impact the viability of nearby roosting sites.

10.2 Environmental Offset

An OMP has been developed to address the Project's residual impacts described above with a copy of the OMP provided in **Appendix L**. The OMP has been prepared in accordance with EPBC Act Environmental Offsets Policy (EPBC Offset Policy) (Commonwealth of Australia, 2012) and the Commonwealth Offset Assessment Guide (DCCEEW, 2022a), and with consideration of discussions with DCCEEW on 3 June 2026.

The OMP is targeted to residual impacts associated with the proposed clearing of vegetation that provides foraging habitat for Carnaby's Black-cockatoo and Forest Red-tailed Black-cockatoo, and to the loss of potential breeding habitat trees. A land-based direct offset is proposed, involving revegetation of cleared agricultural land, long-term protection and management of the land, and provision of artificial nest boxes. This approach is intended to provide an offset that is directly related to the affected protected matters. The approach is consistent with the requirement that offsets compensate for residual significant impacts after avoidance and mitigation measures have been exhausted.

The OMP identifies an offset site that has been assessed for its capacity to deliver revegetation outcomes and longer-term habitat values for the relevant black cockatoo species. The proposed offset comprises revegetation and long-term protection of 27.25 ha of cleared agricultural land to establish locally appropriate native vegetation and suitable black-cockatoo foraging habitat. The offset also includes retention of mature Marri paddock trees within the offset area, and installation and maintenance of artificial nest hollows based on the confirmed impact to suitable hollows in Rank 3 trees.

The OMP outlines management actions, implementation timing, monitoring, progressive performance indicators, completion criteria, trigger values, corrective actions, reporting and adaptive management Implementation of the OMP is expected to improve the extent, condition and connectivity of black cockatoo foraging habitat and fauna habitat more broadly in the local landscape and to provide compensatory breeding habitat outcomes through artificial nest boxes.

11.0 Ecological Sustainable Development

This section describes how the Project meets the principles of ecological sustainable development (ESD) as defined in Section 3A of the EPBC Act.

11.1 Integration of economic, environmental, social and equitable considerations

Principle (a): decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;

The Project has been designed to deliver positive economic, environmental, social and equitable outcomes, consistent with its positioning as a project of State significance and in the public interest.

Decision making processes adopted throughout the design of the Project strongly considered environmental and technical assessments, the outcomes of which directly informed design refinements and mitigation measures. These assessments considered a broad range of environmental and social factors including flora and vegetation, terrestrial fauna, noise, visual amenity, heritage values, and community interests.

During construction, temporary impacts such as increased traffic, noise and localised disturbance may occur; however, these are managed through implementation of relevant management plans. These short-term impacts have been balanced against the Project's broader benefits, including opportunities for local employment, contractor engagement and increased regional economic activity.

From an economic and strategic perspective, the Project contributes to a diversification of income in a predominantly agricultural region and supports local communities through initiatives such as a Community Benefit Fund and a Neighbour Benefit Sharing Scheme, ensuring that both the broader community and nearby landholders directly benefit from the development.

Environmentally, the Project has been carefully sited and designed to minimise impacts on the environment and surrounding land uses, including iterative layout refinements, avoidance of higher value vegetation and habitats where practicable, and implementation of adaptive management measures for birds and bats. The Project will also contribute to reducing greenhouse gas emissions through renewable energy generation, supporting both State and national decarbonisation targets.

Social and equitable considerations have been central to the Project's development, with extensive stakeholder and community engagement undertaken to understand and respond to local concerns and expectations. The inclusion of community benefit mechanisms and ongoing consultation demonstrates a commitment to equitable distribution of benefits and minimisation of impacts to nearby receptors.

The Project represents a balanced approach that integrates economic growth, environmental protection, social responsibility and equitable benefit-sharing, leading to positive outcomes for each of these factors.

11.2 Potential for threats of serious or irreversible environmental damage

Principle (b): if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

The Project has completed sufficient baseline surveys and technical assessments in accordance with relevant guidelines and standards and by suitably qualified consultants. These studies provide certainty of the environmental values with the potential to be impacted by the Project and confidence in the mitigation measures and environmental outcomes.

Project design has adopted a precautionary approach by favouring avoidance where practicable, supported by established management measures. Examples of precautionary approaches adopted include:

- Strategic siting of infrastructure within predominantly cleared land to avoid higher-value native vegetation and habitat.
- Application of conservative assumptions in defining disturbance footprints and assessing potential impacts, ensuring that potential risks are not underestimated.
- Undertaking targeted and seasonal surveys over multiple periods and seasons to address data gaps and reduce uncertainty in understanding species presence and behaviour.

