Appendix B

Environmental Assessment and Management Plan

Environmental Assessment and Management Plan

Parron Wind Farm Development

Project No: EP23-085(13)

Prepared for Zephyr Energy Pty Ltd
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Executive Summary

Emerge Associates (Emerge) was engaged by Zephyr Energy Pty Ltd (the proponent) to provide environmental consultancy services to support the development of Parron Wind Farm (also referred to as 'the proposal'), 8 km north-west of Badgingarra, Western Australia. The proposal area (also referred to as 'the site') is located approximately 180 km north of Perth Central Business District (CBD) and comprises a total area of approximately 8,392 hectares (ha) ('proposal area'). The proposal area is located on various lots within the Shire of Dandaragan on cleared freehold agricultural land and is zoned 'Rural' under the Shire of Dandaragan's Local Planning Scheme No. 7.

The purpose of this Environmental Assessment and Management Plan (EAMP) is to provide a synthesis of information regarding the environmental values and attributes of the site and a management plan to respond to these values. The EAMP is the key supporting environmental document for the development application (DA), ultimately facilitating the consideration of environmental issues by the local government and various state government agencies and authorities.

The Parron Wind Farm development layout has responded to site-specific environmental considerations and to avoid the need for impacts on intact native vegetation within the proposal area. This document provides an environmental assessment and management plan framework to be implemented across the site during development and operation of the proposed wind farm. The key components of this framework are summarised as follows:

- A *Construction Environmental Management Plan* (CEMP) to be prepared as part of the engineering detailed design that will consider landform, soils and geology, and to mitigate the risk of soil erosion.
- A *Water Management Strategy* (WMS) to be prepared to identify the site-based water management approach to support the CEMP.
- Groundwater abstraction for the proposed development will be undertaken in accordance with an approved groundwater licence.
- Flora and vegetation management will include the avoidance of clearing any intact native vegetation and black cockatoo habitat trees through micro-siting of wind turbines, delineation of tree protection zones (TPZ), and hygiene protocols to limit the spread of declared weeds and pathogens.
- Curtailment protocols to be considered if required (i.e. turning off wind turbines when wind levels are low and are at speeds that are less profitable or at particular periods of high risk (e.g. dawn and dusk)).
- Wind farm construction and service vehicle speeds to be kept low, to avoid collision impacts on native fauna.
- A *Fauna Management Plan* including pre-clearing fauna inspection, fauna trapping and translocation, fauna spotter and hygiene protocols to deter feral and pest species.
- Design and implementation of an *Avifauna Monitoring Programme*, documenting baseline use of the development envelope by migratory birds and other avifauna, and any regular local movement patterns that may be identified, with equivalent monitoring and collection of avifauna and bat mortality data post-commissioning of the turbines.

- A noise impact assessment was carried out for the operational wind farm at 25 identified receiver points, and noise emissions were determined to comply with the noise criteria specified in EPA of South Australia *Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021* based on the background noise monitoring, with the exception of four locations. Two of these are considered "stakeholder premises" and these comply with the criteria recommended for "stakeholder premises". The proponent is seeking neighbour agreements with the remaining two landowners such that these will also become "stakeholder premises". A Noise Management Plan will be prepared to demonstrate that noise emissions will achieve compliance with the requirements of the in EPA of South Australia *Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021*.
- Construction noise to be managed within the designated hours and noise suppression devices to be maintained.
- Visual amenity to be managed through positioning of proposal elements.
- Shadow flicker management to utilise flicker timers to shut-down in case of flicker and non-reflective paint/materials to be used to reduce blade glint.
- Traffic management measures include intersection modifications to appropriately accommodate construction traffic
- Traffic management measures to ensure minimal tracking of dirt and queuing of heavy vehicles on public roads, and to coordinate shared transport route.
- Management of aviation will include providing WTG details to Airservices Australia and local and regional aircraft operators. Additionally, the rotor blades, nacelles and towers should be painted white.
- Compliance with the *Bushfire Management Plan* 'acceptable solution' for each of the bushfire protection criteria through the siting of the various proposal elements without the need for clearing of native vegetation to mitigate hazards.

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Appendices

Appendix A

Detailed Flora and Vegetation Assessment

Appendix B

Basic Fauna and Targeted Bird and Bat Assessment

1 Introduction

1.1 Background

Zephyr Energy Pty Ltd (the Proponent) is proposing to develop the Parron Wind Farm (herein referred to as 'the proposal') in Badgingarra, Western Australia, approximately 8 km north-west of Badgingarra town and 180 km north of the Perth Central Business District (CBD).

The proposal is located across various lots within the Shire of Dandaragan, on freehold agricultural land adjacent to the existing Badgingarra Wind Farm, referred to herein as the proposal area or site. The proposal area comprises a total area of approximately 8,392 hectares (ha). A plan showing the location and extent of the proposal area is provided in **Figure 1.**

1.2 Purpose of this report

The purpose of this Environmental Assessment and Management Plan (EAMP) is to describe how the proposal will respond through management measures to each of the environmental attributes and values relevant within the proposal area.

Specifically, this report:

- Discusses the proposal and corresponding environmental approval requirements (**Section 2**)
- Identifies the existing environmental attributes and values of the proposal (**Section 3**)
- Discusses how the proposed design responds to the existing environment and outlines environmental management measures (**Section 3**).

The EAMP is the key supporting environmental document for the development application, ultimately facilitating the consideration of environmental issues by the local government and various state government agencies and authorities.

1.3 Scope of work

Emerge Associates (Emerge) was engaged by the Proponent to undertake an environmental assessment to document the existing environmental attributes and values of the site and ensure relevant environmental values were considered within the design and future development and operational of the wind farm. This involved utilising a range of information sources including local and regional reports, databases, mapping and site-specific investigations (which are described further in **Section 3**). The outcomes of these findings include information on the following attributes:

- Landform and soils
- Hydrology
- Biodiversity and natural assets, including flora, vegetation and terrestrial fauna
- Social environment, including heritage, noise and visual amenity
- Bushfire hazards.

2 Proposal

The proposal area is approximately 8,392 ha and follows existing lot boundaries. The proposal area includes 54 Wind Turbine Generators (WTG) that have already been approved as part of an existing planning approval (207066) with an additional 25 WTG, collectively which form the focus for this assessment. As per the existing planning approval, access to the site is along Cadda Road and Yerramullah Road only.

The proposal comprises the following, which corresponds to the layout as shown in **Figure 1**, and the proposal footprint has accommodated all of the following:

- Maximum of 79 WTG.
- WTG hardstand of 65 m x 48 m and blade hardstand of 16 m x 85 m.
- Substation and nominated capacity: 200 m x 210 m bench size for up to 489.8 MW.
- Switching station required for cut into existing transmission line. Dimensions 150 m in width and 200 m in length.
- Operation and maintenance facility including office/ storage area: operations and maintenance facility - 50m x 70m within a site compound of 18,000 m^2.
- Overground and underground electrical reticulation cabling requirements: cabling within internal accessways, extent of excavation indicatively approximately 0.6m deep and 1m wide for length of cable corridor.
- Three (3) temporary batching plants: 100 m x 100 m.
- Construction power source from diesel generator.
- Internal access tracks crushed rock pavements over earth fill subbase. Tracks nominally 5.5 m wide with a 0.5 m shoulder each side and additional 2.5 m for cable installation.
- Temporary and permanent fencing requirements, security fencing requirements: security fencing to be provided around substations and the operation and maintenance facility, consisting of galvanised chain wire mesh fence with barbed wire, total fence height 3.0 m.
- Temporary construction infrastructure and facilities: site offices, construction camps, ablutions, power and water supply, storage/laydown, parking and access points.

The wind turbine design is Vestas V162 – 6.2 MW with a hub height 149 m and tip height 230 m. The wind turbines' blade length is 79.35 m and the potential rotation speed is up to 12.1 RPM. The maximum range of power output is 0 MW to 489.8 MW and maximum power output capacity is up to 489.8 MW.

The WTG will be spaced at least 500 m from each other and will be connected to the onsite substation. The proposal will connect into Western Power's existing 330kV transmission network (South West Interconnected System (SWIS)) line, which runs along the western side of the proposal area.

Stages of development with indicative timeframes are as follows:

- Pre-construction activities: 12 months
- Construction activities:24 months

- Ongoing maintenance/operation: 35 years
- Decommissioning/remediation.

The site and surrounding area are primarily utilised for low intensity agricultural uses and are largely already cleared. Remnant native vegetation is proposed to be retained, with isolated non-native vegetation pockets only needing to be impacted/cleared. The total indicative disturbance footprint, inclusive of wind turbines, transmission lines, cables and substation, is approximately 545 ha. This will include earth moving, establishment of roads, hardstands and other project infrastructure. There will be limited direct impacts to areas of intact native vegetation, with very limited intended clearing of any intact native vegetation within the site. The only intact vegetation clearing would be associated with road upgrade works at the intersection of Cowalla Road and Brand Highway.

2.1 Assessment process

2.1.1 Previous approvals

The proposal area was originally included in the environmental assessments and approvals for the Badgingarra Wind Farm across a broader area, including an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral, which was deemed to be a 'Not Controlled Action' (EPBC 2007/3529). A range of potential wind farm layouts were provided as part of the EPBC Act referral, with the key approach specified throughout the referral that the most suitable foraging and roosting habitat for Carnaby's black cockatoo would be avoided by the wind farm layouts.

In relation to the Parron portion of the Badgingarra Wind Farm referred action, it was proposed that turbines and access tracks would be located within cleared agricultural areas and there was no need to remove any native vegetation or Carnaby's black cockatoo habitat. The Badgingarra Wind Farm has been operational since 2019 but the Parron portion was never progressed as part of this development.

Zephyr Energy, as the proponent for the Parron Wind Farm proposal, has undertaken investigations to understand the potential for impacts on Matters of National Environmental Significance (MNES) within the proposal area, including Carnaby's black cockatoo. The findings of these investigations have been used to formulate the Parron Wind Farm proposal and ensure that it has been formulated on the same basis as the previous, and avoid the potential for significant impacts on any MNES.

2.1.2 Planning approvals

The Shire of Dandaragan is the relevant local planning authority and the Shire's Local Planning Scheme No. 7 is currently applicable at the site. The Shire Council applied Local Planning Scheme No. 7 and granted development approval at the Ordinary Meeting of Council held on 27 June 2019 for the Parron Wind Farm Request. The Council recognised 'Parron Wind Farm' as the title for the wind turbines to be constructed upon the following lots in the Badgingarra and Hill River localities:

- Lot 3738
- Lot 3739
- Lot 3742

- Lot 3743
- Lot 3744

To the west of the site some of the WTG in the broader development area have been installed. A further 79 WTG are proposed to be installed as part of the Parron Wind Farm proposal, of which 54 are included within the existing development approval.

2.1.3 Environmental approvals

2.1.3.1 Environmental Protection Act 1986

Part IV Section 38(1) of the *Environmental Protection Act 1986* (EP Act) provides that, where a proposal is likely to have a significant effect on the environment, a proponent may refer the proposal to the Environmental Protection Authority (EPA) for a decision on whether or not it requires formal assessment under the EP Act. The EPA then decides whether a proposal should be assessed, and which level of assessment is appropriate, based on consideration of and environmental significance framework guided by EPA policy on environmental factors.

Although significant impacts to EPA factors are considered unlikely for the proposal, the proposal is being referred pursuant to the EP Act to provide certainty for the project to proceed.

Based on the investigations undertaken to date, and the nature of the proposal, it is likely that environmental impacts associated with the EPA factors can be managed to meet the EPA's objectives for these factors, demonstrated through site selection, proposal design and appropriate site management measures including avoiding the need for the clearing of native vegetation.

Under the EP Act it is an offence to clear native vegetation unless the clearing is done in accordance with a clearing permit, or an exemption applies. 'Native vegetation' is defined in s 3(1) and 51A of the EP Act and Regulations as follows:

Indigenous aquatic or terrestrial vegetation, that includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation.

Native vegetation does not include vegetation that was intentionally sown, planted or propagated (even if this involves indigenous terrestrial plant species), although natural regeneration of previously areas would constitute native vegetation. Clearing vegetation that is not native vegetation for the purposes of the EP Act can be cleared without requiring a clearing permit or exemption.

A native vegetation clearing permit pursuant to Part V of the EP Act will be required to facilitate the development of the wind farm given the proposal will likely require the clearing of 'completely degraded' native vegetation (i.e. areas with scattered native species) and possibly some very limited areas of intact native vegetation, at the intersection of Cowalla Road and Brand Highway.

2.1.3.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act protects listed MNES, and it is an offence to implement any action that would have or is likely to have a significant impact on any MNES. If a proponent believes their proposed action (i.e.

the proposal) is likely to have a significant impact on any MNES, then they are required to refer the proposal to the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Information on habitat preferences and distribution of threatened flora and fauna species with the potential to occur within the site was reviewed and assessed against the general site conditions and habitat types recorded during the field surveys (discussed further in **Section 3**).

Based on the proposed development layout within the site, it is considered unlikely that the proposed action would present a risk of the being a significant impact on any MNES pursuant to the EPBC Act. No listed flora species or communities occur within the site, and the extent and quality of black cockatoo foraging habitat is limited to the extent that impacts (i.e. the removal) of black cockatoo habitat can be largely avoided. In addition, there has been consideration of the level of risk posed through bird strikes and habitat avoidance through the presence of operational WTGs, which is conserved low and unlikely to pose a risk of significant impacts.

Notwithstanding the above, the proposed action (i.e. the Parron Wind Farm proposal) is being referred pursuant to the EPBC Act in order to confirm its status to enable the proposal to proceed with certainty.

3 Environmental Values and Management

3.1 General site conditions

The site is located in the Shire of Dandaragan in the Wheatbelt region of Western Australia and extends over 8,392 hectares (ha) as shown in **Figure 1**. The site is bounded by a mix of agricultural land and remnant native vegetation to the north and east, Badgingarra National Park and Cadda Road to the south, and Yerramullah Road to the west. The site includes road reserves, namely Cowalla Road (both sides), Yerramullah Road (eastern side only), Cadda Road (northern side only) and the Great Northern Highway and Cadda Road intersection (western side only).

3.2 Climate

3.2.1 Outline of characteristics and values

The Wheatbelt region of Western Australia experiences a Mediterranean climate of hot dry summers and moderately wet mild winters (Hobbs 2003). The closest weather station to the site is Badgingarra Research Station (009037) which is approximately 15 km east of the site. Recent rainfall at the weather station has been somewhat inconsistent (lower) with long term averages, as shown below in **Plate 1** (BoM 2024). The average morning (9am) wind speeds are consistently lower than afternoon (3pm) wind speeds at the nearest weather station and are both higher in summer than winter as illustrated in **Plate 2**.

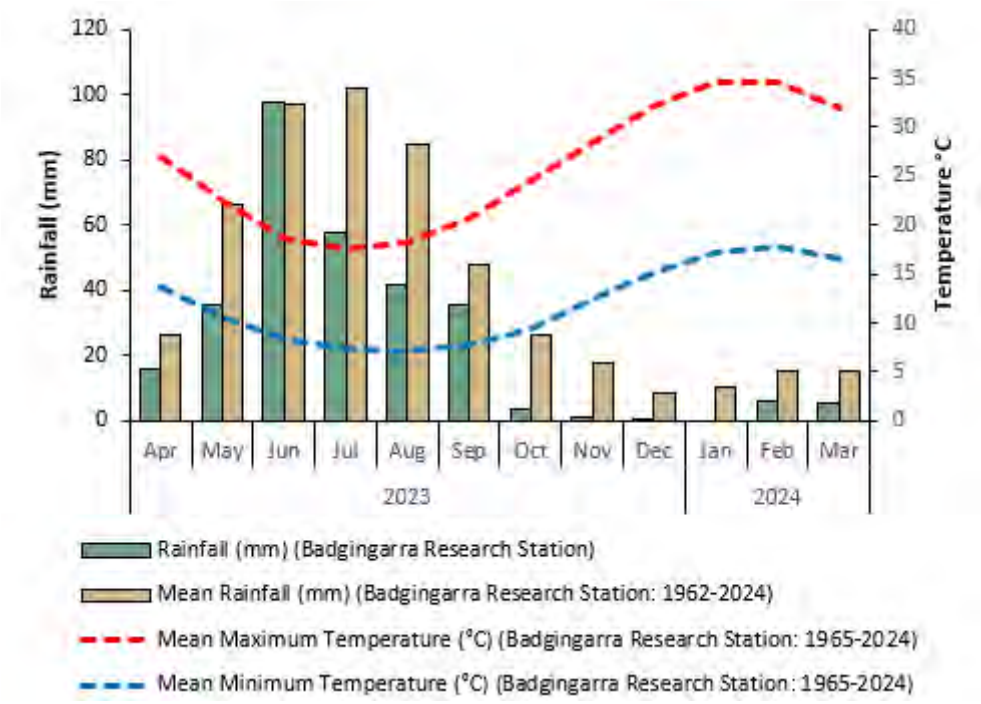

Plate 1: Recent rainfall and long term mean temperature and rainfall

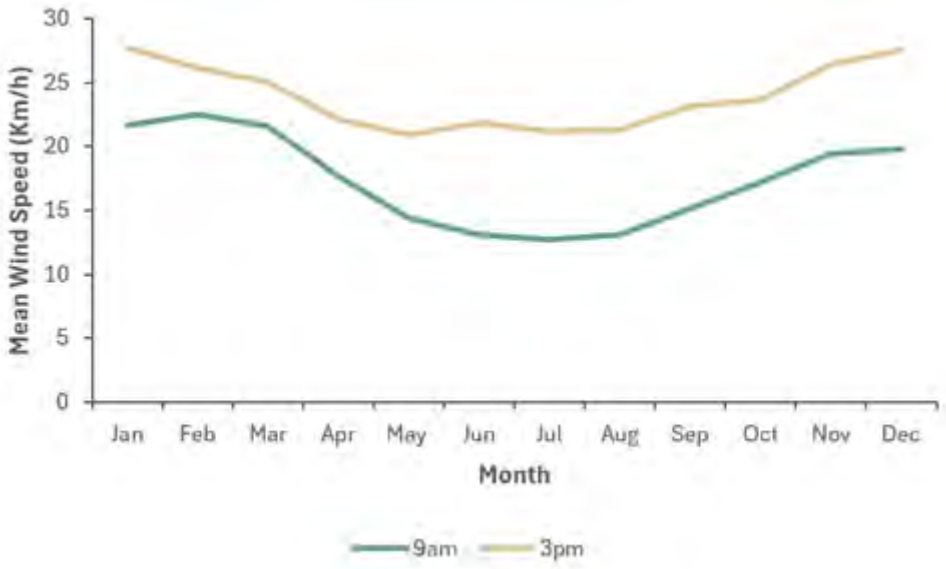

Plate 2: Mean 9am and 3pm wind speeds

3.2.2 Management

There are no specific management considerations in relation to climate.

3.3 Topography

3.3.1 Outline of values

The elevation of the site ranges from 94 metres in relation to the Australian Height Datum (m AHD) in the north-western corner, to 278 m AHD in the centre to south-western corner of the site (DoW 2008).

Topographic contours over the site and within the immediate vicinity are provided in **Figure 2**.

3.3.2 Management

There are no specific management considerations directly in relation to topography.

3.4 Landform, soils and geology

3.4.1 Outline of characteristics and values

The site occurs on the Geraldton Sandplains in the Lesueur Sandplain subregion, which is the geomorphic unit that characterises the region spanning from Dongara in the north, to Greenhead in the south and reaching inland to Badgingarra.

The Geraldton Sandplains comprises three subregions: Edel, Geraldton Hills and Lesueur Sandplains, which stretch from the south end of the Carnarvon basin to the northern areas of the Perth Basin and Pinjarra Orogen (CALM 2003). The region is characterised by an undulating lateritic sandplain

mantling Permian to Cretaceous strata with areas of coastal aeolian sands and limestone. Alluvial outwash plains exist in areas of valleys and hills (Purdie *et al.* 2004).

Fine scale soil landscape mapping by DPIRD (2022) shows eight units occurring within the site, as detailed in **Table 1** and illustrated in **Figure 2**. The site is not known to contain any restricted landforms or unique geological features.

Table 1: Soil landscape mapping units within the site

Soil landscape unit	Location within site	Description
Yerramullah 1 Subsystem	In the central and southeastern portion	Laterite plateau residual; shallow gravel, shallow sand over duricrust, sandy gravels.
Yerramullah 2 Subsystem	Scattered throughout much of the site	Plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands.
Yerramullah 3 Subsystem	Most abundant system covering the majority of the site	Colluvial slopes and some plateau remnants, very gently to gently inclined hillslopes and sand filled minor valleys; pale and yellow deep sands, pale sandy gravels, shallow gravel over duricrust, some sandy duplexes and sandy earths.
Yerramullah 4 Subsystem	In the north-western portion	Plateau residuals, complex of Ye2 and Ye3; pale sandy gravels, gravelly pale deep sand, shallow gravel over duricrust, pale deep sand, some sandy duplexes, yellow deep sand.
Yerramullah 6 Subsystem	In the south-eastern portion	Colluvial slopes, very gently to gently inclined mid to lower hillslopes and sand filled minor valleys; pale deep sand, some sandy duplexes and shallow sand over pan or bog iron.
Yerramullah 9 Subsystem	In the south-western portion	Narrow alluvial flats of minor creeks; pale to brown deep sands, sandy and loamy duplexes, shallow sand over pans.
Mintaja Hills System	In the north-western portion	Rises and low hills on sedimentary rocks north and south of the Mount Lesueur area. Variable soils including red/brown non-cracking clays, brown loamy earths, and grey/brown shallow loamy duplexes. Woodlands.
Nylagarda 1 Subsystem	In the north-eastern portion	Drainage line and adjacent very gently inclined footslopes; mainly sandy duplexes, brown deep sand and brown sandy earth.

3.4.1.1 Acid sulfate soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged anoxic conditions and do not present any risk to the environment. When oxidised, ASS produce sulphuric acid, which can pose risks to the surrounding environment, infrastructure, and human health. Projects involving the disturbance of ASS must therefore assess the risk associated with disturbance by considering potential impacts.

Regional WA ASS risk mapping indicates that the site is classified as having a low risk of ASS occurring at the site (DWER 2023).

3.4.2 Management

As the site does not feature any restricted landforms or unique geology, and has a low risk of ASS occurring, there are no specific management considerations at the site.

A *Construction Environmental Management Plan* (CEMP) will be prepared as part of the engineering detailed design that will consider landform, soils and geology, and address erosion control and soil stability during construction, although this isn't considered to pose a particularly high risk within the site.

3.5 Hydrology

3.5.1 Outline of characteristics and values

3.5.1.1 Groundwater

A review of the Water Register (DWER 2021) indicates the site falls within the Jurien Groundwater Area and the Badgingarra Groundwater Subarea, and the Yarragadee aquifer. The Yarragadee aquifer is a major freshwater resource in the Badgingarra Groundwater Subarea which is capable of supplying bore yields of >5000 kL/day. The Jurien Groundwater Area is an area proclaimed for licensing under the *Rights in Water and Irrigation Act 1914* (Government of WA 1914), which thereby requires that a 5C licence is obtained to abstract water for construction purposes. The 5C groundwater licence allows the licence holder to take a specified amount of water from the proclaimed area, water that may be transferred to another user, traded or leased, subject to approval. The 5C groundwater licence would be considered a temporary groundwater usage, which includes any activity with a set timeframe associated with the activity.

There are eight (8) groundwater bores/wells (some historic) located within the project area, one of which provides details on the depths to groundwater across the site (**Figure 3**). Since 2002 the groundwater level at bore AWRC Ref 61718041 in the north of the project area has plateaued between 129 mAHD and 131 mAHD which is at ground level where the sampling location is (ground level approximately 124-130 mAHD) and there is a wetland present in the area. Prior to 2002 the groundwater level increased from approximately 116 mAHD in 1972 up to approximately 129 mAHD in 2002. No groundwater levels mapping is available for the site.

3.5.1.2 Surface water

The site is also within the Hill River Catchment area. The Hill River, a major tributary, passes to the north-east of the site, outside the site boundary, before continuing westward to the north of the site. Multiple minor tributaries of the Hill River intersect with the site. The Hill River flows from Badgingarra westward for about 85 km to the Indian Ocean before discharging south of Jurien Bay. The majority of the Hill River catchment area, including the site, is used for agriculture, predominantly grazing and cropping.

The Hill River and tributaries catchment, as mapped by the Department of Water and Environmental Regulation (DWER), is gazetted as a Proclaimed surface water area allowing for the commercial use

of water under a license as set out in the *Rights in Water and Irrigation Act 1914* (Government of WA 1914). The RIWI Act's purpose is to regulate the taking of water from watercourses and wetlands.

3.5.1.3 Wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Wetlands can be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al.* 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. A review of the *Ramsar List of Wetlands of International Importance* (DBCA 2017) and *A Directory of Important Wetlands in Australia – Western Australia* (DBCA 2018) indicates that no Ramsar or listed 'important wetlands' are located within or near the site.

The Department of Water and Environmental Regulation (DWER) hydrography linear dataset (DWER 2018) records the following 43 wetland or water related features within the site:

- 16 earth dams,
- 18 watercourses – minor, non-perennial
- 9 unnamed hydrological features

The *Geomorphic Wetlands of Cervantes Eneabba (DBCA-015)* dataset (DBCA 2023a) maps geomorphic wetland features and classifies them based on their landform shape and water permanence. Each wetland feature is classified according to their host landform and hydroperiod.

A review of the *Geomorphic Wetlands, Cervantes Eneabba* dataset indicated that one dampland wetland feature (Unique Feature Identifier (UFI) 581) occurs within the central northern side part of the site and one non-classified wetland feature (UFI 258) occurs in the south-western part of the site (DBCA 2023a). The locations of the geomorphic wetlands and hydrological features in the site are provided in **Figure 3**.

3.5.1.4 Public drinking water source areas

Public Drinking Water Source Areas (PDWSAs) are proclaimed by the Department of Water to protect identified drinking water sources, including surface water and groundwater sources (DoW 2009). They are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947* as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas. PDWSAs provide the population with the majority of its drinking water supplies and can be vulnerable to contamination from a range of land uses. Once an area is identified as a PDWSA, consideration needs to be given to the intended land use and associated activities to ensure that they are appropriate in meeting the water protection quality objectives of the area.

A review of the *Public Drinking Water Source Area* dataset indicates the site is not located within a proclaimed PDWSA.

3.5.1.5 Sewerage sensitive areas

Sewerage sensitive areas are proclaimed under the *Government Sewerage Policy* (DPLH 2019) to protect groundwater and surface water systems. A review of the *Government Sewerage Policy* dataset (DPLH 2021) indicates the site is not a sewerage sensitive area.

3.5.2 Management

A *Water Management Strategy* (WMS) will be prepared to identify the water management approach to support the CEMP. Water will be managed using an integrated water cycle management approach, which has been developed using the philosophies and design approaches described in the *Stormwater Management Manual for Western Australia* (DWER 2022). This guidance manual is specifically State focused but is in keeping with national guides including:

- *Book 9 - Runoff in Urban Areas, Australian Rainfall and Runoff: A Guide to Flood Estimation* (Coombes and Roso 2019)
- *Australian Runoff Quality – A Guide to Water Sensitive Urban Design* (Engineers Australia 2006)
- *National Water Quality Management Strategy #10 – Australian Guidelines for Urban Stormwater Management* (ANZECC and ARMCANZ 2000)

Based on the existing environment and desktop investigations that have been conducted to date, the site is not located within a public drinking water source area nor is it a sewerage sensitive area, therefore this will not require management measures. Additionally, as no Ramsar or listed 'important wetlands' are located within or near the site, wetlands also will not require specific wetland management measures.

Groundwater management will be passive and will avoid interaction with underlying groundwater levels. Construction activities have the potential to contaminate ground water through the use of fuel, oil and other contaminants required for construction. The following measures will be implemented specifically with respect to groundwater:

- Storage of contaminants such as fuel, oil and other chemicals is to be off site (preference) or restricted to designated areas.
- Suitable clean-up materials must be retained at these storage areas and with all vehicles where a possibility of leakage may occur. Personnel are to be adequately trained in clean-up procedures.

The site is part of the Hill River catchment area, and surface water is used for agriculture at the site. Surface water management will be consistent with the historical approach to water management at the site.

Groundwater abstraction for the proposed development will be undertaken in accordance with an approved groundwater licence.

3.6 Flora and vegetation

3.6.1 Outline of characteristics and values

In the context of environmental impact assessment, the State EPA objective for flora and vegetation is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*' (EPA 2016b). At the state level, threatened flora species are listed under sections 19(1) and 26(2) of the *Biodiversity Conservation Act 2016* (BC Act), while threatened ecological communities (TECs) are listed under sections 27(1) and 33 of the BC Act. Threatened flora species and TECs are also acknowledged through other state environmental approval processes such as environmental impact assessment pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

TECs are ecological communities that are rare or under threat and therefore warrant special protection. Once listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable'. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment.

At the State level, an ecological community under consideration for listing as a TEC, but which does not yet meet survey criteria or has not been adequately defined, or which is rare but not currently threatened, is referred to as a priority ecological community (PEC). Similarly, species of flora which are potentially rare or threatened, or meet the criteria for near threatened, or have recently been removed from the threatened species list are classed as 'priority' flora species. PECs and priority flora are not protected statutorily.

At the federal level, certain listed TECs and threatened flora are protected through the EPBC Act and are identified as Matters of National Environmental Significance (MNES). Any action likely to have a significant impact on a listed TEC or threatened flora species requires approval from the Commonwealth Minister.

These values are considered further below.

3.6.1.1 Regional context

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides Australia into floristic subregions (Environment Australia 2000).

The site is contained within the Geraldton Sandplains IBRA region and within the 'GES02' or Lesueur Sandplain subregion. The Geraldton Sandplains region (previously 'Northern Sandplains' region) is described as comprising mainly 'scrub heath on sandplain near the coast, *Acacia* to *Casuarina* thickets further inland and *Acacia* scrub with scattered trees of *Eucalyptus loxophleba* on hard-setting loams' (Beard 1990).

Variations in native vegetation can be further classified based on regional vegetation mapping. Beard *et al.* (2013) mapping shows the majority of the site as comprising vegetation association 'Le

Sueur_1031' which is described as 'scrub-heath or heath'. A small portion in the north-eastern portion of the site is mapped as comprising the 'Le Sueur_1034' vegetation association which is described as 'woodland' (Beard *et al.* 2013).

The 'Le Sueur_1031' association was determined to have 34.48% of its pre-European extent remaining in the Geraldton Sandplains region in 2017, with 14.72% protected for conservation purposes. The 'Le Sueur_1034' association was determined to have 61.90% of its pre-European extent remaining with 36.73% protected for conservation purposes (Government of Western Australia 2018).

3.6.1.2 Historical land use

A review of historical images available from 2000 onwards show the majority of the site was cleared of native vegetation prior to 2000, likely for grazing and/or cropping uses. Since this time the extent of native vegetation within the site has remained relatively stable (WALIA 2024). The earliest available aerial imagery shows that the surrounding areas have also supported agricultural land uses over the same time period.

3.6.1.3 Environmentally sensitive areas

Environmentally sensitive areas (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding significant, threatened or scheduled flora, vegetation communities or ecosystems. Exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply within ESAs.

The site is not located within an environmentally sensitive area.

3.6.1.4 Site specific surveys

Flora and vegetation investigations were undertaken for the Badgingarra Wind Farm in March 2007, which identified two native vegetation types within the site that ranged from 'low' to 'high' quality remnants (Brett Lane & Associates Pty Ltd 2008). The majority of the site was mapped as comprising 'exotic (introduced) vegetation'. Two conservation significant flora species were recorded within remnant native vegetation 4 km south of the site. No threatened or priority flora species were identified within the site during the survey.

Recently the proponent engaged Emerge Associates to undertake a flora and vegetation assessment to the standard required of a 'detailed' and 'targeted flora' survey in the EPA's *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016c).

The *Detailed Flora and Vegetation Assessment* was undertaken by Emerge Associates (2024c) (**Appendix A**). The assessment included a desktop study of the environmental context of the site and the likelihood of occurrence of threatened and priority flora and ecological communities. Field surveys were conducted over multiple days between September and November 2023 during which the composition and condition of vegetation was recorded. The detailed flora and vegetation assessment included three separate site visits in spring (18-22 September, 23-27 October and 2-3

November 2023), and considered conservation significant flora, such as threatened flora species and TECs listed under the EPBC Act.

3.6.1.5 Plant communities

Plant communities (vegetation units) identified in the *Detailed Flora and Vegetation Assessment* (Emerge Associates 2024c) are listed in **Table 2** and provided in **Figure 4**.

Table 2: Description and extent of vegetation units identified within the site

Vegetation code	Description	Area (ha)
Cc	Open woodland *Corymbia calophylla* and scattered non-native trees over pasture weeds and occasional native species.	14.62
CcXpEm	Low woodland *Corymbia calophylla* (or absent) over open shrubland *Xanthorrhoea preissii*, *Banksia armata* var. *armata*, *Hakea lissocarpha*, *Gastrolobium oxylobioides* and *Hibbertia hypericoides* over rushland *Ecdeiocolea monostachya*, *Lepidosperma* sp. 5 and *Caustis dioica* over sparse grassland *Austrostipa elegantissima* over mixed native forbs and occasional pasture weeds on sandy loam soils.	4.12
EgEdGpTa	Open mallee woodland *Eucalyptus gittinsii* subsp. *illucida* and *Eucalyptus drummondii* over shrubland *Gastrolobium plicatum*, *Banksia shuttleworthiana* and *Hibbertia hypericoides* over low scattered shrubs *Tetratheca angulata* (P3) and *Scaevola* spp. over diverse native herbs on sandy soils sometimes with latertic gravel associated with lower slopes and flats.	7.44
El	Open woodland *Eucalyptus lane-poolei* over mixed native understorey vegetation encroaching from adjacent **EtBaBmBc** vegetation (or absent), bare ground and pasture weeds.	7.27
ElEaJcCa	Open woodland *Eucalyptus lane-poolei* and occasional *Eucalyptus accedens* over open shrubland *Jacksonia calcicola*, *Acacia pulchella* var. *glaberrima*, *Gastrolobium oxylobioides* and *Hibbertia hypericoides* over open rush/sedgeland *Mesomelaena pseudostygia*, *Caustis dioica* and *Lepidosperma* sp. 7 over low shrubland *Conostylis aculeata* var. *aculeata* on sandy soils.	6.62
EtBaBmBc	Low open woodland *Eucalyptus todtiana*, *Banksia attenuata*, *Banksia menziesii*, *Banksia candolleana* and occasional *Banksia prionotes* and/or *Hakea obliqua* over open shrubland *Apectospermum spinescens*, *Adenanthos cygnorum* subsp. *cygnorum*, *Allocasuarina humilis* and *Callitris acuminata* over low shrubland *Eremaea* spp., *Hypocalymma xanthopetalum*, *Hibbertia hypericoides*, *Stirlingia latifolia* and *Conospermum* spp. over forb/rushland *Alexgeorgea subterranea*, *Alexgeorgea nitens*, *Chordifex sinuosus*, *Chordifex microdon*, *Mesomelaena pseudostygia* and *Lomandra* spp. over mixed native herbs and occasional weeds on sandy soils/sandplains. See **Plate 3**.	182.39
GsBaX	Heathland to sparse heathland *Gastrolobium spinosum*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Banksia armata* var. *armata*, *Allocasuarina humilis* and *Xanthorrhoea* sp. 1 over sparse rush/sedge/grassland *Lepidosperma* sp. 3., *Schoenus brevisetis* and *Neurachne alopecuroidea* and pasture weeds on lower laterite hills.	64.15
M	Woodland to tall shrubland *Melaleuca* spp. over pasture weeds and occasional native species.	2.11
MpEt	Woodland *Melaleuca preissiana* and *Eucalyptus todtiana* over pasture weeds and/or **Juncus acutus* and occasional native species.	4.22
Mr	Occasional *Corymbia calophylla* and *Acacia acuminata* over closed shrubland *Melaleuca radula* and occasional *Calothamnus* sp. 1, *Hibbertia hypericoides* and *Styphelia serratifolia* over sparse forbland *Dianella revoluta*, *Dichopogon capillipes*, *Haemodorum simplex* over open grassland *Themeda triandra* or **Briza maxima* on sandy loam soils.	1.83

Table 2: Description and extent of vegetation units identified within the site (continued)

Vegetation code	Description	Area (ha)
Predominantly non-native vegetation	Heavily disturbed areas comprising predominantly pasture grasses and forbs and/or scattered non-native and planted trees with occasional native species including scattered *Eucalyptus todtiana*, *Eucalyptus lane-poolei* and *Eucalyptus rudis* trees. Waterways dominated by **Juncus acutus*, bare soil, roads and buildings have also been included in this category. See **Plate 4**.	8152.7
Ps	Tall open shrubland *Petrophile shuttleworthiana* over scattered native shrubs over sparse grassland *Austrostipa* spp. and/or pasture weeds.	10.85
PsBsAhX	Closed heathland *Petrophile shuttleworthiana*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Lambertia multiflora* var. *multiflora*, *Allocasuarina humilis*, *Banksia kippistiana* var. *paenepeccata* (P3), *Hibbertia hypericoides* and *Xanthorrhoea* spp. over sparse low shrubland *Banksia stenoprion* and *Banksia nana* (P3) over open rush/sedgeland *Mesomelaena* spp., *Schoenus* spp., *Lepidosperma* spp. over diverse native forbs on laterite plateaus and rises.	52.52
X	Shrubland to open shrubland *Xanthorrhoea* spp. over scattered mixed native shrubs (or absent) over pasture weeds and occasional native species.	1.98
XBcM	Heathland *Xanthorrhoea* spp., *Banksia carlinoides*, *Lambertia multiflora* var. *multiflora*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Calothamnus longissimus* and *Melaleuca* sp. 2 over rush/sedgeland *Mesomelaena* spp., *Schoenus* spp., *Lepidosperma* spp. and *Lepidobolus quadratus* (P3) over diverse native herbs on lateritic breakaways.	13.92
	Total area	**8526.74**

*Plate 3: Plant community **EtBaBmBc**.*

*Plate 4: Plant community **Predominantly non-native vegetation**.*

3.6.1.6 Vegetation condition

Vegetation condition was assessed as part of the *Detailed Flora and Vegetation Assessment* (Emerge Associates 2024c). The extent of vegetation by condition category is detailed in **Table 3** and illustrated in **Figure 5**. Based on the survey results the majority of the site comprises predominantly non-native vegetation in 'completely degraded' condition (8152.7 ha).

Table 3: Extent of vegetation condition categories within the site

Condition category (Keighery 1994)	Size (ha)
Pristine	0
Excellent	168.48
Very good	88.53
Very good – good	23.59
Good	3.64
Good – degraded	26.34
Degraded	33.09
Degraded – completely degraded	30.35
Completely degraded	8152.7
Total	**8526.7**

3.6.1.7 Threatened and priority ecological communities

The *Detailed Flora and Vegetation Assessment* conducted a desktop search using the *Protected Matters Search Tool* (DCCEEW 2024) and DBCA's TEC and PEC database (reference no. 46-0923EC). The search identified five (5) TECs and four (4) PECs occurring or potentially occurring within a 50 km radius of the site, as detailed in **Table 4**.

Table 4: Conservation significant communities and likelihood of occurrence assessment

Code	Community name	TEC/PEC	Level of significance State	Level of significance EPBC Act	Likelihood of occurrence
SCP07	Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. 1994)	TEC	EN	CR	Nil
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	TEC/PEC	P3	CR	Nil
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	TEC	CR	EN	Nil
Lesueur-Coomallo A1.2	Lesueur-Coomallo floristic community A1.2 as originally described by Griffin and Hopkins (1990)	TEC	CR	-	Nil
Lesueur-Coomallow D1	Lesueur-Coomallo floristic community D1 as originally described by Griffin and Hopkins (1990)	TEC	CR	-	Nil
Lesueur-Coomallo DFGH	Lesueur-Coomallo Floristic Community DFGH	PEC	P1	-	Nil
Lesueur-Coomallo M2	Lesueur-Coomallo Floristic Community M2 (*Melaleuca preissiana* woodland)	PEC	P1	-	Nil
Gp200-170	*Petrophile chrysantha* low heath on Lesueur dissected uplands (Gp200-170)	PEC	P2	-	Nil

All TECs and PECs identified from database searches were determined to have a 'nil' likelihood of occurrence within the site. This is based on the field survey conducted by Emerge Associates (2024c) which found no occurrences of TECs or PECs within the site.

3.6.1.8 Threatened and priority flora species

Emerge Associates (2024c) conducted searches using the DCCEEW *Protected Matters Search Tool*, DBCA's *Threatened and Priority Flora Database* and *WA Herbarium Database* (DBCA 2023d) (reference no. 72-0923FL) which identified 41 threatened and 160 priority flora occurring or potentially occurring within a 20 km radius of the site. The likelihood of occurrence assessment identified 13 threatened and 106 priority flora that were classified as having a 'high' or 'moderate' likelihood of occurrence within the site.

The field surveys conducted by Emerge Associates (2024c) recorded a total of 23 priority flora species (78 individuals) within areas of native vegetation as listed in **Table 5**. Most of the species were recorded scattered throughout areas of native vegetation, with the exception of one record of

Eucalyptus x carnabyi which occurred within predominantly non-native vegetation immediately adjacent to vegetation unit **EtBaBmBc**.

Table 5: Priority flora species recorded within the site

Species	Conservation status	Number of individuals recorded
Chordifex reseminans	P2	6
Hypocalymma serrulatum	P2	1
Leucopogon plumuliflorus	P2	4
Lyginia excelsa	P2	2
Synaphea xela	P2	1
Austrostipa nunaginensis	P3	2
Banksia kippistiana var. *paenepeccata*	P3	13
Banksia nana	P3	11
Beaufortia bicolor	P3	4
Drosera prophylla	P3	2
Hensmania stoniella	P3	6
Lepidobolus quadratus	P3	5
Phlebocarya pilosissima subsp. *pilosissima*	P3	3
Stylidium hymenocraspedum	P3	1
Stylidium nonscandens	P3	1
Tetratheca angulate	P3	3
Banksia chamaephyton	P4	2
Desmocladus elongatus	P4	3
Eucalyptus x *carnabyi*	P4	1
Hypolaena robusta	P4	2
Schoenus griffinianus	P4	1
Stylidium aeonioides	P4	3
Stylidium inversiflorum	P4	1

Note: P1-P4 = priority 1 to priority 4

3.6.2 Management

The *Detailed Flora and Vegetation Assessment* conducted by Emerge Associates (2024c) determined that all potentially occurring TECs and PECs have no likelihood of occurrence within the site. Occurrences of TECs and PECs therefore will not require any management response within the site.

Areas of vegetation in 'good – degraded' or better condition may provide potentially suitable habitat for threatened flora species. Priority flora species were all recorded in areas of native vegetation,

with the exception of one record immediately adjacent to a native vegetation unit. The proposed management measures for priority flora species are consistent with the EPA mitigation hierarchy, with avoidance of impacts on the highest environmental values within the site being the highest priority.

A key principle guiding development within the site is to maximise the retention of the existing vegetation values through avoidance of clearing of native vegetation. Management measures for flora and vegetation to be implemented as part of construction at the site include:

- Positioning of the proposed wind farm layout to avoid necessity to remove any native vegetation, as illustrated in **Figure 4.**
- Future micro-siting of the WTGs to avoid impacting scattered native species.
- Preparation of a *Construction Environmental Management Plan* (CEMP) to guide construction works.
- Utilise existing access roads.
- Avoid impacts to any large (greater than 500 mm diameter at breast height (DBH)) remnant native trees.
- Identification of tree/vegetation retention areas on engineering drawings and delineation of tree protection zones (TPZ). These will be identified as 'no go zones' or similar and managed in accordance with arborist advice. No storage of machinery or equipment will be permitted under retained trees/vegetation.
- As part of agricultural/non-native vegetation clearing, mulch vegetation in situ.
- Implement hygiene protocols during the clearing and construction process to minimise introduction/spread of weeds and plant pathogens. This will include
  - Vehicles, machinery, and personnel to be free of mud/soil and plant material upon entering the site. Inspections to be completed prior to works commencing.
  - Minimising clearing and earthworks during wet conditions.
  - Using landscaping species not identified as weeds.

The management measures will be documented with a CEMP to support construction activities within the site.

3.7 Terrestrial fauna

3.7.1 Outline of characteristics and values

In the context of environmental impact assessment, the EPA's objective for terrestrial fauna is *'to protect fauna so that biological diversity and ecological integrity are maintained'* (EPA 2016a). The mitigation hierarchy has been applied to avoid or minimise impacts to terrestrial fauna .

The EPBC Act also provides protection for listed 'threatened' species, including black cockatoos, for which the site contains foraging and potential breeding habitat. Any proposed action which is considered likely to result in a 'significant' impact upon MNES, should be referred to the Commonwealth DCCEEW.

Specifically regarding black cockatoos, the EPBC Act *Referral guidelines for 3 WA threatened black cockatoo species* (DAWE 2022), recommends referral of proposed action that involve any of the following:

- loss of high-quality native foraging habitat greater than 1 ha
- loss of low-quality native foraging habitat of greater than 10 ha
- loss of exotic foraging habitat greater than 1 ha
- any loss of breeding habitat
- any loss of a known roosting site.

3.7.1.1 Site specific surveys

Fauna investigations were undertaken for the Badgingarra Wind Farm in 2007, and more recently a fauna assessment to the standard required of a 'level 1' fauna survey in accordance with the EPA's *Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020). A 'targeted' bird and volant mammal (bat) assessment was conducted as these groups are typically most susceptible to the operational impacts of wind farms.

The *Basic Fauna and Targeted Bird and Bat Assessment* (Emerge Associates 2024a) was undertaken by Emerge Associates, including field survey between 18 to 22 September 2023 (**Appendix B**). During the field survey opportunistic sightings of fauna were recorded and an assessment was made on the fauna habitat within the site and its suitability to provide habitat for threatened, specially protected and priority fauna.

A *Bird Risk Assessment* was undertaken by Emerge Associates (2024b) in response to feedback from the DCCEEW during a pre-referral meeting. The report adopted a risk assessment methodology to qualitatively conduct an impact assessment for two MNES species highlighted in previous fauna survey from the site as potentially occurring:

- *Zanda latirostris* – Carnaby's Cockatoo (endangered under the EPBC Act) and;
- *Apus pacificus* – Pacific swift/fork-tailed swift (migratory under the EPBC Act)

3.7.1.2 Fauna

The *Basic Fauna and Targeted Bird and Bat Assessment* identified 10 broad fauna habitats within the site, as listed in **Table 6** and illustrated in **Figure 6**.

Table 6: Fauna habitats within the site

Fauna habitat	Description	Total area (ha)	Proportion of site (%)
Agricultural vegetation	Planted **Chamaecytisus palmensis*. Value of habitat varies across the site with some locations densely vegetated, others planted more recently in rows and with an open structure and some locations intermixed with broken woody debris and dead vegetation. • Value to fauna varies dependent on vegetation cover and structure. • Low microhabitat complexity. • Areas with more dense vegetation may provide habitat for larger mammals as well as common and widespread avifauna	738.07	8.65
Bare ground and pasture	Mostly cleared or low non-native (weed) grassland paddocks used for sheep grazing. Includes farm laneways, firebreaks and cleared areas around infrastructure (houses, sheds etc.). • Provides little to no value for most fauna • Low microhabitat complexity • May be utilised by raptor species hunting for lambs, mice and rats in the paddocks • Used by livestock • Some avifauna may traverse across this habitat to move to more intact native vegetation	7246.97	84.97
Dams	Permanent or semi-permanent water features. Mostly agricultural dams built adjacent to wetland areas to service livestock. • Most likely used by widespread and common avifauna, amphibia and introduced mammals and livestock. • Higher quantity of invertebrate species including *Cherax destructor*.	2.31	0.03
Eucalypt woodland	Dense woodland of native *Eucalyptus* spp. trees over mixed native shrub and understory species. • Moderate microhabitat complexity (woody debris, burrows, runnels, fallen logs, leaf litter). • Canopy and dense shrub layer likely supports an array of common and rarer avifauna. • Denser understory areas combined with soft soils are likely to support ground dwelling fauna and reptiles. • Connectivity with intact roadside vegetation outside of the site.	19.58	0.23
Laterite hills and breakaways	Native shrubland vegetation on laterite breakaways and hills. Includes some smaller hills in paddocks which are mostly grazed and have lower cover of shrubs. • Moderate microhabitat complexity for most areas (details) • Low microhabitat complexity in smaller hills in paddocks. • Provides habitat for smaller shrub-dwelling birds and some raptor species as well as small reptiles. Larger mammals may traverse through these sites. • Used by livestock.	71.76	0.85
Open forest	Open Eucalyptus spp. forest of mostly non-native, planted trees interspersed with some native species. Heavy disturbance from vehicle tracks and livestock grazing. • Low microhabitat complexity. Some fallen woody debris and sandy patches with reptile burrows. • Utilised by common and widespread avifauna and livestock.	120.68	1.41

Table 6: Fauna habitats within the site (continued)

Fauna habitat	Description	Total area (ha)	Proportion of site (%)
Plateau	Native shrubland located on a rocky laterite plateau. • High microhabitat complexity (woody debris, rocky outcroppings, small caves, dense shrubs, burrows). • Likely utilised by a broad fauna assemblage including most avifauna not requiring canopy, mammals and reptiles. • Fenced with few livestock incursions. • Connectivity with sandplain woodland habitat as well as high value vegetation outside the site.	58.75	0.69
Riparian and wetland vegetation	Riparian vegetation surrounding water features or growing in seasonally inundated drainage lines. • Moderate microhabitat complexity. Some woody debris, dense understory vegetation, water features (puddles, drainage line, muddy terrain). • Species are likely to move between this habitat and dams and water features. • Used mostly by widespread and common avifauna, amphibia and likely introduced mammals and livestock. Where not fenced, areas are frequented by livestock for shade. • Where not fenced, areas are frequented by livestock for shade.	22.89	0.27
Sandplain	Open *Eucalyptus* spp. and *Proteaceae* woodland over native shrubs on sandy soils. • High microhabitat complexity (woody debris, burrows, runnels, fallen logs, leaf litter) • Denser areas may provide habitat for larger mammals and a wide assemblage of common and rarer avifauna as well as reptiles. • Largest areas of habitat fenced from livestock.	191.81	2.25
Scattered trees and shrubs	Scattered native and non-native trees and shrubs over non-native grasses. Mostly associated with *Eucalyptus gomphocephala* in paddocks or along firebreak/laneway edges and remnant **Chamaecytisus palmensis* in paddocks. • Low microhabitat complexity • Utilised mostly by livestock for shade. Some common avifauna may use sparingly. • Poor connectivity with surrounding areas of vegetation. • Some *Pinus spp.* on the western edge of the site provide primary food resources for Carnaby's black cockatoo.	55.73	0.65

A search was initially conducted for fauna species that have been recorded within a 20 km radius of the site using the *Protected Matters Search Tool* (DCCEEW 2024), *NatureMap* (DBCA 2023c), DBCA's conservation significant fauna database (reference no. FAUNA7936), Atlas of Living Australia (ALA 2023) and other literature references. A total of 932 fauna species were identified from database searches as occurring or potentially occurring within 50 km of the site (Emerge Associates 2024a).

During the field survey, a total of 58 native and eight introduced fauna species were directly or indirectly (from foraging evidence) recorded. The 58 native fauna species recorded during the survey are mostly common in the region and were typically observed in areas of more intact vegetation with higher connectivity to nearby vegetation.

3.7.1.3 Bats

Emerge Associates (2024a) recorded three bat taxa from three sample locations within the site, including *Chalinolobus gouldii* (Gould's wattled bat), *Nyctophilus spp*. (Long-eared bat), and *Vespadelus regulus* (Southern forest bat).

The three species of microbat recorded at the site are common and widespread across several regions in Australia. All species prefer roosting in old tree hollows and occasionally utilise cliff overhangs. The open forest, plateau, laterite hills and breakaways, sandplain, eucalyptus woodland habitats in the site contain potential roosting spots for bat species and intact vegetation that supports an array of insect prey for them to feed on. A significant proportion of ridge and breakaway overhangs that may provide suitable roosting habitat contained feral honeybee hives, limiting their usability for bats.

3.7.1.4 Birds

Emerge Associates (2024a) undertook bird utilization surveys using six fixed-point samples. Survey locations were selected based on areas where wind turbines were most likely to be situated and areas with the highest elevation. Locations aligned with the pre-development bird surveys for the Badgingarra Wind Farm (Brett Lane & Associates Pty Ltd 2008). Each bird species recorded was classified into one of the following three broad height categories according to the height at which the species was frequently observed:

- Height Category 1 (HC1) – Predominantly observed flying above canopy height
- Height Category 2 (HC2) – Predominantly observed flying at canopy height
- Height Category 3 (HC3) – Predominantly observed flying below canopy (in shrubs or crop/grasses).

A total of 32 bird species were observed across the six sample sites. A further 19 bird species were observed during the survey within the site but outside of the fixed-point bird survey sites. Eleven species were observed from HC1, 12 species in HC2 and 29 species in HC3. A summary count of the bird species observed across all fixed-point sites as well as all recorded opportunistic observations are provided within **Appendix B**.

The site provides little suitable habitat for most bird species due to largely comprising pastureland and planted agricultural vegetation. Habitat at each sample location was similar, being predominantly pasture adjacent to patches of native vegetation.

Emerge Associates (2024a) observed the highest value to birds in the patches of native vegetation in the south-east of the site with a mixture of native bird species also recorded in the patches of planted tuart stands scattered throughout the site. A much lower diversity of species and abundance of individuals was observed in the pasture area associated with each survey location.

The small number of species and individuals observed in HC1 was attributed to the five raptor species found across the site. Pastureland, particularly those with annual lambing seasons provide regular, reliable feeding sources for raptors, and so the presence of five common raptors was not

unexpected. The rest of the birds found throughout the site are common and widespread across the region and restricted to pasture/grasses and the high-quality fenced habitats.

3.7.1.5 Conservation significant fauna

Evidence of Carnaby's black cockatoo was recorded within the site and this species is discussed in **Section 3.7.1.6**.

Two specially protected and four priority species were considered to have a moderate likelihood of occurring at the site, as described below.

- The Pacific swift (MI) and peregrine falcon (OS) are highly mobile species that may opportunistically fly over or forage in the site for short periods of time as part of a much larger home range but are unlikely to perch. Neither of these species would breed within the site. Any occurrence of pacific swift or peregrine falcon in the site would likely be in the air space and largely independent from terrestrial habitat.
- The woollybush bee (P3) is a territorial native bee species which has two records approximately 14 km west of the site. The species has been recorded on *Adenanthos* sp., *Banksia* sp., *Jacksonia* sp. and *Grevillea* sp. These plant species were recorded in the site during the flora assessment (Emerge Associates 2024c) and therefore the woollybush bee may occur in the sandplain and plateau habitats.
- Mt Lesueur shield-backed trapdoor spider (P2) is only known from one specimen in Lesueur National Park approximately 20 km north west of the site and is categorized as a data deficient species (Rix *et al.* 2018). Therefore, it is not possible to assess whether the species would occur in the site due to lack of information on its ecology or record distribution. However, given trap door spiders of the *Idiosoma* genus are known to occur in banksia woodland and heathland soils, the sandplain habitat in the site may represent suitable habitat for the species.
- Records of the western brush wallaby (P4) occur within 20 km of the site and the species occupies dry sclerophyll forests, banksia woodlands and heath or shrubland vegetation (Christensen and Strahan 1984). The sandplain, plateau and fenced areas of the laterite hills and breakaways habitats represent suitable habitat for the species within the site and have some connectivity to surrounding vegetation of similar type and quality. The species may therefore be present, although only in the eastern or southern areas of the site with more intact native vegetation.
- Several records exist for the black-striped snake (P4) approximately 20 km south of the site in Wongonderrah Nature Reserve. The species is known to occur in sandplains and heathland vegetation. The sandplain, plateau and fenced laterite hills and breakaways habitats in the site may provide suitable habitat for this species.

3.7.1.6 Black cockatoo habitat

Foraging evidence of Carnaby's black cockatoo in the form of chewed banksia fruits were observed during the Emerge Associates (2024a) survey in the sandplain habitat in the south of the site and many records exist for the species in the surrounding area (DBCA 2023d). The site lies within the northern part of the Carnaby's black cockatoo modelled distribution and breeding range which stretches to Eneabba, approximately 40 km north of the site (DoEE 2016).

The site is located outside of the modelled distribution range of Baudin's black cockatoo and forest red-tailed black cockatoo further (DoEE 2016) and so these species are not considered likely to occur and have not been discussed.

Breeding and roosting

Emerge Associates (2024a) recorded a total of 185.86 ha of potential breeding habitat for Carnaby's black cockatoo within the site. Breeding habitat within the site comprised mostly of tuart, jarrah, marri, *Eucalyptus rudis* (flooded gum) and stag (dead) trees. A total of 185.86 ha of roosting habitat for Carnaby's black cockatoos was recorded within the site. No roosts or evidence of roosting were observed within the site during the field survey.

Approximately 2% of the site supports trees which may be suitable for breeding and roosting for Carnaby's black cockatoo as illustrated in **Figure 7**. Breeding and roosting habitat was mapped as areas which likely contain breeding trees (eucalypts with diameter at breast height (DBH) >= 50cm) and/or roosting trees (eucalypts >10 m high). Breeding and roosting trees were not individually mapped. The number of habitat trees and presence of suitable hollows for Carnaby's black cockatoo breeding within these areas was not determined (Emerge Associates 2024a).

Foraging

A total of 468.36 ha of foraging habitat for Carnaby's black cockatoo was recorded at the site (Emerge Associates 2024a). The extent of foraging habitat is detailed below in **Table 7**.

The site contains native foraging habitat for Carnaby's black cockatoo. The highest value foraging resource in the site is the primary native habitat due to the presence of *Banksia* spp. in the eastern portion and marri trees scattered on the western edge.

The primary native foraging habitat in the eastern portion is close to Badgingarra National Park, which supports extensive foraging habitat and multiple records of Carnaby's black cockatoo (DBCA 2023d). It is likely that Carnaby's black cockatoo forage in the site in combination with other habitat in the region including Badgingarra National Park. The pine and marri trees are more isolated foraging resources but may still be used by Carnaby's black cockatoo as they move throughout the region.

The remainder of the site supports scattered lower value foraging habitat which may be occasionally used by Carnaby's black cockatoo and extensive areas of non-foraging vegetation.

Table 7: Foraging habitat recorded within the site

Foraging habitat	Foraging habitat for Carnaby's black cockatoos (ha)
Primary native	276.93
Primary non-native	6.37
Secondary native	47.55
Secondary non-native	137.51
Total	**468.36**

3.7.2 Management

The *Basic Fauna and Targeted Bird and Bat Assessment* (Emerge Associates 2024a) found the key MNES and conservation significant species that were identified as having a 'high' or 'moderate' likelihood to occur within the site or recorded within the site during surveys, include:

- One threatened fauna species *Zanda lateritic* (Carnaby's black cockatoo) (recorded during surveys)
- One migratory fauna species *Apus pacificus* (Pacific swift)
- One other specially protected species *Falco peregrinus* (peregrine falcon).

Pacific swift and peregrine falcon are highly mobile species that may opportunistically fly over or forage in the site for short periods of time as part of a much larger home range but are unlikely to perch. Neither of these species would breed within the site. Any occurrence of pacific swift or peregrine falcon in the site would likely be in the air space and largely independent from terrestrial habitat.

The *Bird Risk Assessment* Emerge Associates (2024b) determined the risks to relevant bird species of concern, including understanding their behavioural movements and the consequence the proposal has on these movements in the broader region. These species considered in the *Basic Fauna and Targeted Bird and Bat Assessment* (Emerge Associates 2024a) are considered to be potentially at risk of injury and mortality due to collision with the turbines. Turbine collision is dependent on the ability of a species to detect a turbine as well as its ability to avoid it. With the combination of high-speed turbine rotation and birds likely traversing the site in movement behaviour rather than distraction behaviours (foraging, courting or searching for habitat), detection of turbines is likely high.

The higher swept range of the rotors means that the turbines will operate at a height that the Carnaby's black cockatoo will most likely fly under, and the position of a small number of the turbines may mean they are close to areas of potential foraging habitat. This is mitigated by micro-siting of the turbines in cleared areas away from vegetation where reasonably practicable, which ultimately reduces the probability and potential for bird strike.

The value of the site to birds is low. The majority of the fauna habitat has been cleared historically for pasture, is of low quality and the remnant vegetation is present in small, disconnected patches. The habitat in the site is of low quality in comparison to nearby Coomallo Nature Reserve and Badgingarra National Park. Birds are unlikely to use the site as primary foraging, roosting or breeding habitat. This land provides little to no value for most fauna other than livestock. Notwithstanding, some fauna habitat values were identified, specifically those associated with black cockatoos, as discussed in **Section 3.7.1.5**.

Approximately 90% of the site is non-native vegetation which is heavily disturbed with only isolated patches of native vegetation across the site. The site contains a total of 185.86 ha of breeding and roosting habitat for Carnaby's black cockatoo. No roosts or evidence of roosting by any species of black cockatoo was recorded within the site during the field survey. Tall native and non-native trees within the site represent suitable roosting habitat Carnaby's black cockatoo. Scattered patches of Carnaby's black cockatoo foraging habitat is found predominantly to the south-east (primary native)

and to the north and centre of the site (secondary native). A total of 468.36 ha of foraging habitat for Carnaby's black cockatoo was mapped within the site, although it is important to note that secondary non-native foraging habitat presents limited material value for black cockatoo (137.5ha).

The key management strategy for the proposal is to avoid the clearing of native vegetation and Carnaby's black cockatoo habitat. Micro-siting of turbines and project infrastructure outside of areas of native vegetation and Carnaby's black cockatoo habitat has been possible. The preliminary layout for the Parron Wind Farm demonstrates that the WTGs are positioned to avoid areas with native vegetation and particularly areas with habitat value for black cockatoos. The ecological survey results have informed the design and placement of turbines and project infrastructure to avoid areas of native vegetation. The proposal has adopted a risk averse approach by avoiding the need to remove any native vegetation, native or primary non-native Carnaby's black cockatoo habitat and/or breeding trees with avoidance of direct impacts being the key strategy.