Environmental management plans and adaptive management frameworks, including monitoring of key environmental values such as bird and bat interactions, provide mechanisms to respond to any unforeseen impacts during construction and operation.

11.3 Inter-generational equity

Principle (c): the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

Renewable energy projects such as the Yathroo Wind Farm, promote intergenerational equity by reducing reliance on fossil fuels and lowering greenhouse gas emissions, thereby helping to mitigate climate change and its long-term impacts.

The Project will seek to create lasting economic benefits, such as job opportunities and technological advancements, and establish an ongoing Neighbour Benefit Scheme providing an annual contribution of $1,050 per MW of installed Wind Capacity and $150 per MW of installed BESS capacity benefit fund which can provide a stable foundation for future economic growth.

Measures to avoid and minimise impacts to the environment have been identified and implemented to ensure the value of the environmental and ecological functions are maintained for future generations. The Project will use a small proportion of agricultural land and will enable the remainder of the Project Area to continue to be used for productive purposes.

11.4 Biological diversity and ecological integrity

Principle (d): the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;

The conservation of biological diversity and ecological integrity was a key Project consideration, particularly during site selection and design.

Ecological constraints analyses and detailed field surveys were used to identify sensitive flora, vegetation and fauna values, which directly informed the Development Corridor and iterative design process. This resulted in avoidance of higher value remnant vegetation (including approximately 300 ha of vegetation in good or better condition), avoidance of threatened flora and key fauna habitat (including black cockatoo nesting and foraging resources), and the placement of turbines more than 3.5 km from wetlands supporting migratory shorebirds.

The Project has sited infrastructure within previously cleared agricultural land as far as practicably (approximately 97% of the indicative footprint), with native vegetation clearing largely confined to small, degraded patches on the edges of remnant vegetation and thereby minimising impacts on biological diversity.

Where impacts cannot be avoided, they have been minimised as far as practicable and will be managed through mitigation measures, rehabilitation and offsets where required, ensuring that biodiversity values and ecological integrity are maintained at a landscape scale.

11.5 Improved Valuation, Pricing and Incentive Mechanisms

Principle (e): improved valuation, pricing and incentive mechanisms should be promoted.

The Project will comply with all relevant environmental legislation and policies, including the EPBC Act environmental offsets framework, which establishes a transparent mechanism for valuing residual impacts on MNES. The financial costs associated with offsets, site rehabilitation, and environmental management and monitoring have been fully incorporated into the Project's capital and operational expenditure, ensuring that environmental values are recognised and accounted for in Project economics.

The Project also contributes to this principle through positive economic and environmental incentives such as:

- Delivery of clean, competitively priced renewable energy: The Project harnesses the region's high-quality wind resource to generate reliable, low-emissions electricity, contributing to national and State decarbonisation objectives. By increasing the supply of renewable energy into the grid, the Project supports downward pressure on wholesale electricity prices while reducing the environmental cost associated with fossil fuel generation.
- Creation of long-term landholder income streams: The Project provides participating landowners with stable lease payments for hosting infrastructure, creating an additional and diversified income source. This improves the economic resilience of rural enterprises and incentivises the retention of land in compatible agricultural and conservation uses.

- Promoting environmental stewardship: The incorporation of offset management, rehabilitation commitments, and ongoing land management obligations establishes long-term commitments for the protection and enhancement of biodiversity values. These mechanisms ensure that environmental outcomes are maintained and improved over time, aligning financial investment with ecological performance.

12.0 Economic and Social Matters

This section addresses economic and social matters as raised by DCCEEW in the RFI dated 23 March 2026.

12.1 Economic and Social Impacts

12.1.1 Economic Costs and Benefits

The Project represents a significant private investment in renewable energy infrastructure, delivering both regional and State-level economic benefits while allowing for co-existence with existing agricultural land uses.

Key economic benefits include:

- Renewable energy generation: The Project will generate up to 500 MW of electricity, supported by a 400 MW / 3200 MWh BESS, contributing to energy security, emissions reduction, and the transition of the SWIS away from coal-fired generation.
- Regional economic diversification: The Project introduces a new industry within a predominantly agricultural region, while maintaining ongoing cropping and grazing activities due to its limited disturbance footprint (approximately 3 - 4% of the Project Site).

  Direct financial benefits to stakeholders:

  - Participating landholders will receive long-term lease income, supporting farm viability.
  - A Community Benefit Fund will provide annual contributions based on installed capacity to support local projects and services.
  - A Neighbour Benefit Sharing Scheme and First Nations benefit-sharing arrangements will provide additional localised economic and social benefits.
- Local economic activity: The Project will increase demand for local goods and services during construction and operations, supporting local businesses and service providers.

Economic costs are primarily associated with the capital investment and ongoing project delivery, including:

- Funding of all infrastructure (grid connection, roads, internal infrastructure) by the Proponent.
- Implementation of environmental management, mitigation measures, and decommissioning obligations.
- Temporary pressures on local accommodation and infrastructure during construction, which will be managed through workforce accommodation planning, traffic management measures, and contributions to road maintenance where required.

Overall, the Project is expected to provide a net positive economic and social contribution through job creation, regional investment, and long-term diversification of the local economy.

12.1.2 Employment Opportunities

The Project will generate employment opportunities across both the construction and operational phases, with an emphasis on local and regional participation.

During the construction phase, up to 450 jobs are expected to be generated at peak over the 33-month construction period, with workforce numbers fluctuating across Project stages. The proponent will prioritise local employment and procurement, with additional opportunities for Indigenous participation and local business involvement identified through stakeholder engagement.

During the operational phase the Project will support 10–15 ongoing full-time roles over its operational life (approximately 30 years), primarily associated with operations, maintenance, and site management.

Additional indirect employment will be generated through local supply chains and service industries. Ongoing community investment programs will be funded through the Community Benefit Fund.

12.2 Public Consultation

Public consultation for the Project has been undertaken in a staged and ongoing manner in consideration of Project design. Engagement commenced with directly affected landholders in late 2023, with broader stakeholder and community consultation undertaken from early 2024 and continuing throughout Project development. Activities have included briefings and meetings with State and Commonwealth agencies (including EPA, DWER, DPLH and DCCEEW), multiple presentations to the Shire of Dandaragan, and ongoing consultation with the Yued Aboriginal Corporation, which has resulted in the execution of a Yued Heritage Protection Agreement and commitments to continued engagement and benefit-sharing.

Consultation with surrounding landholders and neighbours has involved one-on-one meetings, provision of Project information and visual materials, and development of participation and benefit-sharing arrangements.

Broader community engagement has included community information sessions, mail-outs, information booklets, a project website and local media. Engagement has also been undertaken with local businesses, service providers, emergency services and accommodation providers to identify potential impacts and opportunities associated with the Project.

Key outcomes of consultation have influenced both Project design and mitigation measures. Strong stakeholder interest in local benefits informed the establishment of a Community Benefit Fund, Neighbour Benefit Sharing Scheme and First Nations benefit-sharing arrangements. Feedback regarding employment, procurement and economic opportunities has informed commitments to prioritise local workforce participation and business engagement.

Potential social impacts identified through consultation, including pressure on local accommodation and road use during construction, have informed the development of an accommodation strategy and traffic management measures. Ongoing consultation with emergency services has also informed emergency response planning.

Overall, consultation has been comprehensive, with outcomes directly reflected in the Project layout, management measures and community benefit initiatives.

Engagement will continue throughout construction, operation and decommissioning to ensure ongoing responsiveness to stakeholder and community feedback.

12.3 Indigenous Engagement

12.3.1 Site Context

The Project is located within the traditional lands of the Yued people, represented by the Yued Aboriginal Corporation (YAC). Consultation and assessment have identified the potential for Aboriginal cultural heritage values within the Project Area, particularly associated with waterways and remnant vegetation, which are recognised as areas of higher archaeological and cultural sensitivity.

A Desktop Aboriginal Heritage Due Diligence Assessment identified two registered Aboriginal heritage sites within the Project Area (artefact scatters), as well as additional areas of potential cultural heritage significance. These sites will be avoided.

Project design has minimised impacts on areas with higher potential for Aboriginal cultural heritage. Heritage surveys will be undertaken prior to ground disturbance in areas as agreed with the YAC.

Potential impacts to Indigenous heritage values will be managed through site avoidance, further surveys, development and implementation of a Chance Finds Procedure, and implementation of cultural heritage management and monitoring protocols in consultation with the YAC.

12.3.2 Indigenous Consultation

Consultation with the YAC commenced in 2024 and has included multiple meetings, workshops and heritage surveys.