Impacts to native fauna will be minimal given the long-term retention of the remnant native vegetation within the site, particularly the potential black cockatoo habitat trees. However, impacts to fauna are possible as part of the construction activities, and in addition to the vegetation protection measures, management measures for terrestrial fauna will include:

- Avoidance of bird and bat habitat through micro-siting of turbines in cleared areas away from vegetation.
- Curtailment protocols to be considered if required (i.e. turning off wind turbines when wind levels are low and are at speeds that are less profitable or at particular periods of high risk (e.g. dawn and dusk).
- Wind farm construction and service vehicle speeds to be kept low, to avoid collision impacts to native fauna.
- Implementation of a *Fauna Management Plan* by an experienced fauna specialist under a valid license from the Department of Biodiversity, Conservation and Attractions (DBCA). This will include a pre-clearing fauna inspection to identify potential fauna interactions, including an inspection of trees for hollows and signs of use. A fauna spotter is to be present during clearing to direct and manage works to avoid impacts to fauna wherever possible and a trapping program to capture and translocate small to medium sized (translocatable) native fauna, if such fauna is present and translocation is practical.
- Ensuring the project is maintained in a clean and tidy manner to ensure feral and other species are not attracted to the site. Waste material is to be disposed of appropriately through waste services and/or to licenced landfill during construction and as part of ongoing operation.
- Design and implementation of an *Avifauna Monitoring Programme*, documenting baseline use of the development envelope by migratory birds and other avifauna, and any regular local movement patterns that may be identified, with equivalent monitoring and collection of avifauna and bat mortality data post-commissioning of the turbines

Clearing/modification of the existing pastoral/non-native vegetation within the site will be the primary impact to fauna species. The short-term potential impacts associated with this (e.g. during construction) can be managed as part of the development process through implementation of fauna

management protocols. The management measures will be documented within a CEMP to support construction activities.

3.8 Social environment

3.8.1 Outline of characteristics and values

3.8.1.1 Existing land uses

The site is within the Shire of Dandaragan and is located 8 km north-west of the town of Badgingarra. The site's land use zoning is rural under the Shire of Dandaragan's Local Planning Scheme No. 7. No R-codes, restricted uses or additional uses apply to the area.

A review of historical images available from 2000 onwards shows that the majority of the site was cleared of native vegetation prior to 2000, likely for grazing and/or cropping uses. Since this time the extent of native vegetation within the site has remained relatively stable (WALIA 2024). The surrounding areas have also supported agricultural land uses since the earliest available aerial imagery.

Currently the existing land uses at the site are general agricultural activities, mostly pastoral grazing. There are around 25 rural dwellings located on the site or immediately adjacent to it, and there are limited existing onsite structures and development.

Two DBCA managed or legislated lands occur immediately adjacent to the site. Badgingarra National Park (R31809) lies adjacent to the entire southern boundary of the site and extends to the south and east. Hill River Nature Reserve (R36093) lies adjacent to the north-eastern corner of the site and extends to the north-west and south-east (DBCA 2023b).

In direct proximity to the site are five (5) existing operational wind farms. Badgingarra Wind Farm was completed in 2019 and operates 37 WTG immediately to the west of the site, west of Yellamullah Road. To the south of this is Emu Downs Wind Farm that has operated 48 WTG since 2006. Approximately 30 km south-east is the Waddi Wind Farm with up to 18 WTG, and approximately 50 km south-east of the site is the Yandin Wind Farm with 51 WTG that commenced in 2021. Warradarge Wind Farm, near Eneabba, was completed toward the end of 2020 and has a total of 51 WTG.

3.8.1.2 Aboriginal heritage

In Western Australia, Aboriginal cultural heritage is currently managed pursuant to the *Aboriginal Heritage Act 1972*. The DPLH maintain the Aboriginal Cultural Heritage Inquiry System (ACHIS), which is a directory containing locations and information about Aboriginal Cultural Heritage (ACH) in the state.

In accordance with the *Aboriginal Heritage Due Diligence Guidelines* (DAA 2013), a search of the ACHIS online database (DPLH 2023) was undertaken which did not identify any Registered Aboriginal Heritage Sites or Other Heritage Places within the proposal area.

The closest Registered Aboriginal Cultural Heritage Place in proximity to the proposal area is JB1 SITE (Place 17118), which is approximately 5 km to the east near the Brand Highway.

Consultation is currently being progressed with the Yued People to ensure that the proposal is fully informed in relation to any relevant cultural heritage considerations.

3.8.1.3 Non-indigenous heritage

In order to determine the actual or potential presence of sites or features of non-indigenous heritage significance within the site, a review of the Australian Heritage Database (DCCEEW 2022), the State Heritage Office database (Heritage Council WA 2022) and the Local Heritage Survey (DPLH-008) was undertaken to determine if any of the following occur within the proposal area:

- World Heritage Sites
- National Heritage Sites
- Commonwealth Heritage Places
- Sites listed in the State Register of Heritage Places.

The desktop search has indicated there are no state registered heritage sites located within the proposal area.

Nearby sites were identified using the Local Heritage Survey (DPLH-008). Cattle Yards near Hill River on Cantabilling Road Badgingarra, North of Hill River (Heritage Place No. 5832) is 6 km to the north of the proposal area. Badgingarra Research Station (Herbert Sudholt's Farm) on Winjardie Road Badgingarra (Heritage Place No. 5828) is 10 km to the east of the proposal area.

3.8.1.4 Noise

A *Noise Impact Assessment* (Herring Storer Acoustics 2024) was conducted for the proposed Parron Wind Farm development. Noise levels were assessed at 25 receiver points at the site, and noise emissions calculated to comply with noise criteria based on background noise monitoring.

The assessment used the EPA of South Australia *'Wind Farms – Environmental noise guidelines- July 2009, Updated November 2021'* (Guidelines), which recommend the predicted equivalent noise level, adjusted for tonality in accordance with the Guidelines, should not exceed:

- 35 dB(A), or
- 40 dB(A) in a primary production or rural industry zone, or
- The 'Alternative Minimum Criteria' (varying with wind speed), or
- The background noise by more than 5 dB(A).

Results of the assessment found that noise emissions at four (4) of the residential receiver sites exceeded the noise criteria based on background noise monitoring. Two of these are considered "stakeholder premises" and these comply with the criteria recommended for "stakeholder premises". The proponent is seeking neighbour agreements with the remaining two landowners such that these will also become "stakeholder premises". A Noise Management Plan will be prepared to demonstrate that noise emissions will achieve compliance with the requirements of the

in EPA of South Australia *Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021*.

3.8.1.5 Visual amenity

A *Visual Impact Assessment* was undertaken for the proposal area by Emerge Associates (2024) which comprised a viewshed analysis for the 79 turbines, based on both average and maximum hub height of 150 m and 170 m respectively, as well as a blade length of 80 m. A viewshed analysis is based on assessing the turbine visibility using topography only, to understand whether the turbines are likely to be visible. The assessment provided a categorised analysis, showing number of turbines that could be visible from any given location within 20 km of the project.

The assessment found that the 79 turbines will be visible from various locations to different extents. The existing landscape provides high and low ridges which screen or display individual turbines at different points in the landscape. Vegetation along some of the major roads is tall enough to screen views of the turbines at some locations. The turbines will be most visible in high points of the landscape where natural screening from hills (landform) is reduced.

A site visit was undertaken to ground truth the outcomes of the analysis and determine locations where the proposed WTG may be visible. A 3D block model was prepared to replicate the anticipated views from selected viewpoint locations, and ten (10) of these were progressed to photomontages, including the following viewpoints:

- Pinnacles Desert
- Cervantes Road
- Bibby Road (west)
- Springhill Road
- Nylagarda Road
- Jurien Road
- Cantabilling Road
- Brand Highway
- Badgingarra town
- Bibby Road (east).

Given the current extent of wind turbines in the area, the visual impacts are overall expected to be marginal (Emerge Associates 2024d). The turbines 'fit' well in the rural landscape character and the topography of the site (which included a broader area than the project) complements the turbines by providing high and low ridges to screen or display each structure at various points throughout the landscape. However, at a number of locations to the east of the site, the project will introduce turbines where these were not previously visible. At some viewpoints, only the blades are likely to be visible, while at other locations the whole turbine is likely to be visible.

Existing turbines from adjacent wind farms are currently visible in many locations around the site and in most cases, it is not expected that additional turbines will significantly alter the overall visual quality. Based on the existing landform and vegetation present, the visual quality of the rural landscape setting can be maintained.

3.8.1.6 Shadow flicker and blade glint

The interaction of the sun with the turning blades of the turbine can cause shadow flicker and blade glint to occur. If the moving shadow of the turbine blades passes over a window that provides natural light this can affect viewers. A *Shadow Flicker and Blade Glint Assessment* (Aurecon 2024b) was undertaken focusing on all the nearby residences within 2 km of the wind farm and concluded that:

- There will be low impact of blade glint given modern turbines use non-reflective paint and materials.
- Four (4) dwellings have shadow flicker effects from the proposed turbines, of which three (3) are identified stakeholder dwellings. The requirements under the *Draft National Guidelines* (EPHC 2010) do not apply to the stakeholder residences.
- The non-stakeholder dwelling is predicted to experience shadow flicker for a duration within the allowable limits.
- It is recommended that the assessment be redone when the WTG model and layout is finalised. If expected flicker effects are in excess of the recommended limits, this can be addressed using flicker timers or other mitigation strategies to decrease the duration of shadow flicker to an acceptable level.

3.8.1.7 Traffic

A *Traffic Impact Statement* (Porter Consulting Engineers 2024) was undertaken to consider the existing transport conditions surrounding the site, various construction vehicle routes (including for over size and over mass (OSOM) vehicles), traffic generation of the proposed development during construction and operation, proposed access arrangements to the site, and transport impact of the proposal to the surrounding road network. The proponent's preferred site access is via Cowalla Road, therefore this road was investigated further in the report.

The construction phase is the critical stage for traffic where there is considerably more traffic generated over the period for construction (up to 2 years). The peak construction period is anticipated to generate in the order of 275 vehicle trips daily with 183 light vehicle trips and 92 heavy vehicle trips should the workforce be accommodated off Site requiring all workers to travel to/from work each day. The movement of OSOM vehicles that will need to be appropriately managed to avoid congestion/delays to traffic along the proposed route from Geraldton Port.

A *Transport Route Study* by Rex J Andrews (2024) was prepared for the route Geraldton Port to the proposal area (221 km) for all turbine components. The study assessed a number of options and determined the most likely route. Each section of road from Geraldton to the proposal area was considered and it was determined whether modifications were required, if caution was required, and identified those sections that had parking areas.

The transport route in its current condition will require upgrades at several locations before it could be deemed suitable for transporting the proposed components. Modifications will be required to bridges, overhead structures, overhead utilities, vegetation, pavement, Geraldton Port, Geraldton,

Dongara, Cowalla Road, Cadda Road, and the proposal area. There will be an increase to existing traffic volume with light, heavy and over-sized vehicles on the transport route.

3.8.1.8 Aviation

An *Aviation Impact Assessment* was conducted by Aviation Projects (2024) to assess the potential aviation impacts associated with the proposal and provide aviation safety advice in respect of relevant requirements of air safety regulations and procedures and inform and document consultation with relevant aviation agencies. The assessment prepared an Aviation Impact Statement (AIS) for consideration by Airservices Australia, Civil Aviation Safety Authority (CASA) and the Australian Department of Defence.

The assessment established that the proposal is not located within 30 nautical miles (nm) of any certified aerodrome and the proposal will not infringe the obstacle limitation surface of any certified aerodrome. There are no verified landing areas located within 3 nm of the proposal, therefore there is no impact caused to aircraft landing areas by the proposal. The proposal will not impact the grid Lowest Safe Altitude or air routes and will not infringe any protection areas associated with aviation facilities. The proposal site is located outside the stated ranges of radar systems in the Perth area. As such, no impacts are expected to aviation.

3.8.1.9 Electromagnetic interference

The established method to ensure no electromagnetic interference from wind turbines is to keep structures out of the Fresnel zone. The Fresnel zone is represented as an ellipsoid around the line of sight between the two ends of the path (telecommunication towers). The second Fresnel zone is often used as a conservative safeguarding of the telecommunications links from potential interference from wind turbines.

The *Electromagnetic Interference Assessment* by Aurecon (2024a) considered all known existing paths from the Australian Communications and Media Authority telecommunication license database and assumed an exclusion area of the second Fresnel zone.

The assessment found that no interference is expected for point-to-point telecommunication links or fixed broadcasting towers as no part of any WTG are within the second Fresnel zone and 2 km exclusion zones respectively.

Several buildings near the proposal may experience reduced mobile phone signal, and the assessment recommended to contact Telstra and Optus to seek feedback on any potential impact that the proposal could have on their services.

The assessment identified seven (7) meteorological radars within 250 nautical miles of the proposal and recommended to contact Bureau of Meteorology (BOM) to discuss the potential effect of the wind farm on these weather radars.

3.8.2 Management

A desktop search determined that no Registered Aboriginal Heritage Sites or Other Heritage Places occur within the proposal area. The nearest ACH site is 5 km away and does not intersect the proposal area. If personnel identify any material suspected to be of Aboriginal or archeological significance during site activities, construction will be suspended immediately near any suspected material.

Noise management will require the proponent to effect neighbour agreements with two landowners such that these will become "stakeholder premises". A Noise Management Plan will be prepared to demonstrate that noise emissions will achieve compliance with the requirements of the in EPA of South Australia *Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021*.

Construction noise management will include:

- Works generating excessive noise and rock breaking will not occur outside the hours of 7am to 7pm or on a Sunday or Public Holiday
- Maintain noise suppression devices in good condition on all operational machinery
- Shut down equipment when not in use
- Operate machinery within the designated hours of operation
- Schedule activities to minimise the likelihood of noise nuisance
- Use the dedicated transport route
- Record and follow up any complaints received regarding noise disturbance immediately to minimise the cause.

Wind turbines are generally not able to be screened for visual impact, and while a prominent feature, can be compatible with existing visual experiences for travelers and locals, particularly given existing views of wind turbines. Mitigation (such as screening planting) would be required at the receptor to have any chance of minimising the visibility of the turbines but is not proposed at this point in time. Based on the existing landform (rolling hills) and interspersed nature of native vegetation and cleared agricultural land the rural landscape character unit (LCU) and urban LCU can be maintained.

The most practical mitigation strategy for shadow flicker is a turbine shut-down protocol which will switch off some of the turbines (namely those causing shadow flicker) so that the total actual duration is no more than the allowable limit. 'Flicker timers' are standard additions that can automate this process by stopping each relevant turbine at the date and time of day when the sun is in a position that would cause shadow flicker. In addition, each relevant turbine can be fitted with a light sensor so that the turbine is only stopped when there is direct sunlight, and rotor orientation can also be considered so that the turbine is not shut down if the rotor is near-parallel to the line from the residence to the sun. It may also be possible to screen the view to the wind turbine that is causing the flicker, for example through additional landscaping devices such as vegetation planting, blocking the wind turbine line of sight. Blade glint will be minimised through the use of non-reflective paint and materials.

Recommendations for aviation management include:

- 'As constructed' details of the coordinates and elevations of the WTGs should be provided to Airservices Australia
- Details of the final wind farm layout should be provided to local and regional aircraft operators so they are aware of the wind farm.
- The rotor blades, nacelles and towers of the WTGs should be painted in white, typical of most wind turbines operational in Australia to ensure they are visible to pilots during the day.

Traffic management measures recommended in the *Traffic Impact Statement* recommend further investigation to be undertaken in regard to the existing pavement condition and sealing of Cowalla Road given the routine maintenance required for unsealed roads and the conditions often imposed on heavy vehicles using unsealed roads when the pavement is visibly wet.

The *Traffic Impact Statement* also identified that a short sealed left turn shoulder (BAL) should be provided on Brand Highway at Cowalla Road to accommodate left turning construction traffic. Further additional intersection works may also need to be provided to allow for the swept path of the 27.5m combination heavy vehicles anticipated to access the site throughout the construction works. The intersection of Brand Highway and Cowalla Road will also require temporary works to accommodate the swept paths of OSOM vehicles. These intersection modifications will need to be designed in liaison with Main Roads WA and will be subject to their approval processes.

Traffic management will be applied during construction to adequately warn contra-flow traffic of vehicles turning into and out of the site. Measures taken to ensure tracking of dirt onto public roads is minimised include rumble grids, rock crossings, and monitoring. Management will ensure sufficient on-site parking is available to prevent parking of staff vehicles and queuing of heavy vehicles on public roads during construction. Consideration will be given to stock movements and grain/harvest movements with heavy vehicles that may share the transport route.

Electromagnetic interference is not expected for telecommunications towers as there were none identified within 2 km of the proposal site and do not require management. All four point-to-point signals crossing the proposal site did not encroach on the second Fresnel zone exclusion zones, therefore no mitigation is required for this. No licensed towers are located within 20 km of the proposal, and interference is considered unlikely. However, it was recommended to consult with the four operators identified for nearby sites to confirm that their services will not be impacted.

No interference is expected on any broadcasting towers and no mitigation is required for the broadcasting towers. Interference to digital TV and radio broadcasting is not expected.

Several dwellings are near or within no coverage areas for the two mobile networks that are available in the area around the proposal and may experience reduced signal as a result of the proposal. It was recommended to contact Telstra and Optus to seek feedback on any potential impact that PWF could have on their services, and if required confirm what mitigation options are available for users, such as a signal amplifier.

There are seven Bureau of Meteorology (BOM) radars within 250 nautical miles of the proposal, and it was recommended to contact BOM to assess the potential effect of the wind farm on these weather radars.

3.9 Bushfire hazard

3.9.1 Outline of values

The state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2021) has identified scattered areas that are bushfire prone within the site and surrounding areas, as provided in **Plate 5**.

The identification of a site within an area declared as bushfire prone necessitates that further assessment of the determined bushfire risk of the proposed development is to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017) and *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia 2018). This is addressed through a site-specific *Bushfire Management Plan* (BMP). The BMP ensures that any bushfire risk is appropriately managed through the layout of the development and the implementation of appropriate construction standards where necessary.

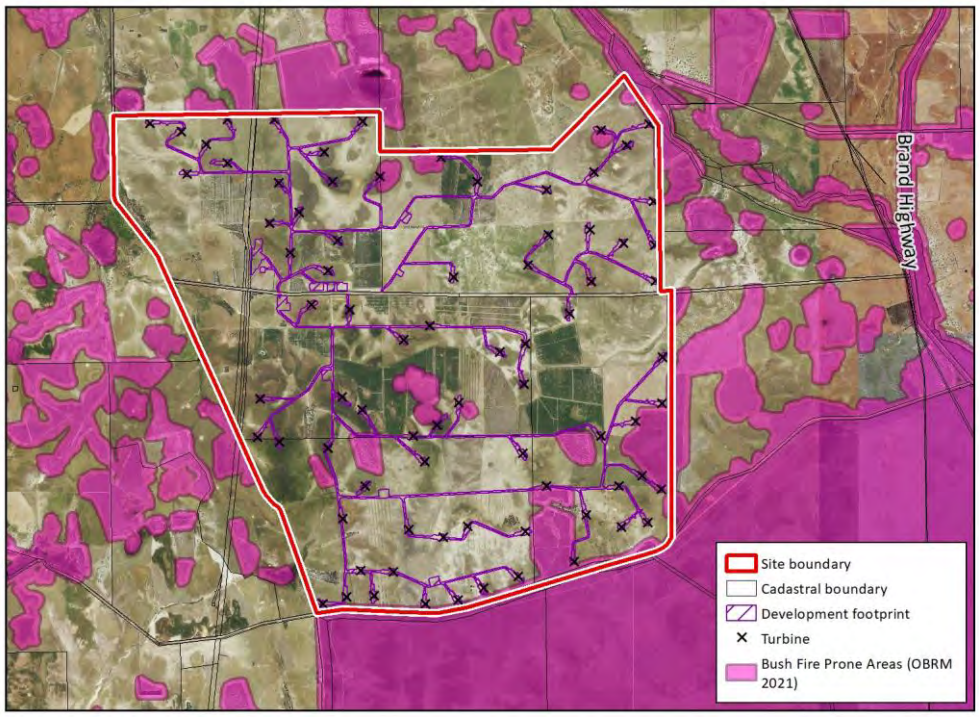

Plate 5: Bushfire prone areas

A Bushfire Attack Level (BAL) assessment involving the classification of vegetation and effective slope within 100 m of the disturbance footprint of the wind farm within the site was undertaken in accordance with AS 3959 (Standards Australia 2018). The majority of the site is identified as a 'moderate' bushfire hazard, with the patches of woodland vegetation considered an 'extreme' hazard. All turbines and associated infrastructure are located in areas of moderate bushfire hazard.

3.9.2 Management

the outcomes of the BMP demonstrate that bushfire risk can be safely managed without the clearing of any of the vegetation surrounding the proposal area. Management measures can satisfy the requirements of SPP 3.7, the Guidelines and the precautionary principle by:

- **Location**: all development is to be located within an area not exceeding a moderate bushfire hazard or can achieve BAL-29 upon completion. The proposed wind farm turbines and key infrastructure are within a moderate bushfire hazard, and all turbines and habitable buildings associated with the development can be located within a BAL-29 classification.
- **Siting and Design**: as required by SPP 3.7 and the Guidelines, all future habitable buildings can be sited within the site so that BAL-29 or less can be achieved. The required APZ is accommodated wholly within the site and existing cleared areas and where trees are present, these can remain. A minimum 10 m-wide APZ is proposed around all turbines and key infrastructure (excluding the roads).
- **Vehicular Access**: development is to have access to a public through road. The proposed development layout provides for multiple egress points to Cowalla Road, which provides connections to the broader public road network, including Yerramullah Road, Brand Highway and Munbinea Road, and are therefore all through roads. Surrounding public roads comply with the minimum technical standards of the Guidelines, in accordance with the Institute of Public Works Engineers Australasia Western Australia Incorporated (IPWEA). The internal access tracks have been considered in the context of 'private driveways' under the Guidelines and are proposed to be 5.5 m wide with a 0.5 m shoulder each side (6.5 m-wide trafficable surface in total). These tracks will also maintain a minimum vertical clearance of 4.5m complying with Table 6, Column 4 of the guidelines. The width of the tracks means no passing bays will be required, and suitable turning areas for fire appliances will be available at the base of each turbine and within 30 m of habitable buildings for other key infrastructure. This can be accommodated without additional clearing to that outlined.
- **Water**: all development is to have water available to defend from bushfire. The development is not serviced by a reticulated water supply but will include the provision of a water system including a 100 000L water tank to be available for firefighting. Water tankers and other firefighting equipment will also be maintained as a part of the development.

4 Conclusions

This EAMP has been prepared on behalf of the proponent to support the assessment, approval and development of the Parron Wind Farm proposal across a proposal area/site of 8,392 ha approximately 8 km north-west of Badgingarra, Western Australia.

The proposal layout has responded to site-specific environmental considerations and will allow the retention of all intact native vegetation within the proposal area, and the only impacts to intact native vegetation being associated with upgrades to the Cowalla Road Brand Highway intersection.

This document provides an environmental assessment and management plan framework to be implemented across the site during development and operation of the proposal. The key components of this framework are summarised for each of the relevant the environmental considerations/factors as follows:

- Landforms, soils and geology:
  - A *Construction Environmental Management Plan* (CEMP) will be prepared as part of the engineering detailed design that will consider landform, soils and geology, and consider the prevention of erosion and erosion risk.
- Hydrology:
  - A *Water Management Strategy* (WMS) will be prepared to identify the water management approach to support the CEMP.
  - Measures implemented specifically with respect to groundwater include the appropriate storage of potential contaminants and availability of clean-up materials.
  - Groundwater abstraction for the proposed development will be undertaken in accordance with an approved groundwater licence.
- Flora and vegetation:
  - Avoidance of clearing of intact native vegetation and habitat trees through micro-siting of wind turbines.
  - Delineation of tree protection zones (TPZ) to be managed with arborist advice.
  - Hygiene protocols during clearing and construction to reduce introduction/spread of weeds and plant pathogens.
- Terrestrial fauna:
  - Avoidance of bird and bat habitat through micro-siting of turbines in cleared areas away from intact nature vegetation.
  - Curtailment protocols to be considered if required (i.e. turning off wind turbines when wind levels are low and are at speeds that are less profitable or at particular periods of high risk (e.g. dawn and dusk)).
  - Wind farm service vehicle speeds to be kept low, to avoid road collision impacts with native fauna
  - *Fauna Management Plan* including pre-clearing fauna inspection, fauna trapping and translocation, fauna spotter and maintenance of clean site to deter feral and pest species.
  - Design and implementation of an *Avifauna Monitoring Programme*, documenting baseline use of the development envelope by birds and other avifauna, and any regular local

movement patterns that may be identified, with equivalent monitoring and collection of avifauna and bat mortality data post-commissioning of the turbines.

- Social environment:
  - The proponent is seeking neighbour agreements with two landowners such that these will become "stakeholder premises". A Noise Management Plan will be prepared to demonstrate that noise emissions will achieve compliance with the requirements of the in EPA of South Australia *Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021*.of the in EPA of South Australia *Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021*.
  - Construction noise to be managed within the designated hours and noise suppression devices will be maintained.
  - Visual amenity to be managed through positioning of proposal elements.
  - Shadow flicker management will utilise flicker timers to shut-down in case of flicker.
  - Non-reflective paint/materials will be used to reduce blade glint.
  - Traffic management measures to ensure minimal tracking of dirt onto public roads, prevent queuing of heavy vehicles on public roads, and coordinate shared transport route.
- Bushfire hazard:
  - No additional clearing is required to achieve a moderate bushfire hazard
  - The required Asset Protection Zone (APZ) is accommodated wholly within the site and existing cleared areas and where trees are present, these can remain.
  - Vehicular access can be accommodated without additional clearing to that outlined.

Overall, the environmental attributes and values of the site can be suitably accommodated within the development plan or can be appropriately managed through the future development in line with the relevant state and local government legislation, policies and guidelines and best management practices.

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5.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 5.1**, with access date information detailed in **Table R1**.

Table R1: Access dates for online references

Reference	Date accessed	Website or dataset name
ALA (2023)	10 July 2024	Biodiversity data
BoM (2024)	24 June 2024	Climate data
DBCA (2017)	25 June 2024	Ramsar sites
DBCA (2018)	25 June 2024	Important wetlands
DBCA (2023b)	25 June 2024	Lands of interest
DBCA (2023c)	10 July 2024	Biodiversity data
DBCA (2023d)	10 July 2024	Threatened species and communities
DBCA (2023a)	25 June 2024	Geomorphic wetlands
DCCEEW (2022)	1 August 2024	Australian heritage database
DoW (2008)	25 June 2024	Elevation data
DPIRD (2022)	25 June 2024	Soil landscape mapping
DPLH (2023)	1 August 2024	Aboriginal cultural heritage inquiry service
DWER (2018)	24 June 2024	Hydrography linear dataset
DWER (2021)	24 June 2024	Water register
DWER (2023)	25 June 2024	ASS risk maps
Heritage Council WA (2022)	1 August 2024	State heritage office database
OBRM (2021)	2 August 2024	Map of bush fire prone areas
WALIA (2024)	24 June 2024	Landgate map viewer

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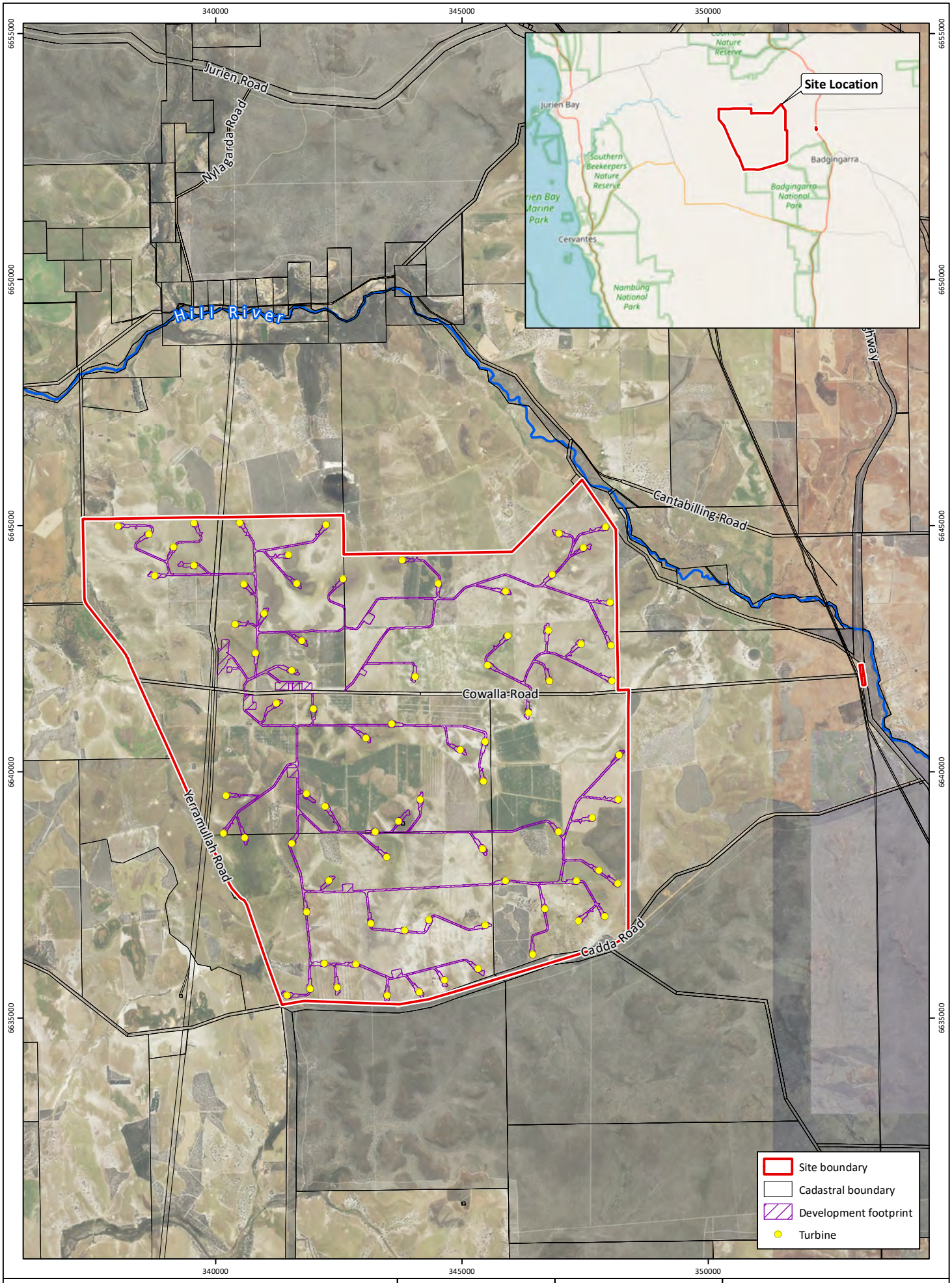

Figure 1: Site Location

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Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F97

Drawn:	GAR
Date:	10/09/2024
Checked:	FK
Approved:	JDH
Date:	01/10/2024

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Kilometers

Scale: 1:100,000@A4

GDA2020 MGA Zone 50

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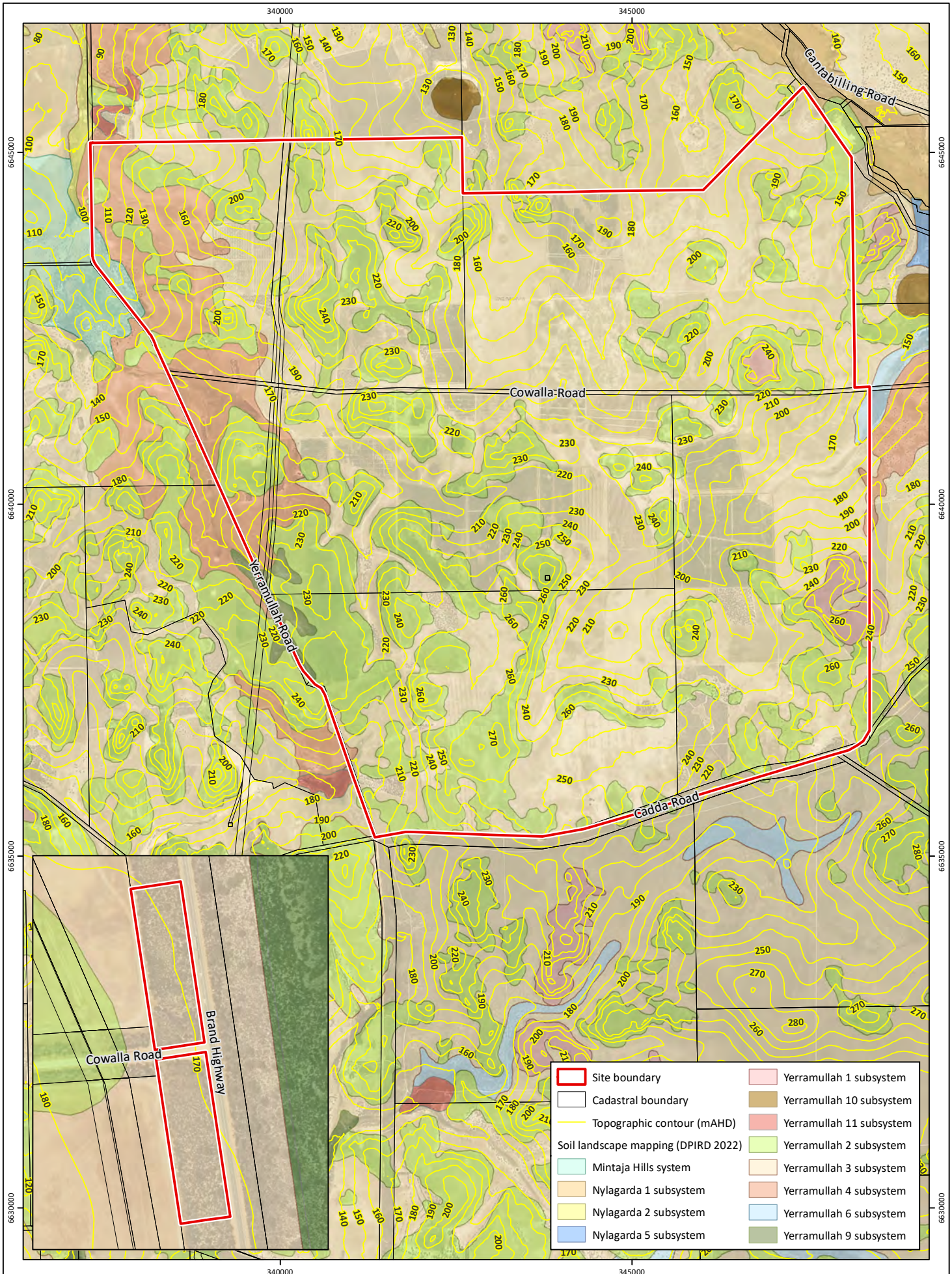

Figure 2: Topography and Soil Landscape Units

Project: Environmental Assessment and Management Plan
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F99

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Date:	10/09/2024
Checked:	FK
Approved:	JDH
Date:	01/10/2024

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Kilometers

Scale: 1:70,000@A4

GDA2020 MGA Zone 50

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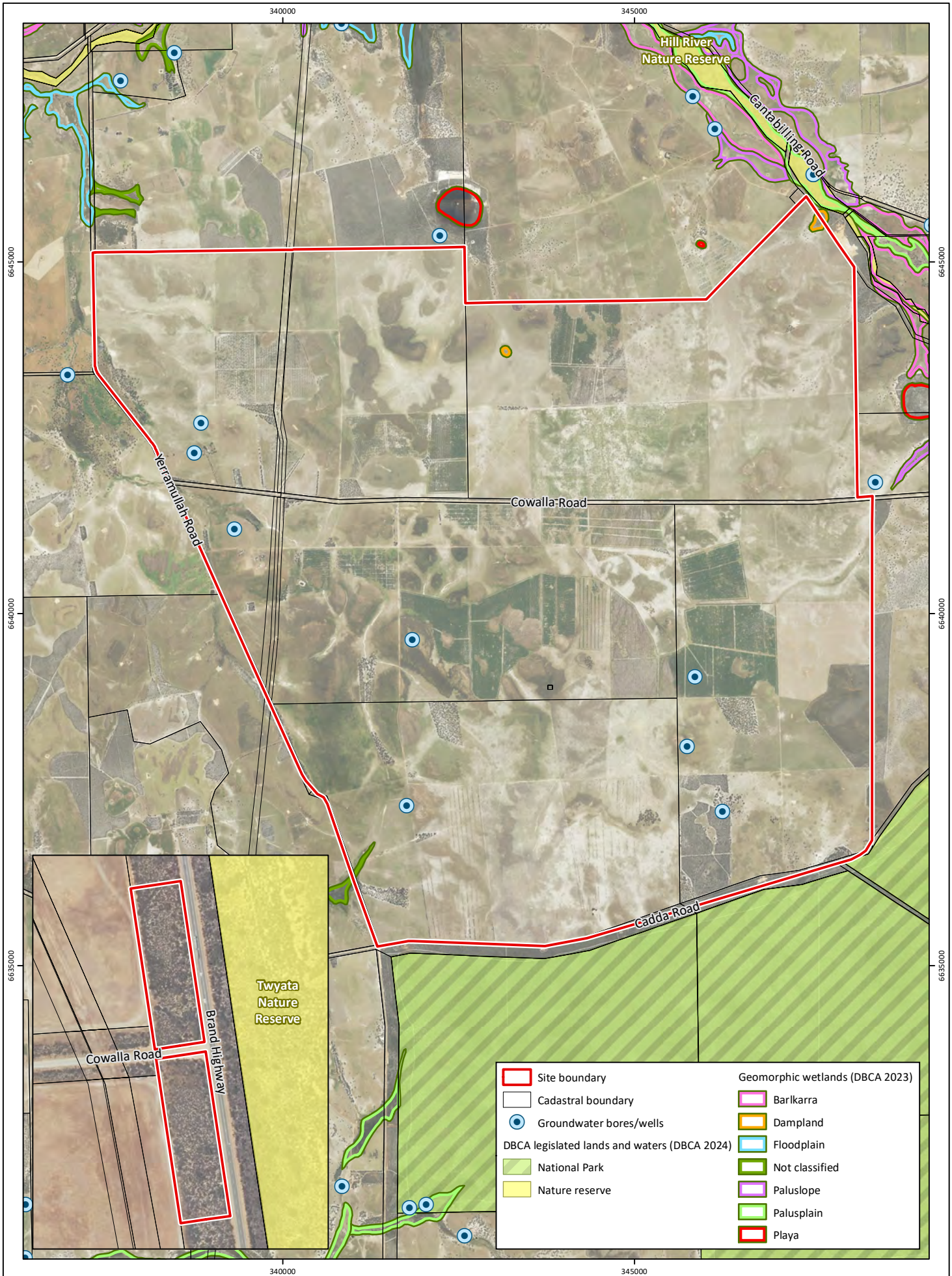

Figure 3: Geomorphic Wetlands and Hydrology

Project: Environmental Assessment and Management Plan
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F129

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Date:	27/09/2024
Checked:	FK
Approved:	JDH
Date:	01/10/2024

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Scale: 1:70,000@A4

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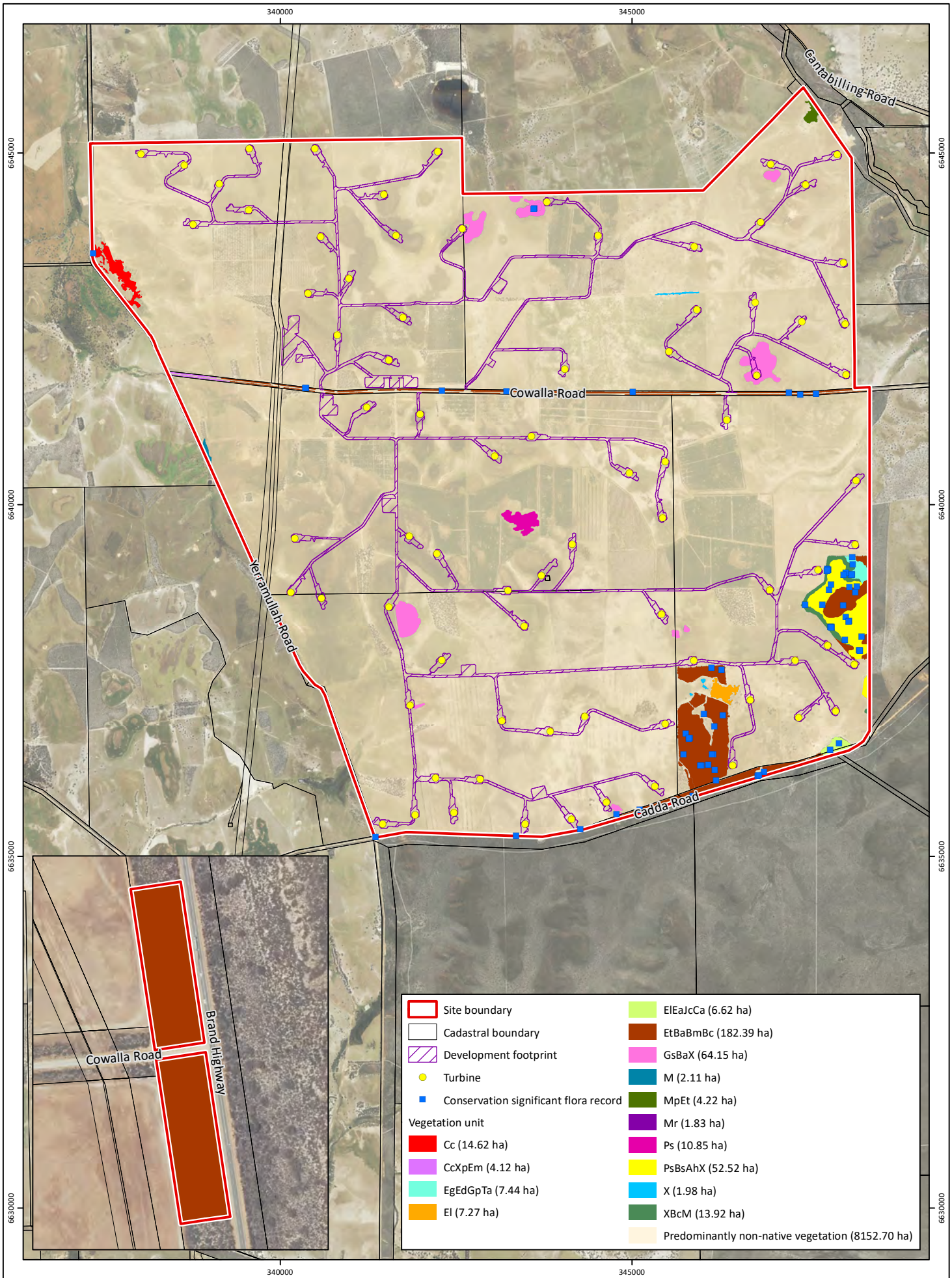

Figure 4: Plant Communities

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Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F98

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Date:	01/10/2024

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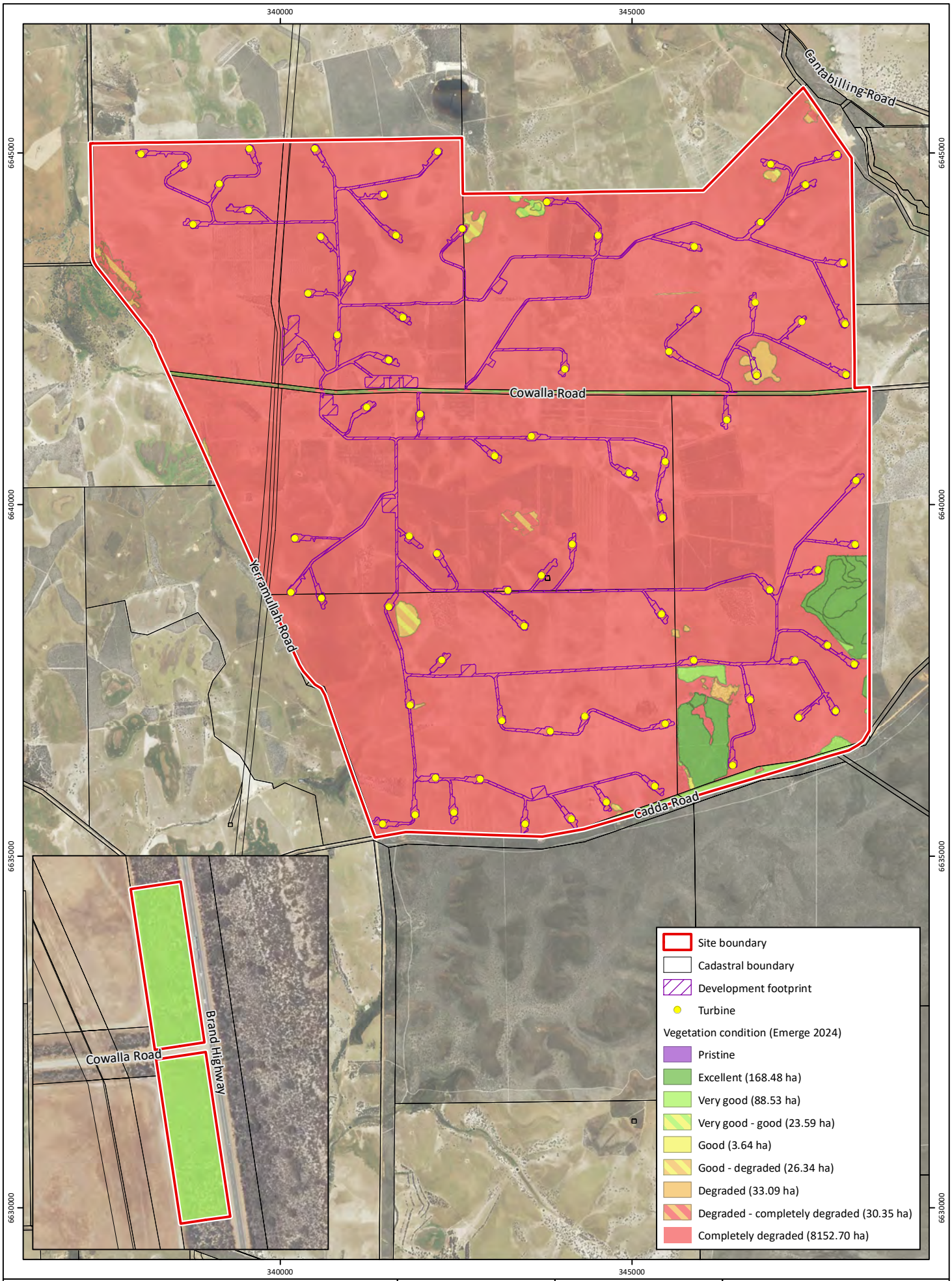

Figure 5: Vegetation Condition

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Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F101

Drawn:	GAR
Date:	10/09/2024
Checked:	FK
Approved:	JDH
Date:	01/10/2024

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Scale: 1:70,000@A4

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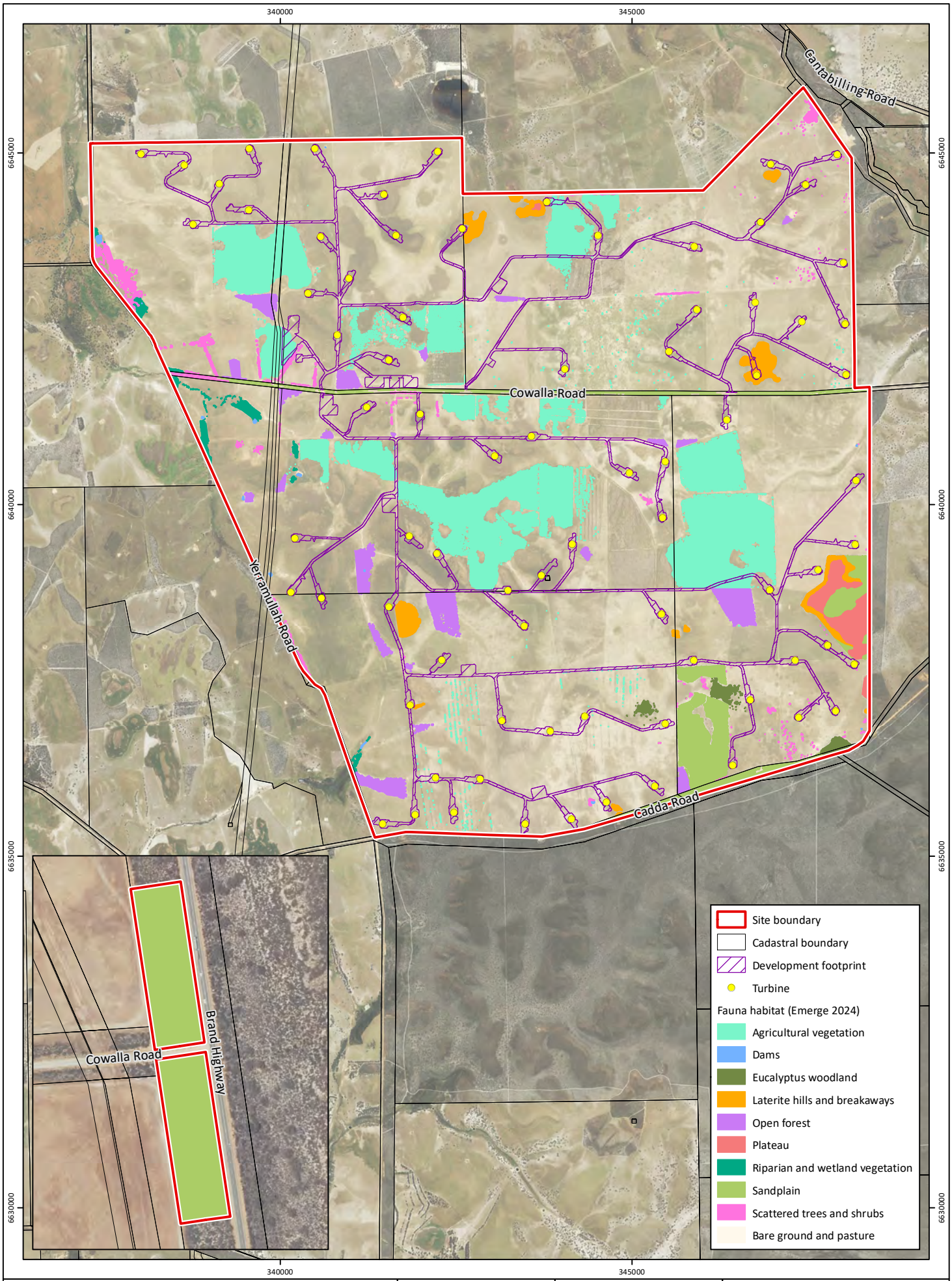

Figure 6: Fauna Habitat

Project:	Environmental Assessment and Management Plan Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F102

Drawn:	GAR
Date:	10/09/2024
Checked:	FK
Approved:	JDH
Date:	01/10/2024

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Kilometers

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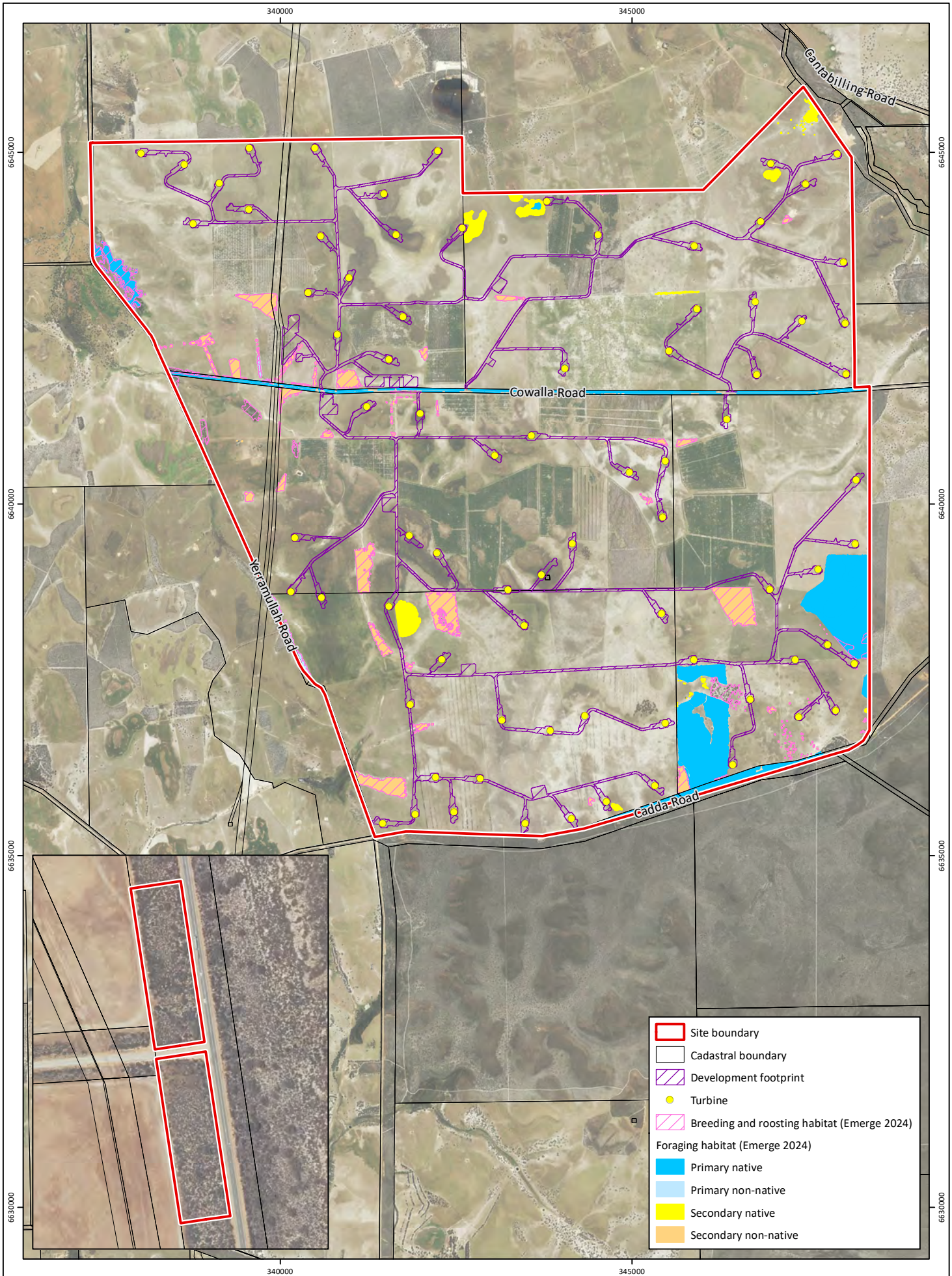

Figure 7: Carnaby's Black Cockatoo Habitat

Project:	Environmental Assessment and Management Plan Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(13)--F103

Drawn:	GAR
Date:	10/09/2024
Checked:	FK
Approved:	JDH
Date:	01/10/2024

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Kilometers

Scale: 1:70,000@A4

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Appendix A

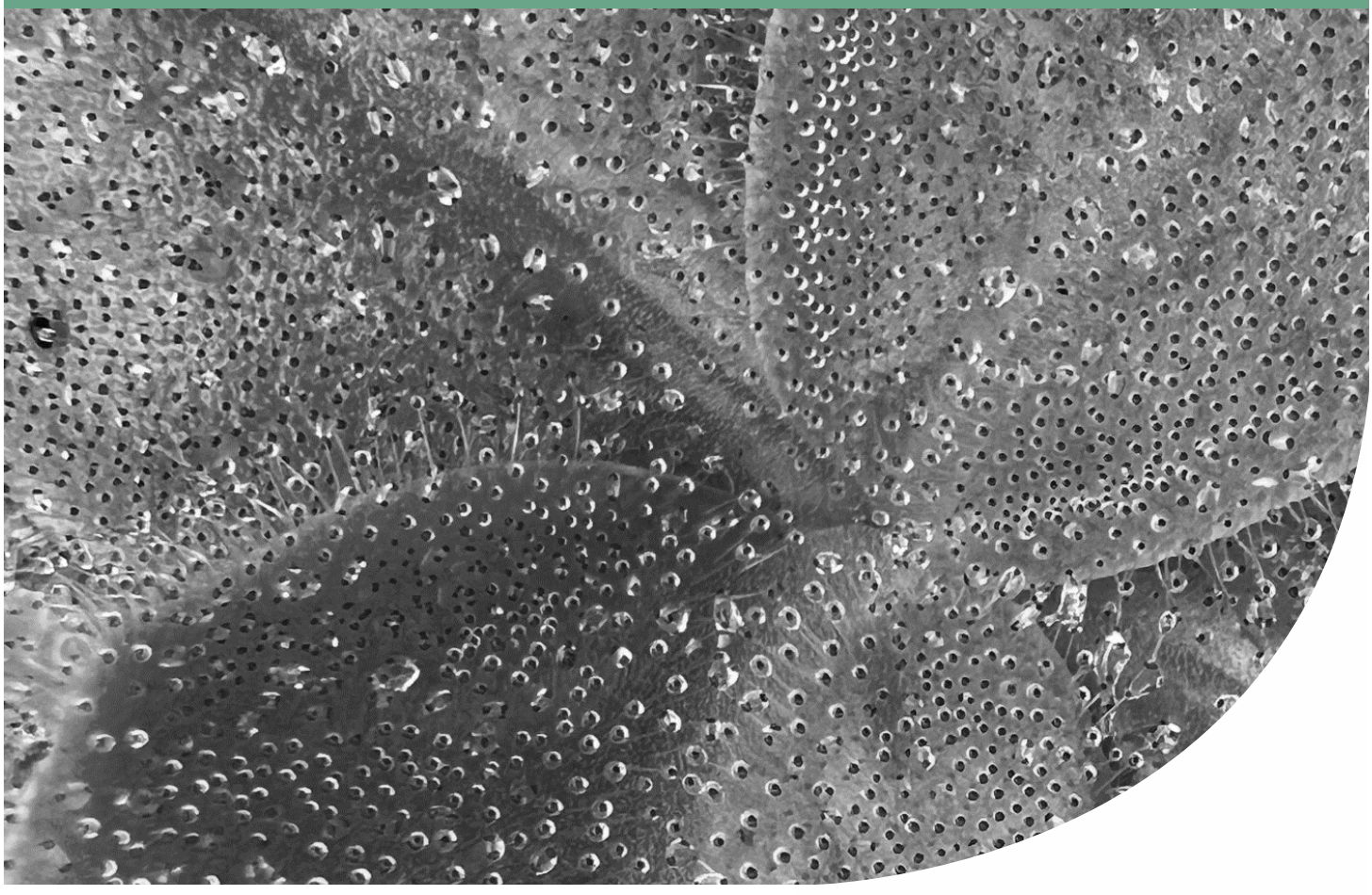
Detailed Flora and Vegetation Assessment

Detailed Flora and Vegetation Assessment

Parron Wind Farm Development Support

Project No: EP23-085(01)

Prepared for Zephyr Energy Pty Ltd
July 2024



Document Control

Doc name:	Detailed Flora and Vegetation Assessment Parron Wind Farm Development Support				
Doc no.:	**EP23-085(01)--006A MS**				
Version	**Date**	**Author**		**Reviewer**	
1	May 2024	Melanie Schubert	MS	Rachel Weber	RAW
	Submitted for client review				
A	July 2024	Melanie Schubert	MS	Rachel Weber	RAW
	Minor updates to methodology following project team review				

Executive Summary

Zephyr Energy Pty Ltd engaged Emerge Associates to conduct a flora and vegetation assessment within the proposed Parron windfarm and associated road reserves in Badgingarra (referred to herein as the 'site').

The assessment included a desktop study of the environmental context of the site and the likelihood of occurrence of threatened and priority flora and ecological communities. Field surveys were conducted over multiple days between September and November 2023 during which the composition and condition of vegetation was recorded. Flora and vegetation values were characterised to the standard required of a detailed survey with reference to EPA (2016b).

Outcomes of the assessment include the following:

- A total of 478 native and 25 non-native or planted flora species were recorded within the site.
- 23 species listed as priority flora in Western Australia were recorded: *Chordifex reseminans* (P2), *Hypocalymma serrulatum* (P2), *Leucopogon plumuliflorus* (P2), *Lyginia excelsa* (P2), *Synaphea xela*, *Austrostipa nunaginensis* (P3), *Banksia kippistiana* var. *paenepeccata* (P3), *Banksia nana* (P3), *Beaufortia bicolor* (P3), *Drosera prophylla* (P3), *Hensmania stoniella* (P3), *Lepidobolus quadratus* (P3), *Phlebocarya pilosissima* subsp. *pilosissima* (P3), *Stylidium hymenocraspedum* (P3), *Stylidium nonscandens* (P3), *Tetratheca angulata* (P3), *Banksia chamaephyton* (P4), *Desmocladus elongatus* (P4), *Eucalyptus* x *carnabyi* (P4), *Hypolaena robusta* (P4), *Schoenus griffinianus* (P4), *Stylidium aeonioides* (P4) and *Stylidium inversiflorum* (P4).
- No threatened flora species were recorded in the site.
- 13 threatened and 84 additional priority flora species may occur in the site.
- The majority of the site comprises **predominantly non-native vegetation** in 'completely degraded' condition (8,152.7 ha, 95.61%).
- 14 native vegetation units were identified within the site, ranging from 'excellent' to 'degraded - completely degraded' condition. Native vegetation occurs over 374.04 ha (4.39% of the site).
- No threatened ecological communities or priority ecological communities occur within the site.

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Appendix C

Conservation Significant Communities and Likelihood of Occurrence Assessment

Appendix D

Species List

Appendix E

Conservation Significant Flora Species Records

Appendix F

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Appendix G

Cluster Dendrograms

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
DBCA	Department of Biodiversity, Conservation and Attractions
DoW	Department of Water (now DWER)
DWER	Department of Water and Environmental Regulation

Table A2: Abbreviations – General terms

General terms	
A	Annual
IBRA	Interim Biogeographic Regionalisation for Australia
CR	Critically endangered
EN	Endangered
NVIS	National Vegetation Information System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
P	Perennial
TEC	Threatened ecological communities
UFI	Unique feature identifier
VU	Vulnerable

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
BC Act	*Biodiversity Conservation Act 2016*
BC Regs	*Biodiversity Conservation Regulations 2018*

Table A4: Abbreviations – Units of measurement

Units of measurement	
ha	Hectare
km	Kilometre
m	Metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

1 Introduction

1.1 Purpose

Emerge Associates (Emerge) were engaged by Zephyr Energy Pty Ltd to conduct a flora and vegetation assessment within Parron Windfarm and associated road reserves in Badgingarra as shown in **Figure 1** (referred to herein as the 'site').