Key outcomes include:

- Execution of a Yued Heritage Protection Agreement (YHPA) in May 2025, establishing a formal framework for consultation, heritage protection and engagement.
- Undertaking of heritage monitoring for early project works (e.g. geo-technical investigations and met mast installation).
- Ongoing collaboration to identify and protect cultural heritage values and inform Project design.
- Agreement to continue discussions regarding Indigenous employment, procurement and benefit-sharing opportunities.

Engagement activities with Yued members have also identified key interests in employment opportunities, environmental protection, cultural heritage management and equitable benefit-sharing.

12.3.3 Alignment with best practice Indigenous engagement

The Project has undertaken Indigenous consultation in consideration of '*Interim Engaging with First Nations People and Communities on Assessments and Approvals under Environment Protection and Biodiversity Conservation Act 1999* (DCCEEW, 2023). Key requirements of this include:

- Identification of affected Indigenous groups: It was identified early that the Project is located in the traditional lands of the Yued people who are represented by the YAC.
- Early and ongoing engagement: Engagement with the YAC commenced in 2024 and consultation has been ongoing through all project phases. Neoen has committed to completing heritage surveys prior to Project ground disturbance and implementing appropriate Aboriginal cultural heritage controls in consultation with the YAC.
- Building trust and ongoing communication: Regular meetings and workshops have been held with the YAC, and a YHPA was signed on 28 May 2025. Neoen is continuing to work with the YAC to understand heritage values throughout the Project Area beyond that of the desktop studies completed to date.
- Appropriate timeframes: Consultation has occurred progressively since 2024 and will continue through approvals, construction and operations. Heritage surveys will be completed prior to ground disturbance in accordance with the YHPA.
- Cultural awareness: Engagement has included culturally appropriate consultation processes, and respect for cultural protocols and heritage management requirements. As part of the site induction training that all personnel will be obliged to undertake, information will be included on cultural awareness.

12.3.4 State Requirements

Indigenous heritage management for the Project is subject to the *Aboriginal Heritage Act 1972* (WA) (AH Act), which protects Aboriginal sites and requires avoidance of impacts unless approvals are obtained.

The Project has sought to comply with key requirements of the AH Act via:

- Engaging with the Traditional Owners.
- Undertaking a due diligence assessment to inform Project design and layout.
- Avoiding known registered heritage sites.
- Commitment to complete Aboriginal heritage surveys in advance of ground disturbance and in accordance with the YHPA.

Furthermore, the Project was granted Development Approval under the *Planning and Development Act 2005* on 23 October 2025. Condition 20 of the approval states:

Prior to the commencement of construction, the proponent shall undertake detailed, on-ground cultural heritage surveys over targeted areas of proposed infrastructure, including Yued Traditional Owner participation, to ensure compliance with the Aboriginal Heritage Act (1972) (as amended). Surveys should consider both tangible and intangible cultural heritage values.

13.0 References

Alabaster, J. S. (1982). *Water Quality Criteria for Freshwater Fish* (2nd ed.). Butterworth-Heinemann. https://doi.org/10.1016/B978-0-408-10849-2.50006-X

ANZECC & ARMCANZ. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3, Primary Industries*. Primary Industies.

Australian Government. (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Department of Sustainability, Environment, Water, Population and Communities (DSEWPC). https://www.dcceew.gov.au/sites/default/files/documents/offsets-policy_2.pdf

Baerwald, E. F., D'Amours, G. H., Klug, B. J., & Barclay, R. M. R. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. *Current Biology*, *18*(16), R695–R696. https://doi.org/10.1016/j.cub.2008.06.029

Bamford. (2020). *Scoring System for the Assessment of Foraging Value of Vegetation for Black-Cockatoos*. Bamford Consulting Ecologists. https://ecologists.bamford.id.au/ecological-consulting/black-cockatoos

Bamford. (2025). *Bird and Bat Management Plan*. Bamford Consulting Ecologists. https://www.epa.wa.gov.au/sites/default/files/Referral_Documentation/MarriWF%20-%20ERD%20-%20Appendix%20Q%20Bird%20and%20Bat%20Management%20Plan.pdf

Bancroft, W., & Bamford, M. (2023). *South32 Collie Offset Areas Threatened Fauna Assessment* (Unpublished Report to South32 Worsley Alumina by M. J. and A. R. Bamford Consulting Ecologists).

BoM. (2024). *Climate Data Online*. Bureau of Meteorology (BoM). http://www.bom.gov.au/climate/data

CCME. (1991). Appendix IX - A protocol for the derivation of water quality guidelines for the protection of aquatic life (April 1991). In *Canadian water quality guidelines*. Canadian Council of Ministers of the Enviornment.