Flora and vegetation assessments are required to characterise vegetation values and, in particular, confirm the presence or absence of values relevant to environmental approvals process, such as, 'native vegetation', 'threatened' flora, 'priority' flora, 'threatened ecological communities' (TECs), 'priority ecological communities' (PECs) and weeds.

1.2 Legislation and policy

'Native vegetation' is defined by the *Environmental Protection Act 1986* (EP Act) as indigenous aquatic or terrestrial flora. In the *Environmental Factor Guideline – Flora and Vegetation* the EPA further defines it as native vascular flora and defines vegetation as groupings of flora (EPA 2016a). Native vegetation is protected in Western Australia and can't be cleared without a permit or valid exemption. Biological diversity, habitat function, scarcity, association with wetlands and other ecosystem services influence the value placed on native vegetation (DWER 2018a). Planted flora and vegetation are generally not regarded as native vegetation unless required to be established under the EP Act or other written law or regulation.

Flora and ecological communities may be listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DCCEEW 2021) and the State *Biodiversity Conservation Act 2016* (BC Act) (DBCA 2022c, 2023f). Threatened flora and TECs are classified as either 'critically endangered'(CR), 'endangered' (EN) and 'vulnerable' (VU) (DCCEEW 2021). Commonwealth and/or State ministerial approval is required to impact threatened flora or TECs.

Native flora and ecological communities that are not listed as threatened, but are otherwise considered rare or under threat, may be added to a Department of Biodiversity, Conservation and Attractions (DBCA) priority list (DBCA 2022b, c). 'Priority flora' and PECs are classified as either 'priority 1' (P1), 'priority 2' (P2), 'priority 3' (P3) or 'priority 4' (P4). They do not have direct statutory protection. However, their priority classification is taken into account during State and Local government approval processes.

Flora that are regarded as having negative environmental or economic impacts are often referred to as weeds (DBCA 2023h). Particularly detrimental weed species may be listed as a 'declared pest' pursuant to the State *Biosecurity and Agriculture Management Act 2007* (BAM Act) or as a 'weed of national significance' (WoNS) (DAWE 2021). Management of weeds, declared pests and WoNS may be required during government approval processes.

Further information on legislation and policy relevant to flora and vegetation assessments is provided in **Appendix A**.

1.3 Scope of work

The Environmental Protection Authority (EPA) *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* establishes standards for the assessment of flora and vegetation in Western Australia (EPA 2016b).

The scope of work was to undertake a detailed survey with reference to EPA (2016b). As part of this scope of work, the following tasks were undertaken:

- Desktop study to provide contextual information and determine the likelihood of occurrence of threatened and priority flora or ecological communities.
- Field surveys to record flora, vegetation units and vegetation condition.
- Analysis and mapping of contextual information, vegetation units, vegetation condition and threatened and priority flora or ecological communities (if present).
- Documentation of the desktop study, methods, results, discussion and conclusions.

2 Desktop Study

2.1 Site context

2.1.1 Location and extent

The site is located in the Shire of Dandaragan in the Wheatbelt region of Western Australia and extends over 8,526.73 hectares (ha) as shown in **Figure 1**. The site is bounded by a mix of agricultural land and remnant native vegetation to the to the north and east, Badgingarra National Park and Cadda Road to the south and Yerramullah Road to the west. The site includes road reserves, namely Cowalla road (both sides), Yerramullah Road (eastern side only), Cadda Road (northern side only) and the Great Northern Highway and Cadda Road intersection (western side only).

2.1.2 Climate

The Wheatbelt region of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters (Hobbs 2003). Recent rainfall at the closest weather station to the site has been somewhat inconsistent (lower) with long term averages, as shown in **Plate 1** (BoM 2024). Flora and vegetation surveys should be undertaken during the season that is most suitable for detection and identification of the range of flora likely to occur in the area (EPA 2016b). For the 'south-west and interzone' botanical province in which the site lies, the primary survey time is spring (September to November) (EPA 2016b).

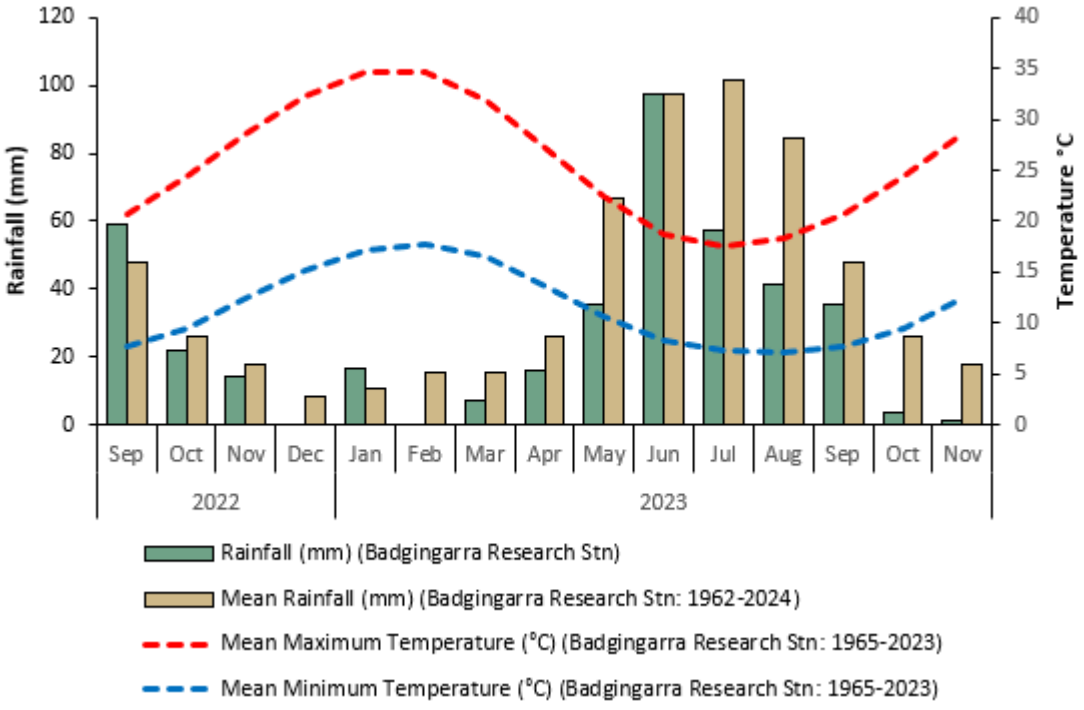


Plate 1: Recent rainfall and long-term mean temperature and rainfall

2.1.3 Geomorphology and soils

The site occurs on the Geraldton Sandplain, which is the geomorphic unit that characterises the region spanning from Dongara in the north, to Greenhead in the south and inland to Badgingarra. The Geraldton Sandplain comprises three subregions: Edel, Geraldton Hills and Lesueur Sandplains. The site lies within the Lesueur Sandplains subregion, which stretch from the south end of the Carnarvon basin to the northern areas of the Perth Basin and Pinjarra Orogen (CALM 2003). The subregion is characterised by an undulating lateritic sandplain mantling Permian to Cretaceous strata with areas of coastal aeolian sands and limestone. Alluvial outwash plains exist in areas of valleys and hills (Purdie *et al.* 2004).

Fine scale soil landscape mapping by DPIRD (2022) shows eight units as occurring within the site, as described in **Table 1** and shown in **Figure 2**.

Table 1: Soil landscape mapping units within the site (DPIRD 2022)

Soil landscape unit	Location within site	Description
Yerramullah 1 Subsystem	Two patches in the central and south-eastern portion	Laterite plateau residual; shallow gravel, shallow sand over duricrust, sandy gravels
Yerramullah 2 Subsystem	Many patches scattered throughout much of the site	Plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands
Yerramullah 3 Subsystem	Most abundant system covering the majority of the site	Colluvial slopes and some plateau remnants, very gently to gently inclined hillslopes and sand filled minor valleys; pale and yellow deep sands, pale sandy gravels, shallow gravel over duricrust, some sandy duplexes and sandy earths
Yerramullah 4 Subsystem	Two patches in the north-western portion	Plateau residuals, complex of Ye2 and Ye3; pale sandy gravels, gravelly pale deep sand, shallow gravel over duricrust, pale deep sand, some sandy duplexes, yellow deep sand
Yerramullah 6 Subsystem	One patch in the south-eastern portion	Colluvial slopes, very gently to gently inclined mid to lower hillslopes and sand filled minor valleys; pale deep sand, some sandy duplexes and shallow sand over pan or bog iron
Yerramullah 9 Subsystem	One patch in the south-western portion	Narrow alluvial flats of minor creeks; pale to brown deep sands, sandy and loamy duplexes, shallow sand over pans
Mintaja Hills System	One patch in the north-western portion	Rises and low hills on sedimentary rocks north and south of the Mount Lesueur area. Variable soils including red/brown non-cracking clays, brown loamy earths, and grey/brown shallow loamy duplexes.Woodlands.
Nylagarda 1 Subsystem	One patch in the north-eastern portion	Drainage line and adjacent very gently inclined footslopes; mainly sandy duplexes, brown deep sand and brown sandy earth

The site is not known to contain any restricted landforms or unique geological features.

2.1.4 Topography

The elevation of the site ranges from 94 m in relation to the Australian height datum (mAHD) in the north-western corner to 278 mAHD in the centre (DoW 2008) (**Figure 2**).

2.1.5 Hydrology and wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Wetlands can be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al.* 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. Review of the *Ramsar List of Wetlands of International Importance* (DBCA 2017) and *A Directory of Important Wetlands in Australia – Western Australia* (DBCA 2018) indicates that no Ramsar or listed 'important wetlands' are located within or near the site.

The Department of Water and Environmental Regulation (DWER) hydrography linear dataset (DWER 2018b) records the following 43 wetland or water related features within the site:

- 16 earth dams,
- 18 watercourses - minor, non-perennial
- nine unnamed hydrological features

The *Geomorphic Wetlands Cervantes Eneabba* dataset maps geomorphic wetland features and classifies them based on their landform shape and water permanence (DBCA 2023a). Each wetland feature is classified according to their host landform and hydroperiod.

The *Geomorphic Wetlands Cervantes Eneabba* dataset dataset records two 'dampland' wetland features (UFIs 581 and 238) occur in the north-central and north-eastern portion of the site (DBCA 2023a). An additional 'not classified' wetland feature (UFI 258) occurs in the south-western portion of the site. The locations of the geomorphic wetlands within and adjacent to the site and are shown in **Figure 3**.

2.1.6 Regional vegetation

Native vegetation is described and mapped at different scales to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation for Australia* (IBRA) divides Australia into floristic subregions (Environment Australia 2000).

The site is contained within the Geraldton Sandplains IBRA region and within the 'GES02' or Lesueur Sandplain subregion. The Geraldton Sandplains region (previously 'Northern Sandplains' region) is described as comprising mainly 'scrub heath on sandplain near the coast, *Acacia* to *Casuarina* thickets further inland and *Acacia* scrub with scattered trees of *Eucalyptus loxophleba* on hard-setting loams' (Beard 1990).

Variations in native vegetation can be further classified based on regional vegetation mapping. Beard *et al.* (2013) mapping shows the majority of the site as comprising vegetation association 'Le Sueur_1031' which is described as 'scrub-heath or heath'. A small portion in the north-eastern portion of the site is mapped as comprising the 'Le Sueur_1034' vegetation association which is described as 'woodland' (Beard *et al.* 2013).

The 'Le Sueur_1031' association was determined to have 34.48% of its pre-European extent remaining in the Geraldton Sandplains region in 2017, with 14.72% protected for conservation purposes. The 'Le Sueur_1034' association was determined to have 61.90% of its pre-European extent remaining with 36.73% protected for conservation purposes (Government of Western Australia 2018).

2.1.7 Threatened and priority flora

The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) has compiled various datasets relating to 'matters of national environmental significance' (MNES) (DCCEEW 2024). The *Protected Matters Search Tool* provides general guidance on threatened flora listed under the EPBC Act that may occur within a location based on validated records and less reliable unvalidated habitat distribution modelling (DCCEEW 2024).

DBCA's *Threatened and Priority Flora Database* and *WA Herbarium Database* contain records of threatened and priority flora in Western Australia (DBCA 2023g). Searches of these databases provide point data for threatened and priority flora within a location, comprising validated and historical unvalidated records.

The *Protected Matters Search Tool* (DCCEEW 2024) and DBCA's threatened and priority flora databases (reference no. 72-0923FL) identified 41 threatened and 160 priority flora occurring or potentially occurring within a 20 km radius of the site (refer **Appendix B**).

2.1.8 TECs and PECs

The *Protected Matters Search Tool* provides general guidance on TECs listed as CR and EN under the EPBC Act that may occur within a location based on reliable records and less reliable habitat distribution modelling (DCCEEW 2024).

DBCA's *Threatened and Priority Ecological Community buffers and boundaries in WA* dataset contains validated records of TECs and PECs. Searches of this dataset provides buffered polygons of TEC and PEC records.

The *Protected Matters Search Tool* (DCCEEW 2024) and DBCA's TEC and PEC database (reference no. 46-0923EC) identified five TECs and four PECs occurring or potentially occurring within a 50 km radius of the site (refer **Appendix C**).

2.1.9 Historical land use

Review of historical images available from 2000 onwards shows that the majority of the site was cleared of native vegetation prior to 2000, likely for Grazing and/or cropping uses. Since this time the extent of native vegetation within the site has remained relatively stable (WALIA 2024).

2.1.10 DBCA managed or legislated land

DBCA has tenure of, or interests in, numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2023b) and *Lands*

of Interest (DBCA 2022a) datasets. The *Legislated Lands and Waters* (DBCA 2023b) dataset includes lands subject to the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA 2022a) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act.

Two DBCA managed or legislated lands occur immediately adjacent to the site. Badgingarra National Park (R31809) lies adjacent to the entire southern boundary of the site and extends to the south and east. Hill River Nature Reserve (R36093) lies adjacent to the north-eastern corner of the site and extends to the north-west and south-east (DBCA 2023b). The locations of both DBCA legislated or managed lands are shown in **Figure 3.**

2.1.11 Previous surveys

A flora and vegetation assessment of the site and wider Badgingarra area was previously undertaken in March 2007 for the now developed Badgingarra wind farm (Brett Lane & Associates Pty Ltd 2008). The survey identified two native vegetation types within the site: 'kwongan heathland' and 'grassy woodland' which ranged from 'low' to 'high' quality remnants. The majority of the site was mapped as comprising 'exotic (introduced) vegetation'.

The survey recorded two conservation significant flora species:

- *Hakea megalosperma* which is listed as threatened (vulnerable) under the EPBC Act and the BC Act
- *Loxocarya gigas* which is listed as priority 2 under in WA.

Both species were found within remnant native vegetation associated with vegetation site number 26 which is located approximately 4 km south of the site. No threatened or priority flora species were identified within the site by Brett Lane & Associates Pty Ltd (2008).

2.2 Likelihood of occurrence

The distribution and habitat preferences of the threatened and priority flora species and ecological communities listed in **Appendix B** and **Appendix C** was reviewed against site context information described in **Section 2.1**. The intensity and results of the field survey was also taken into account when determining the likelihood of occurrence. Likelihood of occurrence of threatened and priority flora species and ecological communities within the site was classified as 'high', 'moderate', 'low' or 'negligible' as outlined in **Table 2**.

Table 2: Decision matrix for likelihood of occurrence of threatened and priority flora and ecological communities post survey

		Distribution[1]	
		Reliable record within search area[2]	No reliable record within search area[2]
Habitat	Suitable	High	Negligible
	Potentially suitable	Moderate	
	Unsuitable	Low	
Conclusive[3] survey undertaken		Nil	

[1] Reliable record defined as validated, recent (within the last ~40 years) and spatially accurate (refer DBCA search meta data) in order to exclude unverified range or habitat projections. [2]Search area defined as a 20 km buffer surrounding the site. [3]Conclusive survey defined as targeted searches undertaken at a suitable time of year and with sufficient effort to detect the species/community.

2.2.1 Threatened and priority flora

13 threatened and 106 priority flora were classified as having a 'high' or 'moderate' likelihood of occurrence within the site, as outlined in **Appendix B**.

2.2.2 TECs and PECs

All TECs and PECs identified from database searches were determined to have a 'nil' likelihood of occurrence within the site following the field survey, as outlined in **Appendix C**.

3 Methods

3.1 Field survey

Experienced botanists visited the site on 18-22 September, 23-27 October and 2-3 November 2023 to conduct the field survey. The site was traversed on foot and the composition and condition of vegetation was recorded. Plant specimens were collected where the identity of flora required further confirmation. Photographic images and notes were recorded as required.

3.1.1 Targeted searches

Targeted searches were conducted for threatened and priority flora and ecological communities, with a particular focus on those with a high or moderate likelihood of occurrence (refer **Section 2.2**). Transects for flora were traversed approximately 50 m apart through areas of potentially suitable habitat. Transects and records were marked using a hand-held GPS receiver (±5 m accuracy).

3.1.2 Sampling

Detailed sampling of the vegetation was undertaken using a combination of non-permanent 10 x 10 m quadrats and relevés. The quadrats were established using fence droppers bounded by measuring tape. The relevés were completed over an equivalent 10 x 10 m area without the use of physical markers and were included to provide a more rapid sample of patches of vegetation in poorer condition and/or of smaller size. The position[1] of each sample was recorded with a hand-held GPS receiver (±5 m accuracy).

The data recorded within each sample included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping, soil type and colour, litter layer, topographical position, time since last fire event)
- biological information (species, plant specimens, vegetation structure, vegetation condition, ‘foliage projective cover’, and disturbance).

A total of 19 locations were sampled, comprised of 15 quadrats and four relevés, as shown in **Figure 4** and **Figure 5**.

3.1.3 Vegetation condition

The condition of the vegetation was assessed using the Keighery (1994) scale (**Table 3**).

[1] For quadrats the north-west corner was recorded.

Table 3: Vegetation condition scale applied during the field survey

Category	Definition (Keighery 1994)
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

^relative to the expected natural diversity for that vegetation.

3.2 Analysis and data preparation

3.2.1 Flora identification

Flora were identified through comparison with named material and through the use of taxonomic keys. Plant specimens collected during the field survey were dried, pressed and named in accordance with requirements of the (Western Australian Herbarium 2024).

Flora was classified as native if indigenous to the IBRA region in which the site occurs. Non-native flora is denoted by '*' in text and raw data. The legal or policy status of flora was denoted using codes outlined in **Appendix A**.

3.2.2 Sampling adequacy

A species accumulation curve was plotted from sample data by generating a trendline (log) in Microsoft Excel. The trendline was forecast to locate the asymptote of the curve (the point at which the curve flattens), which provides an indication of amount of sampling that would be required before it can be assumed few species remain undetected.

Species richness was estimated in PRIMER v6 (Clarke and Gorley 2006). Jacknife1 and Chao2 non-parametric estimators are reported as these are known to perform well in comparison to simulated and real data sets and are also recommended for small sample sizes (Gotelli and Colwell 2011).

Differences between recorded and estimated species richness was used to evaluate the adequacy of sampling effort.

3.2.3 Threatened and priority flora confirmation

Threatened and priority flora were confirmed as absent from the site where no significant limitation was identified that could have affected their detection (refer **Section 3.3**).

3.2.4 Vegetation unit identification and description

The vegetation units within the site were identified from the sample data collected during the field survey. Sample similarity was calculated using PRIMER v6. A cluster analysis was performed to generate a dendrogram of sample groups.

The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (NVIS Technical Working Group 2017).

3.2.5 TEC and PEC confirmation

Vegetation units were assessed against TEC and PEC diagnostic characteristics and, if available, size and/or vegetation condition thresholds (DBCA 2023c). TECs and PECs were confirmed as absent from the site where no significant limitation was identified that could have affected their detection (refer **Section 3.3**).

3.2.6 Mapping

Environmental features, vegetation units, vegetation condition, threatened or priority flora or ecological communities were mapped on aerial photography using notes and data collected in the field.

3.3 Limitations

It is important to note constraints imposed on assessments and the degree to which these may have limited outcomes. An evaluation of the desktop study and methods applied in the current assessment against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) is provided in **Table 4**.

Table 4: Evaluation of assessment against standard constraints outlined in (EPA 2016b)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in **Section 2.1** and information available from previous surveys is adequate to place the site and vegetation in context.

Table 5: Evaluation of assessment against standard constraints outlined in (EPA 2016b)(continued)

Constraint	Degree of limitation	Details
Availability of contextual information	Minor limitation	Recent high quality aerial imagery for the area of the site was limited. The highest quality imagery available was the 2015 Landgate imagery (WALIA 2024). However, as the imagery is over eight years old, some of the vegetation boundaries mapped using this imagery may not be current. Notes and photos taken in the field, as well as comparison to other aerial imagery streaming services were used to ensure vegetation boundaries are drawn as accurately as possible.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by qualified botanists with over five years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with 13 years' experience in environmental science in Western Australia.
Suitability of timing	Limitation	In Mediterranean climates some flora spend part of their lifecycle as underground storage organs or seed to avoid excessive heat and drought over the summer period. These species, known as 'geophytes' or 'annuals', tend to re-emerge during winter and are often most visible during spring, which is the flowering period for the majority of plant species. Therefore, spring is the optimal time to complete flora and vegetation surveys in the south-west of WA. The survey was conducted during September, October and November and thus within the main flowering season for the region. Rainfall for June 2023 was consistent with long-term averages but rainfall in July and August 2023 was lower. However, total rainfall prior to the survey was considered sufficient to promote flowering and emergence in spring and this was confirmed during the survey by the presence of various annual and geophytic species. Therefore, survey timing was considered adequate to allow the detection of most species for which seasonal timing is critical. The survey was undertaken outside or partially outside of the flowering period of some conservation significant annual or perennial geophytic species, including *Diuris recurva* (P4), *Poranthera asybosca (P1), Schoenus pennisetis (P3), Thelymitra pulcherrima* (P2) and *Thelymitra apiculata* (P4) and so they would not have been detectable during the survey.
Temporal coverage	Minor limitation	Detailed flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was visited on three occasions, in September, October and November 2023 which falls during the main flowering period for the region. As such the survey may not strictly meet the definition of a detailed survey. However, the survey is considered to provide a fair estimate of the flora assemblage present and the condition of the vegetation and so this is only considered a minor limitation.

Table 5: Evaluation of assessment against standard constraints outlined in (EPA 2016b)(continued)

Constraint	Degree of limitation	Details
Spatial coverage and access	Limitation	Site coverage was comprehensive (track logged). However, due to the large scale of the site, transects during targeted searches were spaced 50 metres (m) apart. The distance from which conservation significant species can be detected depends on the size of the target species and the density of the vegetation. Some of the conservation significant species with potential to occur in the site are small (e.g. orchids) and the vegetation was often dense and so it is possible that some conservation significant species were not detected during targeted searches.
	No limitation	All parts of the site could be accessed as required.
Sampling intensity	Limitation	A total of 502 species were recorded, of which 325 were recorded from 19 sample locations and 177 were recorded opportunistically. Minimum species richness within site is estimated at between 459 (Jacknife1) and 503 (Chao2) species (refer species accumulation curve and estimates shown in **Plate 2**). The number of species recorded in the site is similar to that of the Chao2 estimate and, combined with the high sampling intensity within native vegetation and the degraded nature of the remainder of the site, demonstrates that survey effort was adequate to prepare a near-comprehensive species inventory for the site.
	Limitation	A high number of conservation significant flora species were identified to have potential to occur within the site as detailed in **Section 2.1.7**. Identification of flora species often requires detailed review of specimens using specialist texts and equipment such as microscopes. Due to the high number of threatened and priority flora species that have potential to occur in the site, and the requirement for detailed analysis using specimen, identification of conservation significant flora species in the field was not possible. A large number of specimens was collected and positively identified. However, occurrences of conservation significant species are restricted to opportunistic collections and vegetation sampling locations and it is likely that additional occurrences of the conservation significant flora species recorded within the site occur within areas of suitable habitat.
Influence of disturbance	Minor limitation	Historical imagery available for the site is limited but time since fire likely to be greater than 20 years as interpreted from aerial imagery. As a result, short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident throughout the much of the site but the disturbance history was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

4 Results

4.1 Flora

4.1.1 Species inventory

A total of 502 species were recorded during the field survey. A summary of legal and policy status of flora records is provided in **Table 5**. A complete species list is provided in **Appendix D**.

Table 5: Summary of legal and policy status of taxa recorded in the site

Status	Unlisted	Threatened	Priority	Declared Pest	Planted	Total
Native	455	0	23	0	0	**478**
Non-native	23	-	-	1	1	**25**
Total	478	0	23	1	1	**502**

Sampling recorded 325 species from 19 samples. A further 178 species were recorded opportunistically across the site. A species accumulation curve derived from sample data is presented in **Plate 2**. Species richness was estimated to be between 459 (Jacknife1) and 503 (Chao2).

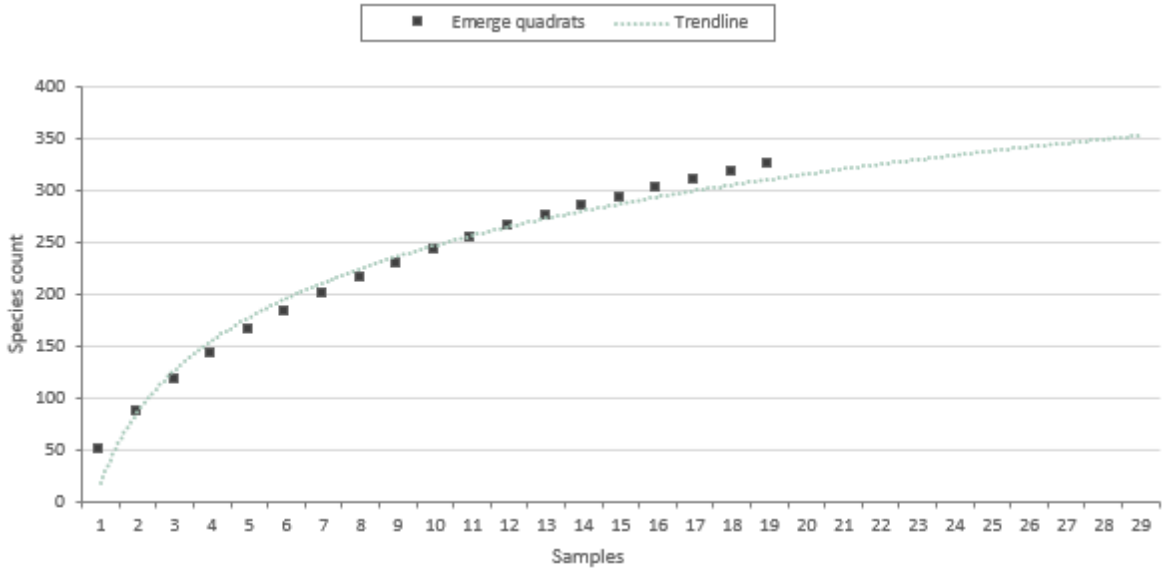


Plate 2: Species accumulation curve derived from sample data y = 99.876ln(x) + 17.112 R^2 = 0.9797

4.1.2 Threatened and priority flora

A total of 23 priority flora species were recorded within areas of native vegetation in the site as listed in **Table 6**. A total of 78 individuals were recorded, with additional plants likely to occur within the site as discussed in **Section 5.1.2.** The locations of these species are shown in **Figure 6** and listed in **Appendix E**.

The remainder of the threatened and priority flora species identified in **Section 2.2** were not recorded in the site during the survey. However, the survey was unable to confirm the

presence/absence of 13 threatened and 84 priority flora species as discussed in **Section 5.1.2** and listed in **Appendix B**.

Table 6: Priority flora species recorded within the site

Species	Conservation status	Number of individuals recorded
Chordifex reseminans	P2	6
Hypocalymma serrulatum	P2	1
Leucopogon plumuliflorus	P2	4
Lyginia excelsa	P2	2
Synaphea xela	P2	1
Austrostipa nunaginensis	P3	2
Banksia kippistiana var. *paenepeccata*	P3	13
Banksia nana	P3	11
Beaufortia bicolor	P3	4
Drosera prophylla	P3	2
Hensmania stoniella	P3	6
Lepidobolus quadratus	P3	5
Phlebocarya pilosissima subsp. *pilosissima*	P3	3
Stylidium hymenocraspedum	P3	1
Stylidium nonscandens	P3	1
Tetratheca angulata	P3	3
Banksia chamaephyton	P4	2
Desmocladus elongatus	P4	3
Eucalyptus x *carnabyi*	P4	1
Hypolaena robusta	P4	2
Schoenus griffinianus	P4	1
Stylidium aeonioides	P4	3
Stylidium inversiflorum	P4	1

Note: P1-P4 = priority 1 to priority 4.

4.1.3 Declared pests

One species listed as a declared pest pursuant to the BAM Act, **Echium plantagineum* (Paterson's curse), was recorded within the site. The species occurs as scattered plants throughout the predominantly non-native vegetation unit. No control category applies to this species. No weeds of national significance (WoNS) were recorded.

4.2 Vegetation

4.2.1 Vegetation units

Fifteen vegetation units were identified within the site. A description and the area of each vegetation unit is provided in **Table 7**. The location of each vegetation unit is shown in **Figure 4**. Raw sample data is provided in **Appendix F** and the output of the cluster analysis are provided in **Appendix G**.

Table 7: Description and extent of vegetation units identified within the site

Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
Cc	Open woodland *Corymbia calophylla* and scattered non-native trees over pasture weeds and occasional native species.	-	14.62	0.17	
CcXpEm	Low woodland *Corymbia calophylla* (or absent) over open shrubland *Xanthorrhoea preissii*, *Banksia armata* var. *armata*, *Hakea lissocarpha*, *Gastrolobium oxylobioides* and *Hibbertia hypericoides* over rushland *Ecdeiocolea monostachya*, *Lepidosperma* sp. 5 and *Caustis dioica* over sparse grassland *Austrostipa elegantissima* over mixed native forbs and occasional pasture weeds on sandy loam soils.	Q15	4.12	0.05	

Table 8: Description and extent of Vegetation units identified within the site (continued)

Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
EgEdGpTa	Open mallee woodland *Eucalyptus gittinsii* subsp. *illucida* and *Eucalyptus drummondii* over shrubland *Gastrolobium plicatum*, *Banksia shuttleworthiana* and *Hibbertia hypericoides* over low scattered shrubs *Tetratheca angulata* (P3) and *Scaevola* spp. over diverse native herbs on sandy soils sometimes with latertic gravel associated with lower slopes and flats.	Q10	7.44	0.09	
El	Open woodland *Eucalyptus lane-poolei* over mixed native understorey vegetation encroaching from adjacent **EtBaBmBc** vegetation (or absent), bare ground and pasture weeds.	-	7.27	0.09	

Table 8: Description and extent of Vegetation units identified within the site (continued)

Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
ElEaJcCa	Open woodland *Eucalyptus lane-poolei* and occasional *Eucalyptus accedens* over open shrubland *Jacksonia calcicola*, *Acacia pulchella* var. *glaberrima*, *Gastrolobium oxylobioides* and *Hibbertia hypericoides* over open rush/sedgeland *Mesomelaena pseudostygia*, *Caustis dioica* and *Lepidosperma* sp. 7 over low shrubland *Conostylis aculeata* var. *aculeata* on sandy soils.	Q18, Q19	6.62	0.08	
EtBaBmBc	Low open woodland *Eucalyptus todtiana*, *Banksia attenuata*, *Banksia menziesii*, *Banksia candolleana* and occasional *Banksia prionotes* and/or *Hakea obliqua* over open shrubland *Apectospermum spinescens*, *Adenanthos cygnorum* subsp. *cygnorum*, *Allocasuarina humilis* and *Callitris acuminata* over low shrubland *Eremaea* spp., *Hypocalymma xanthopetalum*, *Hibbertia hypericoides*, *Stirlingia latifolia* and *Conospermum* spp. over forb/rushland *Alexgeorgea subterranea*, *Alexgeorgea nitens*, *Chordifex sinuosus*, *Chordifex microdon*, *Mesomelaena pseudostygia* and *Lomandra* spp. over mixed native herbs and occasional weeds on sandy soils/sandplains.	Q1, Q2, Q3, Q8, Q9	182.39	2.14	

Table 8: Description and extent of Vegetation units identified within the site (continued)

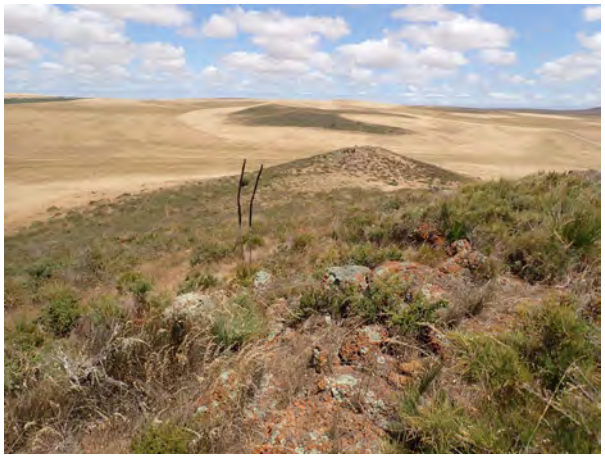
Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
GsBaX	Heathland to sparse heathland *Gastrolobium spinosum*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Banksia armata* var. *armata*, *Allocasuarina humilis* and *Xanthorrhoea* sp. 1 over sparse rush/sedge/grassland *Lepidosperma* sp. 3., *Schoenus brevisetis* and *Neurachne alopecuroidea* and pasture weeds on lower laterite hills.	R13, R14	64.15	0.75	
M	Woodland to tall shrubland *Melaleuca* spp. over pasture weeds and occasional native species.	-	2.11	0.02	

Table 8: Description and extent of Vegetation units identified within the site (continued)

Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
MpEt	Woodland *Melaleuca preissiana* and *Eucalyptus todtiana* over pasture weeds and/or **Juncus acutus* and occasional native species.	-	4.22	0.05	
Mr	Occasional *Corymbia calophylla* and *Acacia acuminata* over closed shrubland *Melaleuca radula* and occasional *Calothamnus* sp. 1, *Hibbertia hypericoides* and *Styphelia serratifolia* over sparse forbland *Dianella revoluta*, *Dichopogon capillipes*, *Haemodorum* ?*simplex* over open grassland *Themeda triandra* or **Briza maxima* on sandy loam soils.	R16	1.83	0.02	

Table 8: Description and extent of Vegetation units identified within the site (continued)

Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
Predominantly non-native vegetation	Heavily disturbed areas comprising predominantly pasture grasses and forbs and/or scattered non-native and planted trees with occasional native species including scattered *Eucalyptus todtiana*, *Eucalyptus lane-poolei* and *Eucalyptus rudis* trees. Waterways dominated by **Juncus acutus*, bare soil, roads and buildings have also been included in this category.	-	8152.7	95.61	
Ps	Tall open shrubland *Petrophile shuttleworthiana* over scattered native shrubs over sparse grassland *Austrostipa* spp. and/or pasture weeds.	-	10.85	0.13	

Table 8: Description and extent of Vegetation units identified within the site (continued)

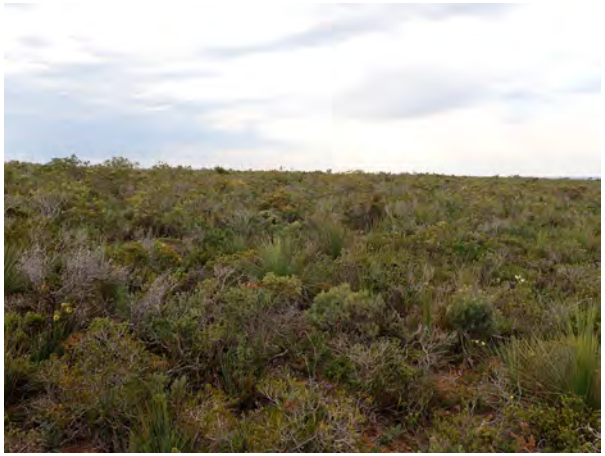
Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
PsBsAhX	Closed heathland *Petrophile shuttleworthiana*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Lambertia multiflora* var. *multiflora*, *Allocasuarina humilis*, *Banksia kippistiana* var. *paenepeccata* (P3), *Hibbertia hypericoides* and *Xanthorrhoea* spp. over sparse low shrubland *Banksia stenoprion* and *Banksia nana* (P3) over open rush/sedgeland *Mesomelaena* spp., *Schoenus* spp., *Lepidosperma* spp. over diverse native forbs on laterite plateaus and rises.	Q4, Q5, Q11	52.52	0.62	
X	Shrubland to open shrubland *Xanthorrhoea* spp. over scattered mixed native shrubs (or absent) over pasture weeds and occasional native species.	-	1.98	0.02	

Table 8: Description and extent of Vegetation units identified within the site (continued)

Code	Description	Sample/s	Total area (ha)	Proportion of site (%)	Representative photograph
XBcM	Heathland *Xanthorrhoea* spp., *Banksia carlinoides*, *Lambertia multiflora* var. *multiflora*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Calothamnus longissimus* and *Melaleuca* sp. 2 over rush/sedgeland *Mesomelaena* spp., *Schoenus* spp., *Lepidosperma* spp. and *Lepidobolus quadratus* (P3) over diverse native herbs on lateritic breakaways.	Q6, Q7, R12	13.92	0.16	

4.2.2 Vegetation condition

The extent of vegetation by condition category is detailed in **Table 8** and shown in **Figure 5**.

Table 8: Extent of vegetation condition categories within the site

Condition category (Keighery 1994)	Total area (ha)	Proportion of site (%)
Pristine	0	0
Excellent	168.48	1.98
Very good	88.53	1.04
Very good - good	23.59	0.28
Good	3.64	0.04
Good - degraded	26.34	0.31
Degraded	33.09	0.39
Degraded - completely degraded	30.35	0.36
Completely degraded	8,152.70	95.61

4.2.3 Threatened and priority ecological communities

No TECs or PECs occur within the site.

5 Discussion

5.1 Flora

5.1.1 Flora inventory

A total of 502 flora species were recorded within the site of which most are native (95.22%). It should be noted that the survey effort was directed towards recording plant taxa within areas of native vegetation and did not aim to record all planted native or non-native species within areas of **predominantly non-native vegetation** which occur over the majority of the site.

The dominant families from which native taxa were recorded are Myrtaceae (75 native and 7 non-native/planted taxa), Proteaceae (65 native taxa) and Fabaceae (54 native and one non-native taxa). The most common genera were *Banksia* (20 taxa), *Acacia* (17 taxa), *Eucalyptus* and *Stylidium* (15 taxa each). The high diversity of flora species recorded was not unexpected given that the site is located within Leseur sandplain subregion which is renowned for its high floristic diversity and level of endemism (Beard 1975; Griffin 1994).

Due to the large number of specimens collected (887) and time and budget limitations not all specimens were identified to species or in some instances genus level. However, all specimens were individually reviewed and identifications were completed for any specimens that had potential to represent conservation significant species.

While both the estimates of the Chao2 and the Jacknife1 (refer **Section 4.1.1**) indicate that the survey effort recorded a near comprehensive species inventory, it is likely that additional species, not recorded during the current survey, occur within the site. This may be due to the wide spacing of transects during targeted searches (50 m) as well as seasonal changes in species composition in the case of annual and perennial geophytic species.

5.1.2 Threatened and priority flora species

A number of priority flora species were recorded within the site as listed in **Table 6**. Most of the species were recorded scattered throughout areas of native vegetation, with the exception of one record of *Eucalyptus* x *carnabyi* which occurred within predominantly non-native vegetation immediately adjacent to vegetation unit **EtBaBmBc**.

Identification of flora species often requires detailed review of specimens using taxonomic keys and equipment such as microscopes. Due to the high number of threatened and priority flora species that have potential to occur in the site, and the requirement for detailed analysis using specimen, identification of conservation significant flora species in the field was not possible. A large number of specimens was collected and positively identified. However, occurrences of conservation significant species are restricted to opportunistic collections and vegetation sampling locations and it is likely that additional occurrences of the conservation significant flora species recorded within the site occur within areas of suitable habitat as detailed below.

Leucopogon plumuliflorus (P2), *Banskia nana* (P3), *Drosera prophylla* (P3), *Stylidium nonscandens* (P3) and *Stylidium aeonioides* (P4) were recorded within vegetation units **PsBsAhX**, **XBcM** and/or

GsBaX which are associated with lateritic hills, rises and breakaways. It is likely that additional individuals of all of these species occur within these vegetation units. The known habitat preferences for these species suggest that these species are likely to be restricted to areas containing lateritic soils and so they are unlikely to occur in areas comprising sandy soils. While vegetation unit **EtBaBmBc** mainly comprises sandy soils, some minor lateritic rises occur scattered amongst this unit in the road reserves and so it is possible that some these species also occur in within vegetation unit **EtBaBmBc** where laterite is present.

Chordifex reseminans (P2), *Hypocalymma serrulatum* (P2), *Lyginia excelsa* (P2), *Synaphea xela* (P2), *Hensmania stoniella* (P3), *Stylidium hymenocraspedum* (P3), *Austrostipa nunaginensis* (P3), *Banksia chamaephyton* (P4), *Desmocladus elongatus* (P4), *Hypolaena robusta* (P4), *Stylidium inversiflorum* (P4) and *Schoenus griffinianus* (P4) were recorded within vegetation units **EtBaBm**, **CcXpEm** and/or **ElEaJcCa** which are associated with sandy and/or loamy soils. It is likely that additional individuals of all of these species occur within these vegetation units.

Banksia kippistiana var. paenepeccata (P3), *Tetratheca angulata* (P3), *Lepidobolus quadratus* (P3) and *Beaufortia bicolor* (P3) were recorded within vegetation units that occur on sandy soils, as well as vegetation units that are associated with laterite, including **EtBaBmBc**, **GsBaX**, **PsBsAhX**, **EgEdGpTa** and/or **XBcM**. The habitat descriptions for all three species suggest that they may occur both on lateritic soils and on sandy soils over laterite, as well as the interzone between the two soil types. Therefore, additional occurrences of these species may occur in the aforementioned vegetation units, as well as vegetation unit **ElEaJcCa**. Similarly, *Eucalyptus* x *carnabyi* (P3) and *Phlebocarya pilosissima* subsp. *pilosissima* (P3), while only recorded within vegetation unit **EtBaBm** which comprises sandy soils, may also occur within other areas comprising sandy soils, as well areas containing laterite, including vegetation units **GsBaX**, **PsBsAhX**, **EgEdGpTa**, **XBcM** and **ElEaJcCa.**

Acacia sphacelata subsp. *verticillata* was recorded throughout much of the site. As this species looks very similar to the undescribed priority 2 species *Acacia* sp. Badgingarra (F. Hort & J. Hort FH 4636) specimens were submitted to the WA herbarium for identification. Herbarium staff confirmed that the lodged specimen represents *A. sphacelata* subsp. *verticillata* and advised that this taxa and *Acacia* sp. Badgingarra (F. Hort & J. Hort FH 4636) are the same entity. It is assumed that the name *Acacia* sp. Badgingarra (F. Hort & J. Hort FH 4636) will soon be removed from DBCA's priority list and the Western Australian plant census kept by the WA herbarium.

As outlined in **Section 4.1.2**, other threatened and priority flora species which were identified as having potential to occur in the site were not recorded during the survey. The survey was undertaken during the flowering period of most of the species with moderate or high likelihood of occurrence. However, some species have flowering periods outside or partially[2] outside of the current survey period and so would not have been visible at the time of the survey, including annual and perennial geophytic species *Diuris recurva* (P4), *Poranthera asybosca (P1), Schoenus pennisetis (P3), Thelymitra pulcherrima* (P2) and *Thelymitra apiculata* (P4), and so they would not have been detectable during the survey. Additionally, targeted searches were undertaken along transects spaced 50 m apart. And while larger perennials such as trees (*Eucalyptus* species) would have still been visible from this distance, smaller species could have been missed. Therefore, it is recommended that an additional

[2] This is relevant as not all areas of native vegetation were traversed during every survey event (September, October and November).

targeted survey is undertaken of any areas of native vegetation in 'good – degraded' or better condition proposed to be cleared in order to identify any occurrences of conservation significant species present and confirm total population and/or impact numbers.

5.2 Vegetation

5.2.1 Vegetation units

The cluster dendrogram allowed for relatively easy determination of vegetation units, with a similarity value of 40% used to separate vegetation units. Where the 40% similarity value intersected the vertical black lines as shown in **Appendix G**, the samples were determined to represent a distinct floristic group. Following statistical analysis, some vegetation units where further separated based on vegetation structure, dominant species and landform, where appropriate.

Samples Q1, Q2, Q3, Q8 and Q9 all occur on a sandplain and are structurally similar (low open woodland) with the same dominant species. These samples showed high similarity to each other (>40%) and so were determined to represent the same floristic group (vegetation unit **EtBaBm**).

Vegetation unit **EtBaBmBc** occurs over most of the Cadda Road, Cowalla Road, Yerramullah Road and Brand Highway road reserves. Occasionally the sandy soils associated with vegetation unit **EtBaBmBc** are intersected with minor incursion of laterite gravel which results in appearance of scattered species that are more characteristic of the vegetation units associated with the laterite ranges, while still containing species that characteristic of vegetation unit **EtBaBmBc**. An example of this is the vegetation associated with sample Q17. Q17 shows low similarity (20-25%) to samples within a number of vegetation units associated with the laterite ranges, as well as the sandplain, including **EgEdGpTa**, **PsBsAhX**, **XBcM**, **EtBaBmBc** and **GsBaX**. Given the small extent of this vegetation and given that it occurs on the boundary of sandy soils and sandy soils with laterite gravel, it is considered to represent a transitional vegetation unit rather than its own floristic group. These transitional areas of vegetation were grouped with other vegetation units depending on which unit it appeared more similar to. In most cases this was vegetation unit **EtBaBmBc** but a few small areas of transitional vegetation within the Yerramullah road reserve are more similar to vegetation unit **GsBaX** which is associated with low laterite hills.

Samples Q4, Q5, Q6, Q7 and Q11 all showed high similarity to each other (>40%) which is not surprising given that all samples occur on the same laterite range and so they share many common species. However, Q4, Q5 and Q11 were largely dominated by *Petrophile shuttleworthiana* and *Banksia sphaerocarpa* and are located on the flat plateau, while samples Q6 and Q7 are dominated by *Xanthorrhoea* spp., *Banksia carlinoides* and *Melaleuca* sp. 2 and are located on the steep breakaway. Therefore, samples were separated into two floristic groups based on differences in dominant species and topographic location: Q4, Q5 and Q11 were determined to represent vegetation unit **PsBsAhX** and samples Q6 and Q7 were determined to represent vegetation unit **XBcM**. Sample R12 is located on an isolated laterite breakaway in poorer condition and with higher weed loads, which is likely the reason why sample R12 didn't show high similarity to any other samples. Given that R12 is associated with a similar landform and was dominated by many of the species characteristic of vegetation unit **XBcM**, namely *Xanthorrhoea* sp. 1 and *Melaleuca* sp. 2, this area was assigned to **XBcM**.

Sample Q10 had moderate similarity to a number of other samples, particularly Q4, Q5, Q6 and Q7 (~35%). This is likely because it is located on the same laterite range and shares many common understorey species with vegetation units **PsBsAhX** and **XBcM**. However, the vegetation associated with Q10 has a distinct overstorey layer of *Eucalyptus gittinsii* subsp. *illucida* and *Eucalyptus drummondii* which other vegetation units lack and so Q10 was determined to represent a distinct floristic group (vegetation unit **EgEdGpTa**).

Determining vegetation units for the remainder of the samples was straight forward and was based solely on the results of the cluster analysis, including samples R13 and R14 in **GsBaX**, samples Q18 and Q19 in **ElEaJcCa**, sample Q15 in **CcXpEm** and R16 in **Mr**.

A number of additional areas in the site contained native vegetation in good - degraded, degraded or degraded - completely degraded condition that were considered too disturbed to warrant formal sampling, including vegetation units **Cc**, **El**, **M**, **Ps**, and **X**. This is because vegetation was largely limited to an overstorey or midstorey layer of native trees or tall shrubs without or with only scattered native understorey vegetation and so was described based on the dominant species present.

5.2.2 Vegetation condition

The majority of the site was mapped as being in 'completely degraded' condition as it comprises predominantly non-native grassland and/or agricultural crops with only occasional scattered native species.

The most intact native vegetation is associated with vegetation units **EtBaBmBc**, **EgEdGpTa**, **XBcM** and **PsBsAhX** in the south-eastern portion of the site. These patches of vegetation were mapped as being in 'excellent' condition as they had an intact vegetation structure with high native species diversity and low weed cover (if any).

Parts of vegetation units **EtBaBmBc**, **Mr** and **XBcM** and all of vegetation units **CcXpEm** and **ElEaJcCa** were mapped in 'very good' condition as previous disturbance was evident through impacts to vegetation structure and/or higher weed cover in combination with lower native species cover and diversity. Most of this vegetation occurs within road reserves or on the edges of larger patches of vegetation where it is more susceptible to disturbance and weed invasion.

Parts of vegetation units **GsBaX** and **EtBaBmBc** were mapped as being in 'good' condition where basic vegetation structure was retained but native species occurred at lower diversity and cover in combination with higher weed loads.

Vegetation units **El**, **M** and **X** as well as part of vegetation unit **GsBaX** were mapped as being in 'degraded' condition as native understorey species cover and diversity was low in combination with high weeds loads.

Multiple compound categories were applied where areas of vegetation partially met criteria for multiple condition categories. Parts of vegetation units **EtBaBmBc** and **GsBaX** were mapped as being in 'very good - good' condition. This is because vegetation the vegetation retained moderate to high native species diversity but the vegetation structure was altered through historical disturbance and weeds were present at higher cover in combination with lower native species cover. Parts of

vegetation unit **GsBaX** was mapped as being in 'good - degraded' condition, as vegetation was impacted by stock grazing which resulted in significant changes to the vegetation structure but native species diversity was often still moderate to high which is more characteristic of 'good' condition. Vegetation units **Ps**, **MpEt** and **Cc** were mapped as being in 'degraded - completely degraded' condition as, while they comprise a native overstorey layer of native trees or tall shrubs, they lack native understorey vegetation and instead occur as a non-native grassland of pasture weeds.

Due to the large size of the site, small scale changes in condition categories, such as narrow strips of vegetation in lower condition along the edges, were not separated.

5.2.3 Threatened and priority ecological communities

Vegetation unit **EtBaBmBc** has some similarity to the 'Lesueur-Coomallo floristic community A1.2' TEC (A1.2 TEC) which is described as 'a species-rich heath with emergent *Hakea obliqua* on sand with faithful species of *Hakea obliqua* and *Beaufortia elegans* and constant species of *Dasypogon bromeliifolius* and *Stirlingia latifolia* over well-drained grey sand over pale yellow sand on lateritic uplands. Associated species include *Allocasuarina humilis*, *Calothamnus sanguineus*, *Hibbertia hypericoides*, *Hypocalymma xanthopetalum* and *Schoenus subflavus'* (DCLM 2002a; DBCA 2023e). A number of the species that are described as characteristic of the A1.2 TEC were recorded within vegetation unit **EtBaBmBc**, including *Hakea obliqua*, *Stirlingia latifolia*, *Allocasuarina humilis*, *Calothamnus sanguineus*, *Hibbertia hypericoides*, *Hypocalymma xanthopetalum* and *Schoenus subflavus*. These species are generally common and widespread throughout sandy soils of the Geraldton Sandplains IBRA region, including areas that do not represent the TEC. The Lesueur-Coomallo Floristic Community A1.2 is currently known from a single occurrence within Lesueur National Park that is 4 ha in size (DCLM 2002a; DBCA 2023e). Martinick and Associates (1989) have undertaken regional vegetation studies over multiple reserves in the wider areas of the site, including Badgingarra National Park. The study identified that *Hakea obliqua* dominated heath on sandy soils occurs in all of the major reserves. Despite significant survey effort in the wider region (Hopkins and Hnatiuk 1981; Martinick and Associates 1989; Griffin and Hopkins 1990; Griffin 1994; Griffin and Hopkins undated), no additional occurrences of the A1.2 TEC have been identified and so it appears that the TEC is floristically distinct from other areas of *Hakea obliqua* heath and that the vegetation type may be restricted to the Mount Leseur area. Therefore, the vegetation in the site is not considered to represent this TEC.

Vegetation units **PsBsAhX**, **XBcM** and **GsBaX** have some similarity to the 'Lesueur-Coomallo floristic community D1' TEC (D1 TEC) which is described as 'a species-rich low heath on moderately to well-drained lateritic gravels on lower slopes and low rises, dominated by *Allocasuarina microstachya* with *Allocasuarina ramosissima*, *Allocasuarina humilis*, *Babingtonia grandiflora*, *Borya nitida*, *Calytrix flavescens*, *Calothamnus sanguineus*, *Conostylis androstemma*, *Cryptandra pungens*, *Banksia armata*, *Gastrolobium polystachyum*, *Hakea auriculata*, *Hakea incrassata*, *Hakea erinacea*, *Hibbertia hypericoides*, *Hypocalymma xanthopetalum*, *Melaleuca trichophylla*, *Petrophile chrysantha*, *Schoenus subflavus* and *Xanthorrhoea drummondii*' (DCLM 2002b; DBCA 2023f). The D1 TEC is currently known from a single occurrence that is 0.1 ha in size and located within private freehold land between Lesueur National Park and Coomallo Creek Nature Reserve. While a number of the species that are characteristic of the D1 TEC were recorded within vegetation units **PsBsAhX** and **XBcM**, including *Allocasuarina microstachya*, they are not dominated by this species which appears to be a key defining feature of the TEC. Therefore, they are not considered to represent this TEC.

Vegetation units **PsBsAhX**, **XBcM** and **GsBaX** have some similarity to the '*Petrophile chrysantha* low heath on Lesueur dissected uplands' PEC (*Petrophile chrysantha* PEC) which is described as 'low heath dominated by *Petrophile chrysantha* on Lesueur dissected uplands. Associated species include *Dryandra armata* and *Hakea undulata'* (DBCA 2023d). This PEC is known from multiple small occurrences within Leseur National Park. While a number of the species that are characteristic of the *Petrophile chrysantha* PEC were recorded within vegetation units **PsBsAhX**, **XBcM** and **GsBaX**, including *Petrophile chrysantha*, they are not dominated by this species and so it is considered unlikely that the vegetation in the site comprises this PEC.

5.2.4 Regional and local significance

Flora and vegetation may be significant irrespective of protection under policy or legislation.

Some of the vegetation in the site represents intact native kwongan heathland which is recognised as supporting a high floristic diversity and level of endemism. Additionally, native vegetation in the southern portion of site, while intersected by Cadda Road, is connected to and forms an extension of Badgingarra National Park and is likely to support dispersal of genetic diversity.

Schoenus subbarbatus, a species of Cyperaceae currently not known from the Geraldton Sandplains IBRA region was recorded within the site. This is a 175 km northern range extension for the species which was previously only known from an area ranging from Perth in the north-west and Cape Arid in the south-east and an isolated occurrence from near Mount Palmer. Additionally, the record of priority 3 species *Eucalyptus* x *carnabyi* represents a slight western range extension with the nearest known records occurring approximately 31 km south-east and 41 km north-east of the site. Due to the distance to other known records, this species did not get reported from database searches for conservation significant flora species undertaken for the site.

The WA Herbarium has advised that flora specimens from the region are limited. Therefore, specimens of interest to the herbarium, including poorly represented taxa, range extensions and specimens identified as being valuable will be lodged for incorporation into the reference herbarium.

The vegetation in the site may be significant as it provides habitat to a range of native fauna species, including threatened *Calyptorhynchus latirostris* (Carnaby's black cockatoo).

6 Conclusions

Outcomes of the assessment include the following:

- A total of 478 native and 25 non-native flora species were recorded within the site.
- 23 species listed as priority flora in Western Australia were recorded: *Chordifex reseminans* (P2), *Hypocalymma serrulatum* (P2), *Leucopogon plumuliflorus* (P2), *Lyginia excelsa* (P2), *Synaphea xela*, *Austrostipa nunaginensis* (P3), *Banksia kippistiana* var. *paenepeccata* (P3), *Banksia nana* (P3), *Beaufortia bicolor* (P3), *Drosera prophylla* (P3), *Hensmania stoniella* (P3), *Lepidobolus quadratus* (P3), *Phlebocarya pilosissima* subsp. p*ilosissima* (P3), *Stylidium hymenocraspedum* (P3), *Stylidium nonscandens* (P3), *Tetratheca angulata* (P3), *Banksia chamaephyton* (P4), *Desmocladus elongatus* (P4), *Eucalyptus* x *carnabyi* (P4), *Hypolaena robusta* (P4), *Schoenus griffinianus* (P4), *Stylidium aeonioides* (P4) and *Stylidium inversiflorum* (P4).
- 13 threatened and 84 additional priority flora species may occur in the site.
- The majority of the site comprises **predominantly non-native vegetation** in 'completely degraded' condition (8152.7 ha, 95.61%).
- 14 native vegetation units were identified within the site, ranging from 'excellent' to 'degraded - completely degraded' condition. Native vegetation occurs over 374.04 ha in the site (4.39%).
- No threatened ecological communities or priority ecological communities occur within the site.