Commonwealth of Australia. (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*.

DAWE. (2013). *Draft survey guidelines for Australia's threatened orchids: Guidelines for detecting orchids listed as 'Threatened' under the* Environment Protection and Biodiversity Conservation Act 1999 (p. 85). Department of Agriculture, Water and Environment (DAWE), Commonwealth of Australia. http://www.environment.gov.au/resource/draft-survey-guidelines-australias-threatened-orchids

DBCA. (2017). *Ramsar Sites (DBCA-010)*. Department of Biodiversity, Conservation and Attractions (DBCA). https://catalogue.data.wa.gov.au/dataset/ramsar-sites

DBCA. (2024a). *DBCA Dandjoo Database*. Database interrogation. Department of Biodiversity, Conservation and Attractions (DBCA). https://bio.wa.gov.au/dandjoo

DBCA. (2024b). *DBCA Threatened and Priority Ecological Communities Database*. Database interrogation. Department of Biodiversity, Conservation and Attractions (DBCA).

DBCA. (2024c). *DBCA Threatened and Priority Fauna Database*. Database interrogation. Department of Biodiversity, Conservation and Attractions (DBCA).

DBCA. (2024d). *Methods for survey and identification of Western Australian threatened ecological communities* (Draft version 4.3, 23 January 2024). Department of Biodiversity, Conservation and Attractions (DBCA), Species and Communities Program. https://www.dbca.wa.gov.au/management/threatened-species-and-communities/resources/threatened-ecological-community-monitoring-resources

DBCA. (2024e). *NatureMap: DBCA WA Herbarium Specimen and Threatened and Priority Flora (TPFL) Databases*. Database interrogation, requested by email. Department of Biodiversity, Conservation and Attractions (DBCA).

DBCA. (2025). *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*. Spatial data. Last updated 28 April 2023. Department of Biodiversity, Conservation and Attractions (DBCA). https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain

DCCEEW. (2022a). *EPBC Act Offsets assessment guide*. DCCEEW. https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-environmental-offsets-policy

DCCEEW. (2022b). *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo* (p. 42). Department of Climate Change, Energy, the Environment and Water (DCCEEW) as Department of Agriculture, Water and the Environment (DAWE). Canberra, Australian Capital Territory. https://www.dcceew.gov.au/sites/default/files/documents/referral-guideline-3-wa-threatened-black-cockatoo-species-2022.pdf

DCCEEW. (2023). *Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia.

DCCEEW. (2025a). Zanda baudinii *in Species Profile and Threats Database*. Department of Climate Change, Energy, the Environment and Water (DCCEEW). https://www.environment.gov.au/sprat

DCCEEW. (2025b). Zanda latirostris *in Species Profile and Threats Database*. Department of Climate Change, Energy, the Environment and Water (DCCEEW). https://www.environment.gov.au/sprat

DEC. (2008). *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan*. Department of Environment and Conservation. https://www.dcceew.gov.au/environment/biodiversity/threatened/recovery-plans/forest-black-cockatoo-and-forest-red-tailed-black-cockatoo-2008

DEMIRS. (2023). *SWIS Demand Assessment 2023 to 2042*. Department of Energy, Mines, Industry Regulations and Safety (DEMIRS). https://www.wa.gov.au/system/files/2023-05/swisda_report.pdf

Department of Biodiversity, Conservation and Attractions (DBCA). (2018a). *Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)* [Dataset]. https://catalogue.data.wa.gov.au/dataset/carnabys-cockatoo-confirmed-breeding-areas

Department of Biodiversity, Conservation and Attractions (DBCA). (2018b). *Directory of Important Wetlands in Australia—Western Australia (DBCA-045)*. Government of Western Australia. https://catalogue.data.wa.gov.au/dataset/directory-of-important-wetlands-in-western-australia

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2015). *Apus pacificus—Fork-tailed Swift*. Species Profile and Threats Database.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2024a). *Calyptorhynchus banksii naso—Forest Red-tailed Black-Cockatoo, Karrak*. Species Profile and

Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=67034

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2024b). *Zanda latirostris—Carnaby's Black Cockatoo, Short-billed Black-cockatoo*. Species Profile and Threats Database. https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=87737

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2025). *Protected Matters Search Tool* [Database interrogation]. https://pmst.awe.gov.au/

Department of the Environment. (2013a). *Matters of National Environmental Significance—Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. https://www.dcceew.gov.au/sites/default/files/documents/nes-guidelines_1.pdf

Department of the Environment. (2013b). *Matters of National Environmental Significant—Significant impact guidelines 1.1*.