7 References

7.1 General references

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7.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 7.1**, with access date information provided in **Table R 1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
(BoM 2024)	1 February 2024	Climate Data Online
(DBCA 2023f)	3 April 2024	Threatened Ecological Communities
(DAWE 2021)	3 April 2024	Weeds of National Significance (WoNS)
(DCCEEW 2024)	20 November 2023	Protected Matters Search Tool
(WALIA 2024)	3 April 2024	Landgate Map Viewer
(Western Australian Herbarium 2024)	Multiple dates between January and April 2024	Florabase

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Figures

Figure 1: Site Location

Figure 2: Soils and Topography

Figure 3: Legislated lands and Hydrology

Figure 4: Vegetation Units

Figure 5: Vegetation Condition

Figure 6: Priority Flora Locations

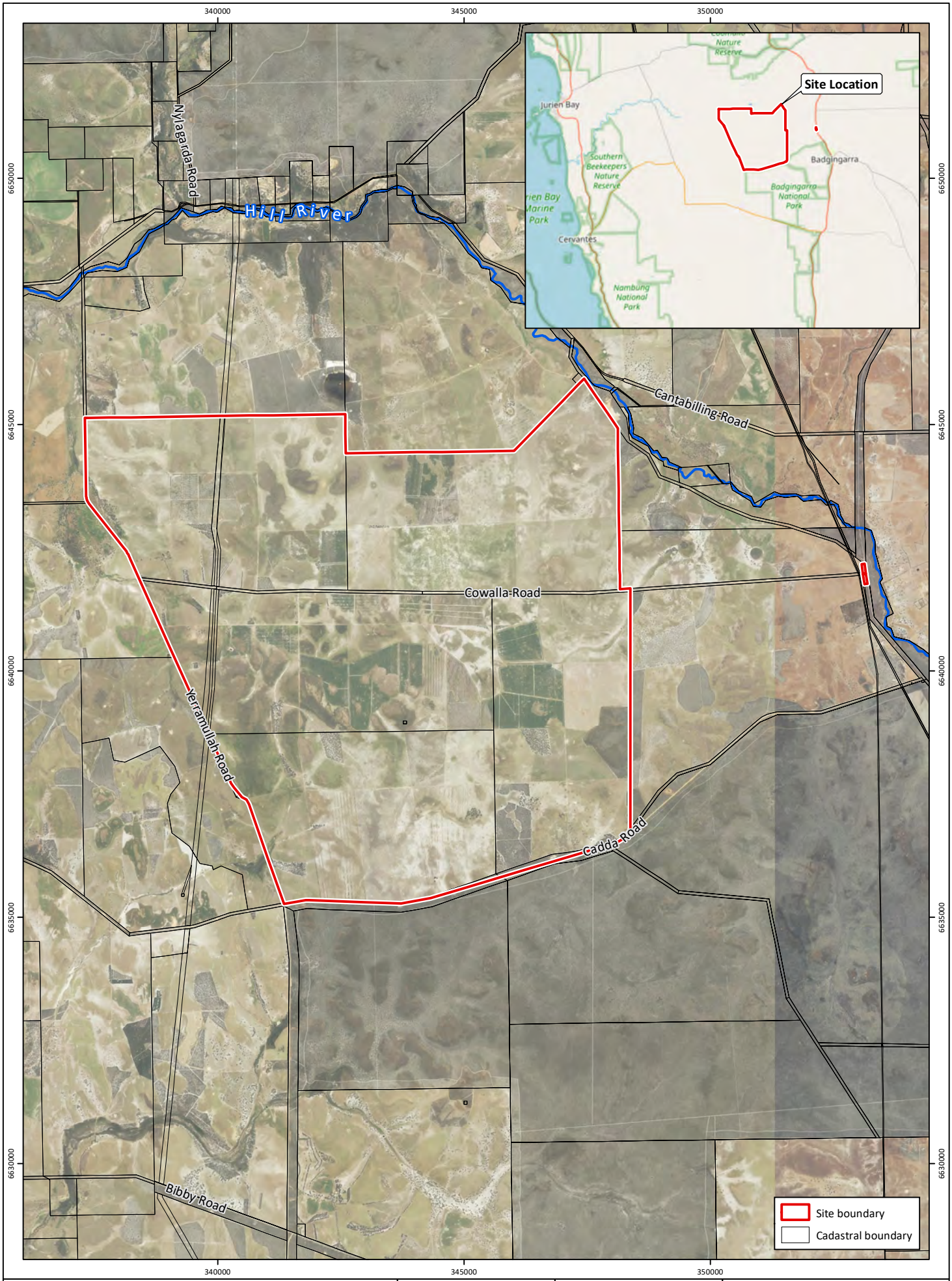

Figure 1: Site Location

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F29

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 1 2
Kilometers

Scale: 1:100,000@A4

GDA2020 MGA Zone 50

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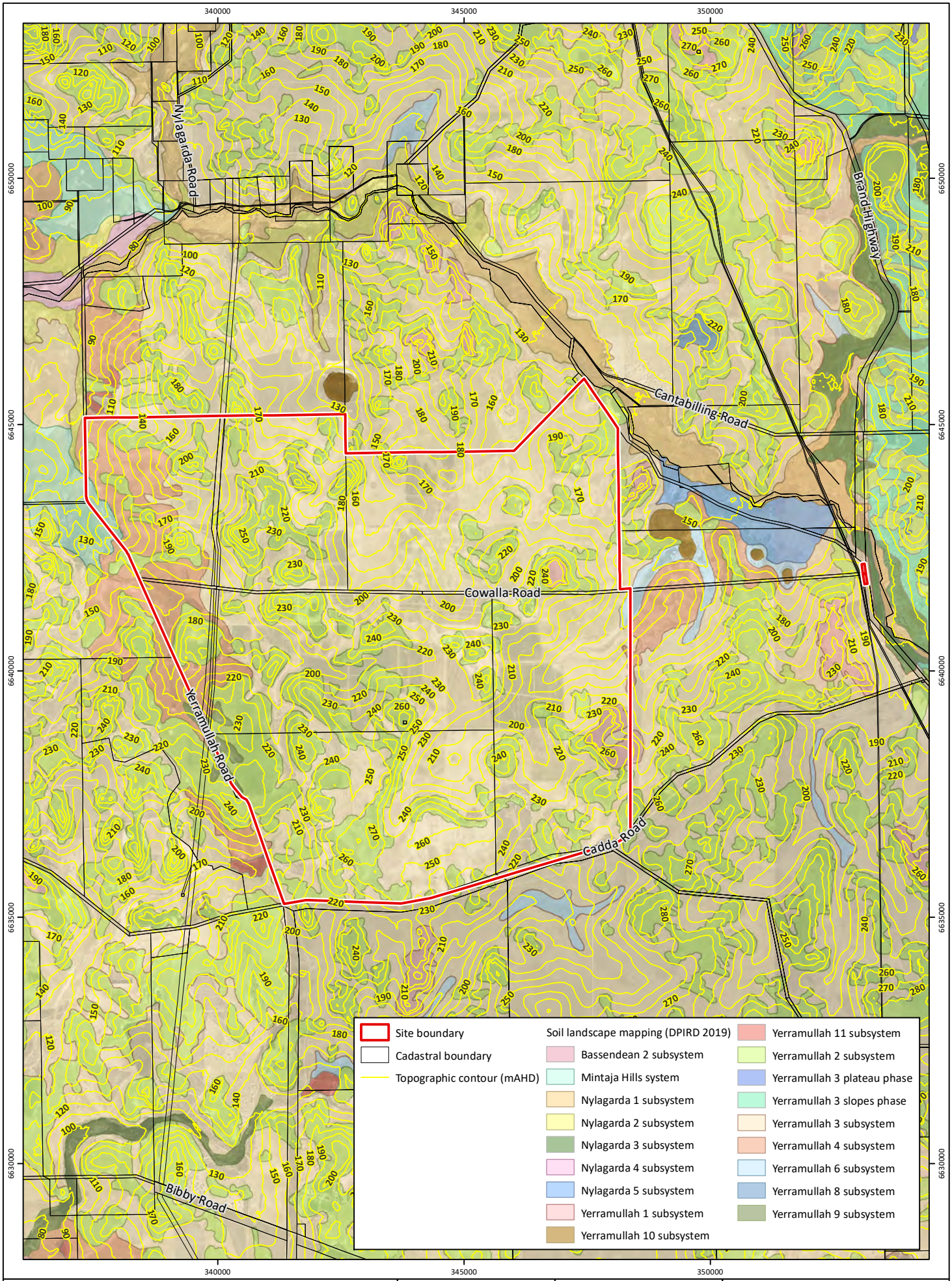

Figure 2: Soils and Topography

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F30

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 1.5 3
Kilometers

Scale: 1:100,000@A4

GDA2020 MGA Zone 50

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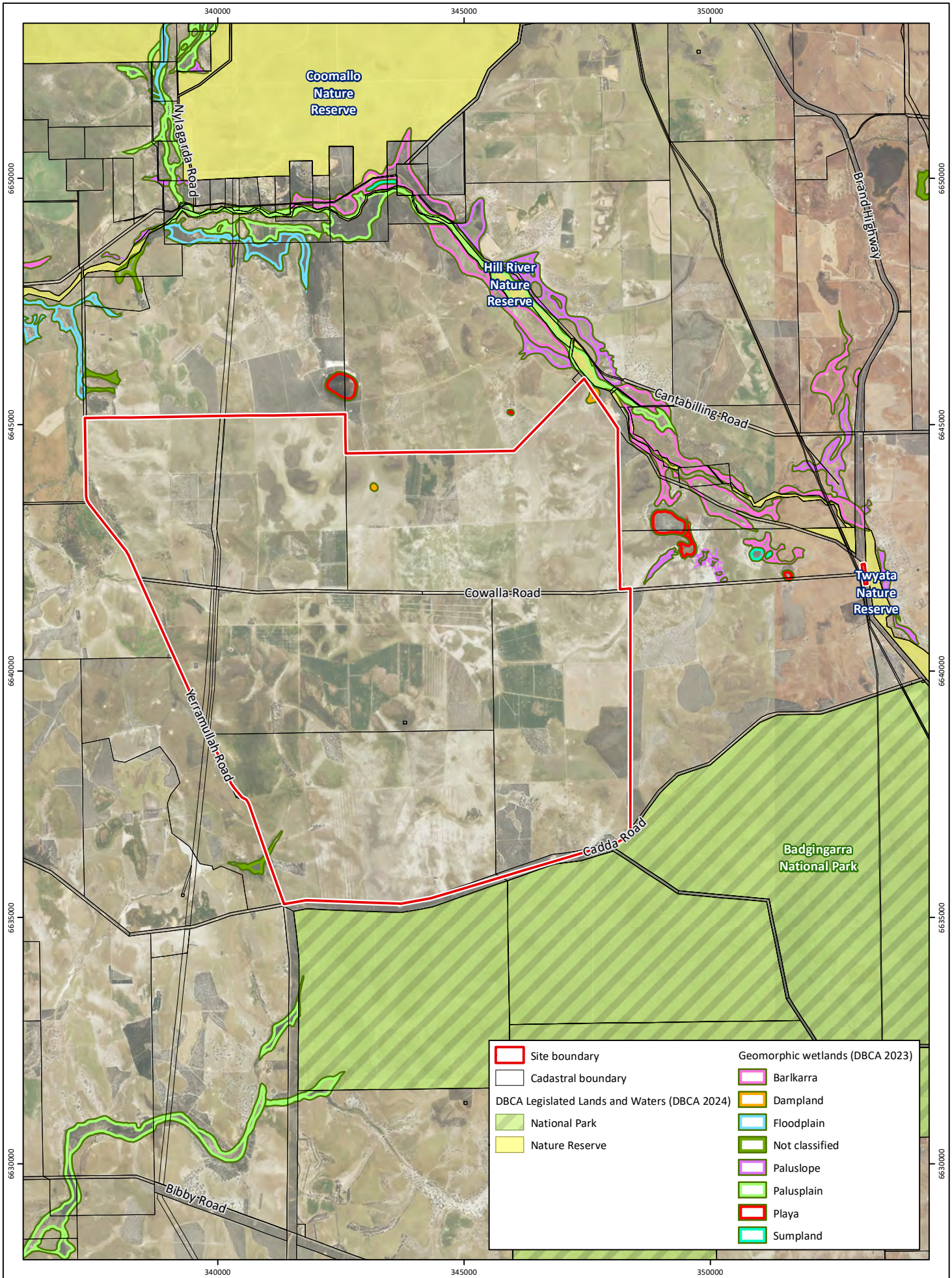

Figure 3: Legislated Lands and Hydrology

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F31

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 1 2
Kilometers

Scale: 1:100,000@A4

GDA2020 MGA Zone 50

emerge ASSOCIATES

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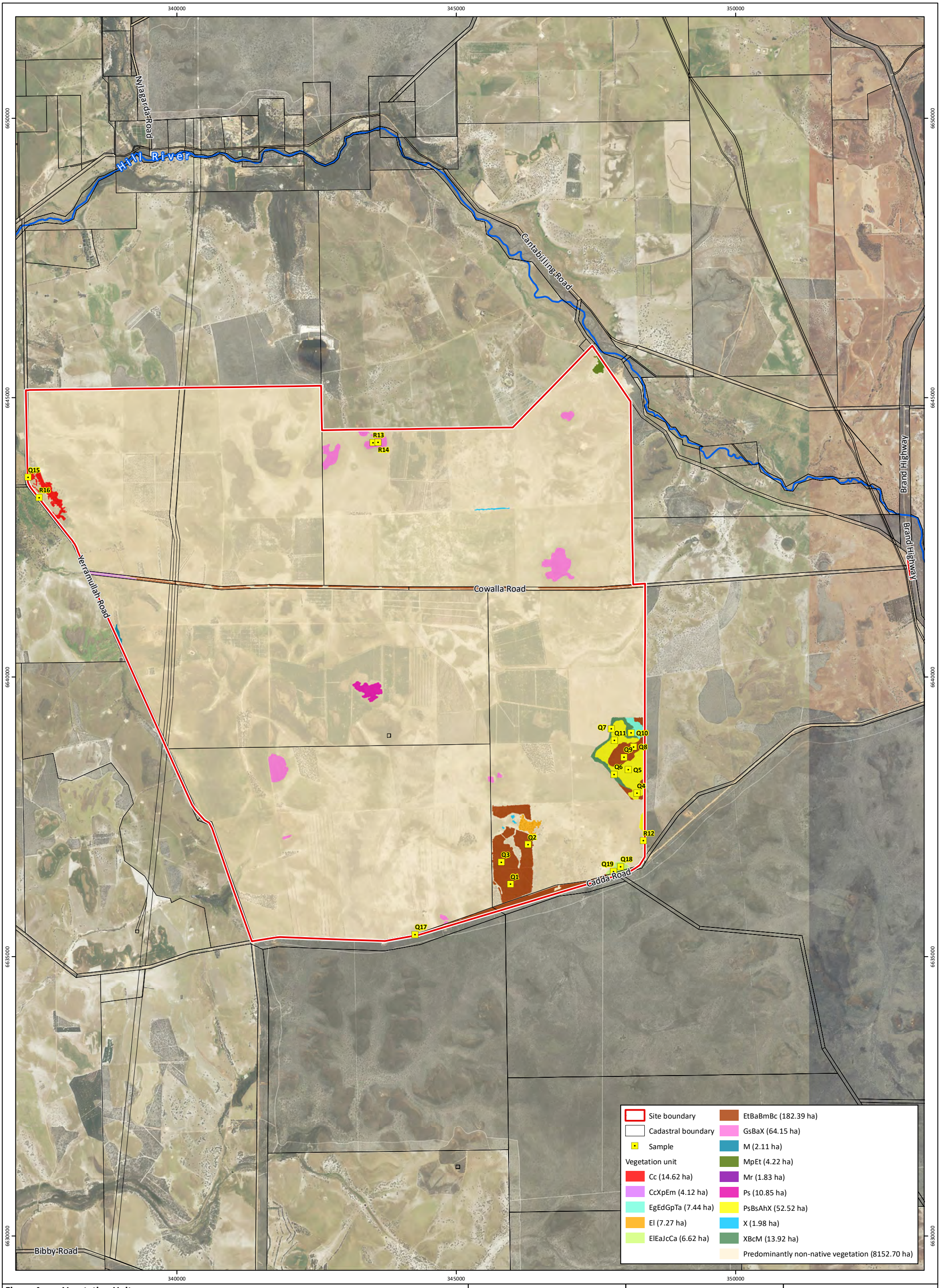

Figure 4: Vegetation Units

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support
Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F32
Drawn: GAR
Date: 29/04/2024
Checked: MS
Approved: RAW
Date: 02/05/2024

N

0 670 1,340 2,010
Metres
Scale: 1:60,000@A3
GDA2020 MGA Zone 50

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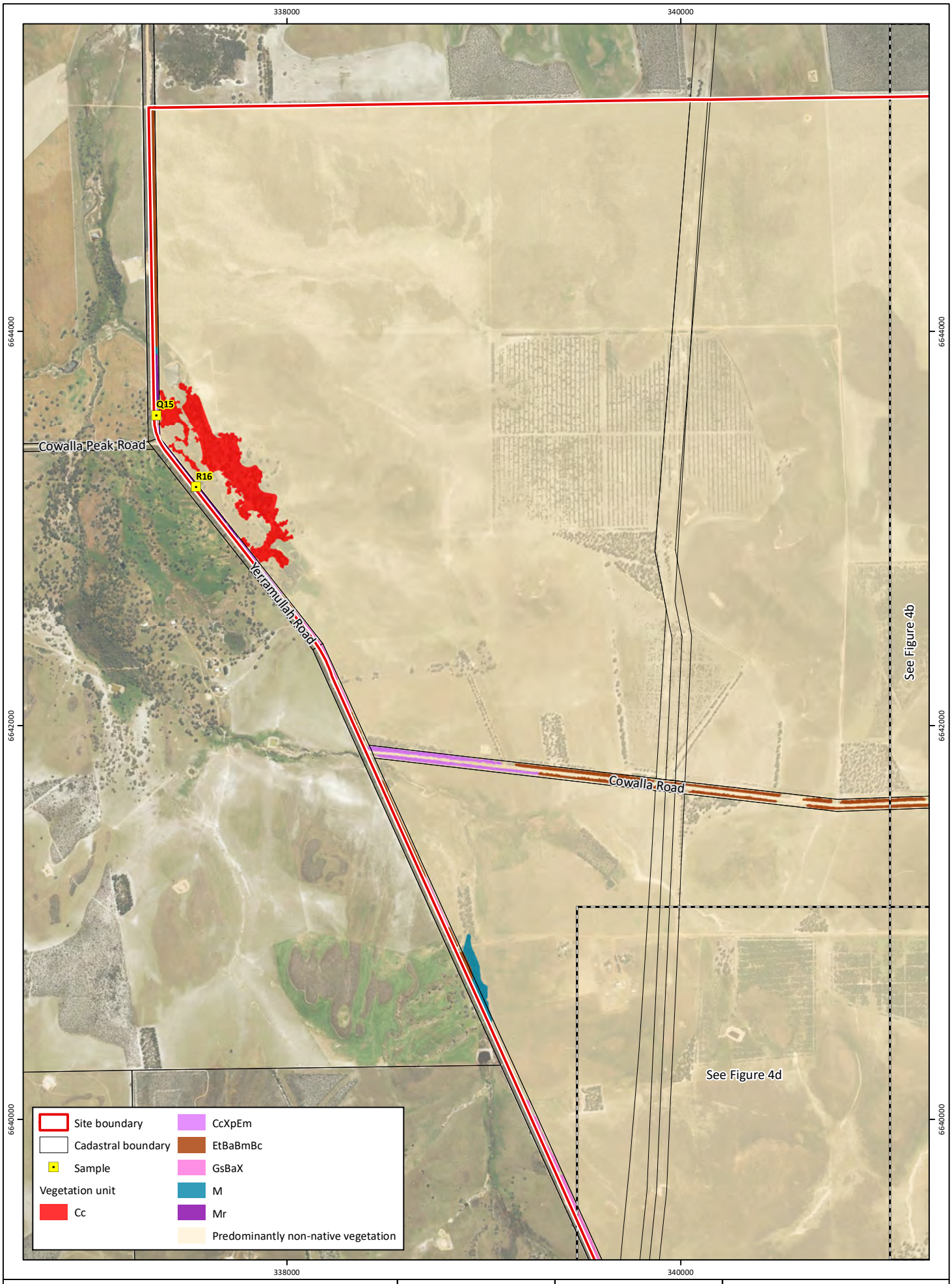

Figure 4a: Vegetation Units

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F33

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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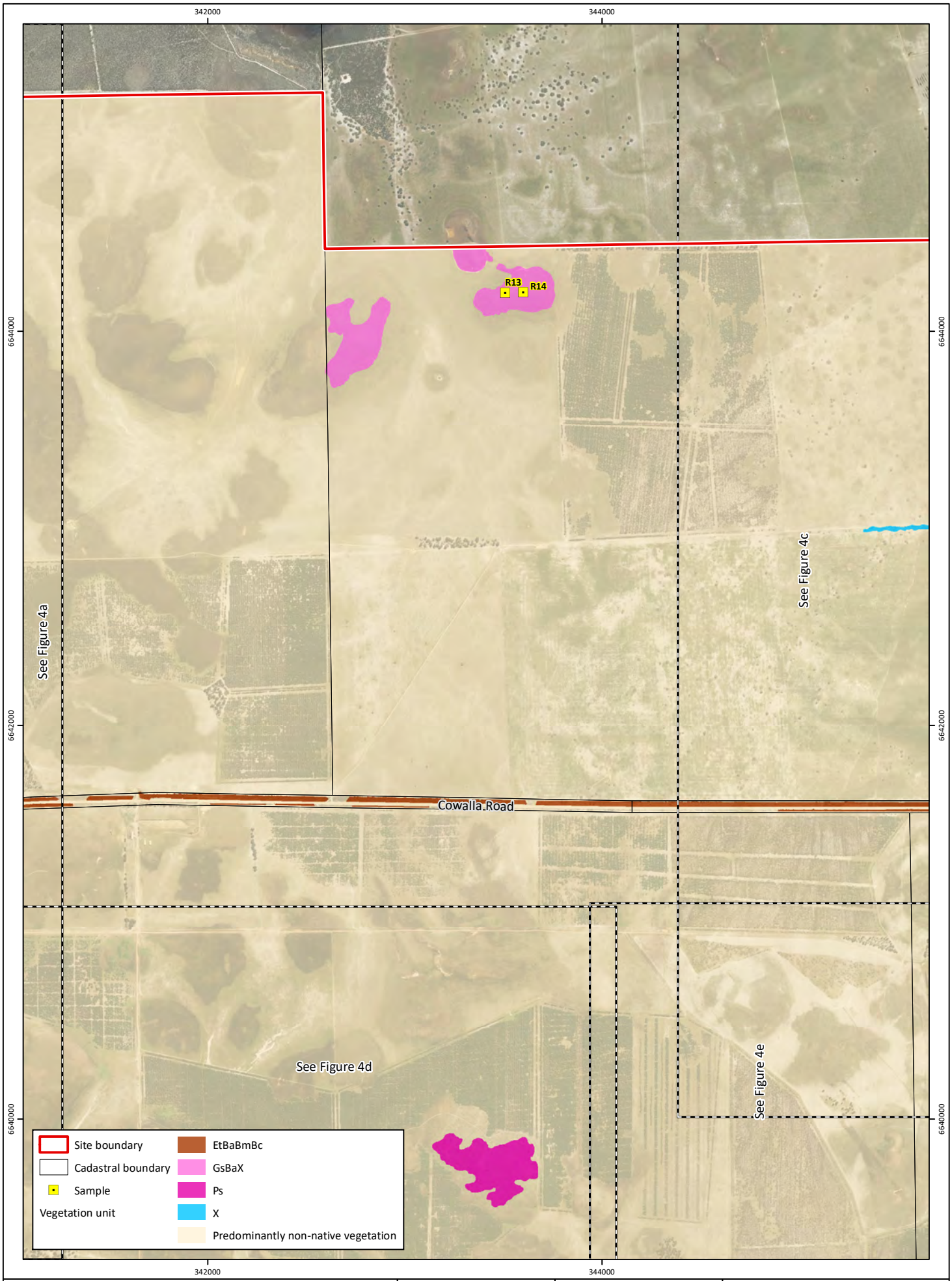

Figure 4b: Vegetation Units

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F33

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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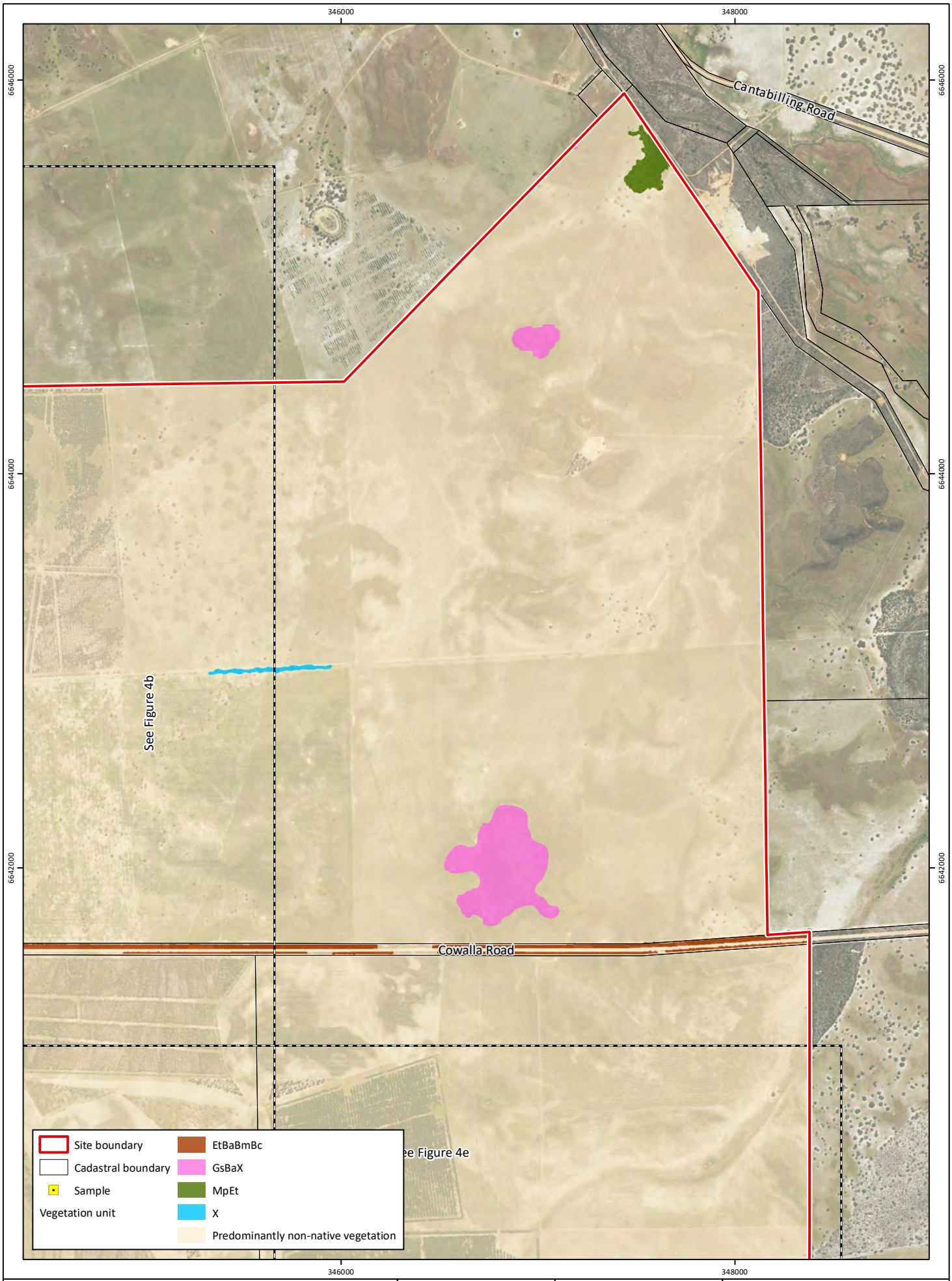

Figure 4c: Vegetation Units

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F33

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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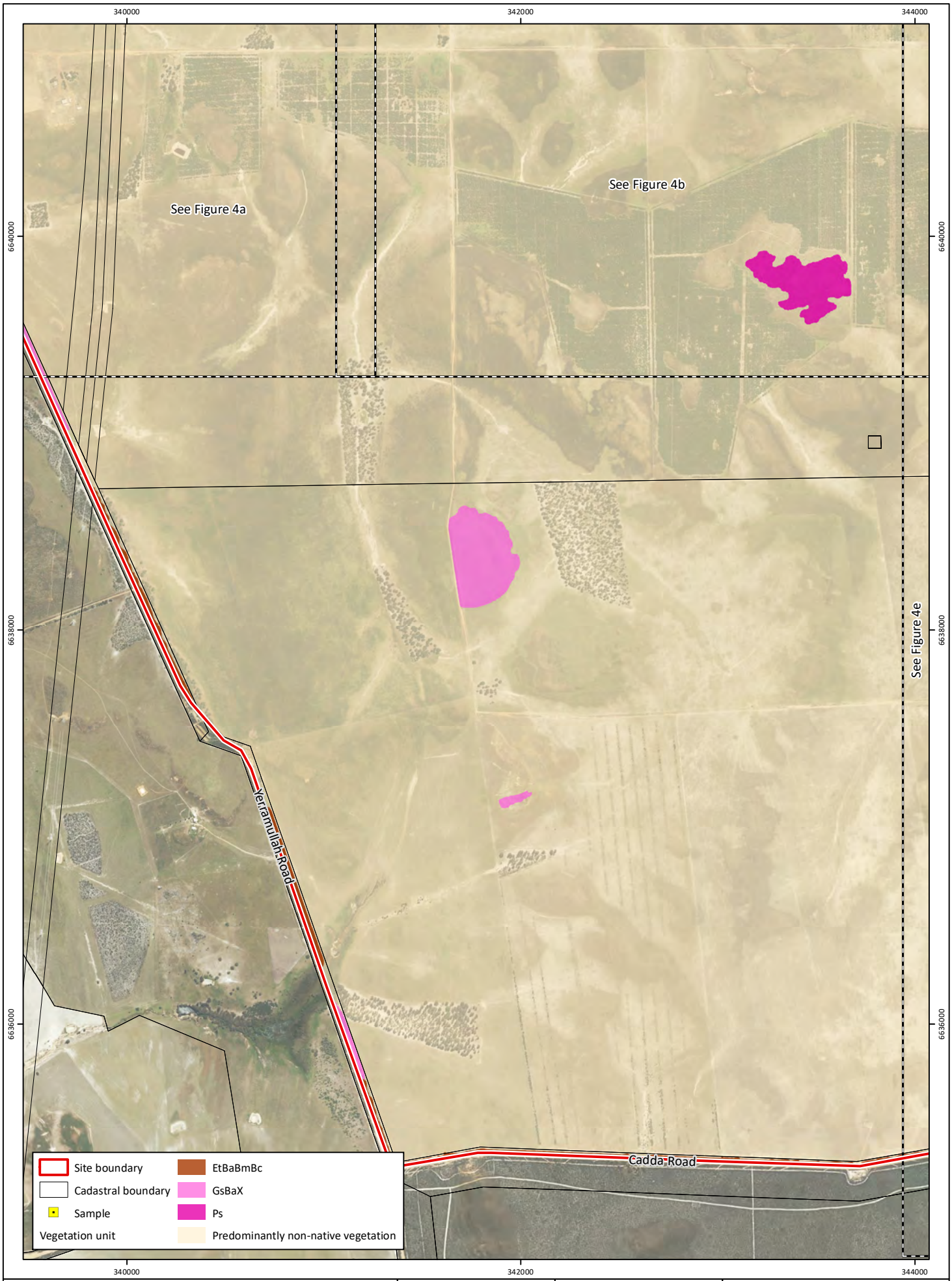

Figure 4d: Vegetation Units

Project:	Detailed Flora and Vegetation Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F33

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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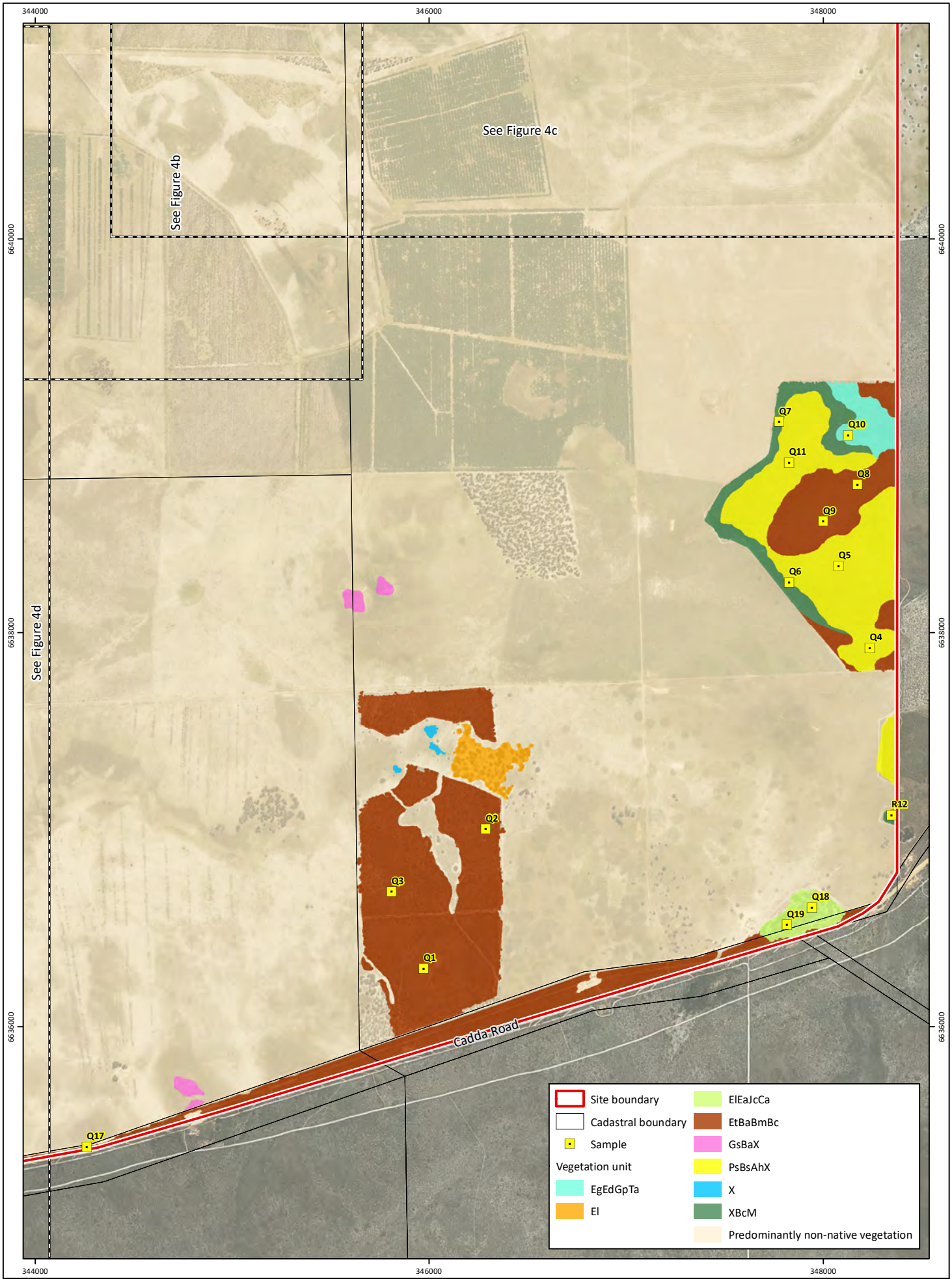

Figure 4e: Vegetation Units

Project:	Detailed Flora and Vegetation Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F33

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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Figure 4f: Vegetation Units

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F33

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 50 100
Metres

Scale: 1:5,000@A4

GDA2020 MGA Zone 50

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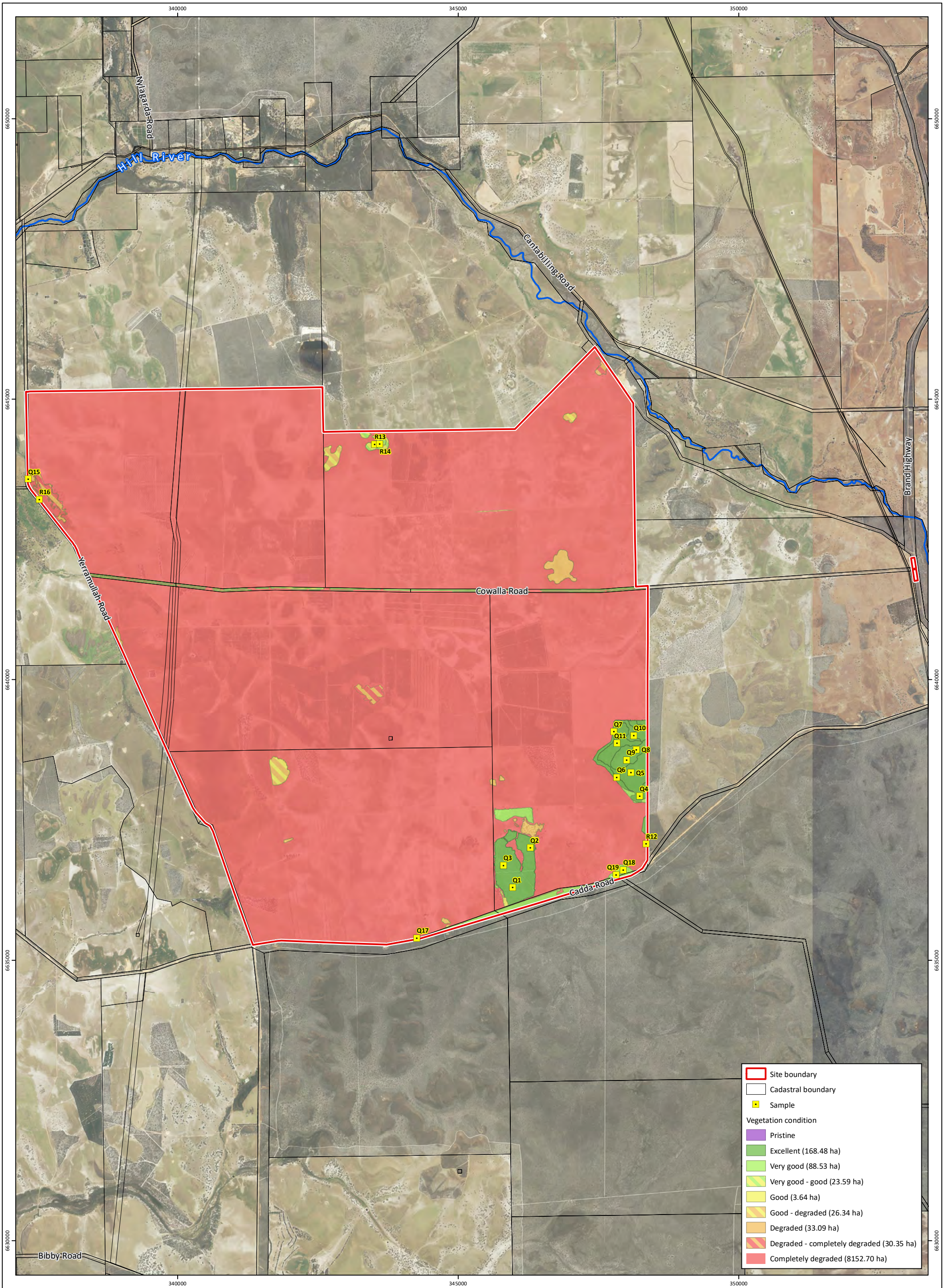

Figure 5: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support
Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F34
Drawn: GAR
Date: 29/04/2024
Checked: MS
Approved: RAW
Date: 02/05/2024

N

0 670 1,340 2,010
Metres
Scale: 1:60,000@A3
GDA2020 MGA Zone 50

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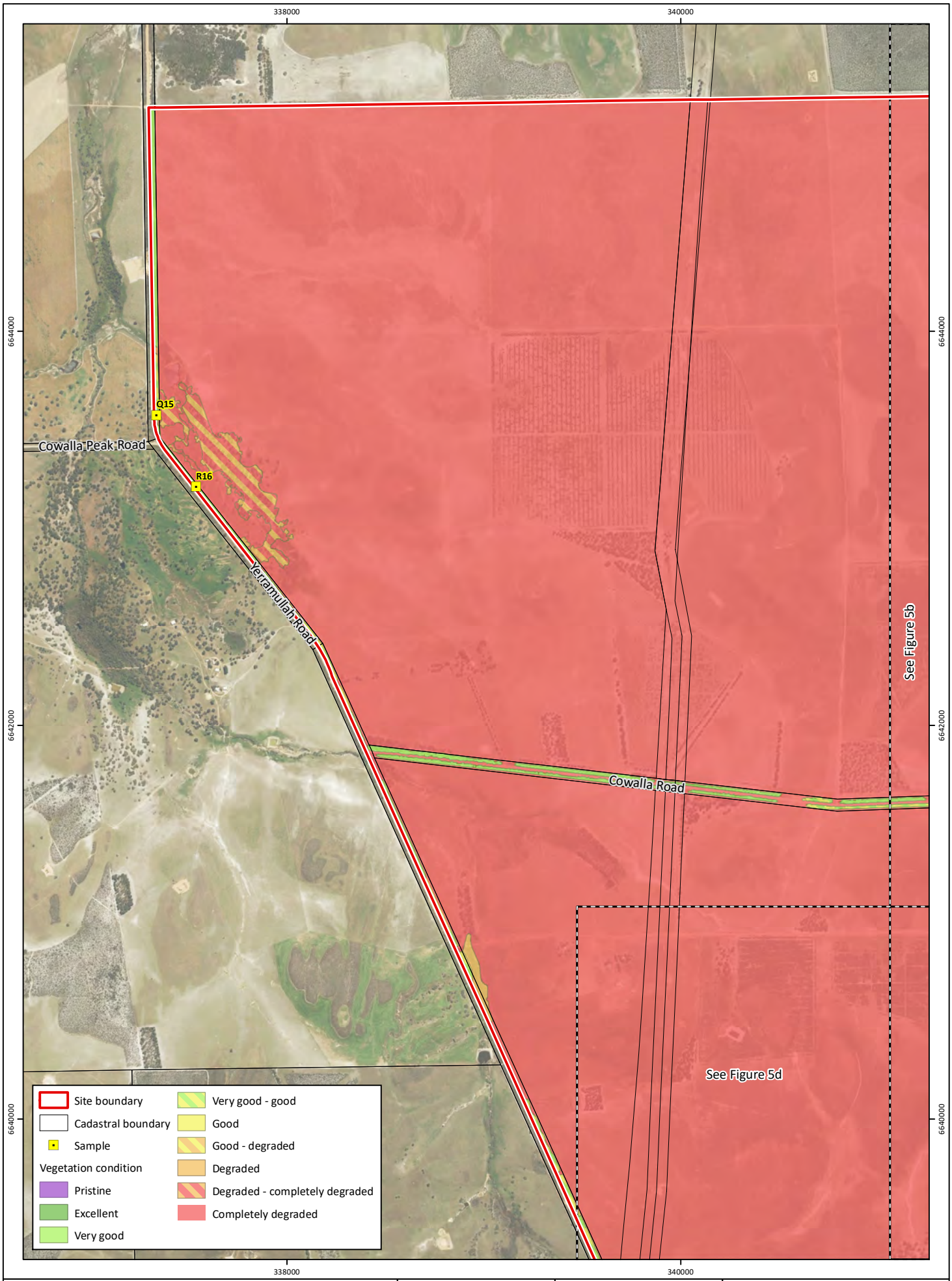

Figure 5a: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F35

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Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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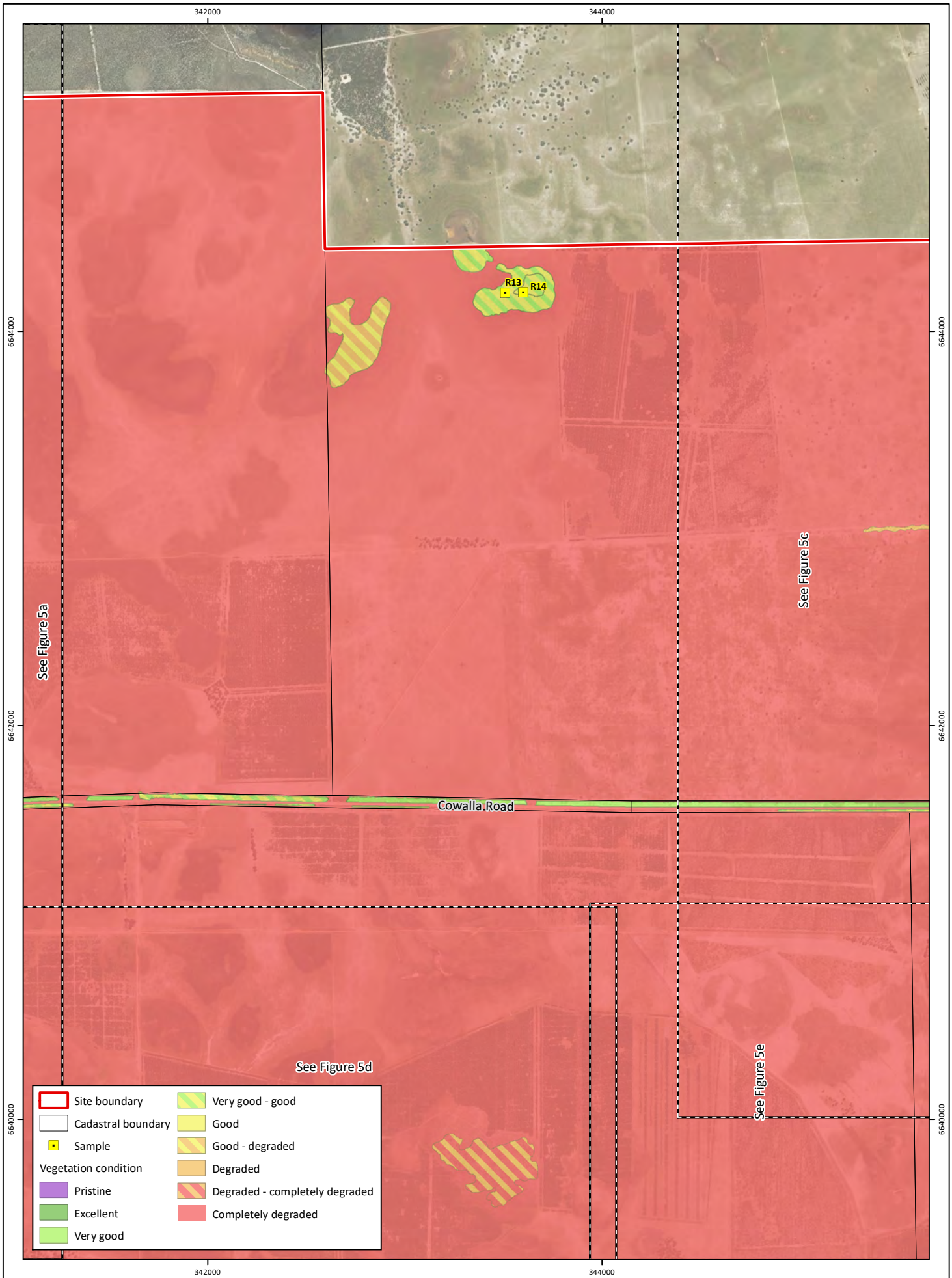

Figure 5b: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F35

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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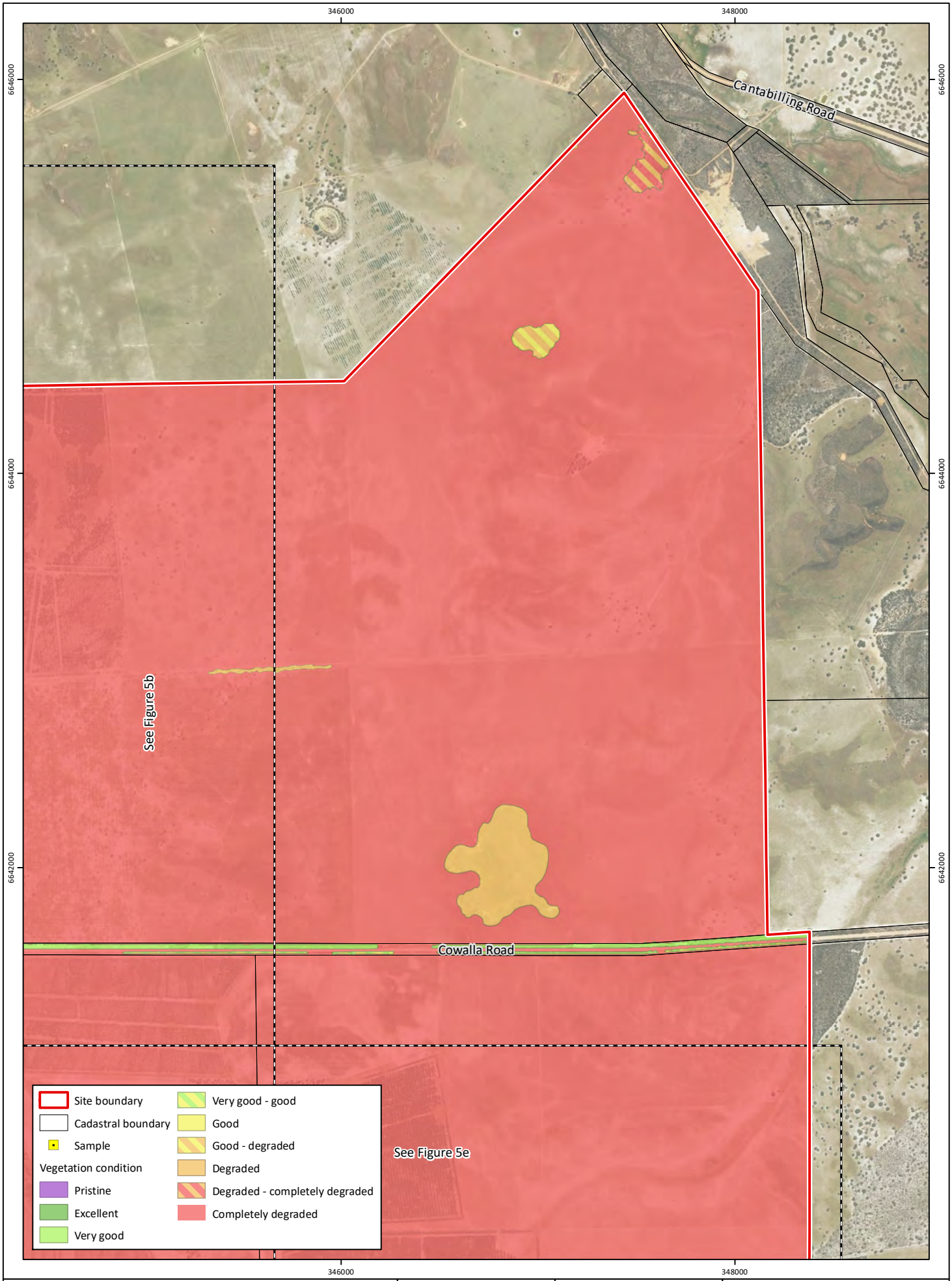

Figure 5c: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F35
Drawn: GAR
Date: 29/04/2024
Checked: MS
Approved: RAW
Date: 02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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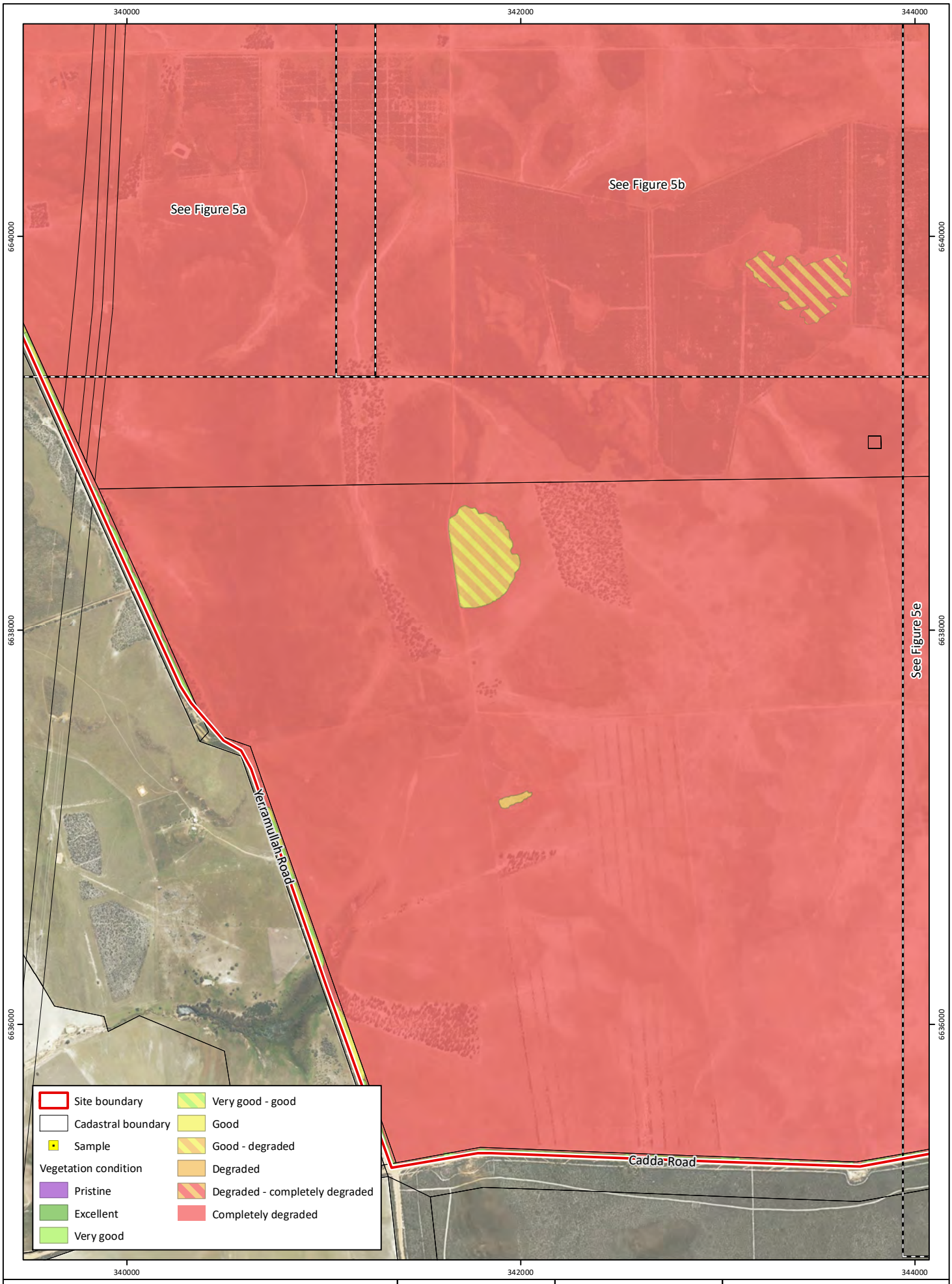

Figure 5d: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F35

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

emerge ASSOCIATES

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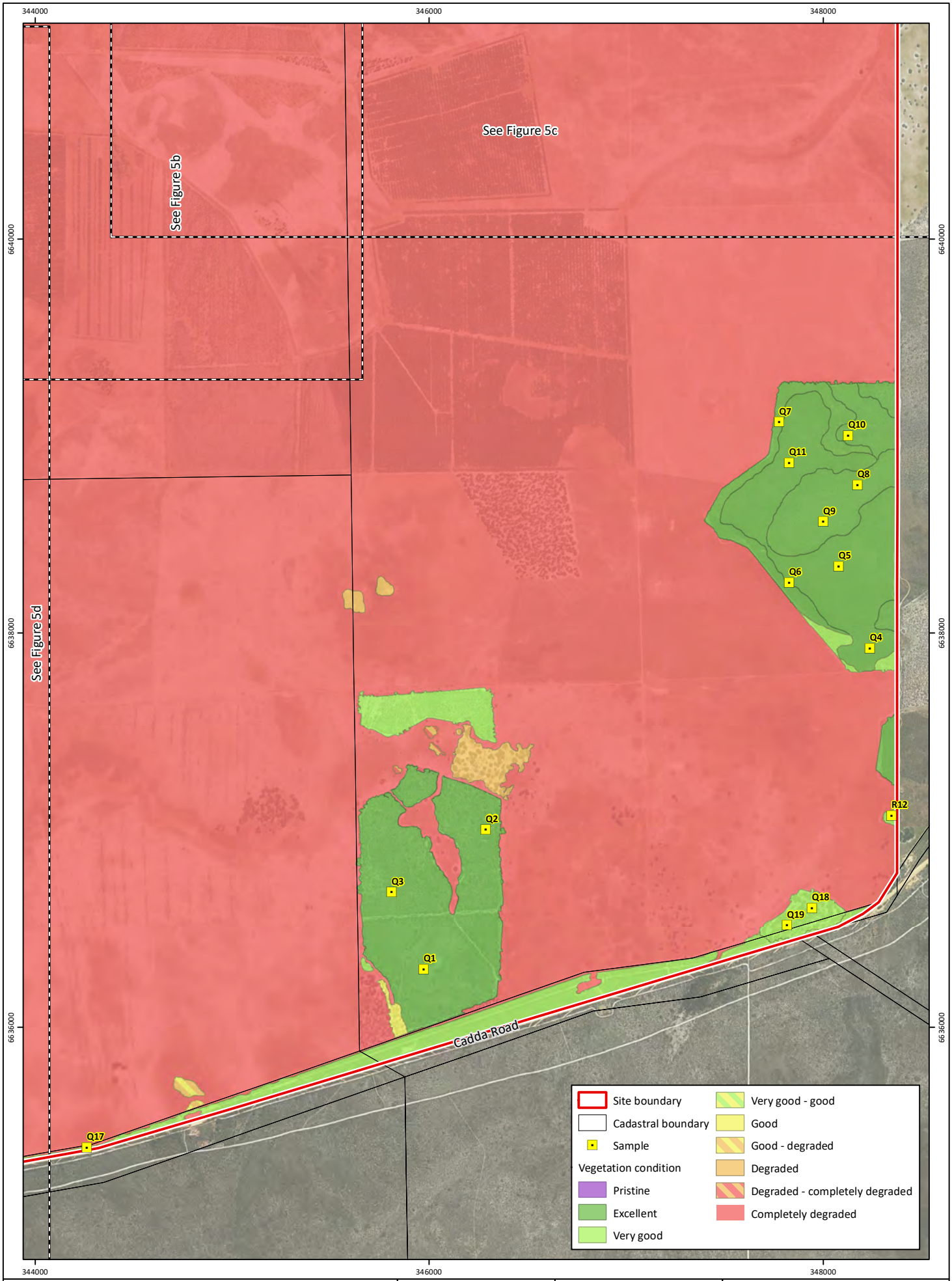

Figure 5e: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(01)--F35

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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Figure 5f: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F35

Drawn:	GAR
Date:	29/04/2024
Checked:	MS
Approved:	RAW
Date:	02/05/2024

N

0 50 100
Metres

Scale: 1:5,000@A4

GDA2020 MGA Zone 50

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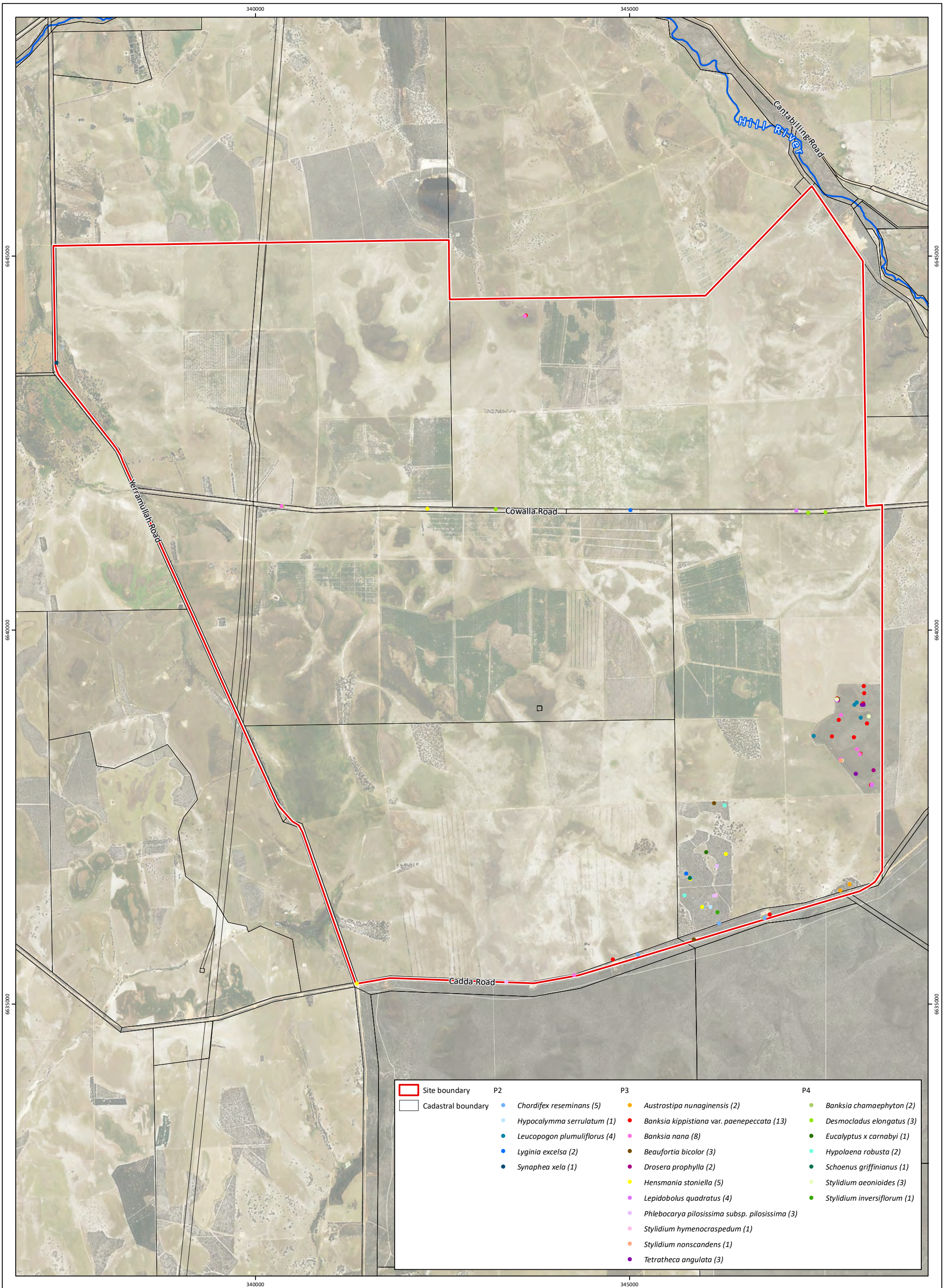

Figure 6: Priority Flora Locations

Project: Detailed Flora and Vegetation Assessment
Parron Wind Farm Development Support
Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(01)--F36
Drawn: GAR
Date: 29/04/2024
Checked: MS
Approved: RAW
Date: 02/05/2024

N

0 500 1,000 1,500
Metres
Scale: 1:45,000@A3
GDA2020 MGA Zone 50

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Appendix A

Additional Information

Conservation Significant Flora and Vegetation

Threatened and priority flora

Flora species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, flora species can be listed as 'threatened' pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In Western Australia, plant taxa may be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act) which is enforced by Department of Biodiversity Conservation and Attractions (DBCA). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act and published in the Biodiversity Conservation (Species) Order 2022. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Section 5(1)1 of the Act defines to take as including "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done.

Threatened flora are assigned categories under the EPBC Act and BC Act according to their conservation status, as outlined in **Table 1**.

Flora species that may be threatened or near threatened but lack sufficient information to be listed under the BC Act may be added to the DBCA's *Priority Flora List* (DBCA 2018b). Priority flora species are considered during State approval processes. Priority flora are assigned categories as listed in **Table 1**.

Table 1: Definitions of threatened and priority flora species pursuant to the EPBC Act and BC Act and on DBCA's Priority Flora List (DBCA 2023b)

Conservation code	Description
EX†	Threatened Flora – Presumed Extinct Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
T^†	Threatened Flora – Extant Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection.
CR^	Threatened Flora – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN^	Threatened Flora – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU^	Threatened Flora – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
P1	Priority One – Poorly Known Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Priority Two – Poorly Known Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey.
P3	Priority Three – Poorly Known Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but needs further survey.
P4	Priority Four – Rare Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

^pursuant to the EPBC Act, †pursuant to the BC Act, on DBCA's *Priority Flora List*

Threatened and priority ecological communities

'Threatened ecological communities' (TECs) are ecological communities that are rare or under threat and therefore warrant special protection. Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. TECs nominated for listing under the EPBC Act are considered by the Threatened Species Scientific Committee and a final decision is made by the Commonwealth Minister for the Environment. Once listed under the EPBC Act, communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable' as defined in **Table 2**. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment.

In Western Australia TECs are listed under sections 27(1), 31 and 33 of the BC Act. TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs listed under the BC Act are defined in Schedule 1 of the Biodiversity Conservation (Threatened Ecological Communities) Order 2023. State TECs are also acknowledged through other environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

TECs are assigned to one of the categories outlined in **Table 2** according to their level of threat.

Table 2: Categories of threatened ecological communities (English and Blyth 1997; DEC 2009)

Conservation code	Description
PD	Presumably Totally Destroyed An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	Critically Endangered An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
E	Endangered An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
V	Vulnerable An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

An ecological community with insufficient information available to be considered a TEC or which are rare but not currently threatened may be listed as a 'priority ecological community' (PEC). PECs are categorised based on a variety of criteria, as described in **Table 3**. Listed PECs are published by DBCA (DBCA 2023a).

Table 3: Categories of priority ecological communities (DEC 2013)

Priority code	Description
P1	Priority One: Poorly known ecological communities Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	Priority Two: Poorly known ecological communities Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	Priority Three: Poorly known ecological communities (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	Priority Five: Conservation Dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Reporting

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

Weeds

A number of legislative and policy documents exist in relation to weed management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding weed management in Western Australia and lists declared pest species. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2018), of which many are also listed under the BAM Act.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 7**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 8**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 9**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD 2020).

Table 4: Legal status of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 10**.

Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017)

Level of inundation	Geomorphology			
	Basin	Flat	Channel	Slope
Permanently inundated	Lake	-	River	-
Seasonally inundated	Sumpland	Floodplain	Creek	-
Seasonally waterlogged	Dampland	Palusplain	-	Paluslope

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 11**.