Department of the Environment. (2015). *Draft Referral Guideline for 14 Birds Listed as Migratory Species Under the EPBC Act*. Commonwealth of Australia. https://www.dcceew.gov.au/sites/default/files/documents/migratory-birds-draft-referral-guideline.pdf

Department of the Environment and Energy. (2017). *EPBC Act Policy Statement 3.21: Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*. Commonwealth of Australia. https://www.dcceew.gov.au/sites/default/files/documents/bio4190517-shorebirds-guidelines.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA). (2009). *Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo) Conservation Advice*. https://www.environment.gov.au/biodiversity/threatened/species/pubs/67034-conservation-advice.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA). (2010). *Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia.

Department of Treasury. (2019). *Energy Transformation Strategy—A brighter energy future*. https://www.wa.gov.au/system/files/2019-08/Energy-Transformation-Strategy.pdf

Desmond, A. (2001). *Swan Coastal Plain 1 (SWA1—Dandaragan Plateau subregion)* (A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, p. 11). Department of Conservation and Land Management.

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*. Commonwealth of Australia.

DEWHA. (2011). *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth of Australia.

DoEE. (2016a). *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (p. 143). Department of the Environment and Energy (DoEE). Canberra, Australian Capital Territory. https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=131

DoEE. (2016b). *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (p. 143). Department of the Environment and Energy (DoEE). Canberra, Australian Capital Territory. https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=131

Dokter, A. M., Liechti, F., Stark, H., Delobbe, L., Tabary, P., & Holleman, I. (2011). Bird migration flight altitudes studied by a network of operational weather radars. *Journal of the Royal Society Interface*, *8*(54), 30–43. https://doi.org/10.1098/rsif.2010.0116

DPAW. (2013). *Carnaby's Cockatoo (Calyptorchynchus latirostris) Recovery Plan*. Department of Parks and Wildlife. https://www.dcceew.gov.au/environment/biodiversity/threatened/recovery-plans/calyptorhynchus-latirostris-recovery-plan

DPIRD. (1986). *Shire of Wanneroo: A study of land resources and planning considerations*. Department of Primary Industries and Regional Development (DPIRD).

DPIRD. (2019). *Pre-European Vegetation (DPIRD-006)*. Department of Primary Industries and Regional Development (DPIRD). https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006

DPIRD. (2024a). *Hydrological Bores (DPIRD-068)*. Department of Primary Industries and Regional Development (DPIRD). https://catalogue.data.wa.gov.au/dataset/hydrological-bores

DPIRD. (2024b). *Soil Landscape Mapping—Rangelands (DPIRD-063)*. Department of Primary Industries and Regional Development (DPIRD). https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-rangelands

Drewitt, A. L., & Langston, R. H. W. (2008). Collision effects of wind-power generators and other obstacles on birds. *Annals of the New York Academy of Sciences*, *1134*(1), 233–266. https://doi.org/10.1196/annals.1439.015

Driessen, J, Kidd, L. R, Weller, D. R, Purnell, C., Maguire, G., Jaensch, R., & LeClair, S. M. (2025). *Australian National Directory of Important Migratory Shorebird Habitat. Report for the Department of Climate Change, Energy, the Environment and Water.* BirdLife Australia.

DWER. (2020). *Western Australian Climate Change Policy*. Department of Water and Environmental Regulation (DWER). https://www.wa.gov.au/service/environment/environment-information-services/western-australian-climate-change-policy

DWER. (2024). *Index of Biodiversity Surveys for Assessments (IBSA)*. Department of Water and Environmental Regulation (DWER). https://biocollect.ala.org.au/ibsa/

Ecoscape. (2019). *Carnaby's Cockatoo and Other Birds Year One Operational Monitoring*. Unpublished report prepared for APA Group, December 2019.