Table 8: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource enhancement (REW)	Partly modified but still supporting substantial functions and attributes	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple use (MUW)	Few wetland attributes but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

The management categories of wetland features are determined based on hydrological, biological and human use features. The DBCA document *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (DBCA 2017) details the methodology by which wetlands on the Swan Coastal Plain are assigned management categories based on a two tiered evaluation system, with preliminary and secondary evaluation stages. The preliminary evaluation aims to identify any features of conservation significance that would immediately place the wetland within the CCW management category. Examples of these significant features include presence on significant wetland lists, presence of TECs or PECs (Priority 1 and 2), presence of threatened flora and

over 90% of vegetation in good or better condition based on the Keighery (1994) scale. If such environmental values are identified the wetland would be categorised as CCW without further evaluation.

Should the preliminary evaluation indicate that no such features occur, the secondary evaluation and site assessment are then applied. In the secondary evaluation, an appropriate management category is determined through the assessment of a range of environmental attributes, functions and values.

Wetland reclassification

DBCA have a protocol for proposing changes to the wetland boundaries and management categories of the existing geomorphic wetland dataset (DEC 2007). The procedure involves a wetland desktop evaluation and site assessment which culminates in a recommended management category. Relevant information should be obtained in the optimal season for vegetation condition and water levels, which is usually spring (DEC 2007). In the case of larger wetlands that have undergone a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values.

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General references

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Appendix B

Conservation Significant Flora Species and likelihood of Occurrence Assessment

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Acacia splendens	CR	EN	P	White sand over clay, pale brown loam, cracked brown soil, gravel, laterite, ironstone. Slopes of breakaways, especially southern slopes, hills.	May	Moderate
Banksia serratuloides subsp. perissa	CR	CR	P	Gravelly lateritic soils.	Aug-Sep	Moderate
Drakaea elastica	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of Kunzea glabrescens.	late Sep-Oct/Nov, survey Jul-Aug	Negligible
Eremophila scaberula	CR	EN	P	Winter-wet plains, inundated areas.	Aug-Oct	Negligible
Eucalyptus absita	CR	EN	P	White lateritic sand. Paddocks.	Apr-Jul	Nil
Eucalyptus dolorosa	CR	EN	P	Laterite. Hillsides.	Feb-Mar	Negligible
Eucalyptus impensa	CR	EN	P	Yellow sand. Lateritic hills.	Jun-Jul	Negligible
Eucalyptus x balanites	CR	EN	P	Light coloured sandy soils over laterite. Habitat consists of gently sloping heathlands; open mallee woodland over shrubland (Population 2) or heathland with emergent mallees (population 1).	Oct - Feb	Nil
Grevillea batrachioides	CR	EN	P	Sandy loam. Sandstone outcrops.	Oct	Low
Grevillea humifusa	CR	EN	P	Gravelly loam over laterite.	Sep-Nov	Moderate
Hemiandra gardneri	CR	EN	P	Grey or yellow sand, clayey sand. Sandplains.	Aug-Oct	Negligible
Tetratheca nephelioides	EN	CR	P	White-grey sand, yellow-brown clayey sand, gravel, laterite. Outcrops, undulating hills, ridges.	Sep	Negligible
Acacia wilsonii	EN	EN	P	White/yellow sand & lateritic gravel, sandy clay over laterite.	Jan-Mar	Moderate
Andersonia gracilis	VU	EN	P	Seasonally damp, black sandy clay flats near or on the margins of swamps.	Sep-Nov	Low
Banksia mimica	VU	EN	P	Flat to gentle slopes in grey and white sand in open woodlands.	Dec-Jan	Negligible
Caladenia hoffmanii	EN	EN	PG	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Aug-Oct	Negligible
Chamelaucium lullfitzii	VU	EN	P	White yellow sand in low woodland.	Oct-Nov	Negligible
Conospermum densiflorum subsp. unicephalatum	EN	EN	P	Clay in low lying areas.	Sep-Nov	Negligible
Eremophila glabra subsp. chlorella	EN	-	P	Sandy clay. Winter-wet depressions.	Jul-Nov	Low
Eucalyptus crispata	EN	VU	P	Sand, loam with lateritic gravel. Lateritic breakaways.	Mar-Jun	Nil
Eucalyptus lateritica	EN	VU	P	White or grey sand with gravel. Lateritic breakaways & mesas.	Aug-Oct	Nil
Eucalyptus leprophloia	EN	EN	P	White or grey sand over laterite. Valley slopes.	Aug-Oct	Nil
Eucalyptus pruiniramis	EN	EN	P	Skeletal soils over sandstone or laterite. Rocky hillslopes.	Dec	Negligible
Eucalyptus x lateritica	EN	VU	P	White or grey sand with gravel. Lateritic breakaways & mesas.	Aug-Oct	Nil
Grevillea christineae	EN	EN	P	Clay loam, sandy clay, often moist.	Aug-Sep	Negligible
Grevillea curviloba subsp. incurva	EN	EN	P	Sand, sandy loam. Winter-wet heath.	Aug-Sep	Negligible
Macarthuria keigheryi	EN	EN	P	Low-lying winter-wet damp grey/white sands in open patches.	Sep-Dec or Feb-Mar	Moderate
Paracaleana dixonii	VU	EN	PG	Deep sand in open areas beneath dense tall shrubs with scattered banksias, or in heathland in shallow sand over laterite. Occurs from near Eneabba to near Cataby	Oct-Jan	Moderate
Patersonia spirifolia	EN	EN	P	Sand over laterite. Low hills.	Oct-Nov	High
Spirogardnera rubescens	VU	EN	P	Laterite, sand over laterite, loam.	Aug-Dec	Moderate
Styphelia obtecta	EN	EN	P	Grey sand.	Aug-Oct	Moderate
Thelymitra stellata	EN	EN	PG	Sandy loam, clay or gravel over laterite or gravel.	Sep-Nov	Moderate
Acacia forrestiana	VU	VU	P	Lateritic gravelly soils, clay loam over sandstone. Gullies, hills, breakaways.	Nov-Dec	Moderate
Anigozanthos viridis subsp. terraspectans	VU	VU	P	Grey sand, clay loam. Winter-wet depressions.	Aug-Sep	Moderate
Banksia catoglypta	VU	VU	P	Lateritic breakaways.	Jun-Jul	Negligible
Eucalyptus argutifolia	VU	VU	P	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops	Mar-Apr	Negligible

Species name	Level of significance WA	Level of significance EPBC Act	Life strategy	Habitat	Flowering period	Likelihood of occurrence
Eucalyptus johnsoniana	VU	VU	P	White/grey sand with lateritic gravel. Sandplains, lateritic breakaways.	Jul-Aug or Oct-Dec or Jan-May	Nil
Eucalyptus suberea	VU	VU	P	Grey sand. Near or on lateritic breakaways.	Nov-Dec or Jan	Nil
Hakea megalosperma	VU	VU	P	Grey sand, loam. Lateritic hills & rocks.	May-Jun	High
Petrophile nivea	VU	VU	P	Dry bare white sand over gravel over laterite. Uplands.	May or Jul	Negligible
Ptychosema pusillum	VU	VU	P	Red, brown & yellow sand rises.	Aug-Oct	Negligible
Chamaescilla maculata	P1	-	P	Boggy, seasonally wet areas.	Jul-Sep	Low
Corymbia chlorolampra	P1	-	P	Sand over limestone. Hills, lateritic breakaways.	Feb (limited data)	Moderate
Drosera allantostigma	P1	-	P	Loam, silica sand or peaty soils. Margins of winter-wet depressions.	Nov-Dec	Moderate
Drosera pedicellaris	P1	-	P	Deep beige sand.	Oct-Nov	High
Eucalyptus absita x loxophleba	P1	-	P	Lateritic sand.	Apr-Jul? (Unknown)	Nil
Grevillea cooljarloo	P1	-	P	Winter-wet flats in grey sand over clay. Floodplains, drainage lines, creeks.	Most of the year with spring peak	Low
Hypocalymma lateriticola	P1	-	P	Lateritic soils. Sand with laterite pebbles, laterite over clay.	Aug-Sep	Negligible
Hypocalymma x proliferum	P1	-	P	Sand, typically along margins of watercourses.	Jun-Oct	Negligible
Lasiopetalum rupicola	P1	-	P	Brown loam over laterite. Hillsides and summits.	Sep-Oct	Negligible
Levenhookia preissii	P1	-	A	Grey or black, peaty sand. Swamps	Sep-Dec/Jan	Low
Poranthera asybosca	P1	-	A	Sand or sand over laterite.	Sep-Oct	Moderate
Rhetinocarpha suffruticosa	P1	-	P	Red-brown loamy clay, gravelly loam or clay loam over laterite. Slopes, small ridges.	Nov-Dec	Low
Stylidium carnosum subsp. Narrow leaves (J.A. Wege 490)	P1	-	P	Gravelly sands over laterite, generally on slopes.	Apr, Sep-Oct (limited data)	Moderate
Acacia carens	P2	-	P	Gravel or sandy gravel. Lateritic uplands.	Apr-Jun	Moderate
Acacia lasiocarpa var. lasiocarpa Cockleshell Gully variant (E.A. Griffin 2039)	P2	-	P	Grey-yellow sand with laterite. Low open heath.	Aug	Negligible
Acacia retrorsa	P2	-	P	Grey sand & lateritic gravel, sandy loam.	Aug-Sep	Moderate
Acacia sp. Badgingarra (F. Hort & J. Hort FH 4636)	P2	-	P	Sand/laterite on hill slopes and rises.	Jun-Oct (limited data)	High (recorded)
Andersonia sp. Mt Lesueur (E.A. Griffin 5536)	P2	-	P	Slope, breakaways. Dry brown/grey/cream sandy clay over sandstone.	Mar-May	Moderate
Andersonia sp. Mysosma (E.A. Griffin 2213)	P2	-	P	Grey sand, sandy clay, slope of sandstone or laterite breakaways, flat.	Sep, Feb (limited data)	Moderate
Boronia scabra subsp. condensata	P2	-	P	Sandy clay or gravel. Upper slopes, edges of lateritic breakaways.	Aug	Negligible
Calectasia palustris	P2	-	P	White or grey sand. Seasonally inundated swamplands.	Jul-Oct	Low
Catacolea enodis	P2	-	P	Deep white sand over laterite. Tall heath.	Aug-Nov (limited data)	Moderate
Chordifex reseminans	P2	-	P	Dry sand. Heath.	Mar-May	High (recorded)
Comesperma rhadinocarpum	P2	-	P	Sandy soils.	Oct-Nov	Moderate
Cristonia biloba subsp. pubescens	P2	-	P	Sand, gravelly loam, sand over laterite.	Jun-July	Moderate
Cyanothamnus ramosus subsp. lesueuranus	P2	-	P	Sand over laterite.	Jul-Aug	Negligible
Desmocladus microcarpus	P2	-	P	Deep white and yellow sand.	Aug-Oct	High
Drosera rubricalyx	P2	-	P	Poorly drained, seasonally moist flats, depressions, and hillslopes	Aug-Sep	Low
Eucalyptus angularis	P2	-	P	Lateritic breakaways.	Unknown	Negligible
Goodenia xanthotricha	P2	-	P	Sandy soils. Gravelly hills.	Nov-Dec or Jan-Feb	Negligible
Grevillea delta	P2	-	P	Sandy clay, loam, gravelly soils, often over sandstone. Sandstone outcrops, creek beds.	Jun-Jul or Sep-Oct	Negligible
Grevillea trichantha	P2	-	P	Cream brown sand (only one observation).	Sep (limited information)	Moderate
Hypocalymma serrulatum	P2	-	P	Grey or white sand. Along drainage lines.	Apr-May	High (recorded)
Hypocalymma tenuatum	P2	-	P	Sandy loam over sandstone. Outcrops, ridges.	Jul-Aug	Low
Jacksonia rubra	P2	-	P	Clayey sand.	Oct	Negligible
Lasiopetalum rutilans	P2	-	P	Brown/white sand with laterite. Skeletal soil over sandstone. Upper slopes or valley floors.	Aug-Dec	Moderate
Lepyrodia curvescens	P2	-	P	Sand, laterite. Seasonally inundated swampland.	Sep-Nov	Low

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Leucopogon plumuliflorus	P2	-	P	Lateritic sandy soils. Amongst lateritic boulders, hillslopes.	Apr or Jul-Nov	High (recorded)
Loxocarya gigas	P2	-	P	Sandy gravelly lateritic soils. Low hills & ridges, sandplains.	Jul, Sep-Oct (limited data)	Negligible
Lyginia excelsa	P2	-	?P	Sand. Dry heath & Banksia woodland.	Mar-Nov	High (recorded)
Phlebocarya pilosissima subsp. teretifolia	P2	-	P	White or grey sand.	Aug-Oct	High
Poranthera moorokatta	P2	-	A	Sandy or clay soils. Dampland or low sandy dunes in banksia woodland.	Sep-early Nov	Moderate
Pultenaea sp. Mt Lesueur (J.S. Beard 7827)	P2	-	P	Gravelly sands over laterite, laterite outcrops. Slopes.	Sep-Nov	Moderate
Schoenus badius	P2	-	A	Grey sand. Moist areas.	Sep-Oct	Moderate
Stenanthemum limitatum	P2	-	P	Sand and lateritic gravel, sandstone.	Oct-Nov	Moderate
Stylidium diplotrichum	P2	-	P	Clayey sand or clay loam over laterite. Hillslopes and gullies.	Sep-Nov	Negligible
Stylidium strigosum	P2	-	P	Clay/loam over laterite. Hillslopes and near watercourses.	Oct-Nov	Moderate
Stylidium tinkeri	P2	-	A	Grey sandy soil. Seasonal wetlands.	Oct	Low
Styphelia carolineae	P2	-	P	White sand over laterite.	May-Jul	Negligible
Styphelia undulata	P2	-	P	Grey sand, dry white sand. Hills, plains.	Dec-Mar	High
Synaphea lesueurensis	P2	-	P	Laterite, sandy soils over laterite or sandstone. Hillslopes.	Aug-Oct	Moderate
Synaphea sparsiflora	P2	-	P	Sandy loam over laterite.	Aug-Sep	Moderate
Synaphea xela	P2	-	P	Red-brown gravelly sand, white-pink, grey-brown clayey sand and loam, over laterite. Undulating sites.	Jul-Sep	High (recorded)
Tetratheca remota	P2	-	P	Sandy gravel.	Nov	Moderate
Thelymitra pulcherrima	P2	-	PG	Open areas among shrubs in laterite soils, rarely sandy soils.	Jun-Sep	High
Acacia cummingiana	P3	-	P	Grey or yellow sand, lateritic gravel on sandplains, lateritic breakaways.	May-Aug	High
Acacia epacantha	P3	-	P	Lateritic gravelly loam or clay.	Jul-Aug	Moderate
Acacia flabellifolia	P3	-	P	Rocky loam, lateritic gravelly soils. Low hills & ridges.	Aug (limited data)	Negligible
Acacia plicata	P3	-	P	Loamy & clayey soils, often over sandstone or siltstone. Along drainage lines.	Aug-Oct	Negligible
Allocasuarina grevilleoides	P3	-	P	Sand over laterite, gravel.	Sep-Nov	High
Allocasuarina ramosissima	P3	-	P	Lateritic soils, gravel.	Jun-Sep	Moderate
Angianthus micropodioides	P3	-	A	Saline sandy soils on edge of rivers, depressions and clay pans.	Nov-Dec or Jan-Feb	Low
Arnocrinum gracillimum	P3	-	P	White, grey, yellow or lateritic sand.	Oct-Nov	Moderate
Austrostipa nunaginensis	P3	-	P	Yellow-brown sand, grey light clay. Slopes with or without stones.	Unknown	High (recorded)
Babingtonia urbana	P3	-	P	Grey sand, lateritic gravel. Associated with wetlands	Jan-Mar	Low
Balaustion grande	P3	-	P	Yellow sand.	Aug-Oct	Negligible
Banksia cypholoba	P3	-	P	Sand & gravelly loam.	Aug	Moderate
Banksia fraseri var. crebra	P3	-	P	Lateritic or gravelly soils, typically sand but also loam/clay.	Jul-Aug (limited data)	Negligible
Banksia kippistiana var. paenepeccata	P3	-	P	Lateritic gravelly soils.	Oct-Nov	High (recorded)
Banksia nana	P3	-	P	White/grey sand and/or gravel over laterite. Hills.	Oct	High (recorded)
Banksia nobilis subsp. fragrans	P3	-	P	Lateritic rises.	Jul-Sep	Negligible
Banksia pteridifolia subsp. vernalis	P3	-	P	White/grey sand over laterite.	Sep-Oct	Moderate
Banksia splendida subsp. macrocarpa	P3	-	P	Lateritic gravel.	Jul-Aug	High
Banksia subulata	P3	-	P	White/grey or yellow sand over laterite, gravelly laterite.	Sep	Moderate
Beaufortia bicolor	P3	-	P	White sand over laterite. Sandplains.	Nov-Dec	High (recorded)
Beaufortia eriocephala	P3	-	P	Lateritic sandy soils. Slopes.	Sep-Nov	Negligible
Beyeria gardneri	P3	-	P	Yellow sand.	Aug-Sep	Negligible
Calytrix ecalycata subsp. brevis	P3	-	P	Dry yellow sand. Sandplains, low rises.	Aug-Sep	Negligible
Centrolepis milleri	P3	-	A	Open sandy soil.	Oct-Nov	Moderate
Conospermum scaposum	P3	-	P	White-grey sand, sandy clay. Low swampy areas, road verges.	Jan-Feb	Moderate
Dampiera tephrea	P3	-	P	Sand, gravelly loam.	Jul	Moderate
Daviesia pteroclada	P3	-	P	Sandy or clay gravelly soils over laterite. Hills.	Jul-Aug	Negligible
Desmocladus biformis	P3	-	P	Sand, sandy clay, lateritic soils. Dry sites.	Sep-Oct	Moderate

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Desmocladus nodatus	P3	-	P	Sand or clay in low-lying areas.	Oct-Nov (limited data)	Moderate
Drosera atrata	P3	-	P	Lateritic soil. Hills and breakaways.	Jun-Aug	High
Drosera prophylla	P3	-	P	Sand over laterite.	Jun-Aug	High (recorded)
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)	P3	-	P	Grey brown sand or clay in winter wet flats.	Sep-Nov	Low
Gompholobium gairdnerianum	P3	-	P	White, cream or brown sandy clay, white sand over sandstone, brown or grey sand over laterite, gravel. Hill summits and slopes, ridges.	Sep-Nov	High
Grevillea florida	P3	-	P	Sand, sandy clay, gravel, laterite. Sandplain, slopes, road verges.	Jul-Sep	Moderate
Grevillea leptopoda	P3	-	P	Loam & lateritic gravel, sand, clay.	Aug-Sep	Negligible
Grevillea thyrsoides subsp. thyrsoides	P3	-	P	Sand or sandy lateritic gravel.	Feb or Aug-Sep	Moderate
Grevillea uniformis	P3	-	P	Sand or sandy loam on sandstone, lateritic gravel. Sandstone outcrops, creeklines.	Jul or Sep-Nov	Moderate
Guichenotia alba	P3	-	P	Sandy & gravelly soils. Low-lying flats, depressions.	Jul-Aug	Moderate
Haemodorum loratum	P3	-	P	Grey or yellow sand, gravel.	Nov	High
Hakea longiflora	P3	-	P	White sand, loam, gravel, laterite. Breakaways.	Jun-Sep	Moderate
Hensmania stoniella	P3	-	P	White, grey or lateritic sand, often winter-wet (but also records on ridges and dry sand)	Sep-Nov	High (recorded)
Hibbertia subglabra	P3	-	P	Sand over laterite on slopes and in gullies.	Aug-Dec (limited information)	Negligible
Hibbertia subvillosa	P3	-	P	Sandy loam. Also sandy sandy creek-beds and graded roadsides.	Apr-Sep	Negligible
Hypocalymma gardneri	P3	-	P	Grey-brown sand, laterite. Sandplains, upper slopes, heathland.	Aug-Sep	Moderate
Hypocalymma quadrangulare	P3	-	P	Sands in Banksia woodlands or shrublands. Sometimes on limestone.	Jul-Oct	Negligible
Hypocalymma tetrapterum	P3	-	P	Grey sand, loam, lateritic gravel. Riverbanks, breakaways.	Aug	Negligible
Isopogon panduratus subsp. palustris	P3	-	P	Winter-wet sands or sandy loams.	Aug-Oct	Moderate
Jacksonia anthoclada	P3	-	P	White or grey sand. Sandplains.	Apr	Moderate
Jacksonia carduacea	P3	-	P	Grey sand, sandy clay.	Aug-Dec	Moderate
Lechenaultia juncea	P3	-	P	White, grey or yellow sand, sandy gravel.	Nov-Dec	Moderate
Lepidobolus quadratus	P3	-	P	Lateritic gravel, grey/white sand. Dry kwongan.	Aug-Sep	High (recorded)
Leucopogon foliosus	P3	-	P	Shallow gravelly soils over laterite.	Oct-Dec (limited data)	High
Patersonia argyrea	P3	-	P	Grey sand and lateritic gravel.	Sep-Nov	Moderate
Persoonia filiformis	P3	-	P	Yellow or white sand over laterite.	Nov-Dec	Moderate
Persoonia rudis	P3	-	P	White, grey or yellow sand, often over laterite.	Dec-Jan	Moderate
Phlebocarya pilosissima subsp. pilosissima	P3	-	P	White or grey sand, lateritic gravel.	Aug-Oct	High (recorded)
Platysace ramosissima	P3	-	P	Sandy soils.	Oct-Nov	Moderate
Schoenus pennisetis	P3	-	A	Grey or peaty sand in swamps and winter-wet depressions.	Aug-Sep	Moderate
Stackhousia sp. red-blotched corolla (A. Markey 911)	P3	-	P	Granitic soils on slopes.	Sep-Nov	Negligible
Stylidium aceratum	P3	-	A	Sandy soils in swamp heathland.	Oct-Nov	Low
Stylidium hymenocraspedum	P3	-	P	Sand over laterite. Hillslopes. Heath, Banksia and Eucalyptus low open woodland.	Sep-Oct	High (recorded)
Stylidium nonscandens	P3	-	P	Sand over laterite. Hillslopes and crests. Banksia woodland, heath, mallee shrubland.	Sep-Nov	High (recorded)
Stylidium periscelianthum	P3	-	P	Loamy clay, moist soils pockets. Wet flats, low granitic hills.	Sep-Oct	Low
Stylidium torticarpum	P3	-	P	Sandy clay and clay loam over laterite adjacent to creeklines, depressions, and beneath breakaways in heath or mallee shrubland.	Sep-Nov	Moderate
Styphelia filamentosa	P3	-	P	Sand or sand over laterite.	Oct-Dec	Moderate
Styphelia filifolia	P3	-	P	Brown over pale yellow sand.	Feb-Apr	Negligible

Species name	Level of significance WA	EPBC Act	Life strategy	Habitat	Flowering period	Likelihood of occurrence
Styphelia williamsiorum	P3	-	P	White-grey sand, yellow-brown sandy loam, gravel, laterite. Uplands, breakaways.	Oct-Dec	High
Synaphea endothrix	P3	-	P	Gravelly loam, sand. Lateritic rises.	Aug-Sep	High
Tetratheca angulata	P3	-	P	Sandy to gravelly laterite soils. Low hill crests, breakaways with massive laterite boulders.	Sep-Dec	High (recorded)
Thysanotus anceps	P3	-	P	White or grey sand, lateritic gravel, laterite.	Oct-Dec	Moderate
Thysanotus vernalis	P3	-	P	Sandy loam.	Sep-Oct	Moderate
Verticordia amphigia	P3	-	P	Sandy loam, clay & rocky loam. Winter-wet depressions.	Oct-Nov	Negligible
Verticordia fragrans	P3	-	P	White, grey or yellow sand, clay loam. Low-lying areas, sandplains.	Sep-Nov	Moderate
Verticordia insignis subsp. eomagis	P3	-	P	Sandy soils over laterite. Sandplains, rocky rises.	Aug-Nov	Moderate
Verticordia rutilastra	P3	-	P	Sand & lateritic gravel. Hills.	Sep-Nov	Moderate
Asterolasia drummondii	P4	-	P	Lateritic gravel & sand or loam. Lateritic hills & sandplains, breakaways.	Jul-Sep	High
Banksia chamaephyton	P4	-	P	Grey or white sand over laterite.	Oct-Dec	High (recorded)
Banksia elegans	P4	-	P	Yellow, white or red sand. Sandplains, low consolidated dunes.	Oct-Nov	Moderate
Banksia tricuspis	P4	-	P	Lateritic rocky soils. Sides & hilltopes, breakaway edges.	Mar-Jul	Moderate
Calothamnus accedens	P4	-	P	Sandy soils over laterite.	Sep-Jan	Moderate
Calytrix chrysantha	P4	-	P	White, grey or yellow/brown sand. Flats.	Jan-Feb	Negligible
Chordifex chaunocoleus	P4	-	P	Grey, siliceous or peaty sand, well to poorly drained. Drainage lines, depressions.	Sep	High
Conostephium magnum	P4	-	P	White-grey sands sometomes associated with laterite gravels. Sand dunes, swampland, disturbed roadside, drainage channels, open woodland.	Jul-Sep	Moderate
Desmocladus elongatus	P4	-	P	Deep sand over laterite.	Aug-Dec	High (recorded)
Diuris recurva	P4	-	PG	Loam. Winter-wet areas.	Jul-Aug	Moderate
Eucalyptus exilis	P4	-	P	Grey sand, gravelly loam. Lateritic ridges.	Aug-Oct	Nil
Eucalyptus foecunda subsp. foecunda	P4	-	P	Sand over limestone. Outcropping limestone.	Jan-Mar	Low
Eucalyptus macrocarpa subsp. elachantha	P4	-	P	White or grey sand over laterite. Hillslopes, ridges, sandplains.	Aug-Sep or Nov-Dec	Nil
Eucalyptus pendens	P4	-	P	White or grey sand with lateritic gravel. Hillsides, breakaways, sandplains.	Aug-Nov	Nil
Grevillea olivacea	P4	-	P	White or grey sand. Coastal dunes, limestone rocks	Jun-Sep	Negligible
Grevillea rudis	P4	-	P	White, grey, yellow or red sand, often with gravel & over laterite.	Jan or Apr or Jun-Sep or Nov-Dec	High
Grevillea saccata	P4	-	P	Yellow or brown sand, often with lateritic gravel.	Apr or Jun-Nov	Moderate
Hakea neurophylla	P4	-	P	Lateritic sandy soils. Hillsides.	Aug	Moderate
Hemiandra sp. Watheroo (S. Hancocks 4)	P4	-	P	Yellow/grey sand.	Jun or Oct-Dec (limited data)	Moderate
Hibbertia propinqua	P4	-	P	Pale grey to yellow sand and sandy loams, usually over laterite or close to laterite breakaways.	Aug-Sep (limited data)	Negligible
Hypolaena robusta	P4	-	P	White sand. Sandplains	Sep-Oct	High (recorded)
Schoenus griffinianus	P4	-	P	White sand.	Sep-Oct	Moderate
Stylidium aeonioides	P4	-	P	Sandy clay loam over laterite. Hillsides and breakaways. Low heath, open woodland.	Sep-Nov	High (recorded)
Stylidium inversiflorum	P4	-	P	White or grey sand over laterite. Sandplains, hillslopes and gullies. Heath, open woodland.	Sep-Nov	High (recorded)
Stylidium longitubum	P4	-	A	Sandy clay, clay. Seasonal wetlands.	Oct-Dec	Low
Stylidium striatum	P4	-	P	Brown clay over laterite on hill slopes.	Oct-Nov	Low
Thelymitra apiculata	P4	-	PG	Grey sand, lateritic gravel.	May-Jul	High
Thysanotus glaucus	P4	-	P	White, grey or yellow sand, sandy gravel.	Oct-Mar	High

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Tripterococcus sp. Brachylobus (A.S. George 14234)	P4	-	P	Winter-wet areas on grey sand.	Oct-Feb	Moderate
Xanthosia tomentosa	P4	-	P	Lateritic gravelly soils.	Sep-Dec	Moderate

Note: CR=critically endangered, EN=endangered, VU=vulnerable, P1 - P4=priority 1 to priority 4, P=perennial, PG=perennial geophyte, A=annual.

Appendix C

Conservation Significant Communities and Likelihood of Occurrence Assessment

Code	Community name	TEC/ PEC	Level of significance		Likelihood of occurrence
			State	EPBC Act	
SCP07	Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. 1994)	TEC	EN	CR	Nil
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	TEC/ PEC	P3	CR	Nil
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	TEC	CR	EN	Nil
Lesueur-Coomallo A1.2	Lesueur-Coomallo floristic community A1.2 as originally described by Griffin and Hopkins (1990)	TEC	CR	-	Nil
Lesueur-Coomallo D1	Lesueur-Coomallo floristic community D1 as originally described by Griffin and Hopkins (1990)	TEC	CR	-	Nil
Lesueur-Coomallo DFGH	Lesueur-Coomallo Floristic Community DFGH	PEC	P1	-	Nil
Lesueur-Coomallo M2	Lesueur-Coomallo Floristic Community M2 (*Melaleuca preissiana* woodland)	PEC	P1	-	Nil
Gp200-170	*Petrophile chrysantha* low heath on Lesueur dissected uplands (Gp200-170)	PEC	P2	-	Nil

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P1 - P4=priority 1 to priority 4.

Appendix D

Species List

Family	Status	Species
Amaranthaceae		*Ptilotus manglesii*
		Ptilotus polystachyus
Anarthriaceae		*Anarthria humilis*
		Lyginia barbata
	P2	*Lyginia excelsa*
		Lyginia imberbis
Apiaceae		*Xanthosia huegelii*
Araliaceae		*Trachymene pilosa*
Asparagaceae		*Chamaescilla sp.*
		Dichopogon capillipes
		Laxmannia omnifertilis
		Laxmannia ramosa subsp. ramosa
		Lomandra ?preissii
		Lomandra ?suaveolens
		Lomandra caespitosa
		Lomandra hastilis
		Lomandra preissii
		Lomandra sericea
		Sowerbaea laxiflora
		Thysanotus arbuscula
		Thysanotus asper
		Thysanotus patersonii
		Thysanotus sp.
		Thysanotus thyrsoideus
		Thysanotus triandrus
Asteraceae	*	*Arctotheca calendula*
		Asteraceae sp.
	*	*Hypochaeris glabra*
		Lagenophora huegelii
		Olearia muricata
		Podotheca ?gnaphalioides
		Podotheca angustifolia
		Pterochaeta paniculata
		Rhodanthe manglesii
		Rhodanthe sp.
		Siemssenia capillaris
		Siloxerus sp.
	*	*Ursinia anthemoides*
		Waitzia acuminata
		Waitzia suaveolens var. suaveolens
Boraginaceae	*DP	*Echium plantagineum*
Brassicaceae	*	*Brassicaceae sp.*
Campanulaceae		*Lobelia cleistogamoides*
Casuarinaceae		*Allocasuarina campestris*
		Allocasuarina humilis
		Allocasuarina microstachya
Celastraceae		*Stackhousia ?monogyna*
		Tripterococcus brunonis

Colchicaceae		*Burchardia congesta*
Crassulaceae		*Crassula colorata*
		Crassula thunbergiana
Cupressaceae		*Callitris acuminata*
Cyperaceae		*Caustis dioica*
		Chaetospora curvifolia
		Isolepis cernua var. setiformis
		Lepidosperma sp. 1
		Lepidosperma sp. 2
		Lepidosperma sp. 3
		Lepidosperma sp. 4
		Lepidosperma sp. 5
		Lepidosperma sp. 6
		Lepidosperma sp. 7
		Lepidosperma sp. 8
		Mesomelaena pseudostygia
		Mesomelaena tetragona
		Morelotia octandra
		Schoenus ?clandestinus
		Schoenus brevisetis
		Schoenus caespititius
	P4	*Schoenus griffinianus*
		Schoenus obtusifolius
		Schoenus pleiostemoneus
		Schoenus sp.
		Schoenus subbarbatus
		Schoenus subflavus subsp. hispid culms (K.R. Newbey 8278)
		Schoenus unispiculatus
Dasypogonaceae		*Calectasia hispida*
		Calectasia narragara
		Dasypogon obliquifolius
		Kingia australis
Dilleniaceae		*Hibbertia acerosa*
		Hibbertia crassiflora
		Hibbertia hypericoides
		Hibbertia mylnei
		Hibbertia pubens
		Hibbertia sericosepala
		Hibbertia striata
		Hibbertia subvaginata
Dioscoreaceae		*Dioscorea hastifolia*
Droseraceae		*Drosera ?drummondii*
		Drosera ?eneabba
		Drosera ?erythrorhiza
		Drosera ?porrecta
		Drosera barbigera
		Drosera drummondii
		Drosera eneabba
		Drosera menziesii

	P3	*Drosera prophylla*
		Drosera sp. 1
		Drosera sp. 2
		Drosera thysanosepala
Ecdeiocoleaceae		*Ecdeiocolea monostachya*
		Georgeantha hexandra
Elaeocarpaceae		*Tetratheca ?confertifolia*
	P3	*Tetratheca angulata*
Ericaceae		*Andersonia heterophylla*
		Andersonia lehmanniana
		Conostephium pendulum
		Ericaceae sp. 1
		Ericaceae sp. 2
		Leucopogon oldfieldii
	P3	*Leucopogon plumuliflorus*
		Leucopogon sp.
		Lysinema ciliatum
		Styphelia conostephioides
		Styphelia crassiflora
		Styphelia kingiana
		Styphelia serratifolia
		Styphelia sp. 1
		Styphelia sp. 2
		Styphelia sp. 3
		Styphelia sp. 4
		Styphelia xerophylla
Euphorbiaceae		*Monotaxis grandiflora*
Fabaceae		*Acacia ?cyclops*
		Acacia ?latior
		Acacia ?moirii subsp. recurvistipula
		Acacia acuminata
		Acacia alata var. tetrantha
		Acacia applanata
		Acacia auronitens
		Acacia cyclops
		Acacia incrassata
		Acacia lasiocarpa var. lasiocarpa
		Acacia multispicata
		Acacia obovata
		Acacia pulchella var. reflexa
		Acacia retrorsa
		Acacia saligna
		Acacia sphacelata subsp. verticillata
		Acacia stenoptera
		Aotus procumbens
		Bossiaea eriocarpa
		Chamaecytisus palmensis
		Chorizema aciculare subsp. Laxum
		Daviesia chapmanii

		Daviesia daphnoides
		Daviesia decurrens subsp. decurrens
		Daviesia epiphyllum
		Daviesia nudiflora subsp. nudiflora
		Daviesia pedunculata
		Daviesia podophylla
		Fabaceae sp.
		Gastrolobium ?oxylobioides
		Gastrolobium axillare
		Gastrolobium ilicifolia
		Gastrolobium linearifolium
		Gastrolobium oxylobioides
		Gastrolobium plicatum
		Gastrolobium polystachyum
		Gastrolobium spinosum
		Gompholobium aristatum
		Gompholobium knightianum
		Gompholobium tomentosum
		Hovea stricta
		Isotropis cuneifolia subsp. cuneifolia
		Jacksonia ?sternbergiana
		Jacksonia angulata
		Jacksonia calcicola
		Jacksonia floribunda
		Jacksonia lehmannii
		Jacksonia sp.
		Kennedia prostrata
		Labichea punctata
		Mirbelia spinosa
		Sphaerolobium drummondii
		Sphaerolobium medium
		Sphaerolobium pulchellum
	*	*Trifolium arvense*
Geraniaceae	*	*Pelargonium capitatum*
Goodeniaceae		*?Goodeniaceae sp.*
		Dampiera ?lavandulacea
		Dampiera ?spicigera
		Dampiera alata
		Dampiera haemotricha subsp. dura
		Dampiera spicigera
		Goodenia affinis
		Goodenia coerulea
		Goodenia micrantha
		Goodenia reinwardtii
		Goodenia sp.
		Goodenia sp. 2
		Goodeniaceae sp. 1
		Goodeniaceae sp. 2
		Lechenaultia biloba

		Lechenaultia floribunda
		Lechenaultia stenosepala
		Scaevola anchusifolia
		Scaevola canescens
		Scaevola glandulifera
Gyrostemonaceae		*Tersonia cyathiflora*
Haemodoraceae		*Anigozanthos humilis subsp. humilis*
		Blancoa canescens
		Conostylis aculeata subsp. breviflora
		Conostylis androstemma
		Conostylis angustifolia
		Conostylis crassinerva subsp. absens
		Conostylis juncea
		Conostylis teretifolia subsp. teretifolia
		Haemodorum ?simplex
		Haemodorum simplex
		Haemodorum simulans
		Haemodorum sp. 1
		Macropidia fuliginosa
		Phlebocarya filifolia
	P3	*Phlebocarya pilosissima subsp. pilosissima*
Haloragaceae		*Glischrocaryon aureum*
		Gonocarpus pithyoides
Hemerocallidaceae		*Arnocrinum preissii*
		Caesia micrantha
		Dianella revoluta
	P3	*Hensmania stoniella*
		Johnsonia pubescens subsp. pubescens
		Tricoryne elatior
Iridaceae		*Patersonia ?drummondii*
		Patersonia occidentalis var. latifolia
	*	*Romulea rosea*
Lamiaceae		*Hemiandra pungens*
		Hemiandra scabra
		Hemiphora bartlingii
		Physopsis spicata
		Quoya verbascina
Lauraceae		*Cassytha glabella*
		Cassytha pomiformis
		Cassytha racemosa
		Cassytha sp.
Loganiaceae		*Phyllangium divergens*
		Phyllangium paradoxum
Loranthaceae		*Nuytsia floribunda*
Malvaceae		*Lasiopetalum drummondii*
		Thomasia foliosa
		Thomasia grandiflora
Molluginaceae		*Macarthuria ?apetala*
		Macarthuria apetala

		Macarthuria australis
Myrtaceae		*?Baeckea sp. 1*
		?Baeckea sp. 2
		?Baeckea sp. 3
		?Leptospermopsis oligandrum
		Apectospermum spinescens
		Babingtonia camphorosmae
		Babingtonia grandiflora
	P3	*Beaufortia bicolor*
		Calothamnus longissimus
		Calothamnus sp. 1
		Calothamnus sp. 2
		Calothamnus sp. 3
		Calothamnus sp. 4
		Calytrix ?angulata
		Calytrix aurea
		Calytrix sp.
		Calytrix sp. 1
		Calytrix sp. 2
		Calytrix sp. 3
		Chamelaucium uncinatum
		Corymbia calophylla
		Darwinia ?helichrysoides
		Darwinia neildiana
		Darwinia sanguinea
		Darwinia speciosa
		Eremaea ?asterocarpa
		Eremaea asterocarpa
		Eremaea beaufortioides
		Eremaea fimbriata
		Eremaea pauciflora
		Eremaea sp. 1
		Eremaea sp. 2
	*	*Eucalyptus ?camaldulensis*
	*	*Eucalyptus ?leucoxylon var. rosea*
		Eucalyptus accedens
	*	*Eucalyptus botryoides*
	*	*Eucalyptus camaldulensis*
		Eucalyptus drummondii
		Eucalyptus gittinsii subsp. illucida
	Pl	*Eucalyptus gomphocephala*
		Eucalyptus lane-poolei
		Eucalyptus opimiflora
	*	*Eucalyptus sp. 1*
	*	*Eucalyptus sp. 2*
		?Eucalyptus sp. 3
		Eucalyptus todtiana
	P4	*Eucalyptus xcarnabyi*
	P2	*Hypocalymma serrulatum*

	Hypocalymma xanthopetalum
	Kunzea ?micrantha
	Leptospermum erubescens
	Melaleuca ?urceolaris
	Melaleuca platycalyx
	Melaleuca radula
	Melaleuca sp. 1
	Melaleuca sp. 10
	Melaleuca sp. 2
	Melaleuca sp. 3
	Melaleuca sp. 4
	Melaleuca sp. 5
	Melaleuca sp. 6
	Melaleuca sp. 7
	Melaleuca sp. 9
	Myrtaceae sp.
	Myrtaceae sp. 1
	Myrtaceae sp. 2
	Myrtaceae sp. 3
	Pileanthus sp.
	Regelia ciliata
	Scholtzia ?parviflora
	Scholtzia involucrata
	Scholtzia sp.
	Verticordia chrysanthella
	Verticordia densiflora
	Verticordia grandis
	Verticordia nobilis
	Verticordia ovalifolia
	Verticordia sp. 1
	Verticordia sp. 2
	Verticordia sp. 3 (sterile)
	Verticordia sp. 4
	Verticordia sp. 5
Olacaceae	*Olax benthamiana*
Orchidaceae	*Caladenia discoidea*
	Caladenia flava
	Caladenia sp. 1
	Caladenia sp. 2
	Caladenia sp. 3
	Diuris corymbosa
	Diuris setacea
	Drakaea livida
	Elythranthera brunonis
	Orchidaceae sp. 1
	Orchidaceae sp. 2
	Paracaleana nigrita
	Prasophyllum elatum
	Pterostylis ?vittata

		Pterostylis sp.
		Pyrorchis nigricans
		Thelymitra campanulata
Orobanchaceae	*	*Orobanche minor*
Poaceae		*?Amphipogon sp. 1 (sterile)*
		?Amphipogon sp. 2 (sterile)
	*	*Aira sp.*
		Amphipogon ?caricinus var. caricinus
		Amphipogon ?turbinatus
		Amphipogon sp. (hairy)
		Aristida sp.
		Austrostipa ?elegantissima (sterile)
		Austrostipa anaiwaniorum
		Austrostipa elegantissima
		Austrostipa hemipogon
		Austrostipa macalpinei
	P3	*Austrostipa nunaginensis*
		Austrostipa sp. (sterile)
	*	*Briza maxima*
	*	*Bromus sp.*
	*	*Chloris sp.*
	*	*Ehrharta calycina*
		Neurachne alopecuroidea
	*	*Pentameris ?airoides subsp. airoides*
		Poaceae sp. 1 (sterile)
	*	*Poaceae sp. 2 (sterile)*
		Rytidosperma sp. 1
		Rytidosperma sp. 2 (hairy)
		Themeda triandra
	*	*Vulpia sp.*
Polygalaceae		*Comesperma acerosum*
		Comesperma calymega
Proteaceae		*?Persoonia quinquenervis*
		Adenanthos cygnorum subsp. cygnorum
		Banksia ?stenoprion
		Banksia armata var. armata
		Banksia attenuata
		Banksia bipinnatifida subsp. multifida
		Banksia candolleana
		Banksia carlinoides
	P4	*Banksia chamaephyton*
		Banksia glaucifolia
		Banksia grossa
		Banksia incana var. incana
		Banksia kippistiana var. kippistiana
	P3	*Banksia kippistiana var. paenepeccata*
	P3	*Banksia nana*
		Banksia platycarpa
		Banksia prionotes

	Banksia shuttleworthiana
	Banksia sphaerocarpa var. sphaerocarpa
	Banksia stenoprion
	Banksia tortifolia
	Banksia tridentata
	Conospermum ?crassinervium
	Conospermum acerosum subsp. acerosum
	Conospermum crassinervium
	Conospermum incurvum
	Conospermum nervosum
	Conospermum wycherleyi subsp. glabrum
	Grevillea synapheae subsp. pachyphylla
	Hakea ?incrassata
	Hakea auriculata
	Hakea eneabba
	Hakea flabellifolia
	Hakea incrassata
	Hakea lissocarpha
	Hakea neospathulata
	Hakea neospathulata
	Hakea obliqua
	Hakea prostrata
	Hakea psilorrhyncha
	Hakea smilacifolia
	Hakea trifurcata
	Isopogon adenanthoides
	Isopogon asper
	Isopogon inconspicuus
	Isopogon linearis
	Lambertia multiflora var. multiflora
	Persoonia ?quinquenervis
	Persoonia comata
	Persoonia rufiflora
	Persoonia trinervis
	Petrophile ?pilostyla subsp. austrina
	Petrophile chrysantha
	Petrophile linearis
	Petrophile macrostachya
	Petrophile rigida
	Petrophile serruriae
	Petrophile shuttleworthiana
	Petrophile striata
	Proteaceae sp.
	Stirlingia latifolia
	Strangea cynanchicarpa
	Synaphea aephynsa
	Synaphea spinulosa subsp. spinulosa
P2	*Synaphea xela*
Pteridaceae	*Cheilanthes sp.*

Restionaceae		*Alexgeorgea nitens*
		Alexgeorgea subterranea
		Chordifex microcodon
	P2	*Chordifex reseminans*
		Chordifex sinuosus
		Chordifex stenandrus
	P4	*Desmocladus elongatus*
		Desmocladus fasciculatus
		Desmocladus flexuosus
		Desmocladus virgatus
	P4	*Hypolaena robusta*
		Lepidobolus preissianus
	P3	*Lepidobolus quadratus*
Rhamnaceae		*Cryptandra pungens*
		Cryptandra sp. 1
		Cryptandra sp. 2
		Cryptandra sp. 3
		Cryptandra sp. 4
		Cryptandra sp. 5
		Stenanthemum limitatum
		Stenanthemum notiale subsp. notiale
		Stenanthemum reissekii
		Trymalium daphnifolium
Rubiaceae		*Opercularia vaginata*
Rutaceae		*Boronia ?crassifolia*
		Cyanothamnus ramosus subsp. anethifolius
		Cyanothamnus sp.
		Diplolaena ferruginea
		Philotheca pinoides
		Philotheca spicata
		Rutaceae sp.
Santalaceae		*Leptomeria pauciflora*
		Santalum acuminatum
Sapindaceae		*Dodonaea ericoides*
Scrophulariaceae		*Eremophila sp.*
Stylidiaceae		*Levenhookia ?stipitata*
		Levenhookia murfetii
		Levenhookia pauciflora
		Levenhookia pusilla
		Stylidium ?kalbarriense/rigidulum
		Stylidium ?miniatum
		Stylidium ?repens
	P4	*Stylidium aeonioides*
		Stylidium bicolor
		Stylidium caricifolium
		Stylidium crossocephalum
		Stylidium cygnorum
	P3	*Stylidium hymenocraspedum*
	P4	*Stylidium inversiflorum*

		Stylidium miniatum
	P3	*Stylidium nonscandens*
		Stylidium repens
		Stylidium scariosum
		Stylidium schoenoides
Thymelaeaceae		*Pimelea ?floribunda*
		Pimelea angustifolia
		Pimelea imbricata var. piligera
		Pimelea sulphurea
Xanthorrhoeaceae		*Xanthorrhoea preissii*
		Xanthorrhoea sp. 1
		Xanthorrhoea sp. 2
		Xanthorrhoea sp. 3

*=non-native, Pl=planted, DP=declared pest, P1-P4=priority 1 to priority 4

Appendix E

Conservation Significant Flora Species Records

Species	**Conservation status**	**Easting**	**Northing**
Chordifex reseminans	P2	345110.33	6635659.67
Chordifex reseminans	P2	346196.71	6636079.28
Chordifex reseminans	P2	346807.00	6636149.97
Chordifex reseminans	P2	345972.64	6636294.28
Chordifex reseminans	P2	345809.60	6636684.29
Hypocalymma serrulatum	P2	346084.26	6636297.85
Leucopogon plumuliflorus	P2	347462.53	6638580.20
Leucopogon plumuliflorus	P2	348091.95	6638826.46
Leucopogon plumuliflorus	P2	348037.79	6639029.01
Leucopogon plumuliflorus	P2	348007.73	6638999.99
Lyginia excelsa	P2	345011.92	6641601.06
Lyginia excelsa	P2	345759.83	6636744.45
Synaphea xela	P2	337337.85	6643573.97
Austrostipa nunaginensis	P3	347943.45	6636604.25
Austrostipa nunaginensis	P3	347817.34	6636516.79
Banksia kippistiana var. paenepeccata	P3	346876.12	6636195.62
Banksia kippistiana var. paenepeccata	P3	347704.98	6638578.05
Banksia kippistiana var. paenepeccata	P3	348138.23	6639153.58
Banksia kippistiana var. paenepeccata	P3	348132.10	6639248.83
Banksia kippistiana var. paenepeccata	P3	347798.45	6638795.09
Banksia kippistiana var. paenepeccata	P3	344779.88	6635597.64
Banksia kippistiana var. paenepeccata	P3	348238.64	6637923.03
Banksia kippistiana var. paenepeccata	P3	348078.85	6638339.28
Banksia kippistiana var. paenepeccata	P3	347776.42	6639070.81
Banksia kippistiana var. paenepeccata	P3	348174.20	6638752.78
Banksia kippistiana var. paenepeccata	P3	348001.40	6638565.23
Banksia kippistiana var. paenepeccata	P3	348128.81	6639002.35
Banksia kippistiana var. paenepeccata	P3	343601.15	6644200.71
Banksia nana	P3	348039.63	6638401.81
Banksia nana	P3	340350.82	6641657.26
Banksia nana	P3	348238.64	6637923.03
Banksia nana	P3	348078.85	6638339.28
Banksia nana	P3	347828.28	6638256.30
Banksia nana	P3	347828.32	6638865.12
Banksia nana	P3	344262.33	6635388.03
Banksia nana	P3	343601.15	6644200.71
Banksia nana	P3	341121.61	6641617.28
Beaufortia bicolor	P3	345862.40	6635861.03
Beaufortia bicolor	P3	346132.54	6637681.27
Beaufortia bicolor	P3	347776.42	6639070.81
Beaufortia bicolor	P3	345837.36	6635851.07
Beaufortia bicolor	P3	339514.01	6641759.54
Beaufortia bicolor	P3	339328.52	6641779.82
Beaufortia bicolor	P3	339209.37	6641794.58
Beaufortia bicolor	P3	342410.15	6641631.91
Beaufortia bicolor	P3	347276.13	6641566.68

Beaufortia bicolor	P3	347590.19	6641600.05
Drosera prophylla	P3	348263.12	6638124.79
Drosera prophylla	P3	347776.42	6639070.81
Hensmania stoniella	P3	341355.22	6635273.28
Hensmania stoniella	P3	342298.70	6641620.55
Hensmania stoniella	P3	345972.64	6636294.28
Hensmania stoniella	P3	345809.60	6636684.29
Hensmania stoniella	P3	346287.84	6637001.91
Hensmania stoniella	P3	340348.94	6641657.53
Hensmania stoniella	P3	353187.04	6642031.71
Lepidobolus quadratus	P3	347230.48	6641596.91
Lepidobolus quadratus	P3	348238.64	6637923.03
Lepidobolus quadratus	P3	347828.28	6638256.30
Lepidobolus quadratus	P3	347776.42	6639070.81
Lepidobolus quadratus	P3	347365.45	6641597.09
Phlebocarya pilosissima subsp. pilosissima	P3	343352.32	6635294.48
Phlebocarya pilosissima subsp. pilosissima	P3	346168.87	6636844.91
Phlebocarya pilosissima subsp. pilosissima	P3	346133.24	6636448.87
Stylidium hymenocraspedum	P3	346153.76	6636452.60
Stylidium hymenocraspedum	P3	346160.47	6636402.10
Stylidium nonscandens	P3	347828.28	6638256.30
Tetratheca angulata	P3	348107.04	6638998.83
Tetratheca angulata	P3	348025.34	6638075.91
Tetratheca angulata	P3	348128.81	6639002.35
Banksia chamaephyton	P4	346807.00	6636149.97
Banksia chamaephyton	P4	340350.82	6641657.26
Banksia chamaephyton	P4	343642.47	6635288.28
Banksia chamaephyton	P4	341121.37	6641617.45
Banksia chamaephyton	P4	341117.61	6641618.88
Banksia chamaephyton	P4	340999.68	6641615.69
Desmocladus elongatus	P4	343213.55	6641614.91
Desmocladus elongatus	P4	347389.67	6641564.89
Desmocladus elongatus	P4	347616.84	6641573.61
Eucalyptus x carnabyi	P4	346024.99	6637029.23
Hypolaena robusta	P4	345734.64	6636453.53
Hypolaena robusta	P4	346273.91	6637654.89
Schoenus griffinianus	P4	345809.60	6636684.29
Stylidium aeonioides	P4	348196.68	6638843.22
Stylidium aeonioides	P4	347828.28	6638256.30
Stylidium aeonioides	P4	347776.42	6639070.81
Stylidium inversiflorum	P4	346178.99	6636224.92

Note: P2-P4=priority 1 to priority 4

Appendix F

Sample Data

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q1

Project no.: EP23-085
Date: 18/09/2023
Author: SCM,MS
Status Permanent
Q1: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	345972.6374	NW corner northing:	6636294.276
Altitude (m):	231	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	no evidence	Disturbance:	no evidence -
Soil type/texture	sand/	Bare ground (%):	25
Rocks (%) and type:	No rocks	Soil colour:	grey/yellow
Litter:	5% (leaves,twigs,branches)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q1

Project no.: EP23-085
Date: 18/09/2023 **Status** Permanent
Author: SCM,MS Q1: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Apectospermum spinescens	0.1
	Acacia stenoptera	2
	Adenanthos cygnorum subsp. cygnorum	2
	Alexgeorgea nitens	1
	Allocasuarina humilis	1
	Amphipogon ?turbinatus	0.5
*	*Arctotheca calendula*	0.1
	Banksia attenuata	20
	Burchardia congesta	0.1
	Caladenia sp. 2	0.1
	Cassytha sp.	0.1
	Chordifex microcodon	1
P2	*Chordifex reseminans*	0.5
	Chordifex sinuosus	2
	Conospermum crassinervium	1
	Conostylis angustifolia	opp
	Conostylis crassinerva subsp. absens	0.1
	Cyanothamnus ramosus subsp. anethifolius	0.1
	Dampiera haemotricha subsp. dura	0.1
	Dasypogon obliquifolius	1
	Daviesia podophylla	5
	Drosera ?eneabba	0.1
	Drosera ?erythrorhiza	0.1
	Drosera thysanosepala	0.1
	Eremaea asterocarpa	1
	Haemodorum ?simplex	0.1
P3	*Hensmania stoniella*	0.1
	Hibbertia hypericoides	0.5
	Hibbertia pubens	opp
	Hovea stricta	0.1
	Hypocalymma xanthopetalum	2
*	*Hypochaeris glabra*	0.1
	Johnsonia pubescens subsp. pubescens	0.5
	Lepidosperma sp. 4	1
	Leucopogon oldfieldii	0.5
	Levenhookia ?stipitata	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q1

Project no.: EP23-085
Date: 18/09/2023 **Status** Permanent
Author: SCM,MS Q1: Page 3 of 3

	Lomandra caespitosa	0.1
	Lomandra sericea	opp
	Lyginia barbata	0.5
	Lysinema ciliatum	0.1
	Melaleuca sp. 7	2
	Mesomelaena pseudostygia	1
	Neurachne alopecuroidea	0.1
	Persoonia comata	0.5
	Petrophile linearis	0.1
	Petrophile rigida	0.5
	Podotheca angustifolia	0.1
	Schoenus brevisetis	0.5
	Schoenus caespititius	0.5
	Schoenus pleiostemoneus	0.1
	Stirlingia latifolia	2
	Stylidium ?repens	1
	Styphelia kingiana	0.5
	Styphelia xerophylla	0.5
	Synaphea spinulosa subsp. spinulosa	0.1
	Trachymene pilosa	0.1
*	*Ursinia anthemoides*	0.1
	Verticordia sp. 5	0.1

Vegetation Sample Data

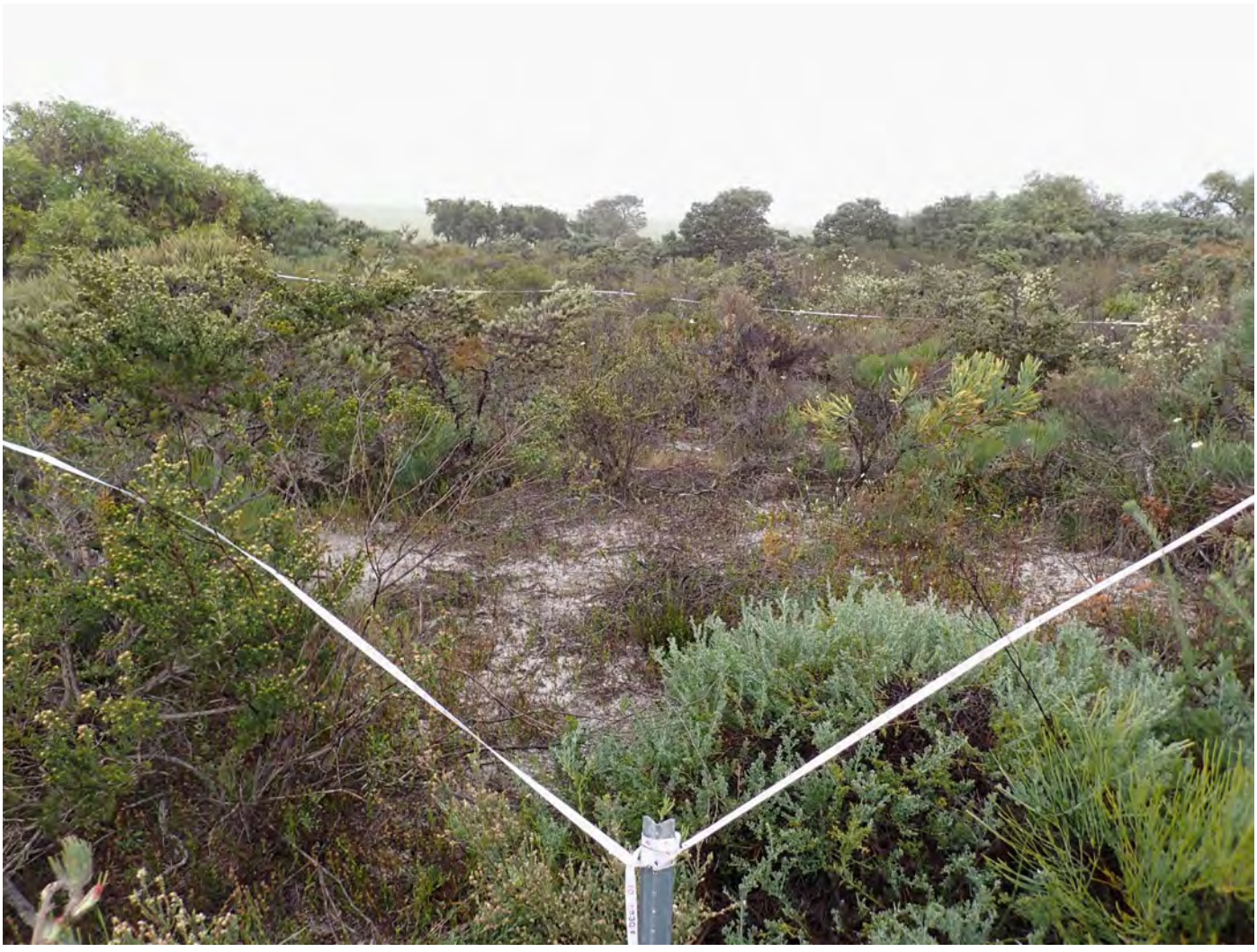
Parron Wind Farm Development Support

Sample Name: Q2

Project no.: EP23-085
Date: 19/09/2023 **Status** Permanent
Author: SCM,MS Q2: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	346287.8423	NW corner northing:	6637001.909
Altitude (m):	237	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	mid-slope
Time since fire:	no evidence	Disturbance:	low - weds
Soil type/texture	sand/	Bare ground (%):	25
Rocks (%) and type:	No rocks	Soil colour:	grey/yellow
Litter:	10% (branches,leaves,twigs)	Vegetation condition:	excellent



Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q2

Project no.: EP23-085
Date: 19/09/2023 **Status** Permanent
Author: SCM,MS Q2: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Apectospermum spinescens	1
	?Amphipogon sp. 2 (sterile)	0.1
	Adenanthos cygnorum subsp. cygnorum	5
	Alexgeorgea subterranea	5
	Allocasuarina humilis	3
	Banksia attenuata	2
	Banksia candolleana	5
	Burchardia congesta	0.1
	Caladenia flava	0.1
	Callitris acuminata	2
	Calytrix sp.	0.1
	Cassytha sp.	0.1
	Chaetospora curvifolia	opp
	Chordifex sinuosus	0.1
	Conospermum crassinervium	0.1
	Conostephium pendulum	1
	Conostylis angustifolia	opp
	Conostylis crassinerva subsp. absens	0.1
	Crassula colorata	0.1
	Cyanothamnus ramosus subsp. anethifolius	0.1
	Dampiera haemotricha subsp. dura	0.1
	Darwinia speciosa	opp
	Daviesia podophylla	2
	Drosera ?eneabba	0.1
	Drosera ?erythrorhiza	0.1
	Drosera thysanosepala	0.1
*	*Ehrharta calycina*	0.1
	Elythranthera brunonis	opp
	Eremaea asterocarpa	3
	Eremaea pauciflora	1
	Eremaea sp. 2	2
	Haemodorum ?simplex	0.1
P3	*Hensmania stoniella*	0.1
	Hibbertia hypericoides	0.1
	Hovea stricta	0.1
	Hypocalymma xanthopetalum	10

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q2

Project no.: EP23-085
Date: 19/09/2023 **Status** Permanent
Author: SCM,MS Q2: Page 3 of 3

*	*Hypochaeris glabra*	0.1
	Jacksonia floribunda	opp
	Levenhookia murfetii	0.1
	Lomandra ?suaveolens	0.1
	Lomandra caespitosa	0.1
	Macarthuria apetala	opp
	Melaleuca sp. 3	0.1
	Mesomelaena pseudostygia	1
	Neurachne alopecuroidea	0.1
*	*Pentameris ?airoides subsp. airoides*	0.1
	Persoonia comata	1
	Petrophile linearis	0.1
	Petrophile rigida	0.1
	Phlebocarya filifolia	0.1
	Podotheca ?gnaphalioides	0.1
	Pterostylis ?vittata	0.1
	Pyrorchis nigricans	opp
	Schoenus brevisetis	0.1
	Schoenus caespititius	0.1
	Schoenus pleiostemoneus	0.1
	Stirlingia latifolia	5
	Stylidium ?repens	opp
	Stylidium bicolor	0.1
	Styphelia crassiflora	2
	Styphelia kingiana	2
	Styphelia xerophylla	opp
	Trachymene pilosa	0.1
*	*Ursinia anthemoides*	0.1
	Verticordia sp. 5	0.1
*	*Vulpia sp.*	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q3

Project no.: EP23-085
Date: 19/09/2023 **Status** Permanent
Author: MS,TDP Q3: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	345809.5994	NW corner northing:	6636684.294
Altitude (m):	249	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	no evidence -
Soil type/texture	sand/	Bare ground (%):	30
Rocks (%) and type:	No rocks	Soil colour:	white/brown
Litter:	5% (branches,leaves,twigs)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q3

Project no.: EP23-085
Date: 19/09/2023 **Status** Permanent
Author: MS,TDP Q3: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Apectospermum spinescens	1
	Acacia stenoptera	0.1
	Adenanthos cygnorum subsp. cygnorum	3
	Alexgeorgea nitens	1
	Alexgeorgea subterranea	1
	Andersonia heterophylla	0.1
	Banksia attenuata	25
	Banksia candolleana	15
	Blancoa canescens	0.1
	Burchardia congesta	0.1
	Callitris acuminata	0.1
	Cassytha sp.	opp
P2	*Chordifex reseminans*	1
	Chordifex sinuosus	0.1
	Conospermum crassinervium	0.1
	Conostephium pendulum	0.1
	Conostylis angustifolia	0.1
	Conostylis crassinerva subsp. absens	0.1
	Conostylis teretifolia subsp. teretifolia	0.1
	Cyanothamnus ramosus subsp. anethifolius	0.1
	Dampiera haemotricha subsp. dura	0.1
	Daviesia pedunculata	opp
	Daviesia podophylla	0.1
	Drosera ?eneabba	0
	Drosera ?erythrorhiza	0.1
	Eremaea asterocarpa	2
	Eremaea pauciflora	20
P3	*Hensmania stoniella*	0.1
	Hibbertia hypericoides	1
	Hibbertia pubens	0.1
	Hypocalymma xanthopetalum	1
	Jacksonia floribunda	1
	Lepidosperma sp. 8	0.1
	Leucopogon oldfieldii	1
	Lyginia barbata	0.1
	Mesomelaena pseudostygia	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q3

Project no.: EP23-085
Date: 19/09/2023 **Status** Permanent
Author: MS,TDP Q3: Page 3 of 3

	Persoonia comata	0.1
	Petrophile linearis	0.1
	Petrophile rigida	0.1
	Phlebocarya filifolia	0.1
	Physopsis spicata	1
	Pimelea angustifolia	0.1
P4	*Schoenus griffinianus*	0.1
	Stirlingia latifolia	1
	Stylidium bicolor	0.1
	Styphelia xerophylla	0.1
	Synaphea spinulosa subsp. spinulosa	1
	Thysanotus patersonii	0.1
	Tricoryne elatior	0.1
	Verticordia sp. 5	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q4

Project no.: EP23-085
Date: 20/09/2023 **Status** Permanent
Author: SCM,MS Q4: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	348238.6355	NW corner northing:	6637923.026
Altitude (m):	253	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	no evidence -
Soil type/texture	silt/	Bare ground (%):	15
Rocks (%) and type:	2%, laterite	Soil colour:	grey/
Litter:	2% (leaves,twigs,)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q4

Project no.: EP23-085
Date: 20/09/2023 **Status** Permanent
Author: SCM,MS Q4: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Apectospermum spinescens	0.1
	Acacia sphacelata subsp. verticillata	0.1
	Acacia stenoptera	0.1
	Allocasuarina humilis	5
	Andersonia lehmanniana	0.1
	Babingtonia grandiflora	0.5
	Banksia glaucifolia	2
P3	*Banksia kippistiana var. paenepeccata*	2
P3	*Banksia nana*	1
	Banksia sphaerocarpa var. sphaerocarpa	10
	Banksia stenoprion	2
	Calectasia hispida	0.5
	Calothamnus longissimus	2
	Calothamnus sp. 4	2
	Cassytha sp.	0.5
	Caustis dioica	0.5
	Comesperma acerosum	0.1
	Conospermum nervosum	0.1
	Conostylis crassinerva subsp. absens	0.1
	Conostylis teretifolia subsp. teretifolia	0.5
	Dampiera alata	0.1
	Dampiera spicigera	0.1
	Daviesia chapmanii	0.1
	Daviesia decurrens subsp. decurrens	0.5
	Desmocladus flexuosus	0.1
	Drosera ?erythrorhiza	0.1
	Elythranthera brunonis	0.1
	Ericaceae sp. 2	0.1
	Gastrolobium plicatum	1
	Glischrocaryon aureum	0.1
	Gompholobium knightianum	0.1
	Goodenia coerulea	0.1
	Haemodorum sp. 1	0.1
	Hakea incrassata	1
	Hakea neospathulata	2
	Hakea smilacifolia	0.5

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q4

Project no.: EP23-085
Date: 20/09/2023 **Status** Permanent
Author: SCM,MS Q4: Page 3 of 3

	Hibbertia crassiflora	0.1
	Hibbertia hypericoides	5
	Hibbertia mylnei	0.1
	Hypocalymma xanthopetalum	0.5
*	*Hypochaeris glabra*	0.1
	Isopogon adenanthoides	opp
	Jacksonia lehmannii	0.1
	Labichea punctata	0.1
	Lambertia multiflora var. multiflora	10
	Lasiopetalum drummondii	0.1
P3	*Lepidobolus quadratus*	0.1
	Lepidosperma sp. 1	0.1
	Lepidosperma sp. 4	0.1
	Leucopogon oldfieldii	0.5
	Lomandra caespitosa	0.1
	Lomandra sericea	0.1
	Macropidia fuliginosa	opp
	Melaleuca sp. 1	0.1
	Melaleuca sp. 3	15
	Mesomelaena pseudostygia	2
	Mesomelaena tetragona	5
	Morelotia octandra	1
	Neurachne alopecuroidea	0.1
	Petrophile ?pilostyla subsp. austrina	1
	Petrophile shuttleworthiana	2
	Philotheca spicata	opp
	Pimelea sulphurea	0.1
	Podotheca ?gnaphalioides	0.1
	Proteaceae sp.	opp
	Schoenus brevisetis	0.1
	Schoenus pleiostemoneus	0.1
	Stylidium ?repens	0.1
	Stylidium bicolor	0.1
	Stylidium cygnorum	0.1
	Synaphea aephynsa	0.1
	Trachymene pilosa	opp
*	*Ursinia anthemoides*	0.1
	Xanthorrhoea sp. 3	10

Vegetation Sample Data

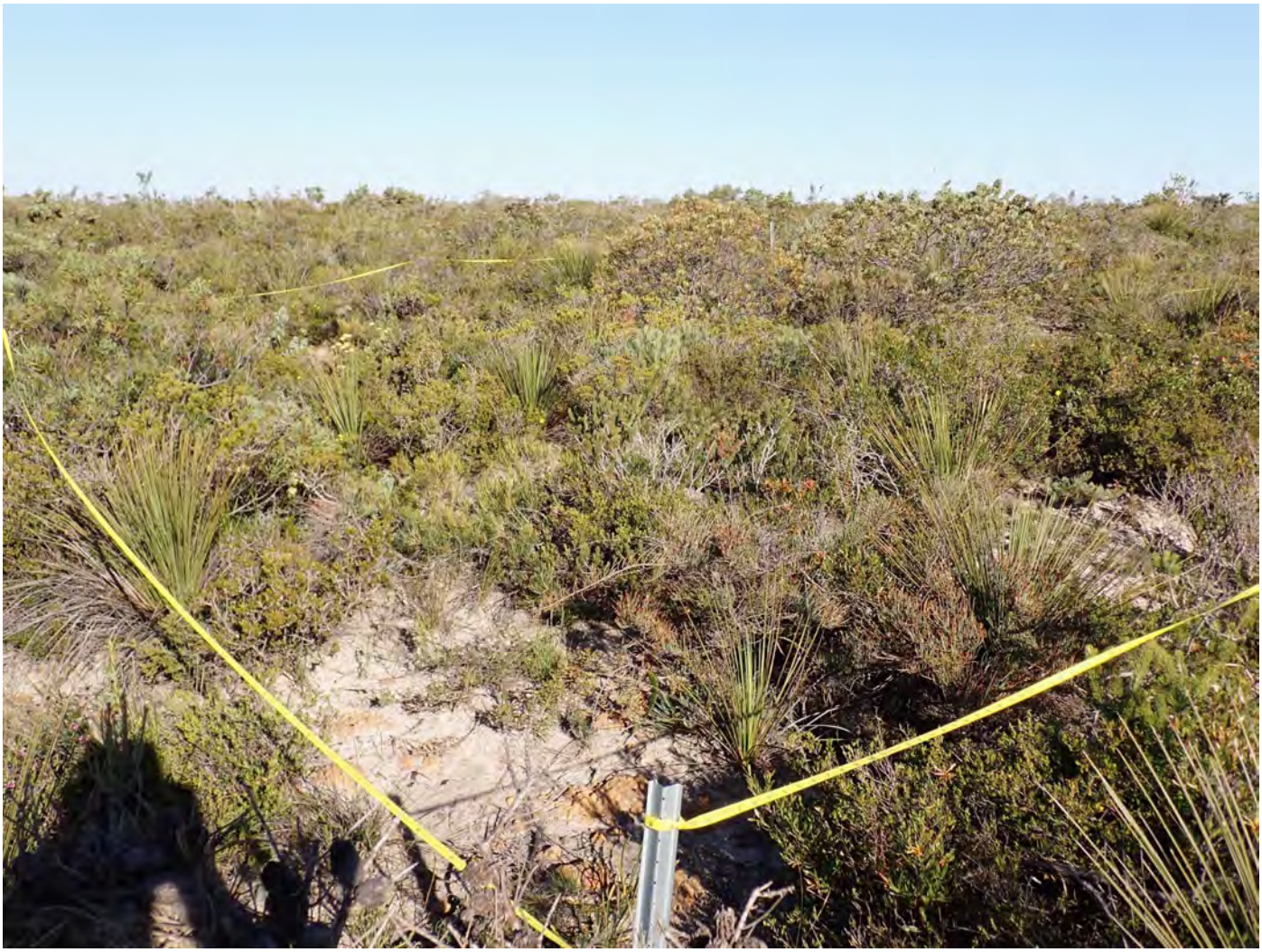
Parron Wind Farm Development Support

Sample Name: Q5

Project no.: EP23-085
Date: 20/09/2023 **Status** Permanent
Author: SCM,MS Q5: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	348078.8508	NW corner northing:	6638339.281
Altitude (m):	262	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	no evidence -
Soil type/texture	silt/	Bare ground (%):	15
Rocks (%) and type:	3%, laterite	Soil colour:	grey/
Litter:	2% (leaves,twigs,)	Vegetation condition:	excellent



Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q5

Project no.: EP23-085
Date: 20/09/2023 **Status** Permanent
Author: SCM,MS Q5: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia sphacelata subsp. verticillata	opp
	Acacia stenoptera	0.1
	Allocasuarina humilis	5
	Amphipogon ?caricinus var. caricinus	opp
	Andersonia lehmanniana	0.1
	Babingtonia grandiflora	0.1
	Banksia bipinnatifida subsp. multifida	0.1
	Banksia glaucifolia	opp
P3	*Banksia kippistiana var. paenepeccata*	1
P3	*Banksia nana*	0.1
	Banksia sphaerocarpa var. sphaerocarpa	1
	Banksia stenoprion	1
	Calectasia hispida	1
	Calothamnus longissimus	1
	Calothamnus sp. 4	2
	Cassytha racemosa	0.1
	Cassytha sp.	0.1
	Caustis dioica	0.1
	Conostylis teretifolia subsp. teretifolia	0.1
	Dampiera alata	0.1
	Desmocladus flexuosus	0.1
	Drakaea livida	0.1
	Drosera ?erythrorhiza	0.1
	Drosera ?porrecta	opp
	Gompholobium knightianum	opp
	Goodenia coerulea	0.1
	Haemodorum sp. 1	0.1
	Hakea incrassata	1
	Hakea neospathulata	1
	Hakea smilacifolia	1
	Hibbertia crassiflora	0.1
	Hibbertia hypericoides	15
	Hibbertia mylnei	0.1
	Hypocalymma xanthopetalum	1
	Isopogon linearis	opp
	Labichea punctata	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q5

Project no.: EP23-085
Date: 20/09/2023 **Status** Permanent
Author: SCM,MS Q5: Page 2 of 3

Lambertia multiflora var. multiflora	5
Lepidosperma sp. 1	opp
Lepidosperma sp. 3	0.1
Leucopogon sp.	0.1
Lomandra sericea	0.1
Melaleuca sp. 1	0.1
Melaleuca sp. 3	10
Mesomelaena pseudostygia	0.1
Mesomelaena tetragona	0.1
Morelotia octandra	0.1
Neurachne alopecuroidea	0.1
Opercularia vaginata	0.1
Persoonia rufiflora	0.1
Petrophile ?pilostyla subsp. austrina	1
Petrophile shuttleworthiana	15
Pimelea sulphurea	0.1
Schoenus brevisetis	0.1
Schoenus pleiostemoneus	0.1
Stylidium ?repens	0.1
Stylidium bicolor	0.1
Synaphea aephynsa	0.1
Thysanotus sp.	0.1
Xanthorrhoea sp. 2	0.1
Xanthorrhoea sp. 3	5
Xanthosia huegelii	0.1

Vegetation Sample Data

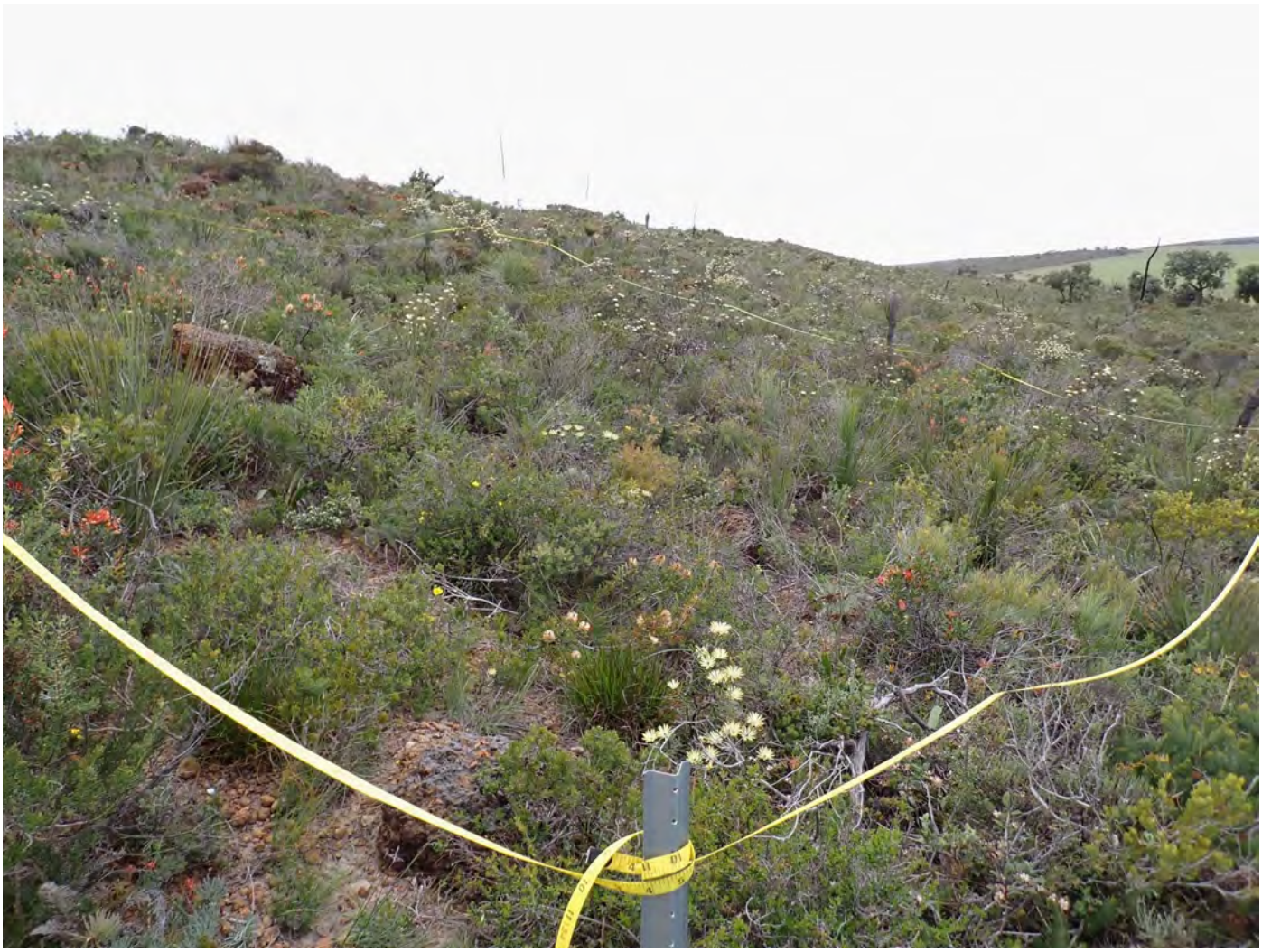
Parron Wind Farm Development Support

Sample Name: Q6

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: SCM,MS Q6: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	347828.2793	NW corner northing:	6638256.296
Altitude (m):	264	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	ridge
Time since fire:	> 5 yrs	Disturbance:	no evidence -
Soil type/texture	silt/	Bare ground (%):	2
Rocks (%) and type:	30%, laterite	Soil colour:	grey/brown
Litter:	2% (leaves,twigs,)	Vegetation condition:	excellent



Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q6

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: SCM,MS Q6: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia ?moirii subsp. recurvistipula	0.1
	Acacia sphacelata subsp. verticillata	0.1
	Allocasuarina humilis	1
	Aotus procumbens	0.1
	Babingtonia grandiflora	0.1
	Banksia bipinnatifida subsp. multifida	1
	Banksia carlinoides	10
P3	*Banksia nana*	1
	Banksia sphaerocarpa var. sphaerocarpa	3
	Banksia stenoprion	0.1
	Burchardia congesta	0.1
	Caladenia sp. 3	0.1
	Calectasia hispida	1
	Callitris acuminata	1
	Calothamnus longissimus	2
	Calothamnus sp. 4	2
	Caustis dioica	0.1
	Conostylis androstemma	0.1
	Conostylis teretifolia subsp. teretifolia	0.1
	Cryptandra sp. 4	0.1
	Cryptandra sp. 5	0.1
	Desmocladus flexuosus	0.1
	Drosera ?erythrorhiza	0.1
	Drosera ?porrecta	0.1
	Drosera barbigera	0.1
	Elythranthera brunonis	0.1
	Ericaceae sp. 1	0.1
	Gastrolobium axillare	0.1
	Gompholobium knightianum	0.1
	Goodenia affinis	0.1
	Haemodorum sp. 1	0.1
	Hakea incrassata	1
	Hakea lissocarpha	0.1
	Hakea smilacifolia	0.1
	Hibbertia crassiflora	1
	Hibbertia hypericoides	5

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q6

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: SCM,MS Q6: Page 3 of 3

	Hibbertia mylnei	0.1
	Hypocalymma xanthopetalum	1
	Isopogon asper	opp
	Kingia australis	opp
	Labichea punctata	0.1
	Lambertia multiflora var. multiflora	3
P3	*Lepidobolus quadratus*	0.1
	Lepidosperma sp. 3	0.1
	Lepidosperma sp. 4	0.1
	Leucopogon oldfieldii	1
	Lomandra sericea	0.1
	Melaleuca sp. 1	0.1
	Melaleuca sp. 2	0.1
	Melaleuca sp. 3	3
	Mesomelaena tetragona	0.1
	Monotaxis grandiflora	2
	Morelotia octandra	1
	Neurachne alopecuroidea	0.1
	Persoonia rufiflora	0.1
	Petrophile ?pilostyla subsp. austrina	1
	Schoenus brevisetis	0.1
	Schoenus pleiostemoneus	0.1
	Scholtzia ?parviflora	0.1
	Stenanthemum reissekii	0.1
P4	*Stylidium aeonioides*	0.1
P3	*Stylidium nonscandens*	opp
	Styphelia sp. 2	0.1
	Tetratheca ?confertifolia	0.1
	Thysanotus sp.	0.1
	Xanthorrhoea sp. 1	5
	Xanthorrhoea sp. 2	0.1
	Xanthosia huegelii	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q7

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: SCM,MS Q7: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	347776.424	NW corner northing:	6639070.813
Altitude (m):	290	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	ridge
Time since fire:	> 5 yrs	Disturbance:	no evidence -
Soil type/texture	silt/	Bare ground (%):	3
Rocks (%) and type:	45%, laterite	Soil colour:	grey/brown
Litter:	1% (leaves,twigs,)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q7

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: SCM,MS Q7: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia ?moirii subsp. recurvistipula	0.1
	Acacia sphacelata subsp. verticillata	0.1
	Allocasuarina humilis	1
*	*Arctotheca calendula*	0.1
	Babingtonia grandiflora	opp
	Banksia bipinnatifida subsp. multifida	0.1
	Banksia carlinoides	opp
	Banksia glaucifolia	opp
P3	*Banksia kippistiana var. paenepeccata*	0.1
	Banksia sphaerocarpa var. sphaerocarpa	5
	Banksia stenoprion	0.1
P3	*Beaufortia bicolor*	0.1
	Calectasia hispida	0.1
	Calothamnus longissimus	2
	Caustis dioica	0.1
	Conostylis androstemma	0.1
	Dampiera alata	0.1
	Desmocladus flexuosus	0.1
	Dodonaea ericoides	0.1
	Drosera barbigera	0.1
P3	*Drosera prophylla*	0.1
	Gastrolobium axillare	0.1
	Gastrolobium plicatum	0.1
	Goodenia coerulea	0.1
	Haemodorum sp. 1	0.1
	Hakea incrassata	1
	Hakea lissocarpha	0.1
	Hakea smilacifolia	0.1
	Hibbertia crassiflora	0.1
	Hibbertia hypericoides	0.1
	Hibbertia mylnei	0.1
	Isopogon asper	0.1
	Jacksonia lehmannii	0.1
	Labichea punctata	opp
	Lambertia multiflora var. multiflora	2
	Lechenaultia biloba	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q7

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: SCM,MS Q7: Page 3 of 3

P3	*Lepidobolus quadratus*	0.1
	Lepidosperma sp. 3	0.1
	Lepidosperma sp. 6	0.1
	Levenhookia pusilla	0.1
	Lomandra sericea	opp
	Melaleuca sp. 2	2
	Melaleuca sp. 3	opp
	Mesomelaena pseudostygia	1
	Mesomelaena tetragona	0.1
	Morelotia octandra	0.1
	Neurachne alopecuroidea	0.1
	Persoonia rufiflora	0.1
	Petrophile ?pilostyla subsp. austrina	1
	Petrophile shuttleworthiana	opp
	Poaceae sp. 1 (sterile)	0.1
	Pterostylis sp.	0.1
	Schoenus brevisetis	1
	Schoenus pleiostemoneus	0.1
	Stenanthemum reissekii	0.1
P4	*Stylidium aeonioides*	0.1
	Stylidium miniatum	0.1
	Styphelia sp. 4	1
	Tetratheca ?confertifolia	opp
	Thomasia foliosa	0.1
	Xanthorrhoea sp. 3	15

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q8

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: MS,TDP Q8: Page 1 of #REF!

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	348174.1988	NW corner northing:	6638752.777
Altitude (m):	243	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	no evidence -
Soil type/texture	sand/silt	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	white/brown
Litter:	10% (twigs,branches,leaves)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q8

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: MS,TDP Q8: Page 2 of #REF!

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Apectospermum spinescens	2
	Alexgeorgea nitens	0.1
	Allocasuarina humilis	opp
	Amphipogon ?caricinus var. caricinus	0.1
	Anigozanthos humilis subsp. humilis	opp
	Banksia attenuata	20
	Banksia candolleana	10
P3	*Banksia kippistiana var. paenepeccata*	1
	Banksia stenoprion	0.1
	Banksia tortifolia	opp
	Burchardia congesta	0.1
	Calothamnus sp. 3	1
	Cassytha sp.	1
	Chaetospora curvifolia	0.1
	Chordifex sinuosus	0.1
	Conostephium pendulum	1
	Conostylis angustifolia	1
	Conostylis crassinerva subsp. absens	0.1
	Conostylis teretifolia subsp. teretifolia	0.1
	Dasypogon obliquifolius	5
	Drosera ?erythrorhiza	0.1
	Drosera eneabba	0.1
	Drosera thysanosepala	0.1
	Eremaea pauciflora	5
	Eucalyptus todtiana	0.1
	Goodenia coerulea	0.1
	Hakea obliqua	0.1
	Hibbertia crassiflora	0.1
	Hibbertia hypericoides	3
	Hibbertia striata	0.1
	Jacksonia floribunda	1
	Johnsonia pubescens subsp. pubescens	0.1
	Lasiopetalum drummondii	0.1
	Lepidosperma sp. 3	0.1
	Lepidosperma sp. 4	0.1
	Leucopogon oldfieldii	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q8

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: MS,TDP Q8: Page 3 of 3

Lyginia imberbis	0.1
Melaleuca sp. 3	5
Melaleuca sp. 7	1
Mesomelaena pseudostygia	1
Monotaxis grandiflora	0.1
Patersonia occidentalis var. latifolia	0.1
Persoonia comata	5
Petrophile linearis	0.1
Petrophile shuttleworthiana	5
Rutaceae sp.	opp
Schoenus brevisetis	1
Schoenus pleiostemoneus	0.1
Stirlingia latifolia	1
Stylidium crossocephalum	opp
Verticordia sp. 3 (sterile)	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q9

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: MS,TDP Q9: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	348001.3967	NW corner northing:	6638565.235
Altitude (m):	251	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	no evidence -
Soil type/texture	sand/silt	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	white/
Litter:	5% (twigs,branches,leaves)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q9

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: MS,TDP Q9: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Apectospermum spinescens	1
	?Goodeniaceae sp.	0.1
	Alexgeorgea nitens	0.1
	Allocasuarina humilis	5
	Amphipogon ?caricinus var. caricinus	0.1
	Anigozanthos humilis subsp. humilis	0.1
	Banksia attenuata	0.1
	Banksia grossa	5
P3	*Banksia kippistiana var. paenepeccata*	1
	Banksia stenoprion	0.1
	Banksia tortifolia	0.1
	Burchardia congesta	0.1
	Caladenia sp. 1	0.1
	Cassytha sp.	1
	Chaetospora curvifolia	1
	Conostylis angustifolia	1
	Conostylis teretifolia subsp. teretifolia	0.1
	Cyanothamnus ramosus subsp. anethifolius	0.1
	Dasypogon obliquifolius	3
	Drosera ?eneabba	0.1
	Drosera ?erythrorhiza	opp
	Drosera ?porrecta	0.1
	Drosera sp. 1	opp
	Eremaea pauciflora	5
	Ericaceae sp. 2	0.1
	Hakea flabellifolia	0.1
	Hibbertia hypericoides	0.1
	Hibbertia striata	0.1
	Hypocalymma xanthopetalum	0.1
	Jacksonia floribunda	0.1
	Johnsonia pubescens subsp. pubescens	0.1
	Lambertia multiflora var. multiflora	0.1
	Lasiopetalum drummondii	2
	Lepidobolus preissianus	1
	Lomandra ?suaveolens	0.1
	Lomandra preissii	opp

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q9

Project no.: EP23-085
Date: 21/09/2023 **Status** Permanent
Author: MS,TDP Q9: Page 3 of 3

	Melaleuca sp. 3	5
	Melaleuca sp. 7	1
	Mesomelaena pseudostygia	1
	Monotaxis grandiflora	0.1
	Neurachne alopecuroidea	0.1
	Persoonia comata	1
	Petrophile linearis	opp
	Petrophile shuttleworthiana	0.1
	Pyrorchis nigricans	0.1
	Rutaceae sp.	opp
	Schoenus brevisetis	0.1
	Schoenus pleiostemoneus	0.1
	Stirlingia latifolia	0.1
	Stylidium ?repens	0.1
	Stylidium bicolor	0.1
	Stylidium crossocephalum	0.1
*	*Ursinia anthemoides*	opp
	Verticordia grandis	1
	Verticordia sp. 3 (sterile)	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q10

Project no.: EP23-085
Date: 23/10/2023 **Status** Permanent
Author: MS, Q10: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	348128.8083	NW corner northing:	6639002.347
Altitude (m):	238	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	low - tracks
Soil type/texture	silt/	Bare ground (%):	20
Rocks (%) and type:	1%, laterite	Soil colour:	white/yellow
Litter:	5% (leaves,twigs,branches)	Vegetation condition:	excellent

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q10

Project no.: EP23-085
Date: 23/10/2023 **Status** Permanent
Author: MS, Q10: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	?Amphipogon sp. 1 (sterile)	0.1
	Acacia pulchella var. reflexa	opp
	Allocasuarina humilis	1
	Amphipogon ?turbinatus	0.1
	Austrostipa sp. (sterile)	opp
	Babingtonia grandiflora	0.1
	Banksia bipinnatifida subsp. multifida	opp
	Banksia carlinoides	0.1
P3	*Banksia kippistiana var. paenepeccata*	1
	Banksia shuttleworthiana	2
	Banksia sphaerocarpa var. sphaerocarpa	1
	Calothamnus longissimus	1
	Calothamnus sp. 4	1
	Calytrix aurea	0.1
	Cassytha glabella	0.1
	Caustis dioica	opp
	Conostylis teretifolia subsp. teretifolia	0.1
	Cryptandra pungens	0.1
	Cyanothamnus ramosus subsp. anethifolius	0.1
	Cyanothamnus sp.	0.1
	Desmocladus flexuosus	0.1
	Drosera sp. 2	opp
	Eucalyptus drummondii	0.1
	Eucalyptus gittinsii subsp. Illucida	2
	Gastrolobium plicatum	25
	Gompholobium knightianum	0.1
	Goodenia coerulea	0.1
	Haemodorum ?simplex	opp
	Hakea lissocarpha	1
	Hibbertia hypericoides	25
	Hibbertia striata	opp
	Hypocalymma xanthopetalum	1
	Isopogon linearis	0.1
	Lambertia multiflora var. multiflora	1
	Lepidosperma sp. 1	0.1
	Lomandra sericea	opp

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q10

Project no.: EP23-085
Date: 23/10/2023 **Status** Permanent
Author: MS, Q10: Page 3 of 3

	Lyginia imberbis	1
	Melaleuca sp. 2	2
	Melaleuca sp. 3	1
	Melaleuca sp. 7	opp
	Mesomelaena pseudostygia	2
	Morelotia octandra	1
	Persoonia comata	1
	Petrophile ?pilostyla subsp. austrina	0.1
	Petrophile shuttleworthiana	1
	Scaevola canescens	opp
	Scaevola glandulifera	opp
	Schoenus ?clandestinus	0.1
	Schoenus brevisetis	0.1
	Schoenus pleiostemoneus	0.1
	Stylidium crossocephalum	0.1
P3	*Tetratheca angulata*	0.1
	Xanthorrhoea sp. 1	1
	Xanthosia huegelii	0.1

Vegetation Sample Data

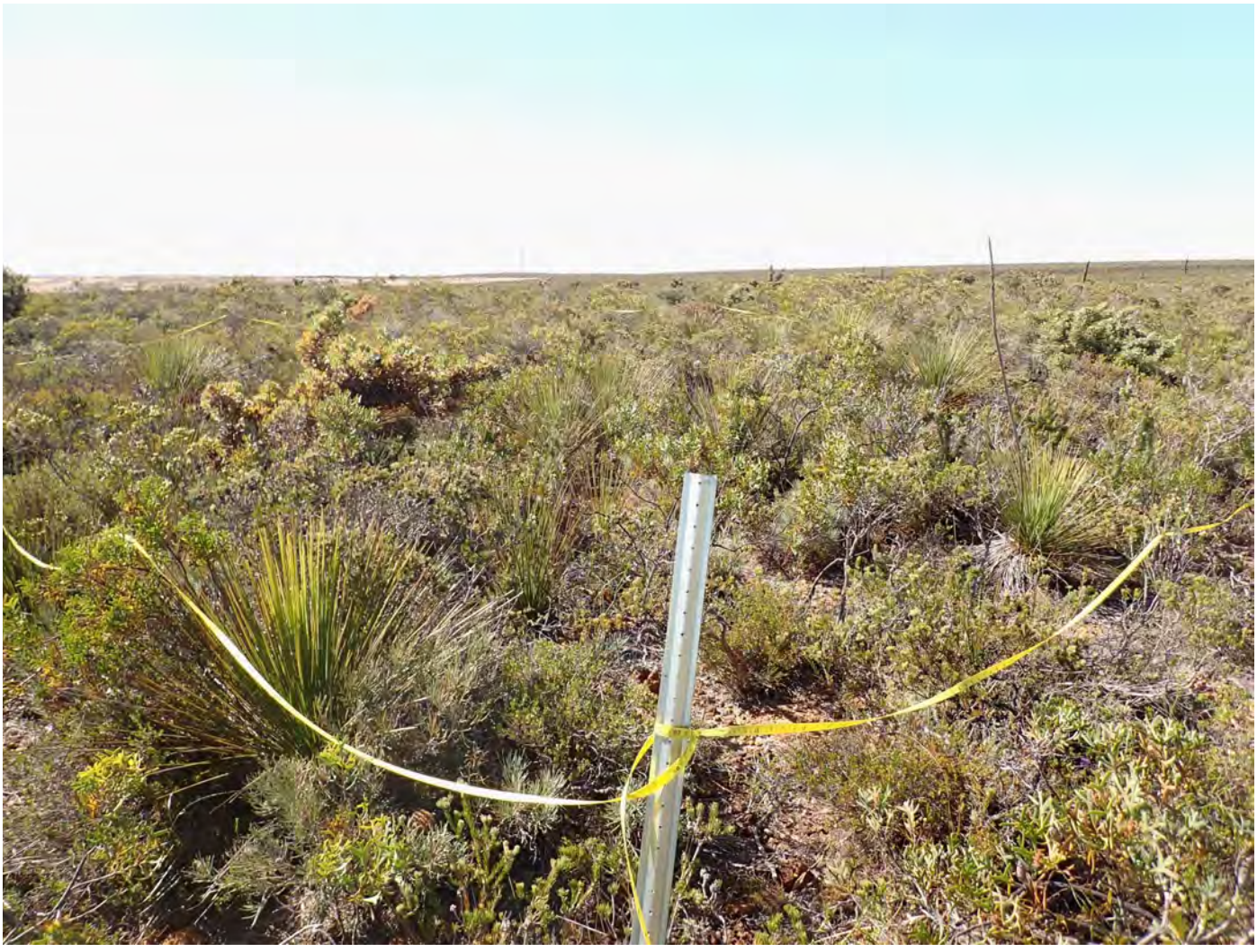
Parron Wind Farm Development Support

Sample Name: Q11

Project no.:	EP23-085		
Date:	24/10/2023	**Status**	Permanent
Author:	MS,	Q11: Page 1 of	3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	347828.3225	NW corner northing:	6638865.123
Altitude (m):	264	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	hilltop
Time since fire:	no evidence	Disturbance:	low - tracks
Soil type/texture	silt/	Bare ground (%):	5
Rocks (%) and type:	30%, laterite	Soil colour:	grey/brown
Litter:	2% (leaves,twigs,branches)	Vegetation condition:	excellent



Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q11

Project no.: EP23-085
Date: 24/10/2023 **Status** Permanent
Author: MS, Q11: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia applanata	0.1
	Acacia sphacelata subsp. verticillata	0.1
	Acacia stenoptera	0.1
	Babingtonia grandiflora	0.1
	Banksia glaucifolia	1
P3	*Banksia nana*	1
	Banksia shuttleworthiana	1
	Banksia sphaerocarpa var. sphaerocarpa	3
	Banksia stenoprion	1
	Calectasia hispida	1
	Calothamnus longissimus	1
	Cassytha pomiformis	0.1
	Cassytha racemosa	1
	Caustis dioica	5
	Chordifex sinuosus	0.1
	Comesperma acerosum	0.1
	Conostylis teretifolia subsp. teretifolia	0.1
	Daviesia decurrens subsp. decurrens	1
	Desmocladus flexuosus	0.1
	Drosera ?drummondii	opp
	Gastrolobium polystachyum	1
	Grevillea synapheae subsp. pachyphylla	0.1
	Haemodorum sp. 1	0.1
	Hakea smilacifolia	1
	Hemiandra scabra	1
	Hibbertia crassiflora	1
	Hibbertia hypericoides	5
	Hibbertia mylnei	1
	Labichea punctata	0.1
	Lambertia multiflora var. multiflora	1
	Lepidosperma sp. 3	0.1
	Lepidosperma sp. 4	0.1
	Leucopogon oldfieldii	opp
	Lomandra preissii	0.1
	Lomandra sericea	0.1
	Melaleuca sp. 1	1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q11

Project no.: EP23-085
Date: 24/10/2023 **Status** Permanent
Author: MS, Q11: Page 3 of 3

Melaleuca sp. 3	5
Melaleuca sp. 5	1
Mesomelaena tetragona	0.1
Morelotia octandra	1
Neurachne alopecuroidea	0.1
Orchidaceae sp. 2	opp
Patersonia ?drummondii	0.1
Persoonia comata	0.1
Persoonia rufiflora	1
Petrophile ?pilostyla subsp. austrina	0.1
Petrophile shuttleworthiana	5
Petrophile striata	1
Schoenus subflavus subsp. hispid culms (K.R. Newbey 8278)	0.1
Styphelia sp. 3	1
Synaphea aephynsa	opp
Thysanotus sp.	0.1
Xanthorrhoea sp. 1	10

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R12

Project no.: EP23-085
Date: 25/10/2023
Author: MS,SCM

Status Non-permanent
R12: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	348347.7635	NW corner northing:	6637072.058
Altitude (m):	262	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	hilltop
Time since fire:	no evidence	Disturbance:	moderate - weeds
Soil type/texture	silt/	Bare ground (%):	5
Rocks (%) and type:	40%, laterite	Soil colour:	white/
Litter:	5% (leaves,twigs,)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R12

Project no.: EP23-085
Date: 25/10/2023 **Status** Permanent
Author: MS,SCM R12: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Allocasuarina humilis
	Caustis dioica
*	*Chamaecytisus palmensis*
	Dianella revoluta
*	*Ehrharta calycina*
	Eucalyptus drummondii
	Gastrolobium ilicifolia
	Glischrocaryon aureum
	Hakea lissocarpha
	Isopogon linearis
	Lepidosperma sp. 7
	Melaleuca sp. 2
	Neurachne alopecuroidea
	Opercularia vaginata
	Petrophile chrysantha
	Petrophile shuttleworthiana
	Santalum acuminatum
	Styphelia sp. 2
	Trymalium daphnifolium
	Xanthorrhoea sp. 1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R13

Project no.: EP23-085
Date: 26/10/2023 **Status** Non-permanent
Author: MS, R13: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	10 m x 10 m
NW corner easting:	343510.6278	NW corner northing:	6644195.534
Altitude (m):	192	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	high - tracks, weeds, grazing
Soil type/texture	silt/	Bare ground (%):	10
Rocks (%) and type:	15%, laterite	Soil colour:	orange/
Litter:	1% (leaves,twigs,)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R13

Project no.: EP23-085
Date: 26/10/2023 **Status** Permanent
Author: MS, R13: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia lasiocarpa var. lasiocarpa
	Amphipogon ?caricinus var. caricinus
	Amphipogon sp. (hairy)
	Austrostipa anaiwaniorum
	Austrostipa elegantissima
	Banksia armata var. armata
	Banksia bipinnatifida subsp. multifida
*	*Brassicaceae sp.*
*	*Briza maxima*
*	*Bromus sp.*
	Daviesia chapmanii
	Desmocladus flexuosus
	Dodonaea ericoides
*	*Ehrharta calycina*
	Gastrolobium spinosum
	Goodeniaceae sp. 1
	Lepidosperma sp. 3
	Melaleuca sp. 2
	Morelotia octandra
	Neurachne alopecuroidea
	Opercularia vaginata
*	*Orobanche minor*
	Petrophile chrysantha
	Ptilotus polystachyus
	Schoenus brevisetis
	Schoenus subflavus subsp. hispid culms (K.R. Newbey 8278)
*	*Trifolium arvense*
	Trymalium daphnifolium
*	*Ursinia anthemoides*
*	*Vulpia sp.*
	Xanthorrhoea sp. 1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R14

Project no.: EP23-085
Date: 26/10/2023 **Status** Non-permanent
Author: MS, R14: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	10 m x 10 m
NW corner easting:	343601.1474	NW corner northing:	6644200.713
Altitude (m):	208	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	hilltop
Time since fire:	no evidence	Disturbance:	high - tracks, weeds, grazing
Soil type/texture	silt/	Bare ground (%):	5
Rocks (%) and type:	25%, laterite	Soil colour:	grey/
Litter:	1% (leaves,twigs,)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R14

Project no.: EP23-085
Date: 26/10/2023 **Status** Permanent
Author: MS, R14: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia lasiocarpa var. lasiocarpa
*	*Aira sp.*
	Allocasuarina humilis
	Austrostipa elegantissima
	Banksia carlinoides
P3	*Banksia kippistiana var. paenepeccata*
P3	*Banksia nana*
	Banksia sphaerocarpa var. sphaerocarpa
	Banksia stenoprion
*	*Bromus sp.*
	Cassytha sp.
	Conostylis teretifolia subsp. teretifolia
	Daviesia decurrens subsp. decurrens
	Desmocladus flexuosus
*	*Ehrharta calycina*
	Hibbertia hypericoides
	Lepidosperma sp. 3
	Melaleuca sp. 2
	Morelotia octandra
	Neurachne alopecuroidea
	Opercularia vaginata
	Podotheca ?gnaphalioides
	Schoenus brevisetis
*	*Trifolium arvense*
*	*Ursinia anthemoides*
*	*Vulpia sp.*
	Xanthorrhoea sp. 1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q15

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, Q15: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	337337.8464	NW corner northing:	6643573.972
Altitude (m):	103	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds
Soil type/texture	loam/ with organic layer	Bare ground (%):	1
Rocks (%) and type:	No rocks	Soil colour:	grey/
Litter:	10% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q15

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, Q15: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	?Baeckea sp. 1	0.1
	Acacia ?latior	0.1
	Acacia incrassata	0.1
	Acacia multispicata	0.1
	Acacia saligna	1
	Allocasuarina microstachya	0.1
	Amphipogon ?caricinus var. caricinus	0.1
	Austrostipa elegantissima	1
	Banksia armata var. armata	1
*	*Briza maxima*	0.1
	Burchardia congesta	0.1
	Caesia micrantha	0.1
	Cassytha sp.	0.1
	Caustis dioica	2
	Chamaescilla sp.	0.1
	Corymbia calophylla	70
	Dianella revoluta	0.1
	Ecdeiocolea monostachya	60
*	*Ehrharta calycina*	1
	Gastrolobium oxylobioides	2
	Georgeantha hexandra	0.1
	Hakea lissocarpha	1
	Hakea neospathulata	0.1
	Hibbertia hypericoides	3
	Lepidobolus preissianus	0.1
	Lepidosperma sp. 5	1
	Leptomeria pauciflora	0.1
	Melaleuca sp. 9	0.1
	Mesomelaena pseudostygia	0.1
	Neurachne alopecuroidea	0.1
	Opercularia vaginata	2
	Orchidaceae sp. 1	0.1
	Pimelea imbricata var. piligera	0.1
	Ptilotus manglesii	0.1
*	*Romulea rosea*	0.1
	Schoenus sp.	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q15

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, Q15: Page 2 of 3

	Sowerbaea laxiflora	0.1
	Styphelia serratifolia	1
P2	*Synaphea xela*	0.1
	Tricoryne elatior	0.1
*	*Ursinia anthemoides*	0.1
	Verticordia sp. 2	1
*	*Vulpia sp.*	1
	Xanthorrhoea ?preissii	2

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R16

Project no.: EP23-085
Date: 27/10/2023 **Status** Non-permanent
Author: MS, R16: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	10 m x 10 m
NW corner easting:	337538.0937	NW corner northing:	6643211.112
Altitude (m):	124	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	high - weeds, clearing
Soil type/texture	loam/	Bare ground (%):	2
Rocks (%) and type:	No rocks	Soil colour:	grey/
Litter:	15% (leaves,twigs,)	Vegetation condition:	good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: R16

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, R16: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia lasiocarpa var. lasiocarpa
*	*Briza maxima*
	Burchardia congesta
	Calothamnus sp. 1
	Cheilanthes sp.
	Corymbia calophylla
	Dianella revoluta
	Dichopogon capillipes
	Haemodorum simplex
	Hibbertia hypericoides
	Melaleuca radula
	Myrtaceae sp.
	Neurachne alopecuroidea
	Ptilotus manglesii
	Stylidium crossocephalum
	Styphelia serratifolia
	Themeda triandra
	Xanthorrhoea preissii
	Diuris setacea

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q17

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, Q17: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	344262.3299	NW corner northing:	6635388.034
Altitude (m):	242	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	hilltop
Time since fire:	no evidence	Disturbance:	moderate - weeds, clearing for road
Soil type/texture	loam/	Bare ground (%):	2
Rocks (%) and type:	1%, laterite	Soil colour:	grey/
Litter:	25% (leaves,logs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q17

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, Q17: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia obovata	0.1
	Adenanthos cygnorum subsp. cygnorum	2
	Alexgeorgea nitens	1
	Allocasuarina humilis	1
	Amphipogon ?turbinatus	0.1
	Anarthria humilis	opp
	Austrostipa elegantissima	0.1
	Austrostipa hemipogon	opp
	Banksia bipinnatifida subsp. multifida	0.1
	Banksia candolleana	25
	Banksia incana var. incana	2
P3	*Banksia nana*	0.1
	Banksia shuttleworthiana	0.1
	Callitris acuminata	0.1
	Caustis dioica	0.1
	Chordifex sinuosus	0.1
	Conostylis angustifolia	0.1
	Conostylis teretifolia subsp. teretifolia	opp
	Daviesia chapmanii	0.1
	Desmocladus fasciculatus	0.1
	Ericaceae sp. 2	0.1
	Eucalyptus lane-poolei	50
	Gastrolobium oxylobioides	opp
	Gompholobium knightianum	opp
	Hakea flabellifolia	1
	Hakea lissocarpha	1
	Hakea smilacifolia	0.1
	Hibbertia mylnei	opp
	Jacksonia lehmannii	0.1
	Lambertia multiflora var. multiflora	5
	Lasiopetalum drummondii	0.1
	Lepidosperma sp. 2	1
	Lepidosperma sp. 3	1
	Lepidosperma sp. 4	1
	Lomandra ?suaveolens	0.1
	Lomandra sericea	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q17

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: MS, Q17: Page 2 of 3

	Lyginia imberbis	0.1
	Melaleuca ?urceolaris	opp
	Mesomelaena pseudostygia	1
	Monotaxis grandiflora	0.1
	Myrtaceae sp. 1	0.1
	Myrtaceae sp. 3	0.1
	Neurachne alopecuroidea	0.1
	Podotheca ?gnaphalioides	opp
	Ptilotus polystachyus	opp
	Santalum acuminatum	opp
	Schoenus brevisetis	0.1
	Stirlingia latifolia	opp
	Synaphea aephynsa	0.1
	Thysanotus sp.	0.1
*	*Ursinia anthemoides*	opp
*	*Vulpia sp.*	opp
	Xanthorrhoea sp. 1	1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q18

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: SCM, Q18: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	347943.4487	NW corner northing:	6636604.251
Altitude (m):	249	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	low - possible historic grazing or clearing
Soil type/texture	sand/silt	Bare ground (%):	25
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	20% (leaves,branches,bark)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q18

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: SCM, Q18: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia alata var. tetrantha	0.5
	Acacia pulchella var. reflexa	1
*	*Aira sp.*	0.1
	Anigozanthos humilis subsp. humilis	opp
	Aristida sp.	0.1
	Austrostipa elegantissima	0.1
P3	*Austrostipa nunaginensis*	0.1
	Bossiaea eriocarpa	0.1
	Calytrix aurea	opp
	Caustis dioica	1
	Chamaescilla sp.	opp
	Conostylis aculeata subsp. breviflora	35
	Cyanothamnus ramosus subsp. anethifolius	0.1
	Dianella revoluta	0.1
	Eucalyptus lane-poolei	15
	Gastrolobium oxylobioides	1
	Glischrocaryon aureum	5
	Gompholobium knightianum	0.1
	Goodenia micrantha	0.1
	Hakea lissocarpha	1
	Hibbertia hypericoides	0.5
	Hibbertia subvaginata	opp
	Hypocalymma xanthopetalum	opp
	Jacksonia calcicola	2
	Kennedia prostrata	opp
	Lagenophora huegelii	0.1
	Lepidosperma sp. 7	2
	Neurachne alopecuroidea	0.1
	Opercularia vaginata	0.1
	Pimelea ?floribunda	opp
	Podotheca ?gnaphalioides	0.1
	Ptilotus manglesii	0.1
	Rytidosperma sp. 1	0.1
	Siloxerus sp.	0.1
	Stackhousia ?monogyna	0.1
	Trachymene pilosa	opp

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q18

Project no.: EP23-085
Date: 27/10/2023 **Status** Permanent
Author: SCM, Q18: Page 2 of 3

*	*Ursinia anthemoides*	opp
	Verticordia sp. 2	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q19

Project no.: EP23-085
Date: 23/10/2023 **Status** Permanent
Author: SCM, Q19: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	347817.3369	NW corner northing:	6636516.795
Altitude (m):	236	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	low - possible historic grazing or clearing
Soil type/texture	silt/	Bare ground (%):	15
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	30% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Parron Wind Farm Development Support

Sample Name: Q19

Project no.: EP23-085
Date: 23/10/2023 **Status** Permanent
Author: SCM, Q19: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	?Baeckea sp. 3	opp
	Acacia alata var. tetrantha	opp
	Acacia pulchella var. reflexa	1
*	*Aira sp.*	0.5
	Allocasuarina humilis	0.1
	Anigozanthos humilis subsp. humilis	0.1
	Austrostipa hemipogon	0.1
P3	*Austrostipa nunaginensis*	opp
	Bossiaea eriocarpa	opp
*	*Briza maxima*	0.1
	Cassytha sp.	0.1
	Caustis dioica	10
	Comesperma calymega	0.1
	Conostylis aculeata subsp. breviflora	2
	Cyanothamnus ramosus subsp. anethifolius	opp
	Cyanothamnus sp.	0.1
	Darwinia neildiana	opp
*	*Ehrharta calycina*	0.1
	Eucalyptus lane-poolei	10
	Gastrolobium oxylobioides	10
	Gompholobium tomentosum	0.1
	Goodenia coerulea	0.1
	Hibbertia hypericoides	2
	Jacksonia calcicola	5
	Lepidosperma sp. 4	0.1
	Mesomelaena pseudostygia	10
	Mesomelaena tetragona	1
	Morelotia octandra	opp
	Neurachne alopecuroidea	0.1
	Opercularia vaginata	0.1
	Podotheca ?gnaphalioides	0.1
	Pterochaeta paniculata	0.1
	Rytidosperma sp. 2 (hairy)	0.1
	Schoenus ?clandestinus	0.1
	Siloxerus sp.	0.1
	Stackhousia ?monogyna	0.1

Vegetation Sample Data

Parron Wind Farm Development Support

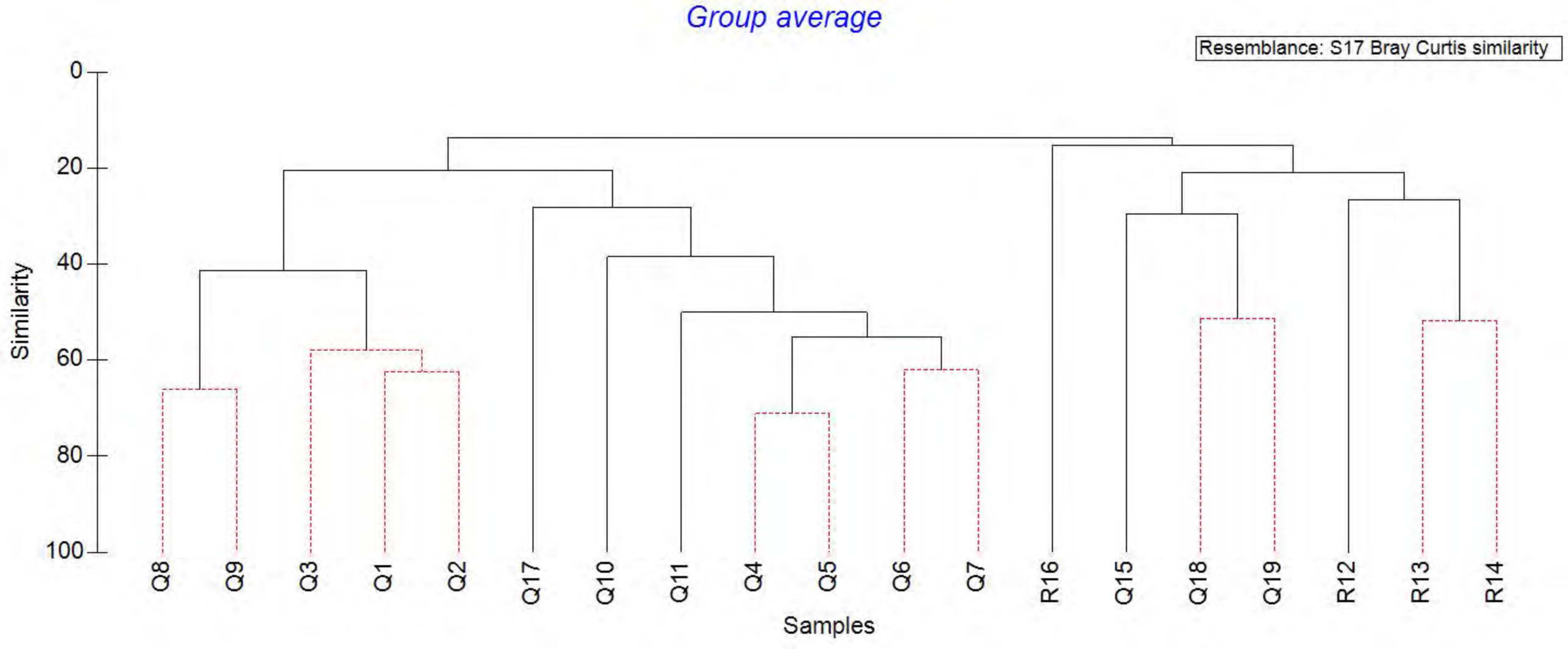
Sample Name: Q19

Project no.: EP23-085
Date: 23/10/2023 **Status** Permanent
Author: SCM, Q19: Page 2 of 3

	Stylidium ?kalbarriense/rigidulum	0.1
	Tetratheca ?confertifolia	opp
	Trachymene pilosa	0.1
*	*Ursinia anthemoides*	0.1
	Verticordia sp. 2	0.5
*	*Vulpia sp.*	0.1
	Xanthorrhoea preissii	opp
	Xanthosia huegelii	opp

Appendix G

Cluster Dendrograms


Group average
Resemblance: S17 Bray Curtis similarity
Similarity
0
20
40
60
80
100
Q8
Q9
Q3
Q1
Q2
Q17
Q10
Q11
Q4
Q5
Q6
Q7
R16
Q15
Q18
Q19
R12
R13
R14
Samples

Appendix B

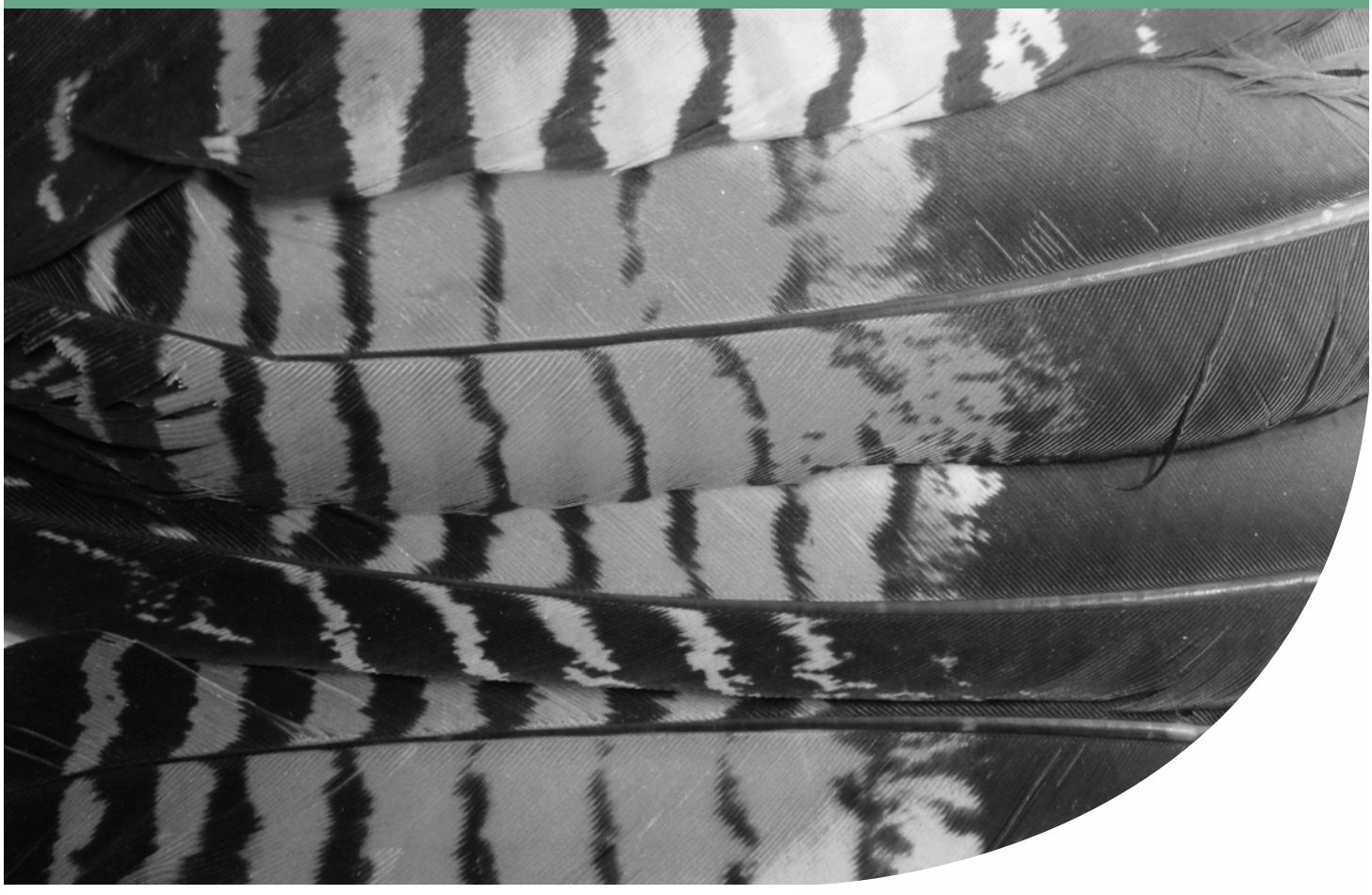
Basic Fauna and Targeted Bird and Bat Assessment

Basic Fauna and Targeted Bird and Bat Assessment

Parron Wind Farm Development Support

Project No: EP23-085(02)

Prepared for Zephyr Energy Pty Ltd
September 2024



Document Control

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Doc no.:	**EP23-085(02)--004A AJU**				
Version	**Date**	**Author**		**Reviewer**	
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	Submitted for client review				
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	Minor updates to methodology and black cockatoo mapping following team review				

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Executive Summary

Zephyr Energy Pty Ltd engaged Emerge Associates to conduct a basic fauna and a targeted bird and bat assessment for the proposed Parron Wind Farm in Badgingarra (referred to herein as the 'site').

As part of the assessment a desktop review of relevant background information was completed and a field survey was undertaken on 18 to 22 September 2023. During the field survey opportunistic sightings of fauna were recorded and an assessment was made on the fauna habitat within the site and its suitability to provide habitat for threatened, specially protected and priority fauna. A targeted bird and bat survey was also undertaken as these groups are typically most susceptible to the operational impacts of wind farms.

Outcomes of the basic fauna assessment include the following:

- The site consists of 10 broad habitat types:
  - **Agricultural vegetation** (738.07 hectares (ha)): planted rows o*f Chamaecytisus palmensis*.
  - **Bare ground and pasture** (7246.97 ha): pastureland, paddocks, firebreaks and roads.
  - **Dams and water features** (2.31 ha): agricultural dams and drainage lines.
  - **Eucalyptus woodland** (19.58 ha): native canopy woodland with sparse understory.
  - **Laterite hills and breakaways** (71.76 ha): shrubby/heathy vegetation on rocky ridges and breakaways.
  - **Open forest** (120.68 ha): forest of mostly non-native trees with some native trees over cleared areas and non-native grassland.
  - **Plateau** (58.75 ha): native shrubland on a rocky laterite plateau.
  - **Riparian and wetland vegetation** (22.89 ha): riparian vegetation in areas with seasonal or permanent inundation.
  - **Sandplain** (191.81 ha): open *Eucalyptus* and *Proteaceae* woodland on sandy soils.
  - **Scattered trees and shrubs** (55.73 ha): scattered native and non-native trees with little to no understory.
- A total of 56 native fauna species were recorded within the site.
- One threatened species was recorded during the survey: Carnaby's black cockatoo (endangered (EN) under the *Environment Protection and Biodiversity Conservation Act* and *Biodiversity Conservation Act*).
- Despite not being recording during the survey, the following species were considered to have a high or moderate likelihood of occurring within the site:
  - Pacific swift (migratory)
  - peregrine falcon (other specially protected)
  - woollybush bee (priority 3)
  - Mt Lesueur shield-backed trapdoor spider (priority 2)
  - western brush wallaby (priority 4 (P4))
  - black-striped snake (P4).

Outcomes of the targeted black cockatoo survey include the following:

- Foraging evidence attributed to Carnaby's black cockatoo was recorded in the site.
- The site occurs within the modelled distribution of Carnaby's black cockatoo but outside of the modelled distribution of forest red-tailed black cockatoo and Baudin's black cockatoo.