Ellison, L. E. (2012). *Bats and wind energy: A literature synthesis and annotated bibliography* (Report Nos. 2012–1110). U.S. Geological Survey. USGS Publications Warehouse. https://doi.org/10.3133/ofr20122011

Energy Transformation Taskforce. (2020). *Whole of System Plan*. https://www.wa.gov.au/system/files/2020-11/Whole%20of%20System%20Plan_Report.pdf

Environmental Protection Authority (EPA). (2019). *EPA Advice: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region*. https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Carnaby%27s%20cockatoo_new%20FINAL.pdf

EPA. (2016a). *Environmental Factor Guideline—Flora and Vegetation*. Environmental Protection Authority. https://www.epa.wa.gov.au/policies-guidance/environmental-factor-guideline-flora-and-vegetation

EPA. (2016b). *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (p. 42). December 2016. Environmental Protection Authority (EPA). https://www.epa.wa.gov.au/policies-guidance/technical-guidance-flora-and-vegetation-surveys-environmental-impact-assessment

EPA. (2020). *Technical Guidance—Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*. June 2020. Environmental Protection Authority (EPA). https://www.epa.wa.gov.au/policies-guidance/environmental-factor-guideline-terrestrial-fauna

Galtbalt, B., McGinness, H. M., Rapley, S., Jackson, M. V., Lloyd-Jones, L. R., Robinson, F., O'Neill, L., Piper, M., Davies, M., & Martin, J. (2025). Flight heights in ibis and spoonbills: Implications for collision risk. *Wildlife Research*, *52*(9), WR24160.

Geering, A., Agnew, L., & Harding, S. (2007). *Shorebirds of Australia*. CSIRO Publishing. https://catalogue.nla.gov.au/catalog/3670412

Government of Western Australia. (2011). *WA Environmental Offset Policy*. https://www.wa.gov.au/service/environment/environmental-impact-assessment/environmental-offsets

Government of Western Australia. (2014). *WA Environmental Offset Guidelines*. https://www.wa.gov.au/service/environment/environmental-impact-assessment/environmental-offsets

Grodsky, S. M., Behr, M. J., Gendler, A., Drake, D., Dieterle, B. D., Rudd, R. J., & Walrath, N. L. (2011). Investigating the causes of death for wind turbine-associated bat fatalities. *Journal of Mammalogy*, *92*(5), 917–925. https://doi.org/10.1644/10-MAMM-A-404.1

Hill, A. L., Semeniuk, C. A., Semeniuk, V., & Del Marco, A. (1996). *Wetlands of the Swan Coastal Plain: Wetland Mapping, Classification and Evaluation, Main Report* (Vol. 2A). Department of Environmental Protection & Water and Rivers Commission. Perth, Western Australia.

Hötker, H., Thomsen, K., & Jeromin, H. (2006). *Impacts on Biodiversity of Exploitation of Renewable Energy Sources: The example of birds and bats*. Report by Nature and Biodiversity Conservation Union (NABU). /https://eolien-biodiversite.com/IMG/pdf/englischewindkraftstudie_1252510701.pdf

IPAC. (2017). *Australian Weeds Strategy 2017–2027*. Invasive Plants and Animals Committee (IPAC). https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/pests-diseases-weeds/consultation/aws-final.pdf

Lawson, M., Jenne, D., Thresher, R., Houck, D., Wimsatt, J., & Straw B. (2020). *An investigation into the potential for wind turbines to cause barotrauma in bats*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7774848/

Lilleyman, A., Garnett, S., Woodworth, B., & Fuller, R. (2021). *Migration pathways and flight altitude selection of far eastern curlew*. https://www.nespthreatenedspecies.edu.au/publications-and-tools/migration-pathways-and-flight-altitude-selection-of-far-eastern-curlew

Lumsden, L. F., Moloney, P., & 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.

Mitchell, D., Williams, K., & Desmond, A. (2002). *Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion)* (A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, p. 18). Department of Conservation and Land Management. https://www.dpaw.wa.gov.au/about-us/science-and-research/biological-surveys/117-a-biodiversity-audit-of-wa

Moloney, P. D., Lumsden, L. F., & 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, Melbourne, Vic., Australia*.

Moore River Catchment Council. (2020). *Natural Resource Management information guide for the Moore River catchment Shires*. https://www.moorecatchment.org.au/wp-content/uploads/2020/03/Moore-nrm-shire-guide-March-2020-Web.pdf

Murcia, C. (1995). *Edge effects in fragmented forests: Implications for conservation*. https://www.sciencedirect.com/science/article/abs/pii/S0169534700889776?via%3Dihub

Nature Advisory. (2025). *Implementation of the Bird and Avifauna Management Plan – Annual Report Prepared*. Unpublished report prepared for RES Australia Pty Ltd, April 2025.

NVIS Technical Working Group. (2017). *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0*. Department of the Environment and Energy. Canberra, Australian Capital Territory.