- The site contains 185.86 ha of breeding and roosting habitat for Carnaby's black cockatoo.
- No black cockatoo roosts occur in close proximity to the site (Peck *et al.* 2019). No roosts or evidence of roosting by any species of black cockatoo was recorded within the site during the field survey. Tall native and non-native trees within the site represent suitable roosting habitat Carnaby's black cockatoo.
- A total of 468.36 ha of foraging habitat for Carnaby's black cockatoo was mapped within the site of which 276.93 ha (59.13%) comprises primary native plants, 6.37 ha (1.36%) comprises primary non-native plants, 47.55 ha (10.15%) provides secondary native plants and 137.51 ha (29.36%) provides secondary non-native plants.
- Additional areas of foraging habitat of similar or higher value occur adjacent to the site and in the wider local area.

Outcomes of the targeted bird survey include the following:

- A total of 51 bird species were observed across the site.
  - 11 species were observed from height category 1 (predominantly above canopy).
  - 12 species were observed from height category 2 (predominantly at canopy).
  - 29 species were observed from height category 3 (predominantly below canopy).

Outcomes of the targeted bat survey include the following:

- Three bat taxa were recorded within the site:
  - *Chalinolobus gouldii* - Gould's wattled bat
  - *Nyctophilus* spp. - Long-eared bats
  - *Vespadelus regulus* - Southern forest bat.

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Appendix I

Bird Survey Site Data

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
ALA	Atlas of Living Australia
BoM	Bureau of Meteorology
EPA	Environmental Protection Authority
DAWE	Department of Agriculture, Water and the Environment (now DCCEEW)
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DoEE	Department of the Environment and Energy
DoW	Department of Water (now DWER)
DPaW	Department of Parks and Wildlife (now DBCA)
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
WAM	Western Australian Museum
WALIA	Western Australian Land Information Authority

Table A2: Abbreviations – Conservation codes

Conservation codes	
CD	Conservation dependent
CR	Critically endangered
EN	Endangered
MI	Migratory
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
OS	Other specially protected
VU	Vulnerable

Table A3: Abbreviations –Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
CALM	*Conservation and Land Management Act 1984*
EBPC Act	*Environment Protection and Biodiversity Conservation Act 1999*
LA Act	*Land Administration Act 1997*
SCRM Act	*Swan and Canning Rivers Management Act 2006*

Table A4: Abbreviations – Units of measurement

Units of measurement	
DBH	Diameter at breast height
cm	Centimetre
ha	Hectare
km	Kilometre
m	Metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

Table A5: Abbreviations - General

General terms	
AFD	Australian Faunal Directory
DP (C3)	Category 3 Declared Pest
HC1	Height Category 1
HC2	Height Category 2
HC3	Height Category 3
IBRA	Interim Biogeographic Regionalisation for Australia
MNES	Matters of National Environmental Significance
UFI	Unique Feature Identifier

1 Introduction

1.1 Purpose

Emerge Associates (Emerge) were engaged by Zephyr Energy Pty Ltd to conduct a basic fauna and targeted bird and bat assessment within the proposed Parron Wind Farm, lots 3738, 3739, 3742, 3743 and 3744, in Badgingarra as shown **Figure 1** (referred to herein as the 'site').

Fauna assessments are required to characterise fauna values and, in particular, confirm the presence or absence of values relevant to environmental approvals process, such as 'fauna habitat', 'threatened' fauna, 'specially protected' fauna and 'priority' fauna.

1.2 Legislation and policy

Fauna may be listed as threatened, extinct or specially protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the State *Biodiversity Conservation Act 2016* (BC Act). Threatened fauna are classified as either 'critically endangered' (CR), 'endangered' (EN) or 'vulnerable' (VU). Extinct species are classified as 'extinct' (EX) or 'extinct in the wild' (EW)[1]. Specially protected species are classified as 'migratory species' (MI), 'species of special conservation interest' (CD) or 'other specially protected' (OS). Commonwealth and/or State ministerial approval is required to impact threatened and specially protected fauna.

Native fauna that are not listed as threatened or specially protected, but are otherwise rare, under threat or poorly known, may be added to a Department of Biodiversity Conservation and Attractions (DBCA) priority list. Priority fauna are classified as either 'priority 1' (P1), 'priority 2' (P2), 'priority 3' (P3) or 'priority 4' (P4). Priority listing does not afford direct statutory protection. However, the classification of priority species is taken into account during State and Local government approval processes.

Introduced fauna that are regarded as having negative environmental or economic impacts may be listed as a 'declared pest' pursuant to the *State Biosecurity and Agriculture Management Act 2007* (BAM Act). Management of declared pests may be required during government approval processes.

Further information on legislation and policy relevant to fauna assessments is provided in **Appendix A**.

1.3 Scope of work

The scope of work was specifically to undertake a terrestrial vertebrate fauna assessment to the standard required of a 'basic' fauna survey and a 'targeted' bird and bat survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2020).

As part of this scope of work, the following tasks were undertaken:

[1] Currently there are no threatened species listed as extinct in the wild in Western Australia.

- Desktop study to provide contextual information and determine the likelihood of occurrence of threatened, specially protected and priority fauna.
- Field survey to record fauna and fauna habitats with a particular focus on habitat for threatened and priority fauna species.
- Analysis and mapping of contextual information, fauna habitat and black cockatoo breeding, roosting and foraging (if present).
- Bird surveys at fixed points within the site.
- Deployment of ultrasonic bat detector devices within the site.
- Documentation of the desktop study, methods, results, discussion and conclusions.

2 Desktop Study

2.1 Site context

2.1.1 Location and extent

The site is located in the Shire of Dandaragan in the Geraldton Sandplains region of Western Australia and extends over 8526.73 hectares (ha) as shown in **Figure 1**. The site is bounded by agricultural land to the to the north and east, Badgingarra National Park and Cadda Rd to the south and Yerramulla Rd to the west.

2.1.2 Climate

The South West region of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters (BoM 2023). Recent rainfall at the closest weather station to the site has been inconsistent with long term averages **Plate 1** (BoM 2023). Targeted surveys should be undertaken during the season that is most suitable for detection and identification of the targeted species (EPA 2020).

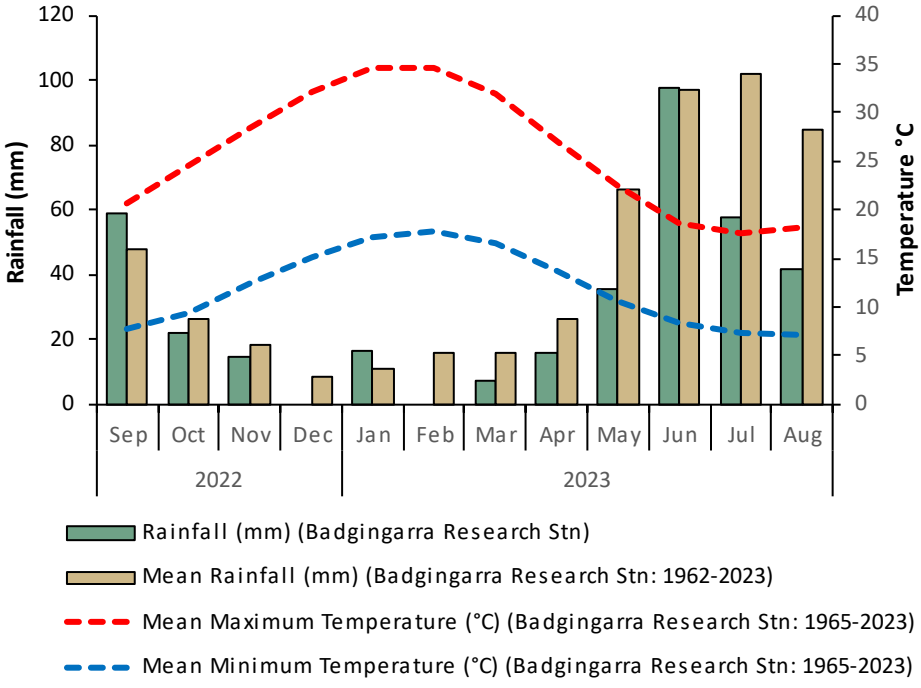

Plate 1: Recent rainfall and long-term mean temperature and rainfall

2.1.3 Geomorphology and soils

Landform and soils influence fauna habitat and species at regional and local scales. The site occurs on the Geraldton Sandplains in the Lesueur Sandplain subregion, which is the geomorphic unit that characterises the region spanning from Dongara in the north to Greenhead in the south and spanning inland to Badgingarra (CALM 2003). This region is characterised by an undulating lateritic sandplain

mantling Permian to Cretaceous strata with areas of coastal aeolian sands and limestone. Alluvial outwash plains exist in areas of valleys and hills (Purdie *et al.* 2004).

Soil landscape mapping from the Department of Primary Industries and Regional Development (DPIRD) is summarised below in **Table 1** and shown in **Figure 2** (DPIRD 2019).

Table 1: Soil landscape mapping within the site.

Soil landscape mapping unit	Description
Yerramullah 1 Subsystem	Laterite plateau residual; shallow gravel, shallow sand over duricrust, sandy gravels
Yerramullah 2 Subsystem	Plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands
Yerramullah 3 Subsystem	Colluvial slopes and some plateau remnants, very gently to gently inclined hillslopes and sand filled minor valleys; pale and yellow deep sands, pale sandy gravels, shallow gravel over duricrust, some sandy duplexes and sandy earths
Yerramullah 4 Subsystem	Plateau residuals, complex of Ye2 and Ye3; pale sandy gravels, gravelly pale deep sand, shallow gravel over duricrust, pale deep sand, some sandy duplexes, yellow deep sand
Yerramullah 6 Subsystem	Colluvial slopes, very gently to gently inclined mid to lower hillslopes and sand filled minor valleys; pale deep sand, some sandy duplexes and shallow sand over pan or bog iron
Yerramullah 9 Subsystem	Narrow alluvial flats of minor creeks; pale to brown deep sands, sandy and loamy duplexes, shallow sand over pans
Mintaja Hills System	Rises and low hills on sedimentary rocks north and south of the Mount Lesueur area. Variable soils including red/brown non-cracking clays, brown loamy earths, and grey/brown shallow loamy duplexes. Woodlands.
Nylagarda 1 Subsystem	Drainage line and adjacent very gently inclined footslopes; mainly sandy duplexes, brown deep sand and brown sandy earth

The site is not known to contain any restricted landforms or unique geological features.

2.1.4 Topography

The elevation of the site ranges from 94 m in relation to the Australian height datum (mAHD) in the north-western corner to 278 mAHD in the centre (DoW 2008) (**Figure 2**).

2.1.5 Hydrology and wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Many wetlands provide important fauna habitat and support high levels of fauna biodiversity and endemism.

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. Review of the *Ramsar List of Wetlands of International Importance* (DBCA 2017) and *A Directory of Important Wetlands in Australia – Western Australia* (DBCA 2018) indicates that no Ramsar or listed 'important wetlands' are located within or near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography linear dataset (DWER 2018) shows the following 43 wetland or water related features occur within the site:

- 16 earth dams
- 18 watercourses - minor, non-perennial
- 9 unnamed hydrological features

The *Geomorphic Wetlands of Cervantes Eneabba* dataset maps geomorphic wetland features and classifies them based on their landform shape and water permanence (DBCA 2023a). Each wetland feature is classified according to their host landform and hydroperiod.

A review of the *Geomorphic Wetlands, Cervantes Eneabba* dataset indicated that one dampland wetland feature (Unique Feature Identifier (UFI) 581) occurs within the central northern side part of the site and one non-classified wetland feature (UFI 258) occurs in the south-western part of the site (DBCA 2023a).

The location of the hydrological features and geomorphic wetland mapped in the site are shown in **Figure 2.**

2.1.6 Regional vegetation

Vegetation types and resulting fauna habitats strongly influence the diversity and composition of fauna taxa present within an area. Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) separates the Geraldton Sandplains into three floristic regions (Environment Australia 2000).

The site is contained within the 'GES02' or Lesueur Sandplain subregion, which is characterised as mainly containing *Acacia-Casuarina* thickets further inlands and *Eucalyptus loxophleba* on hard-setting loams (Beard 1990).

Variations in native vegetation can be further classified based on regional vegetation mapping. Beard *et al.* (2013) mapping shows the site as comprises vegetation association 'Lesueur 1034' which is described as 'medium woodland; marri and wandoo' and 'Lesueur 1031' which is described as 'mosaic: shrublands; hakea scrub-heath/shrublands; dryandra heath'.

2.1.7 Historic land use

Review of historical images available from 2000 onwards shows that the majority of the site was cleared of native vegetation prior to 2000, mostly for grazing and cropping as well as some residential uses (WALIA 2023)

2.1.8 DBCA managed or legislated land

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2021b) and *Lands of Interest* (DBCA 2021a) datasets. The *Legislated Lands and Waters* (DBCA 2021b) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA 2021a) dataset includes all

other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Lands as the responsible agency.

Two areas of DBCA managed or legislated lands or lands of interest occur adjacent to the site (DBCA 2021b). Badgingarra National Park lies adjacent to the southern border of the site and extends to the south and east. Hill River Nature Reserve lies adjacent to the north-eastern corner of the site and extends along Hill River. These features are shown in **Figure 3**.

2.1.9 Threatened, specially protected and priority fauna

The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) has compiled various datasets relating to 'matters of national environmental significance' (MNES) (DCCEEW 2023b). The *Protected Matters Search Tool* provides general guidance on threatened and specially protected fauna listed under the EPBC Act that may occur within a location based on validated records and less reliable unvalidated habitat distribution modelling (DCCEEW 2023b).

DBCA's *Threatened and Priority Fauna* database and *NatureMap* database, as well as the spatial portal of the Atlas of Living Australia (ALA) contain records of threatened specially protected and priority fauna in Western Australia (ALA 2023; DBCA 2023c, b). Searches of these databases provide point data for threatened, specially protected and priority fauna within a location, comprising validated and historical unvalidated records.

A search was initially conducted for fauna species that have been recorded within a 20 km radius of the site using the *Protected Matters Search Tool* (DCCEEW 2023b), *NatureMap* (DBCA 2023b), DBCA's conservation significant fauna database (reference no. FAUNA7936), Atlas of Living Australia (ALA 2023) and literature references.

A total of 932 fauna species were identified from database searches as occurring or potentially occurring within 50 km of the site[2] as listed in **Appendix B.**

2.1.10 Pest fauna

The term 'pest fauna' can refer to any animal that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Pest fauna species are generally not native but some Australian or Western Australian fauna may also be considered pests.

A particularly invasive or detrimental pest species may be listed as a 'declared pest' pursuant to Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. Current pest status and control categories for Western Australia are provided in the *Western Australian Organism List* (DPIRD 2022). Further information on categories of declared pests is provided in **Appendix A**.

2.1.11 Previous surveys

Brett Lane & Associates Pty Ltd. previously conducted a fauna assessment and targeted bird and bat survey of the site and wider Badgingarra area for the now developed Badgingarra wind farm (Brett

[2] Includes native and non-native species

Lane & Associates Pty Ltd 2008). The survey found that the site comprised mostly of cleared pasture land with little to no value to fauna as well as some planted eucalyptus, heathland and woodland habitats which supported a variety of native wildlife. Carnaby's black cockatoo were recorded during the survey in all habitats but showed preference for heathland areas. No threatened species of mammals, reptiles or frogs were recorded within the site, and all bats found were common and widespread species.

Astron Environmental Services conducted a 'level 1' (now referred to as a 'basic') fauna survey within the site and areas to the south and east in 2015 (Astron environmental Services 2016). The survey recorded one threatened species (Carnaby's black cockatoo (EN)), one previously specially protected species (rainbow bee-eater (MI), now marine) and one priority species (western brush wallaby (P4)). Astron environmental Services (2016) stated that large areas of vegetation in the local area provided high value foraging resources for Carnaby's black cockatoo.

Ecoscape conducted Carnaby's black cockatoo and bird monitoring at the established Badgingarra wind farm in February-April and July 2019 (Ecoscape 2019). Bird utilisation and abundance surveys found a statistically significant difference in both general bird and Carnaby's black cockatoo count data in both wind farm and reference sites, with presence of all bird species higher in reference sites by up to 90%. In total, 83 Carnaby's black cockatoos and 559 other birds were observed in sites with turbines and 840 Carnaby's cockatoos and 7,026 other birds were recorded in the reference sites.

2.2 Likelihood of occurrence

The distribution and habitat preferences of the threatened and priority fauna species listed in **Appendix B** was reviewed against site context information described in **Section 2.1**. Likelihood of occurrence of threatened, specially protected and priority fauna species within the site was classified as 'high', 'moderate', 'low', 'negligible' or 'nil' as outlined in **Table 2**.

Table 2: Likelihood of occurrence assessment categories and definitions

		Reliable record[1]		Unreliable record[2]
		Access to site not impeded	Access to site impeded	
Habitat	Suitable	High	Low	Nil
	Potentially suitable	Moderate		
	Unsuitable	Negligible		

[1]Reliable record defined as DBCA or validated ALA record from the last ~20 years, [2]Unreliable record defined as record >20 years old or PMST prediction.

One threatened, two specially protected and four priority species were classified as having a 'high' or 'moderate' likelihood of occurrence. The legislative or policy status and habitat preferences of these species are shown in **Table 3**.

The remainder of the conservation significant fauna species identified in the desktop assessment (32 species) were considered as having a 'low', 'negligible' or 'nil' likelihood of occurrence. Refer to **Table 3** and **Appendix C** for detail on individual species likelihood of occurrence.

Table 3: Summary of conservation significant fauna species with potential to occur in the site

Species name	Common name	Status		Habitat description
		WA	EPBC Act	
Birds				
Apus pacificus	Pacific swift	MI	MI	Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities
Falco peregrinus	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes
Zanda latirostris	Carnaby's black cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of *Pinus* spp. Attracted to seeding *Banksia* spp., *Dryandra* spp., *Hakea* spp., *Eucalyptus* spp., *Corymbia calophylla*, *Grevillea* spp., and *Allocasuarina* spp.
Invertebrates				
Hylaeus globuliferus	Woollybush bee	P3	-	Males are territorial and may be found perched on the growing tips of *Adenanthos* sp., *Banksia* sp. or *Jacksonia* sp. Has also been recorded visiting the flowers of *Grevillea* sp.
Idiosoma gardneri	Mt Lesueur shield-backed trapdoor spider	P2	-	Only one recorded specimen. Found in Lesueur National Park, likely has similar biology to *Idiosoma sigillatum*.
Mammals				
Notamacropus irma	Western brush wallaby	P4	-	Dry sclerophyll forest, *Banksia* spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover.
Reptiles				
Neelaps calonotos	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and *Banksia* spp. woodlands.

2.3 Black cockatoos

Three threatened species of black cockatoo occur in the south-west of WA (referred to herein collectively as 'black cockatoos'):

- *Zanda*[3] *latirostris* (Carnaby's black cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Zanda*[3] *baudinii* (Baudin's black cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories. **Breeding habitat** refers to 'habitat trees' which consist of native trees of a suitable species that

[3] Previously *Calyptorhynchus*

either contain nesting hollows or have a large enough diameter at breast height[4] (DBH) to develop a nesting hollow over time (DAWE 2022). Black cockatoos typically utilise breeding habitat within their defined breeding season: August to March for Baudin's black cockatoo, July to December for Carnaby's black cockatoo and throughout the year for forest red-tailed black cockatoo, with peaks in April – June and August – October (DAWE 2022). **Roosting habitat** consists of a stand of tall trees (>8 m) within 6 km of water and food resources and 12 km of additional foraging resources where black cockatoos rest overnight (Shah 2006; Glossop *et al.* 2011; Le Roux 2017; DAWE 2022). **Foraging habitat** is vegetation that black cockatoos are known to feed on, which varies between black cockatoo species (Groom 2011; Johnstone *et al.* 2011; DAWE 2022). A full range of foraging plants and their foraging category assigned by Emerge Associates is available in **Appendix D**.

A review of black cockatoo datasets was undertaken as outlined in **Table 4** and shown in **Figure 4**. Further information on black cockatoo habitat is available in **Appendix A**. Counts for all known black cockatoo roosts within 12 km are available in **Appendix E**.

Table 4: Summary of black cockatoo background review

Category	Black cockatoo site context			Source
	Carnaby's	Baudin's	Forest red-tailed	
Site located within species distribution	Yes	No	No	(DAWE 2022)
Site in known breeding distribution	Yes	N/A	N/A	(DAWE 2022)
Site is located within 12km of a confirmed or possible breeding site	No	N/A	N/A	(Glossop *et al.* 2011)
Site located in important bird area	No	N/A	N/A	(DPaW 2013; BirdLife International 2022)
Known roosts occur within site^	N/A		N/A	(Peck *et al.* 2019)
Known roosts occur within 12 km of site^	6		N/A	
Potential foraging habitat within site	Yes	N/A	N/A	(Forest Products Commission 2020; Emerge Associates 2021)
Potential foraging habitat in local area (including pine plantations)	Yes	N/A	N/A	

^'White-tailed black cockatoo roosts can be Carnaby's black cockatoo and/or Baudin's black cockatoo.

[4] ≥50 cm or ≥30 cm for wandoo or salmon gum

3 Methods

3.1 Field survey

Two zoologists from Emerge visited the site from 18 September 2023 to 22 September 2023 to conduct the basic fauna survey and a targeted bird and bat survey field survey.

3.1.1 Active and opportunistic searches

Transects were traversed across the site during the day to evaluate the fauna habitat and record the presence of fauna species. Fauna habitat was assessed based on vegetation condition, the overall disturbances to the area and the microhabitat characteristics such as soil type and leaf litter density as well as the presence of logs, rocks, leaf litter and water. An opportunistic fauna list was compiled which included evidence of species presence such as tracks, scats, skeletal remains, foraging evidence and calls.

3.1.2 Cameras

Five non-baited motion-sensor cameras (Acorn Ltl-5310) were placed across the site for between 2-4 nights/3-5 days. Cameras were located within habitat types likely to support ground dwelling fauna that may not have been observed during active and opportunistic searches.

The dates and coordinates of each camera is provided in **Appendix F**. The location of each fauna camera sampling site is shown in **Figure 5**.

3.1.3 Black cockatoos

The site was traversed and the presence of potential black cockatoo breeding, night roosting and foraging habitat was recorded. If observed, the presence of black cockatoos within or near the site was noted. Active searches for evidence of breeding, roosting and foraging activity such as chew marks, branch clippings, droppings, moulted feathers and chewed marri or banksia fruit were conducted.

3.1.3.1 Breeding habitat

Breeding habitat was identified as vegetation with native eucalypts that met the required DBH (≥50 cm for suitable species or ≥30 cm for wandoo or salmon gum). Individual habitat trees within each patch of vegetation were not recorded.

3.1.3.2 Roosting habitat

Roosting habitat was identified as groups of tall native and non-native trees. The presence of active or historical roosts in these trees was determined through evidence of roosting activity, such as branch clippings, droppings or moulted feathers.

Tall groups of native and non-native trees in the site within 1,000 m of an existing large roost (>150 individuals) or 500 m of an existing small roost (<150 individuals) were assumed to be associated with that roost (Glossop *et al.* 2011).

3.1.3.3 Foraging habitat

Foraging habitat was identified by assessing vegetation in the site for plant species known to provide food for black cockatoos (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Groom 2011; Johnstone *et al.* 2011; DAWE 2022).

Foraging habitat was classified as either 'native' or 'non-native' based on the predominant vegetation's naturalised status. It was also classified as either 'primary' or 'secondary' based on black cockatoo foraging preferences. Primary food plants were defined as those with historical and contemporary records of regular consumption by a black cockatoo species. Secondary food plants were defined as plants that black cockatoo species have been recorded consuming occasionally or that, based on their limited extent or agricultural origin, should not be considered a sustaining resource. A list of plant species classified as primary or secondary food plants is provided as **Appendix D**.

Each patch of foraging habitat was assigned a foraging value for each species of black cockatoo likely to occur within the site. As it is not always possible to separate out food plants from non-food plants, mapped foraging habitat may also include vegetation comprising non-food plants. The proportion of non-food plants in mapped foraging habitat was minimised as far as practicable.

Evidence of black cockatoo foraging, such as chewed fruits, was searched for within the site and allocated to a black cockatoo species where possible.

3.1.1 Birds

Bird utilization surveys were undertaken using six fixed-point samples. Survey locations were selected based on areas where wind turbines were most likely to be situated and areas with the highest elevation. Locations aligned with the pre-development bird surveys for the Badgingarra wind farm (Brett Lane & Associates Pty Ltd 2008).

Each survey was 15 minutes in duration and consisted of a count of all birds identified within positive identification range (approximately 200-300 m radius) from the sample location. Birds were identified to species level by sight or call. Each site was sampled for four consecutive days and sampled at a different time of the day to account for variation in movements of species over the course of the day. Each bird species recorded was classified into one of the following three broad height categories according to the height at which the species was frequently observed:

- Height Category 1 (HC1) – Predominantly observed flying above canopy height.
- Height Category 2 (HC2) – Predominantly observed flying at canopy height.
- Height Category 3 (HC3) – Predominantly observed flying below canopy (in shrubs or crop/grasses)

Notes on the weather and survey time were also taken for each site.

The locations of bird utilisation survey sampling sites are shown in **Figure 5**.

3.1.2 Bats

Bat echolocation calls were recorded using two bioacoustics recorders (Wildlife Acoustics Song Meter SM4BAT FS). The devices were placed in locations where bats were considered most likely to occur, mostly in remnant intact vegetation and woodland habitats which contained suitable bat foraging species.

Each device was programmed to record ultrasonic sound from 30 minutes pre-dusk to 30 minutes post-dawn. Each device was placed at two locations for one night each.

The dates and coordinates of each bat detector survey is provided in **Appendix G**. The locations of sampling sites are shown in **Figure 5**.

3.2 Data analysis

3.2.1 Fauna identification

Fauna observed during the survey were identified in the field where possible. Photographs and/or noted observations were recorded on unknown species and they were later identified through the use of taxonomic keys and field guides.

3.2.1.1 Nomenclature and sources of information

Taxonomy and nomenclature of scientific and common names for mammals, reptiles and amphibians follow *the Western Australian Museum* (WAM) *Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2022). For birds taxonomy and nomenclature of scientific and common names follows the Australian Faunal Directory (AFD) (DCCEEW 2023a). Where common names were not provided by the WAM or the AFD, these have been derived from other sources as noted.

Literature listed in **Appendix A** represent the main publications used to identify fauna species and habitats within the site.

3.2.2 Fauna habitat

Fauna habitats were described according to the dominant flora species and vegetation type present, as determined from observations made during the field survey and information provided in the '*Detailed Flora and Vegetation Assessment*' (Emerge Associates 2024). Significant microhabitat features present in each habitat were also described.

The identified fauna habitats were mapped on aerial photography with the boundaries interpreted from aerial photography, Emerge Associates (2024) plant communities and notes taken in the field.

3.2.3 Black cockatoo habitat

3.2.3.1 Breeding and roosting habitat

Breeding and roosting habitat was mapped using notes taken in the field.

3.2.3.2 Foraging habitat value

Foraging habitat was described according to the dominant flora species or vegetation type present and mapped using boundaries interpreted from aerial photography and notes taken in the field. The foraging value of each patch of foraging habitat was attributed separately for each species of black cockatoo likely to occur in the site. Foraging value was assigned as outlined in **3.1.1.3**.

3.2.4 Birds

Total bird counts from across all fixed-point bird survey sites were tallied according to site number. The height category of each species observed during fixed-point and opportunistic surveys was refined to reflect their maximum flight height according known biology from literature sources and survey observations.

3.2.5 Bats

Recordings were analysed by experienced zoologist Brenden Metcalf by comparing calls recorded in the site to established bat call libraries using Kaleidoscope Pro Analysis Software (Wildlife Acoustics 2023).

3.3 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA's document *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) is provided in **Table 5**.

Table 5: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)

Constraint	Degree of limitation	Details
Level of survey	No limitation	A basic survey (desktop study and field survey) in combination with a targeted bird and bat survey was undertaken. The level of survey and survey effort are considered adequate to assess the fauna habitat values within the site, in addition to providing baseline bird and bat data.
Scope	No limitation	The survey focused on vertebrate fauna and habitat values, with particular focus on conservation significant taxa with potential to occur within the site.
Proportion of fauna identified, recorded and/or collected.	No limitation	All observed vertebrate fauna were identified.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	No limitation	Adequate information was available from database searches, previous surveys and literature references.

Table 5: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020) (continued)

Constraint	Degree of limitation	Details
The proportion of the task achieved and further work which might be needed.	Minor limitation	The task was achieved in its entirety. The targeted bat and bird survey data is preliminary and likely to require multi season/year surveys.
Experience level of personnel	No limitation	This fauna and black cockatoo assessment was undertaken by qualified zoologists with over four and two years of zoological experience in Western Australia. Technical review was undertaken by a senior environmental consultant with over 15 years' experience in environmental science in Western Australia.
Suitability of timing, weather and season	No limitation	Survey timing is not considered to be of great importance for basic fauna assessments but the weather conditions during the survey were ideal for detecting fauna species. Carnaby's black cockatoos migrate south from the Badgingarra region to the northern Swan Coastal Plain in the summer months. The survey was therefore undertaken outside any periods of migration for black cockatoos (Johnstone *et al.* 2008). No night surveys were undertaken to observe nocturnal bird species.
Completeness	No limitation	The desktop assessment, field survey and targeted black cockatoo components of the survey were completed comprehensively.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	All parts of the site could be accessed as required.
Survey intensity	Minor limitation	The intensity of the survey was adequate given the size of the site and the relatively low habitat value present. Due to errors in each bat audio detector only one night of sampling was achieved at each location.
Influence of disturbance	No limitation	The site is highly modified due to historical disturbance.
Adequacy of resources	No limitation	All resources required to perform the survey were available. No federal or state guidelines for wind farm surveys exist at the survey. The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is limited and relies heavily on technical experts preparing their own methodology. This assessment applies an internally developed methodology that is considered to provide a systematic and balanced characterisation of black cockatoo habitat.
Compliance with EPA (2020) guidance	Minor limitation	The EPA guidance requires that a full list of all fauna species with potential to occur within the site is compiled. As part of this assessment a comprehensive list of fauna species of conservation significance was compiled. Non-conservation taxa with potential to occur within the site were not compiled into a list but are provided as raw data in **Appendix B**. Given that all species with potential to occur within the site are still identified within the relevant appendices this is not considered to affect the outcomes of this assessment.

4 Results

4.1 Fauna

4.1.1 Species inventory

A total of 58 native and eight introduced fauna species, were directly or indirectly (from foraging evidence) recorded during the field survey. This includes three species recorded from camera capture events which are shown in **Plate 2** to **Plate 4**: *Dromaius novaehollandiae* (emu), *Macropus fuliginosus* (western grey kangaroo) and *Tarsipes rostratus* (honey possum).

Plate 2: Capture event of emu at camera site 3

Plate 3: Capture event of western grey kangaroo at camera site 4

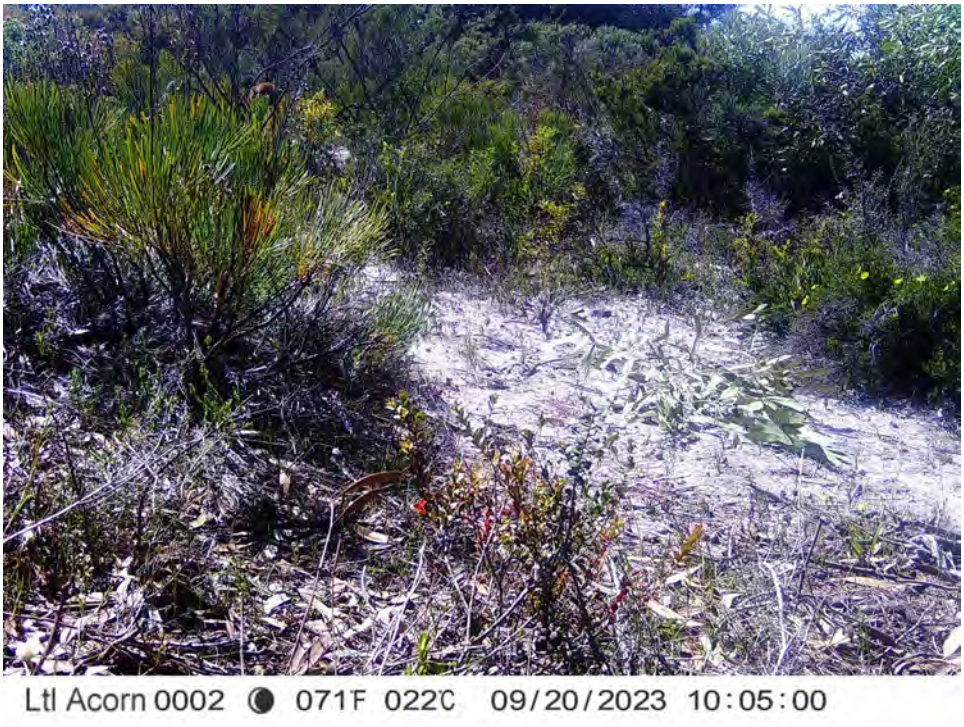

Plate 4: Capture event of honey possum at camera site 4

A complete species list is provided in **Appendix H**.

4.1.2 Threatened, specially protected and priority fauna

One threatened species was recorded within the site during the field survey: *Zanda latirostris* (Carnaby's black cockatoo (EN)).

4.1.3 Declared pests

Three species listed as a declared pest (C3) pursuant to the BAM Act, *Oryctolagus cuniculus* (rabbit) and *Vulpes vulpes* (fox) and *Sus scrofa* (pig), were identified from scats and diggings within the site.

4.2 Fauna habitat

10 broad fauna habitats were identified within the site, as listed in in **Table 7**.

A description, the size of the area and a representative photograph of each habitat is provided in **Table 7**. The location of each habitat is shown on **Figure 6**.

Table 6: Fauna habitats within the site

Fauna habitat	Description	Total area (ha)	Proportion of site (%)	Representative photograph
Agricultural vegetation	Planted **Chamaecytisus palmensis*. Value of habitat varies across the site with some locations densely vegetated, others planted more recently in rows and with an open structure and some locations intermixed with broken woody debris and dead vegetation. • Value to fauna varies dependent on vegetation cover and structure. • Low microhabitat complexity. • Areas with more dense vegetation may provide habitat for larger mammals as well as common and widespread avifauna	738.07	8.65	
Bare ground and pasture	Mostly cleared or low non-native (weed) grassland paddocks used for sheep grazing. Includes farm laneways, firebreaks and cleared areas around infrastructure (houses, sheds etc.). • Provides little to no value for most fauna • Low microhabitat complexity • May be utilised by raptor species hunting for lambs, mice and rats in the paddocks • Used by livestock • Some avifauna may traverse across this habitat to move to more intact native vegetation	7246.97	84.97	

Table 6: Fauna habitats within the site (continued)

Fauna habitat	Description	Total area (ha)	Proportion of site (%)	Representative photograph
Dams	Permanent or semi-permanent water features. Mostly agricultural dams built adjacent to wetland areas to service livestock. • Most likely used by widespread and common avifauna, amphibia and introduced mammals and livestock. • Higher quantity of invertebrate species including *Cherax destructor*.	2.31	0.03	
Eucalypt woodland	Dense woodland of native *Eucalyptus* spp. trees over mixed native shrub and understory species. • Moderate microhabitat complexity (woody debris, burrows, runnels, fallen logs, leaf litter). • Canopy and dense shrub layer likely supports an array of common and rarer avifauna. • Denser understory areas combined with soft soils are likely to support ground dwelling fauna and reptiles. • Connectivity with intact roadside vegetation outside of the site.	19.58	0.23	

Table 6: Fauna habitats within the site (continued)

Fauna habitat	Description	Total area (ha)	Proportion of site (%)	Representative photograph
Laterite hills and breakaways	Native shrubland vegetation on laterite breakaways and hills. Includes some smaller hills in paddocks which are mostly grazed and have lower cover of shrubs. • Moderate microhabitat complexity for most areas (details) • Low microhabitat complexity in smaller hills in paddocks. • Provides habitat for smaller shrub-dwelling birds and some raptor species as well as small reptiles. Larger mammals may traverse through these sites. • Used by livestock.	71.76	0.85	
Open forest	Open Eucalyptus spp. forest of mostly non-native, planted trees interspersed with some native species. Heavy disturbance from vehicle tracks and livestock grazing. • Low microhabitat complexity. Some fallen woody debris and sandy patches with reptile burrows. • Utilised by common and widespread avifauna and livestock.	120.68	1.41	

Table 6: Fauna habitats within the site (continued)

Fauna habitat	Description	Total area (ha)	Proportion of site (%)	Representative photograph
Plateau	Native shrubland located on a rocky laterite plateau. • High microhabitat complexity (woody debris, rocky outcroppings, small caves, dense shrubs, burrows). • Likely utilised by a broad fauna assemblage including most avifauna not requiring canopy, mammals and reptiles. • Fenced with few livestock incursions. • Connectivity with sandplain woodland habitat as well as high value vegetation outside the site.	58.75	0.69	
Riparian and wetland vegetation	Riparian vegetation surrounding water features or growing in seasonally inundated drainage lines. • Moderate microhabitat complexity. Some woody debris, dense understory vegetation, water features (puddles, drainage line, muddy terrain). • Species are likely to move between this habitat and dams and water features. • Use mostly by widespread and common avifauna, amphibia and likely introduced mammals and livestock. • Where not fenced, areas are frequented by livestock for shade.	22.89	0.27	

Table 6: Fauna habitats within the site (continued)

Fauna habitat	Description	Total area (ha)	Proportion of site (%)	Representative photograph
Sandplain	Open *Eucalyptus* spp. and *Proteaceae* woodland over native shrubs on sandy soils. • High microhabitat complexity (woody debris, burrows, runnels, fallen logs, leaf litter) • Denser areas may provide habitat for larger mammals and a wide assemblage of common and rarer avifauna as well as reptiles. • Largest areas of habitat fenced from livestock.	191.81	2.25	
Scattered trees and shrubs	Scattered native and non-native trees and shrubs over non-native grasses. Mostly associated with *Eucalyptus gomphocephala* in paddocks or along firebreak/laneway edges and remnant **Chamaecytisus palmensis* in paddocks. • Low microhabitat complexity • Utilised mostly by livestock for shade. Some common avifauna may use sparingly. • Poor connectivity with surrounding areas of vegetation. • Some *Pinus spp.* on the western edge of the site provide primary food resources for Carnaby's black cockatoo.	55.73	0.65	

4.3 Black cockatoo habitat

4.3.1.1 Breeding

A total of 185.86 ha of potential breeding habitat for Carnaby's black cockatoos was recorded within the site as shown in **Figure 7**.

Breeding habitat within the site comprised mostly of tuart, jarrah, marri, *Eucalyptus rudis* (flooded gum) and stag (dead) trees.

4.3.1.2 Roosting

A total of 185.86 ha of roosting habitat for Carnaby's black cockatoos was recorded within the site as shown in **Figure 7.**

No roosts or evidence of roosting were observed within the site during the survey.

4.3.1.3 Foraging

A total of 468.36 ha of foraging habitat for Carnaby's black cockatoo was recorded in the site as shown in **Figure 7**.

The extent of foraging habitat by value category is detailed in **Table 7**.

Table 7: Foraging habitat recorded within the site

Foraging habitat	Foraging habitat for Carnaby's black cockatoos (ha)
Primary native	276.93
Primary non-native	6.37
Secondary native	47.55
Secondary non-native	137.51
Total	468.36

4.4 Birds

A total of 32 bird species were observed across the six sample sites. A further 19 bird species were observed during the survey within the site but outside of the fixed-point bird survey sites.

Eleven species were observed from HC1, 12 species in HC2 and 29 species in HC3.

A summary count of the bird species observed across all fixed-point sites as well as all recorded opportunistic observations are shown in **Table 8** and a record of the average species abundance and richness across each site each day is show in **Appendix I** and **Plate 5.** Species richness across all sites is shown in **Plate 6.**

Table 8: Total number of bird species observed at each site across the total duration of the survey sorted according to most observed height category

Species name	Common name	Site and number of individuals observed						Opportunistic observations	Total
		1	2	3	4	5	6		
Height category 1									
Anas gracilis	Grey teal	0	0	0	0	0	0	X	N/A
Anas superciliosa	Pacific black duck	0	0	0	0	0	0	X	N/A
Aquila audax	Wedge-tailed eagle	0	0	0	0	1	0	X	1
Cacatua sp.	Corella sp.	0	0	0	0	0	25		25
Circus approximans	Swamp harrier	0	0	0	0	0	0	X	N/A
Chenonetta jubata	Australian wood duck	0	0	0	0	0	0	X	N/A
Egretta novaehollandiae	White-faced heron	0	0	0	0	0	0	X	N/A
Elanus axillaris	Black-shouldered kite	0	1	0	0	0	0	X	1
Falco cenchroides	Nankeen kestrel	0	3	2	1	2	2	X	10
Lophoictinia isura	Square-tailed kite	2	0	0	0	0	0	X	2
Threskiornis spinicollis	Straw-necked ibis	0	0	0	7	0	54	X	61
Height Category 2									
Artamus cinereus	Black-faced woodswallow	0	0	0	0	0	0	X	N/A
Barnardius zonarius	Australian ringneck	0	0	2	1	0	2	X	5
Cincloramphus cruralis	Brown songlark	18	26*	23*	15*	27*	17*	X	126*
Coracina novaehollandiae	Black-faced cuckoo shrike	2	0	0	0	1	2		5
Corvus bennetti	Little crow	0	0	0	1	0	0		1

Table 8: Total number of bird species observed at each site across the total duration of the survey sorted according to most observed height category (continued)

Species name	Common name	Site and number of individuals observed						Opportunistic observations	Total
		1	2	3	4	5	6		
Corvus coronoides	Australian raven	6	2	8	14	20	29	X	79
Cracticus nigrogularis	Pied butcherbird	1	1	1	4	2	0	X	9
Cracticus tibicen	Australian magpie	11	8	8	14	8	6	X	55
Eolophus roseicapilla	Galah	0	0	0	5	0	0	X	5
Grallina cyanoleuca	Magpie-lark	10	1	7	8	6	4	X	36
Hirundo neoxena	Welcome swallow	14	0	0	0	0	0	X	14
Manorina flavigula	Yellow-throated miner	0	0	6	12*	0	0		18*
Height Category 3									
Acanthiza chrysorrhoa	Yellow-rumped thornbill	0	0	0	0	0	0	X	N/A
Anthochaera carunculata	Red wattlebird	0	0	0	2	0	0	X	2
Anthus novaeseelandiae	Australian pipit	16*	3	2	10	7	5	X	43*
Chrysococcyx basalis	Horsfield's bronze-cuckoo	2	0	1	0	0	0	X	3
Cacomantis flabelliformis	Fan-tailed cuckoo	1	0	3	0	0	0	X	4
Cincloramphus mathewsi	Rufous songlark	3	0	6	0	0	0	X	9
Colluricincla harmonica	Grey shrikethrush	0	0	0	0	0	0	X	N/A
Coturnix pectoralis	Stubble quail	13*	22*	13	9*	1	4	X	62*
Dromaius novaehollandiae	Emu	0	9	0	1	0	0	X	10

Table 8: Total number of bird species observed at each site across the total duration of the survey sorted according to most observed height category (continued)

Species name	Common name	Site and number of individuals observed						Opportunistic observations	Total
		1	2	3	4	5	6		
Epthianura albifrons	White-fronted chat	0	0	0	0	0	0	X	N/A
Gerygone fusca	Western gerygone	0	0	0	1	0	0	X	1
Gliciphila melanops	Tawny-crowned honeyeater	0	0	1	0	0	0	X	1
Lichmera indistincta	Brown honeyeater	3	0	9	5	0	0	X	17
Malurus assimilis	Purple-backed fairywren	0	0	0	0	0	0	X	N/A
Malurus leucopterus	White-winged fairywren	0	12	2	0	0	0	X	14
Malurus spendens	Splendid fairywren	0	0	0	0	0	0	X	N/A
Melithreptus brevirostris	Brown-headed honeyeater	0	0	0	0	0	0	X	N/A
Neophema elegans	Elegant parrot	0	0	0	0	0	0	X	N/A
Ocyphaps lophotes	Crested pigeon	0	0	1	0	0	0	X	1
Pachycephala rufiventris	Rufous whistler	0	0	1	0	0	0	X	1
Phaps chalcoptera	Common bronzewing	0	0	0	0	0	0	X	N/A
Phylidonyris niger	White-cheeked honeyeater	0	0	0	0	0	0	X	N/A
Rhipidura albiscrapa	Grey fantail	0	0	0	0	0	0	X	N/A
Rhipidura leucophrys	Willy wagtail	3	0	4	0	0	0	X	7
Sericornis maculatus	Spotted scrubwren	0	0	0	0	0	0	X	N/A

Table 8: Total number of bird species observed at each site across the total duration of the survey sorted according to most observed height category (continued)

Species name	Common name	Site and number of individuals observed						Opportunistic observations	Total
		1	2	3	4	5	6		
Smicrornis brevirostris	Weebill	0	0	0	0	0	0	X	N/A
Tachybaptus novaehollandiae	Australasian grebe	0	0	0	0	0	0	X	N/A
Vanellus tricolor	Banded lapwing	0	0	0	0	0	0	X	N/A
Zosterops lateralis	Silvereye	0	0	2	0	0	0		2

*Counts that were approximate for at least one of the bird survey days. Totals only counted for species observed during fixed-point bird surveys.

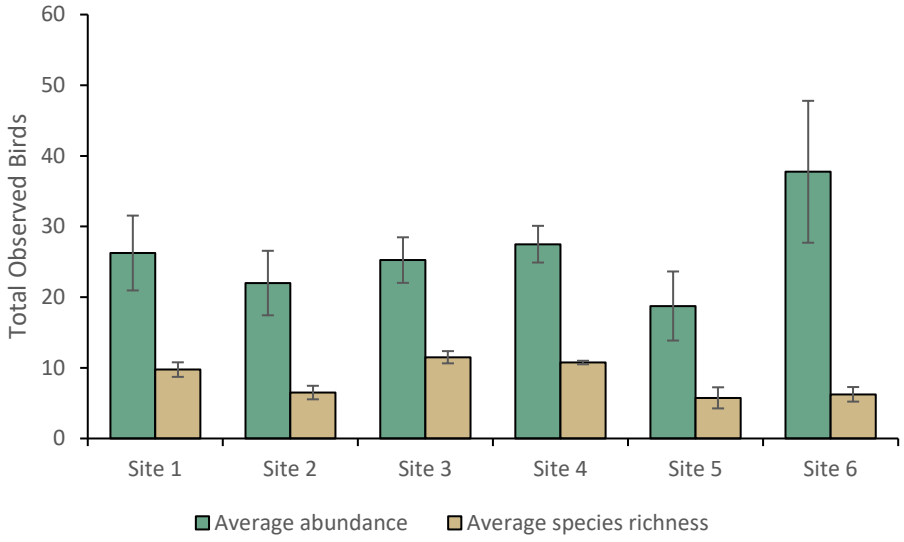

Plate 5: Average abundance and species richness across each site

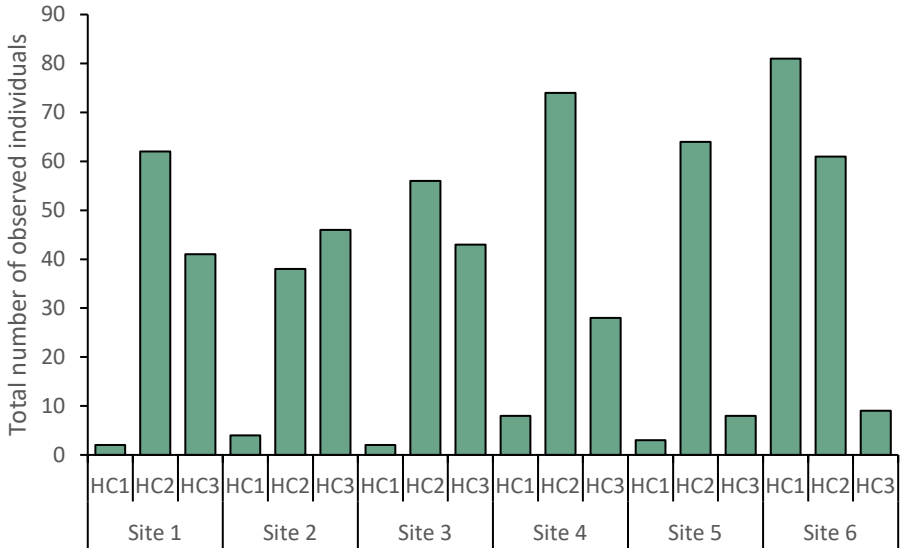

Plate 6: Total abundance across each height category in each site

4.5 Bats

Three bat taxa were recorded from three sample locations within the site. Site C did not record any bats.

The number of each species is shown in **Table 9**. A summary of the analysed data across all the recorders is provided in **Appendix G**.

Table 9: Bat species and relative abundance.

Species		Site and relative abundance			
Scientific name	Common name	A	B	C	D
Chalinolobus gouldii	Gould's wattled bat	22	1	-	132
*Nyctophilus spp.^*	Long-eared bats	22	4	-	-
Vespadelus regulus	Southern forest bat	9	10	-	5

^The *Nyctophilus* spp. calls were unable to be separated to species level but regional restrictions on the genus suggest it is likely *Nyctophilus geoffroyi*, lesser long-eared bat.

5 Discussion

5.1 Fauna

The 58 native fauna species recorded during the survey are mostly common in the region and were typically observed in areas of more intact vegetation with higher connectivity to nearby vegetation. The low number of amphibians and reptiles observed is a consequence of the low intensity nature of basic fauna surveys.

Two of the six introduced species are livestock farmed in the site. The three declared pests, European red fox, pig and rabbit, are widespread in farming regions of WA and therefore not unexpected. It is common practice by locals across WA farming regions to place *Cherax destructor* (common yabby) into dams and so presence of this species was also not unexpected.

5.1.1 Threatened, specially protected and priority fauna

Evidence of Carnaby's black cockatoo was recorded within the site and this species is discussed in **Section 5.3**.

Two specially protected and four priority species were considered to have a moderate likelihood of occurring in the site, as described below.

- The Pacific swift (MI) and peregrine falcon (OS) are highly mobile species that may opportunistically fly over or forage in the site for short periods of time as part of a much larger home range but are unlikely to perch. Neither of these species would breed within the site. Any occurrence of pacific swift or peregrine falcon in the site would likely be in the air space and largely independent from terrestrial habitat.
- The woollybush bee (P3) is a territorial native bee species which has two records approximately 14 km west of the site. The species has been recorded on *Adenanthos* sp., *Banksia* sp., *Jacksonia* sp. and *Grevillea* sp. These plant species were recorded in the site during the flora assessment (Emerge Associates 2024) and therefore the woollybush bee may occur in the sandplain and plateau habitats.
- Mt Lesueur shield-backed trapdoor spider (P2) is only known from one specimen in Lesueur National Park approximately 20 km north west of the site and is categorized as a data deficient species (Rix *et al.* 2018). Therefore, it is not possible to assess whether the species would occur in the site due to lack of information on its' ecology or record distribution. However, given trap door spiders of the *Idiosoma* genus are known to occur in banksia woodland and heathland soils, the sandplain habitat in the site may represent suitable habitat for the species.
- Records of the western brush wallaby (P4) occur within 20 km of the site and the species occupies dry sclerophyll forests, banksia woodlands and heath or shrubland vegetation (Christensen and Strahan 1984). The sandplain, plateau and fenced areas of the laterite hills and breakaways habitats represent suitable habitat for the species within the site and have some connectivity to surrounding vegetation of similar type and quality. The species may therefore be present, although only in the eastern or southern areas of the site with more intact native vegetation.

- Several records exist for the black-striped snake (P4) approximately 20 km south of the site in Wongonderrah Nature Reserve. The species is known to occur in sandplains and heathland vegetation. The sandplain, plateau and fenced laterite hills and breakaways habitats in the site may provide suitable habitat for this species.

5.2 Fauna habitat

The highest habitat values within the site are associated with the **sandplain**, **eucalyptus woodland**, **laterite hills and breakaways** and **plateau habitats**. These habitats have been subject to low levels of disturbance and supported the highest diversity of reptiles and bird species in the site, with many species recorded only within these habitats. Most of these habitats are connected to native vegetation outside of the site, including Badgingarra National Park. As such there is likely some level of movement by an array of species between these habitats and intact surrounding vegetation. Most of these habitats are fenced and undisturbed, except patches of the laterite hills and breakaways located within paddocks which are heavily degraded due to livestock use

Much of the **riparian and wetland vegetation** habitat is connected to the **dams** habitats. Species utilising the dams, frogs, water birds, invertebrates, are likely to rely on components of the **riparian and wetland vegetation** habitats including drainage to fill dams, insect and other prey species spawning, tall trees for roosting and inundated sedgelands for foraging. Some dams are isolated from surrounding vegetation and would provide little value to fauna.

The **open forest** and **agricultural vegetation** habitats are located in wooded portions throughout the site as isolated pockets of sparse forest vegetation. Due to the lack of understory and heavy disturbace they provide little value for most fauna aside from macrofauna like emus and kangaroos or common birds utilising the canopy. Carnaby's black cockatoo may use the areas of planted tuart for foraging and breeding/roosting.

The remainder of the site consists of the **scattered trees and shrubs** and **bare ground and pasture** habitats which provide limited value for native fauna. These habitats may be used by fauna for traversal between habitats but this would likely only occur where high quality habitats are relatively close, like in the north and south-eastern portions of the site. Raptors may utilise these habitats, as discussed in **Section 5.4**.

5.3 Black cockatoo habitat

Foraging evidence of Carnaby's black cockatoo in the form of chewed banksia fruits were observed during the survey in the sandplain habitat in the south of the site and many records exist for the species in the surrounding area (DBCA 2023c). The site lies within the northern part of the Carnaby's black cockatoo modelled distribution and breeding range which stretches to Eneabba, approximately 40 km north of the site (DoEE 2016).

The site is located outside of the modelled distribution range of Baudin's black cockatoo and forest red-tailed black cockatoo and so these species are not considered likely to occur and have not been discussed further (DoEE 2016).

5.3.1 Breeding and roosting

Approximately 2% of the site supports trees which may be suitable for breeding and roosting for Carnaby's black cockatoo as shown in **Figure 7**. Breeding and roosting habitat was mapped as areas which likely contain breeding trees (eucalypts with DBH >= 50cm) and/or roosting trees (eucalypts >10 m high). Breeding and roosting trees were not individually mapped. The number of habitat trees and presence of suitable hollows for Carnaby's black cockatoo breeding within these areas has not been determined and would require further survey.

5.3.2 Foraging

The site contains native foraging habitat for Carnaby's black cockatoo. The highest value foraging resource in the site is the primary native habitat due to the presence of *Banksia* spp. in the eastern portion and marri and pine trees scattered on the western edge.

The primary native foraging habitat in the eastern portion is close to Badgingarra National Park, which supports extensive foraging habitat and multiple records of Carnaby's black cockatoo (DBCA 2023c). It is likely that Carnaby's black cockatoo forage in the site in combination with other habitat in the region including Badgingarra National Park. The pine and marri trees are more isolated foraging resources but may still be used by Carnaby's black cockatoo as they move throughout the region.

The remainder of the site supports scattered lower value foraging habitat which may be occasionally used by Carnaby's black cockatoo and extensive areas of non-foraging vegetation.

5.4 Birds

The site provides little suitable habitat for most bird species due to being largely comprised of pastureland and planted agricultural vegetation. Habitat at each sample location was similar, being predominantly pasture adjacent to patches of native vegetation.

The highest value to birds was observed in the patches of native vegetation in the south-east of the site with a mixture of native bird species also recorded in the patches of planted tuart stands scattered throughout the site. These patches of vegetation were located on the edges of each of the fixed-point bird survey site and many of the HC2 and HC3 species observed during surveys were attributed to them. A much lower diversity of species and abundance of individuals was observed in the pasture area associated with each survey location. Some individuals were likely permanent residents as the same species and number of individuals were recorded across multiple days and habitats are relatively isolated.

There was little difference in individual abundance and species richness across each site, with one notable difference from **Plate 5** and **Plate 6** showing a large number of HC1 individuals in site 6, being attributed to a flock of corellas and a straw-necked ibis recorded on 19 and 21 September 2023.

The small number of species and individuals observed in HC1 was attributed to the five raptor species found across the site. Seventeen raptors occur within the region and vary in occurrence likelihood depending on distribution, habitat requirements and home ranges. Pastureland, particularly those with annual lambing seasons provide regular, reliable feeding sources for raptors, and so the presence of five common raptors was not unexpected.

The rest of the birds found throughout the site are common and widespread across the region and restricted to pasture/grasses and the high-quality fenced habitats.

The current survey was conducted at six of the XX locations established by Brett Lane & Associates Pty Ltd (2008) and recorded similar results in terms of bird abundance and species richness.

Some differences in methodology exist between the Brett Lane & Associates Pty Ltd (2008) survey and the current survey but comparison of the results is considered valid. The Brett Lane & Associates Pty Ltd (2008) survey was conducted in autumn as opposed to spring, though they noted similar weather conditions to those which occurred during the current survey period. Bird flight height was classified based on direct observations in Brett Lane & Associates Pty Ltd (2008), as opposed to the current survey using categories according to a combination of the species biology and field flight height. These two surveys provide a snapshot of the bird assemblage that occurs within the site over two brief periods 16 years apart. Further surveys would be required to account for seasonal and temporal variation which would likely occur in the site and region.

5.5 Bats

The three species of microbat recorded in the site are common and widespread across several regions in Australia. All species prefer roosting in old tree hollows and occasional utilise cliff overhangs. The open forest, plateau, laterite hills and breakaways, sandplain, eucalyptus woodland habitats in the site contain potential roosting spots for bat species and intact vegetation that supports an array of insect prey for them to feed on. A significant proportion of ridge and breakaway overhangs that may provide suitable roosting habitat contained feral honeybee hives, limiting their usability for bats. This was particularly prevalent in the **plateau** habitat which may contribute to the lack of recordings of bats from sample site C in this area.

6 Conclusions

Outcomes of the basic fauna assessment include the following:

- The site consists of 10 broad habitat types:
  - **Agricultural vegetation** (738.07 ha): planted rows o*f Chamaecytisus palmensis*.
  - **Bare ground and pasture** (7246.97 ha): pastureland, paddocks, firebreaks and roads.
  - **Dams and water features** (2.31 ha): agricultural dams and drainage lines.
  - **Eucalyptus woodland** (19.58 ha): native canopy woodland with sparse understory.
  - **Laterite hills and breakaways** (71.76 ha): shrubby/heathy vegetation on rocky ridges and breakaways.
  - **Open forest** (120.68 ha): forest of mostly non-native trees with some native trees over cleared areas and non-native grassland.
  - **Plateau** (58.75 ha): native shrubland on a rocky laterite plateau.
  - **Riparian and wetland vegetation** (22.89 ha): riparian vegetation in areas with seasonal or permanent inundation.
  - **Sandplain** (191.81 ha): open *Eucalyptus* and *Proteaceae* woodland on sandy soils.
  - **Scattered trees and shrubs** (55.73 ha): scattered native and non-native trees with little to no understory.
- A total of 56 native fauna species were recorded within the site.
- One threatened species was recorded during the survey: Carnaby's black cockatoo (EN) under the *EPBC Act* and *BC Act*).
- Despite not being recording during the survey, the following species were considered to have a high or moderate likelihood of occurring within the site:
  - Pacific swift (MI)
  - peregrine falcon (OS)
  - woollybush bee (P3)
  - Mt Lesueur shield-backed trapdoor spider (P2)
  - western brush wallaby (P4)
  - black-striped snake (P4).

Outcomes of the targeted black cockatoo survey include the following:

- Foraging evidence attributed to Carnaby's black cockatoo was recorded in the site during the field survey.
- The site occurs within the modelled distribution of Carnaby's black cockatoo but outside of the modelled distribution of forest red-tailed black cockatoo and Baudin's black cockatoo.
- The site contains 185.86 ha of breeding and roosting habitat for Carnaby's black cockatoo.
- No black cockatoo roosts occur in close proximity to the site (Peck *et al.* 2019). No roosts or evidence of roosting by any species of black cockatoo was recorded within the site during the field survey. Tall native and non-native trees within the site represent suitable roosting habitat Carnaby's black cockatoo.
- A total of 468.36 ha of foraging habitat for Carnaby's black cockatoo was mapped within the site of which 276.93 ha (59.13%) comprises primary native plants, 6.37 ha (1.36%) comprises primary non-native plants, 47.55 ha (10.15%) provides secondary native plants and 137.51 ha (29.36%) provides secondary non-native plants.

- Additional areas of foraging habitat of similar or higher value occur adjacent to the site and in the wider local area.

Outcomes of the targeted bird survey include the following:

- A total of 51 bird species were observed across the site.
  - 11 species were observed from HC1.
  - 12 species were observed from HC2.
  - 29 species were observed from HC3.

Outcomes of the targeted bat survey include the following:

- Three bat taxa were recorded within the site:
  - *Chalinolobus gouldii* - Gould's wattled bat
  - *Nyctophilus* spp. - Long-eared bats
  - *Vespadelus regulus* - Southern forest bat.