Rollins, K. E., Meyerholz, D. K., Johnson, G. D., Capparella, A. P., & Loew, S. S. (2012). A forensic investigation into the etiology of bat mortality at a wind farm: Barotrauma or traumatic injury? *Veterinary Pathology*, *49*(2), 362–371. https://doi.org/https://doi.org/10.1177/0300985812436745

RPS. (2010). *Avifauna Assessment—Proposed Waddi Wind Farm Development, Dandaragan Shire*. Unpublished report prepared for Wind Prospect WA Pty Ltd, November 2010.

Schuster, E., Bulling, L., & Köppel, J. (2015). Consolidating the state of knowledge: A synoptical review of wind energy's wildlife effects. *Environmental Management*, *56*, 300–331.

Semeniuk, C. A., & Semeniuk, V. (1995). A geomorphic approach to global classification for inland wetlands. *Vegetatio*, *118*, 103–124.

Senner, N. R., Stager, M., Verhoeven, M. A., Cheviron, Z. A., Piersma, T., & Bouten, W. (2018). High-altitude shorebird migration in the absence of topographical barriers: Avoiding high air temperatures and searching for profitable winds. *Proceedings of the Royal Society B: Biological Sciences*, *285*(1881), 20180569. https://doi.org/10.1098/rspb.2018.0569

TSSC. (2016). *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain Ecological Community*. Threatened Species Scientific Committee (TSSC), Department of Environment and Energy. http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf

Umwelt. (2025a). *Yathroo Wind Farm: Basic and Targeted Fauna Assessment*. Umwelt (Australia) Pty Ltd. Unpublished report prepared for Neoen Australia Pty Ltd, August 2025.

Umwelt. (2025b). *Yathroo Wind Farm Detailed and Targeted Flora and Vegetation Assessment* (Unpublished Report for Neoen 24360/R03).

Umwelt. (2025c). *Yathroo Wind Farm: Targeted Fauna Habitat Assessment*. Umwelt (Australia) Pty Ltd. In preparation.

Umwelt. (2025d). *Yathroo Wind Farm—Draft Preliminary Bird and Bat Adaptive Management Plan*. Umwelt (Australia) Pty Ltd.

Umwelt. (2025e, March). *Yathroo Wind Farm: Bird and Bat Utilisation Survey Memo—Summer 2025*. Unpublished Briefing Note prepared by Umwelt (Australia) Pty Ltd (Umwelt) for Neoen Australia Ltd (Neoen).

Umwelt. (2026). *Yathroo Wind Farm Targeted Shorebird Survey Report*. Report prepared for Neoen Australia.

USEPA. (1986). *Quality criteria for Water*. United States Environmental Protection Agency.

WAPC. (2021). *State Planning Strategy 2050*. Western Australian Planning Commission (WAPC). https://www.wa.gov.au/government/publications/state-planning-strategy-2050

Watts, B. D., Smith, F. M., Hines, C., Duval, L., Hamilton, D. J., Keyes, T., Paquet, J., Pirie-Dominix, L., Rausch, J., Truitt, B., Winn, B., & Woodard, P. (2021). The costs of using night roosts for migrating whimbrels. *Journal of Avian Biology*, *52*(1), jav.02629. https://doi.org/10.1111/jav.02629

Western Australian Herbarium. (1998). *Florabase: The Western Australian Flora. Department of Biodiversity, Conservation and Attractions.* [Database]. https://florabase.dpaw.wa.gov.au/

Appendix A

Detailed and Targeted Flora and Vegetation Assessment

Appendix B

Basic and Targeted Fauna Assessment

Appendix C

Targeted Fauna Habitat Assessment

Appendix D

Preliminary Bird and Bat Adaptive Management Plan

umwelt

Appendix E

Protected Matter Search Tool Results



umwelt

Appendix F

Likelihood of Occurrence Assessment

Appendix G

Preliminary Construction Environmental Management Plan



umwelt

Appendix H

Bird and Bat Utilisation Summary Report

Appendix I

Bird and Bat Utilisation Survey Year 2 Memos

Appendix J

Significant Impact Assessments



Appendix K

Targeted Shorebird Survey Report



umwelt

Appendix L

Offset Management Plan

Appendix M

Preliminary Decommissioning and Rehabilitation Management Plan



umwelt

Appendix N

Bird and Bat Species Recorded (to May 2026)

Appendix O

Response to Public Submissions



umwelt

umwelt

P 1300 793 267 E info@umwelt.com.au W umwelt.com.au

NSW | ACT | WA | QLD | VIC | SA ABN 18 059 519 041