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7.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 7.1**, with access date information provided in **Table R 1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
Atlas of Living Australia	15 September 2023	Atlas of Living Australia – Spatial Portal
BirdLife International (2023)	27 October 2023	Important Bird Areas
BoM (2023)	1 November 2023	Climate Data Online
DAWE (2023)	2 November 2023	Species Profile and Threats Database
DAWE (2023)	20 November 2023	Protected Matters Search Tool
DBCA (2023)	15 September 2023	NatureMap
DCCEEW (2023)	2 November 2023	Australian Faunal Directory
WALIA (2023)	27 October 2023	Landgate Map Viewer

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Figure 1: Site Location

Figure 2: Hydrography, Soils and Topography

Figure 3: Environmental Features

Figure 4: Black Cockatoo Habitat Context

Figure 5: Fixed-Point Bird Survey, Camera Trap and Bat Recorder Locations

Figure 6: Fauna Habitat

Figure 7: Carnaby's Black Cockatoo Foraging and Breeding Habitat

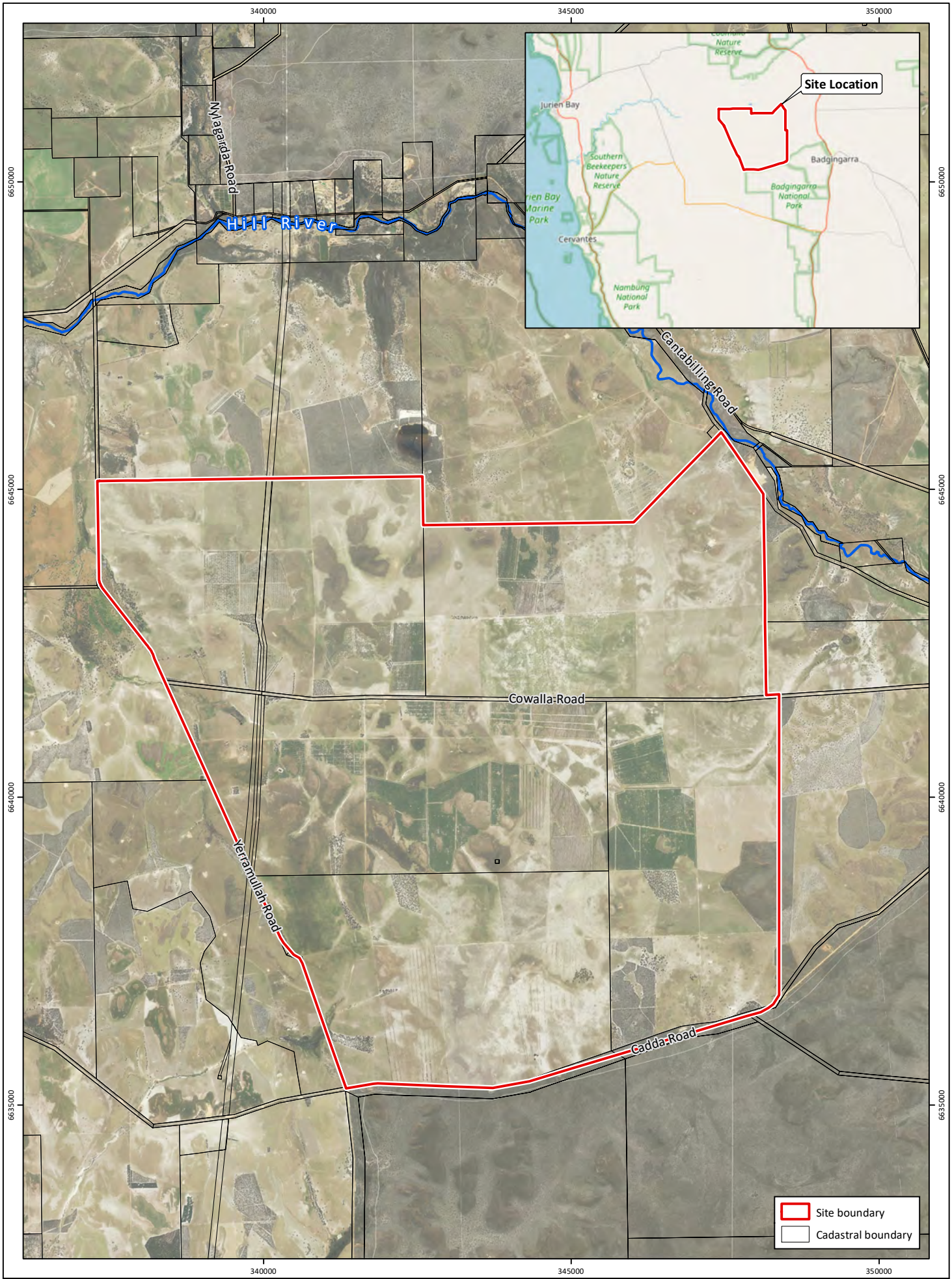

Figure 1: Site Location

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(02)--F13

Drawn:	GAR
Date:	14/02/2024
Checked:	AJU
Approved:	RAW
Date:	05/03/2024

N

0 1 2
Kilometers

Scale: 1:80,000@A4

GDA2020 MGA Zone 50

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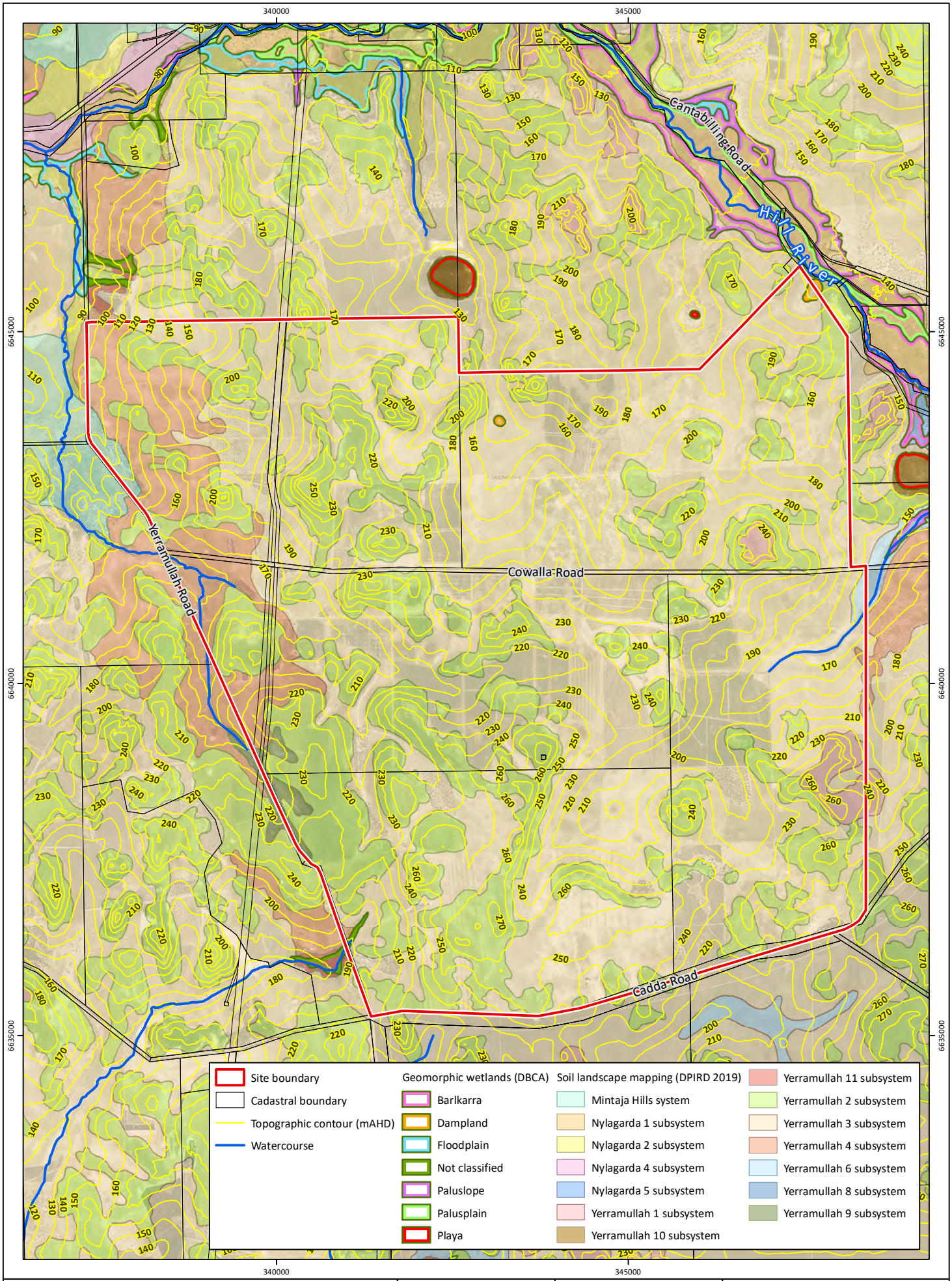

Figure 2: Hydrography, Soils and Topography

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(02)--F14

Drawn:	GAR
Date:	14/02/2024
Checked:	AJU
Approved:	RAW
Date:	05/03/2024

N

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Kilometers

Scale: 1:70,000@A4

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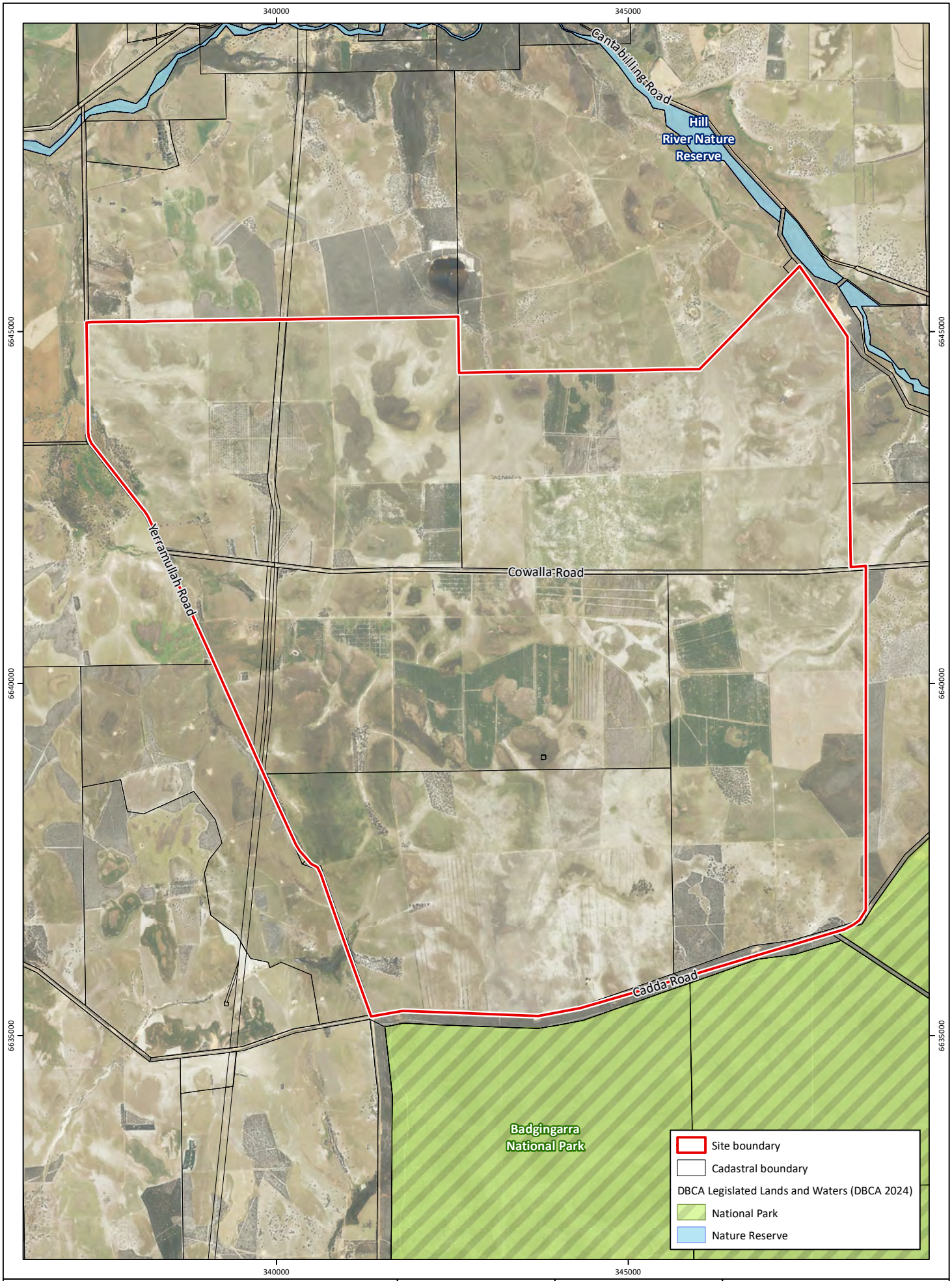

Figure 3: Environmental Features

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F15

Drawn:	GAR
Date:	14/02/2024
Checked:	AJU
Approved:	RAW
Date:	05/03/2024

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Kilometers

Scale: 1:70,000@A4

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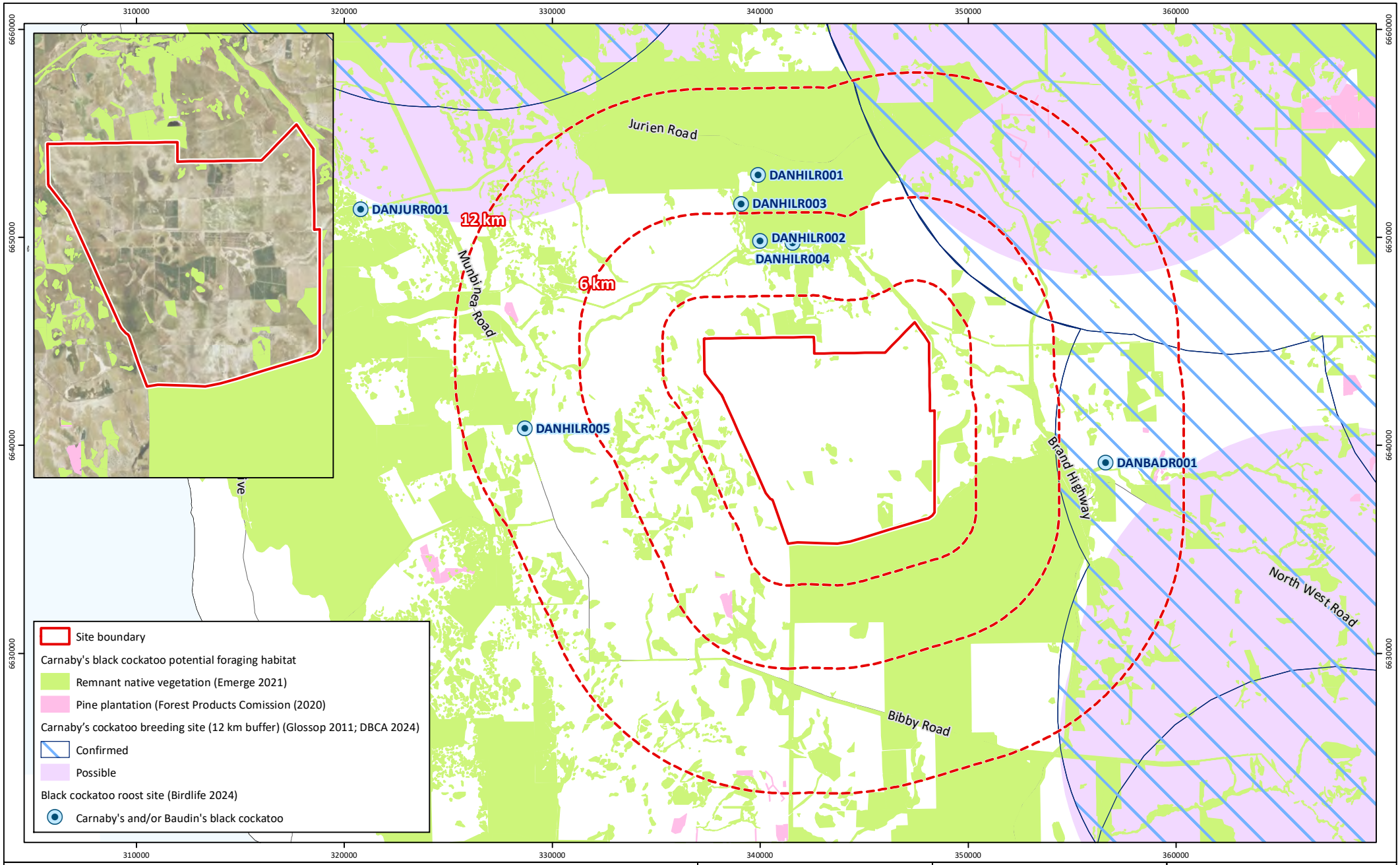

Figure 4: Black Cockatoo Habitat Context

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F16a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

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Kilometers

Scale: 1:240,000@A4

GDA 2020 MGA Zone 50

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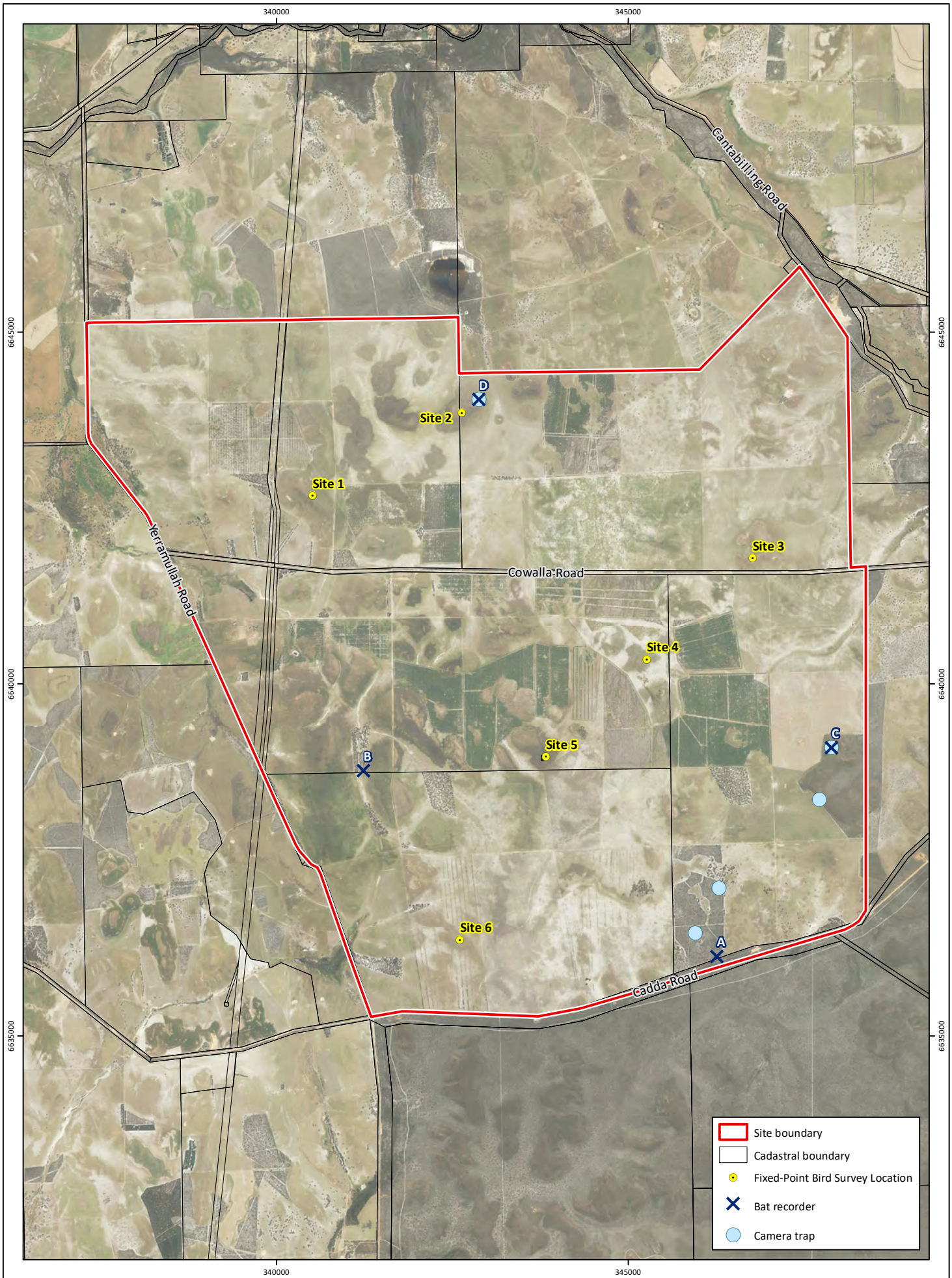

Figure 5: **Fixed-Point Bird Survey, Camera Trap and Bat Recorder Locations**

Project: Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(02)--F17

Drawn:	GAR
Date:	14/02/2024
Checked:	AJU
Approved:	RAW
Date:	05/03/2024

N

0 1 2

Kilometers

Scale: 1:70,000@A4

GDA2020 MGA Zone 50

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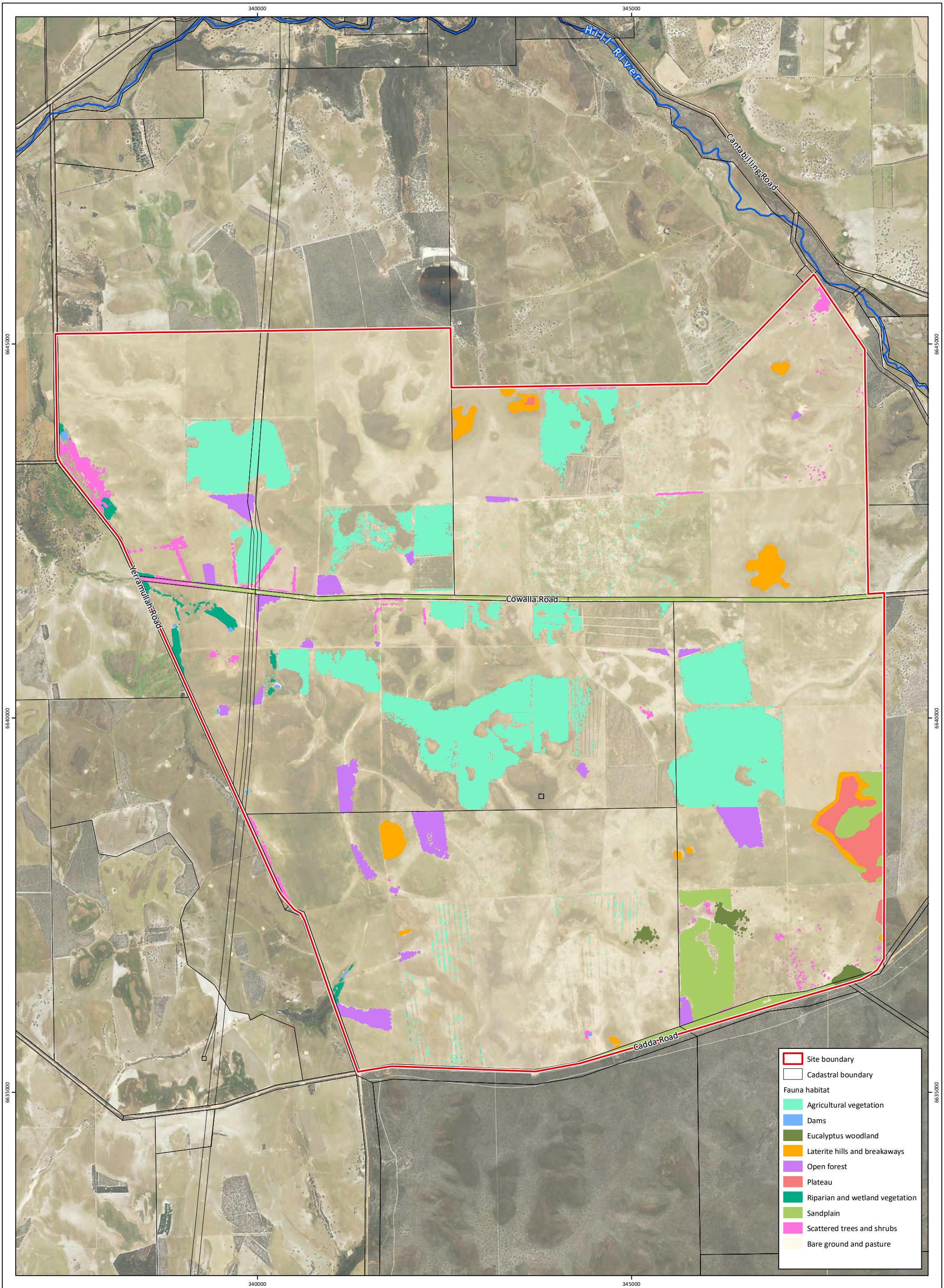

Figure 6: Fauna Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support
Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F18a
Drawn: GAR
Date: 28/08/2024
Checked: AJU
Approved: RAW
Date: 28/08/2024

N

0 500 1,000 1,500
Metres
Scale: 1:45,000@A3
GDA2020 MGA Zone 50

emerge ASSOCIATES

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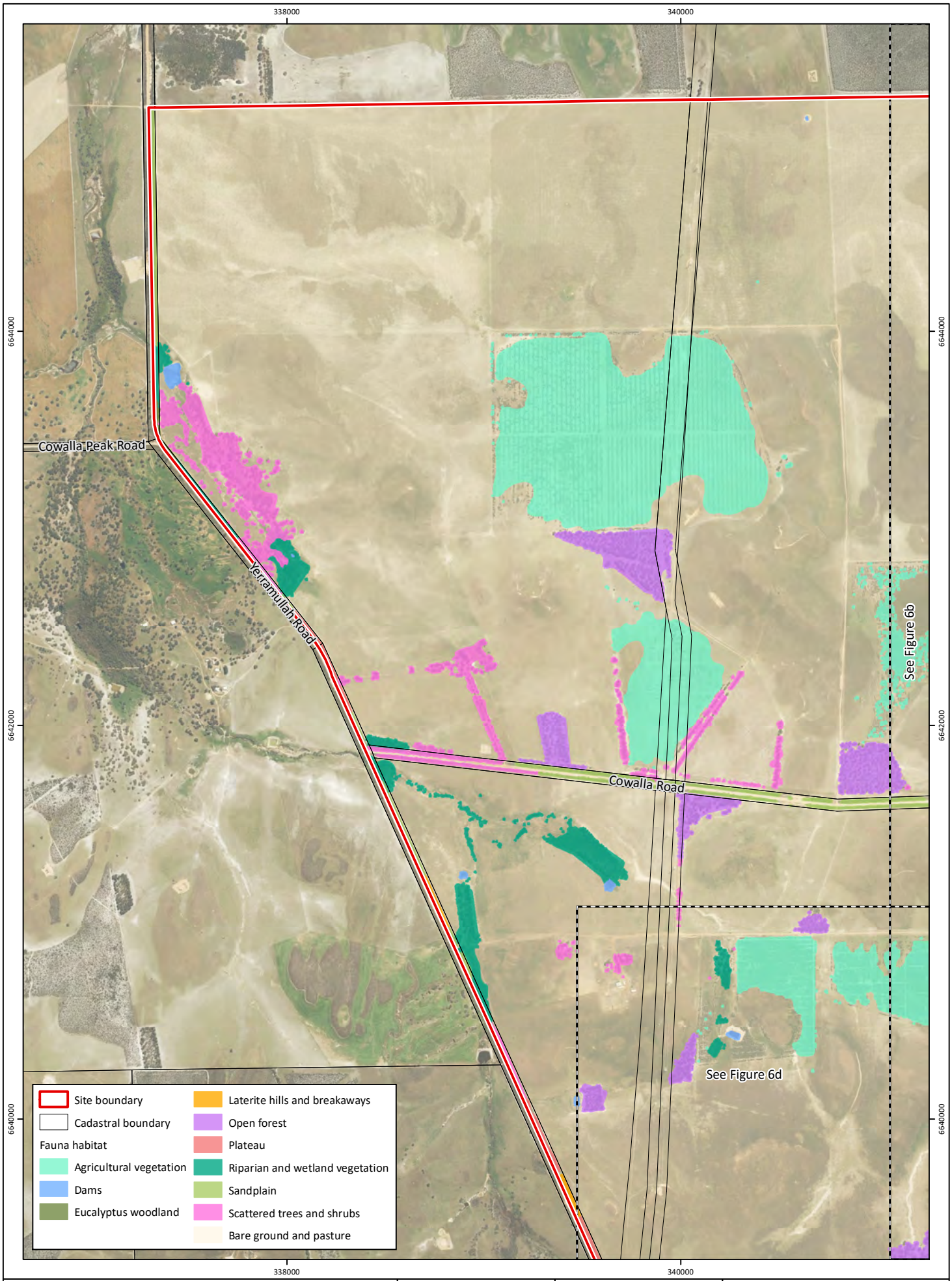

Figure 6a: Fauna Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(02)--F19a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

emerge ASSOCIATES

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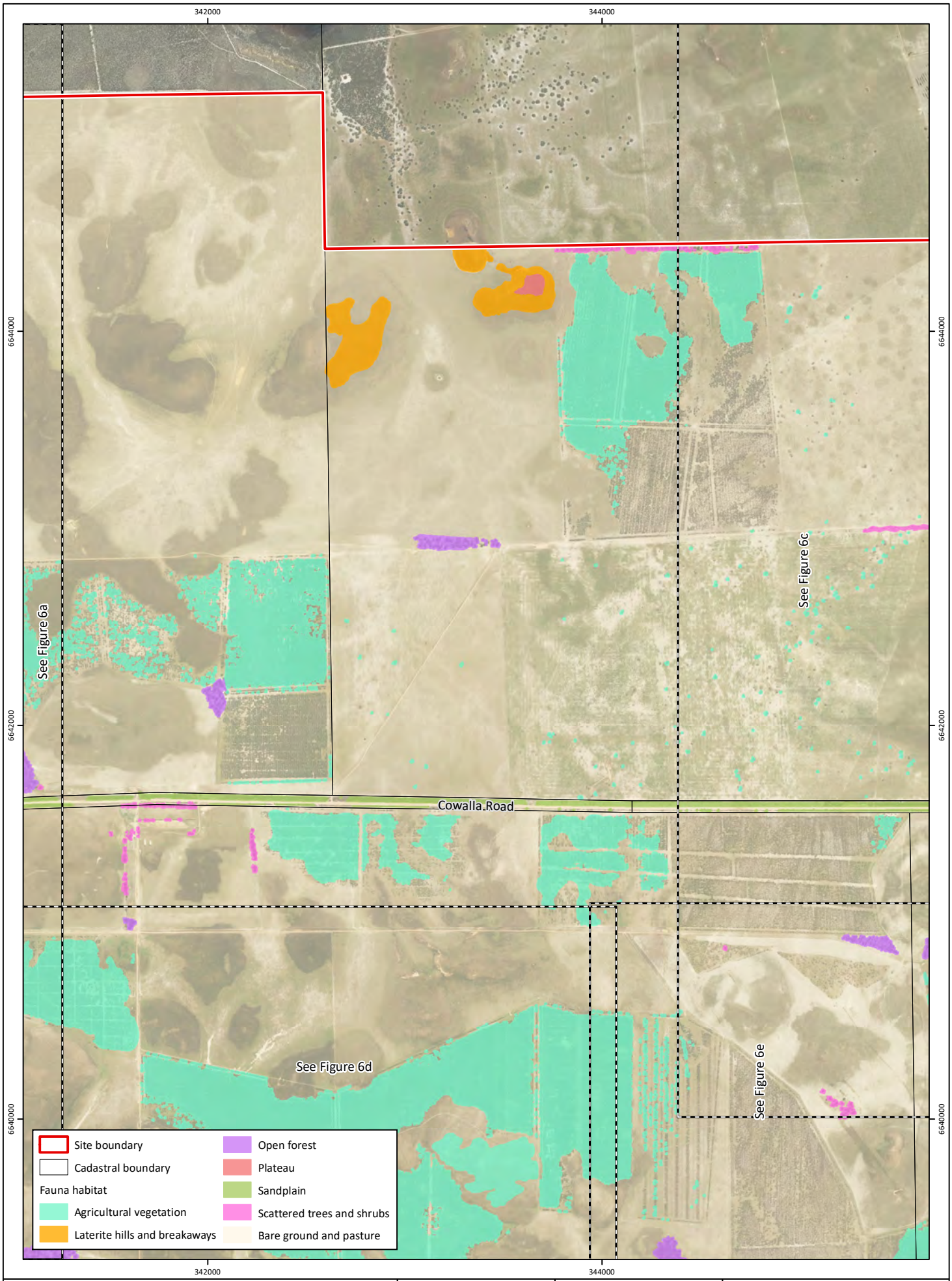

Figure 6b: Fauna Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number: EP23-085(02)--F19a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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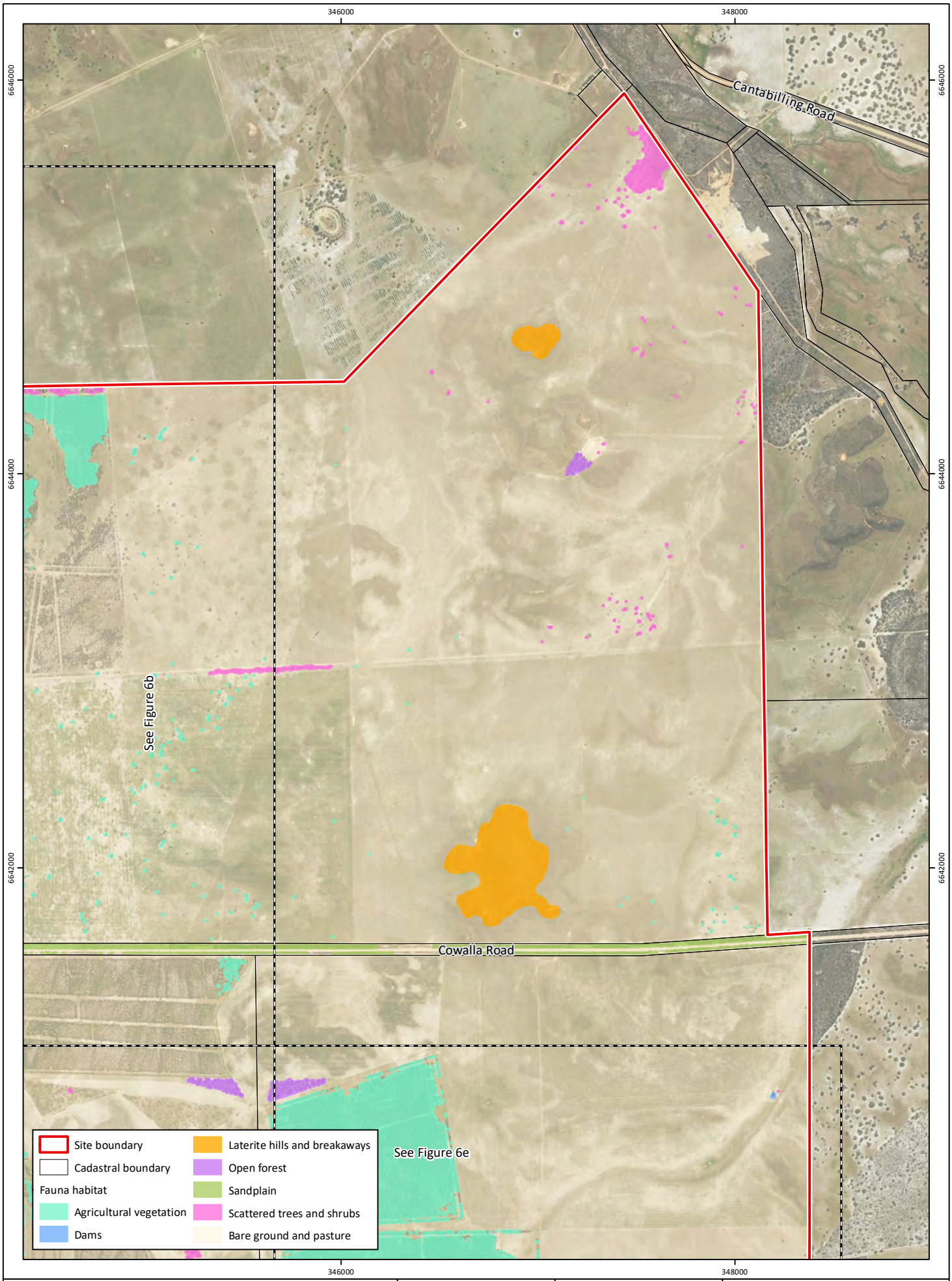

Figure 6c: Fauna Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F19a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

emerge ASSOCIATES

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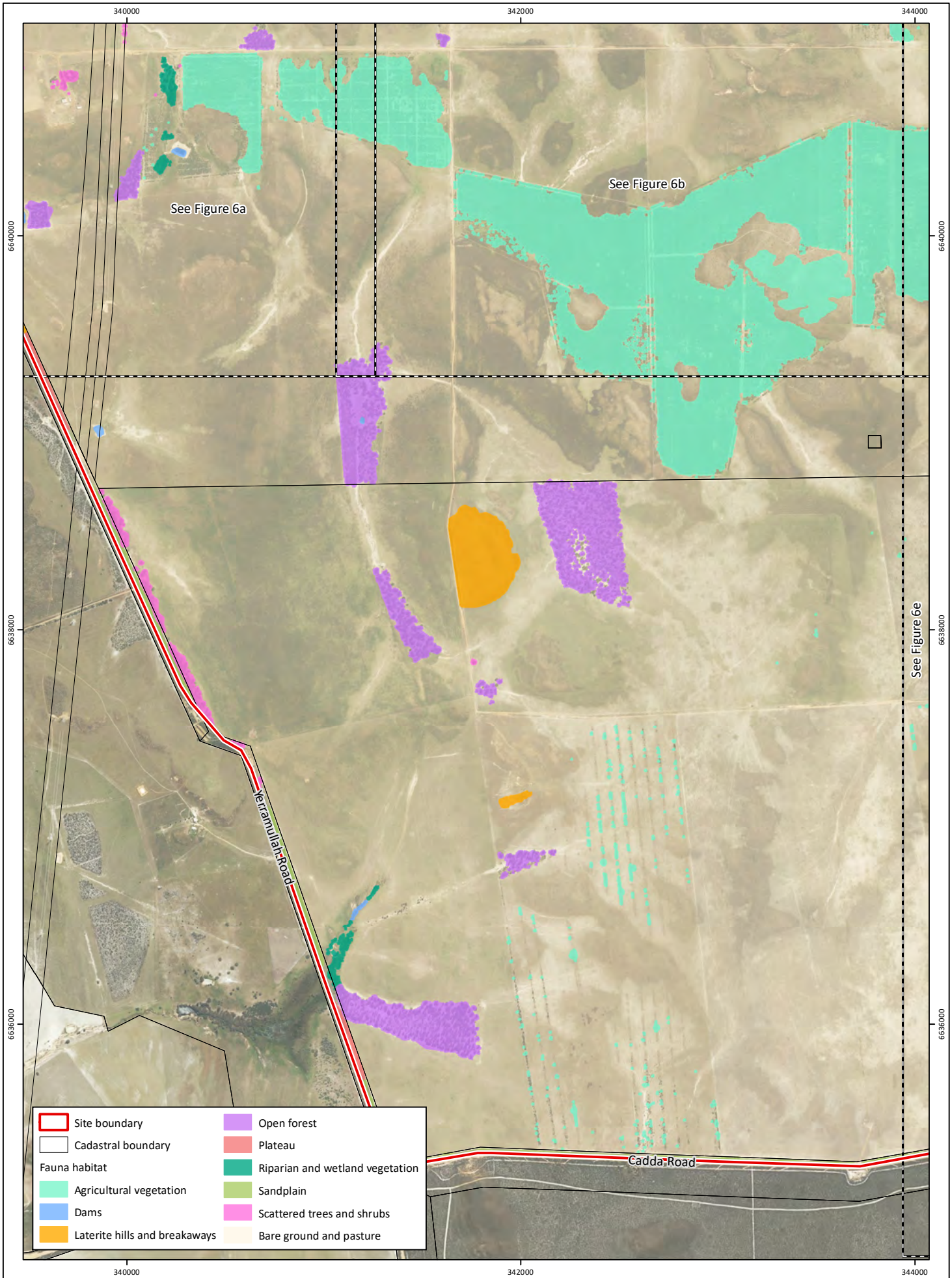

Figure 6d: Fauna Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F19a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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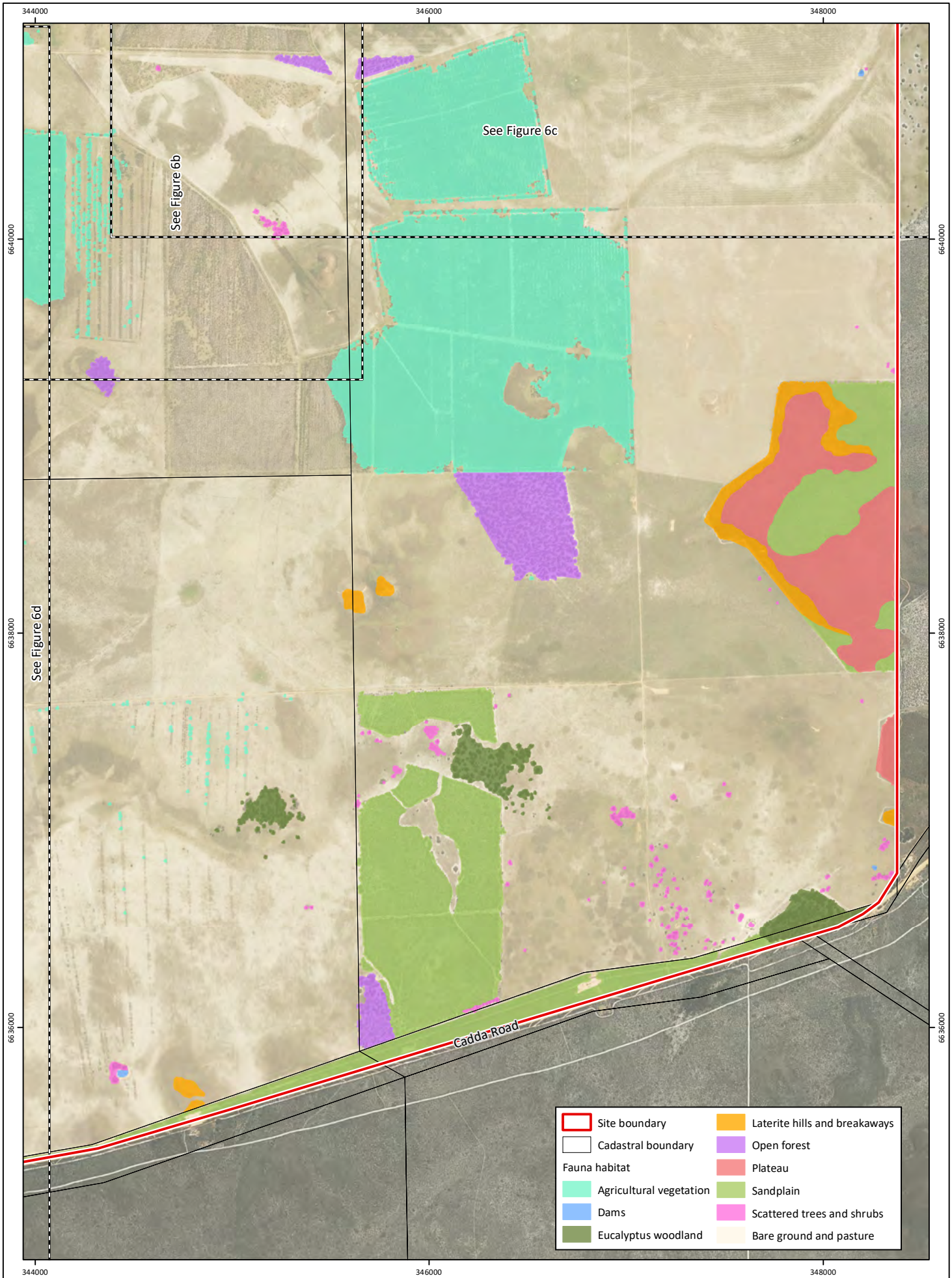

Figure 6e: Fauna Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support

Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F19a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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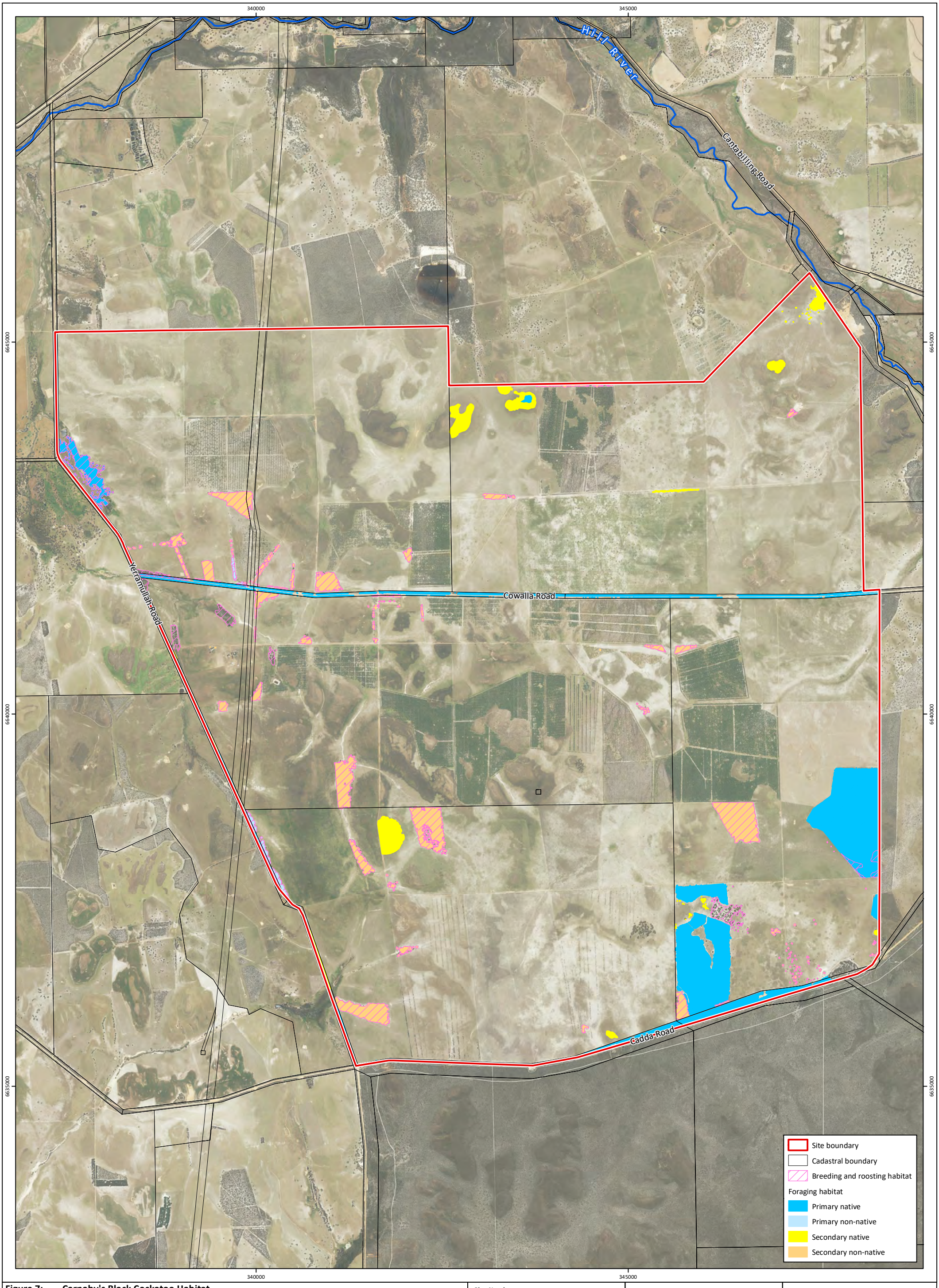

Figure 7: Carnaby's Black Cockatoo Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Parron Wind Farm Development Support
Client: Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F20a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 500 1,000 1,500
Metres

Scale: 1:45,000@A3

GDA2020 MGA Zone 50

emerge ASSOCIATES

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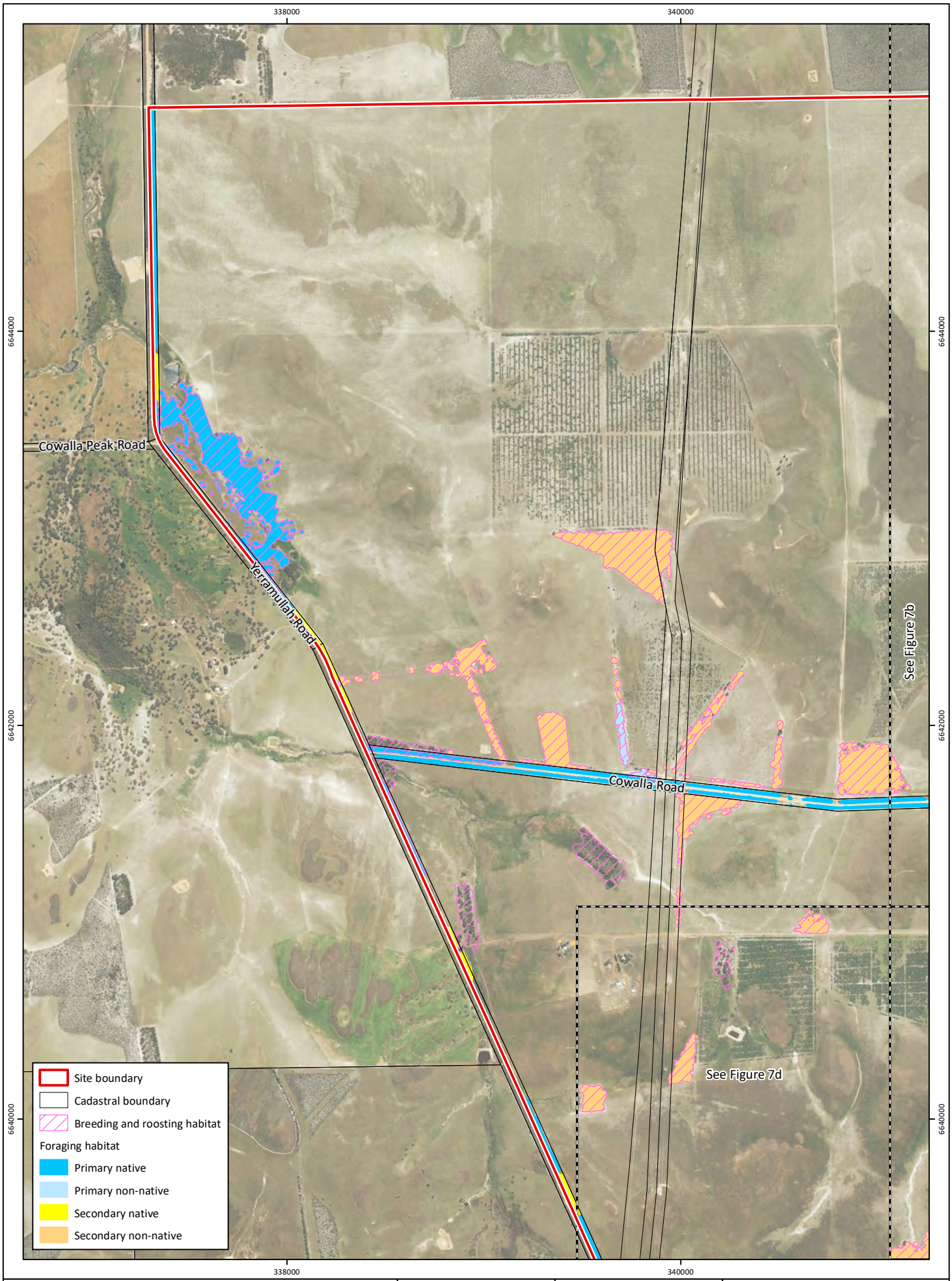

Figure 7a: Carnaby's Black Cockatoo Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F21a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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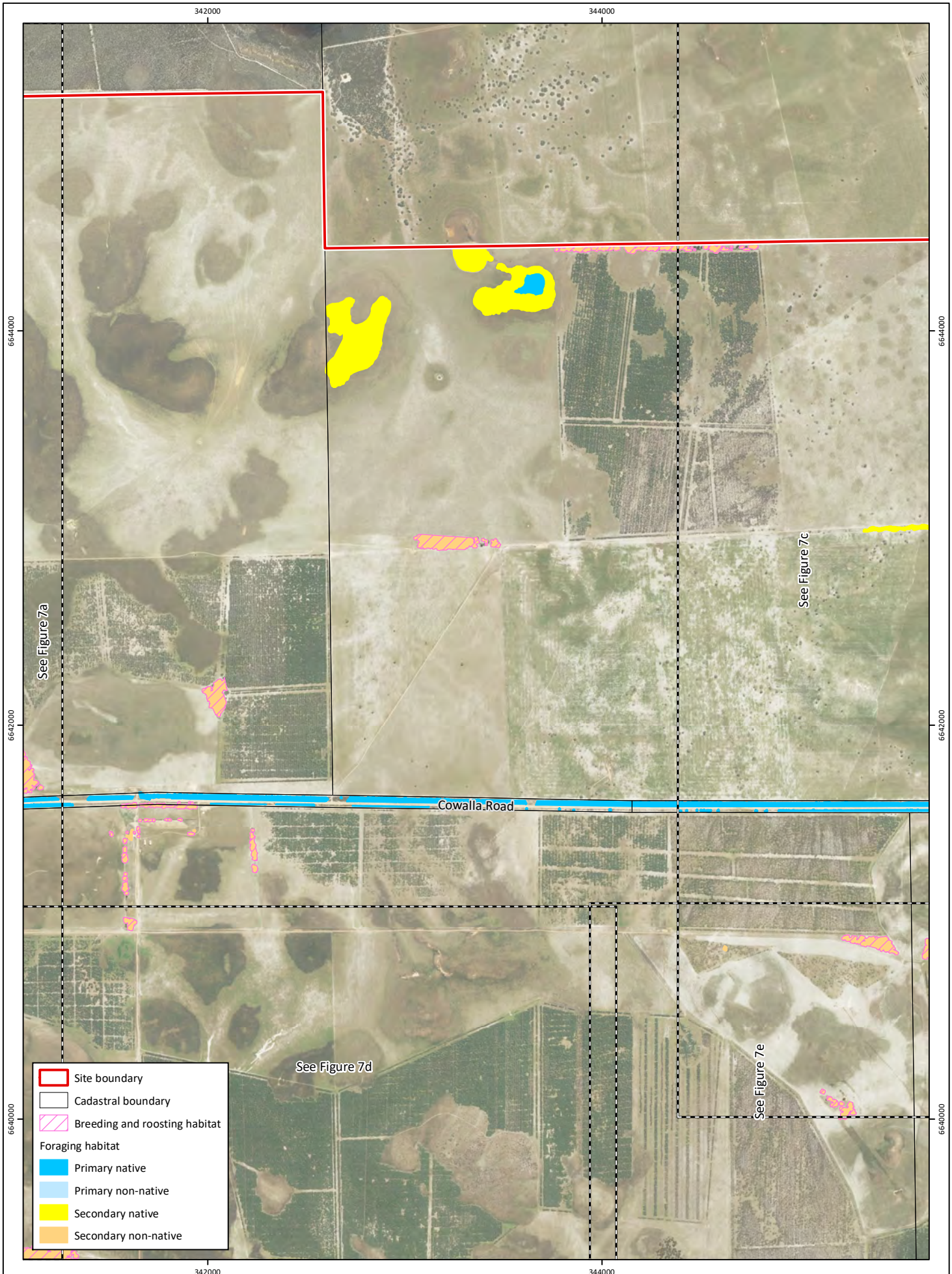

Figure 7b: Carnaby's Black Cockatoo Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F21a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

emerge ASSOCIATES

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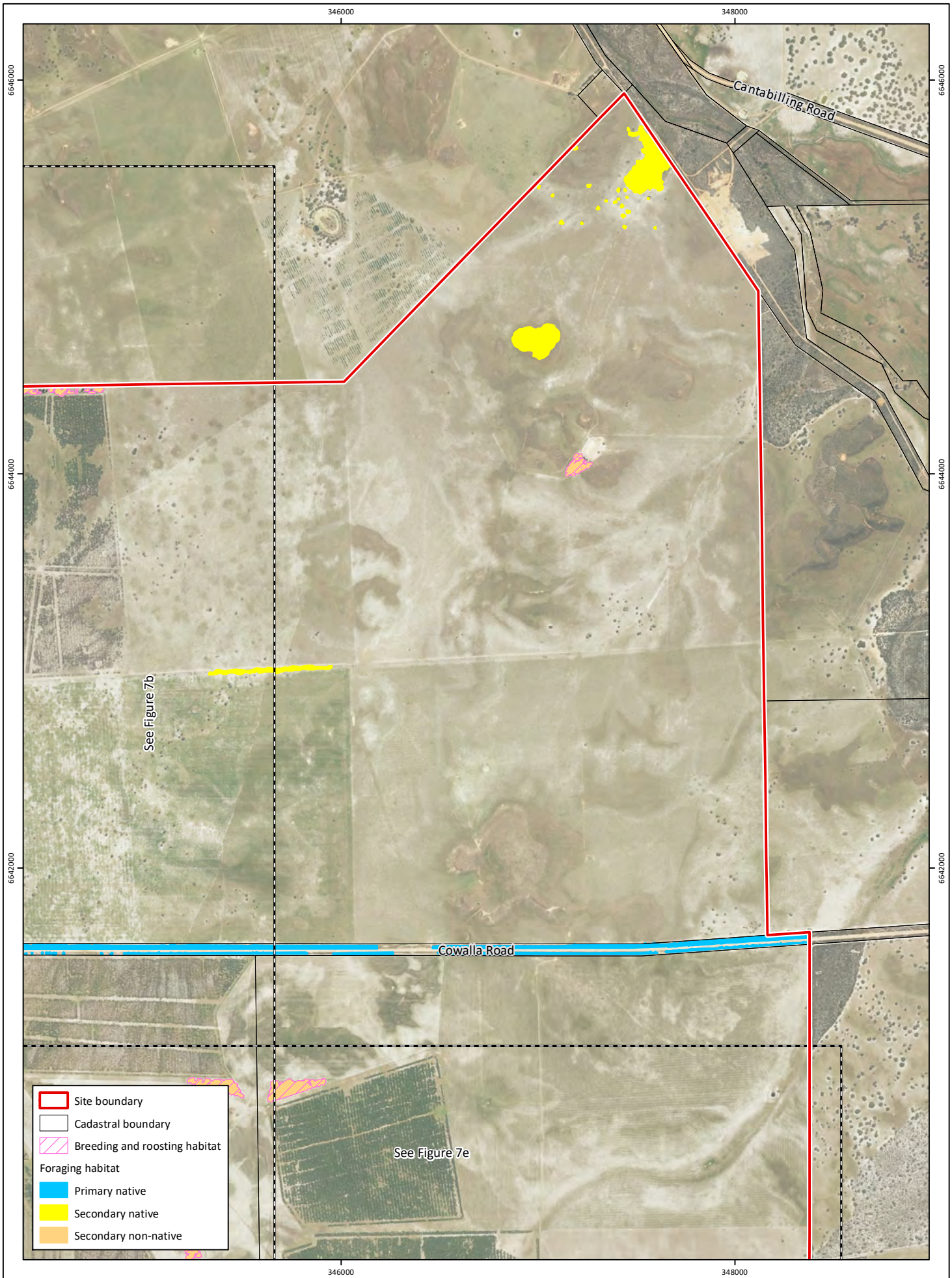

Figure 7c: Carnaby's Black Cockatoo Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number: **EP23-085(02)--F21a**

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500

Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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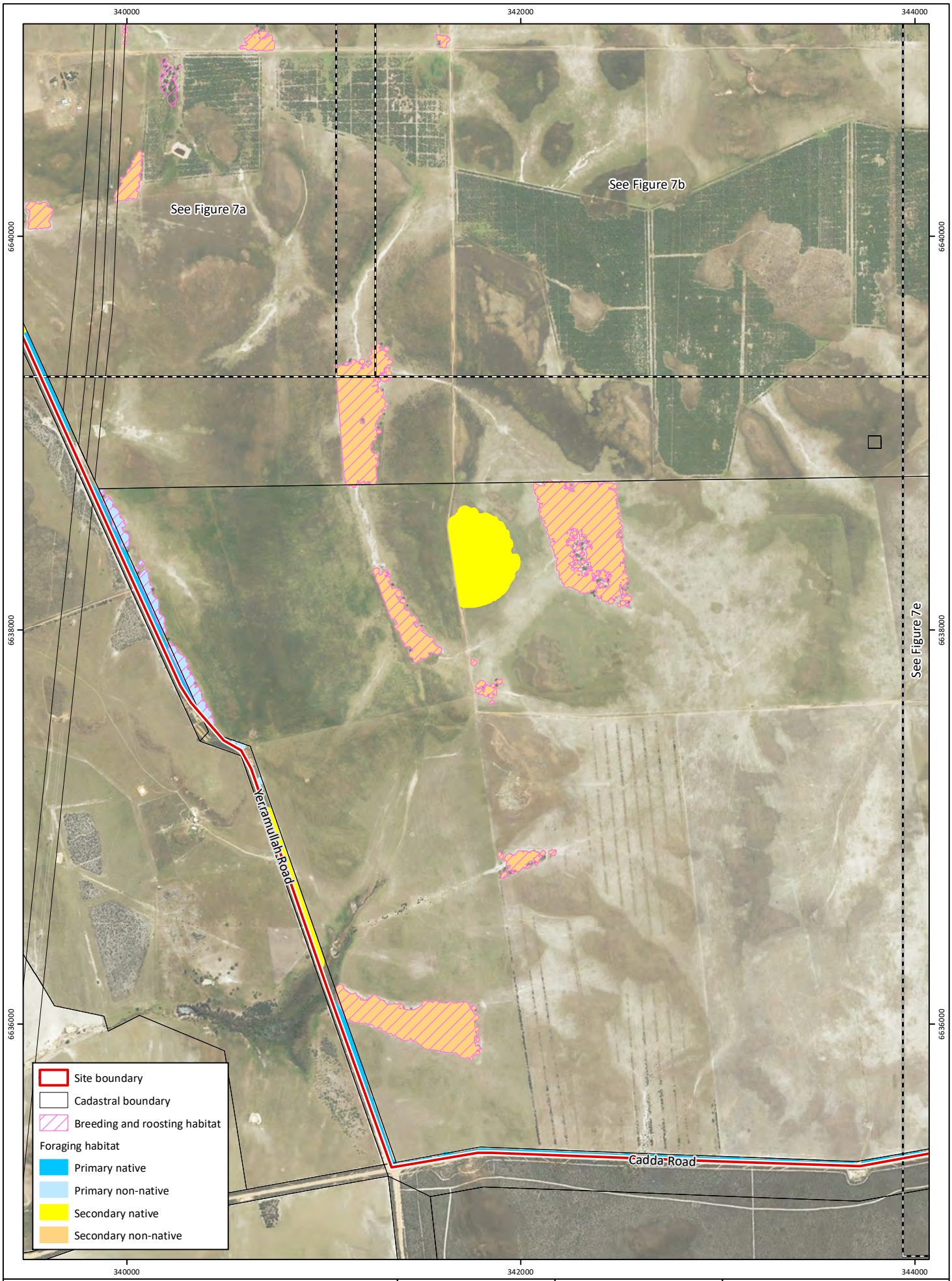

Figure 7d: Carnaby's Black Cockatoo Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F21a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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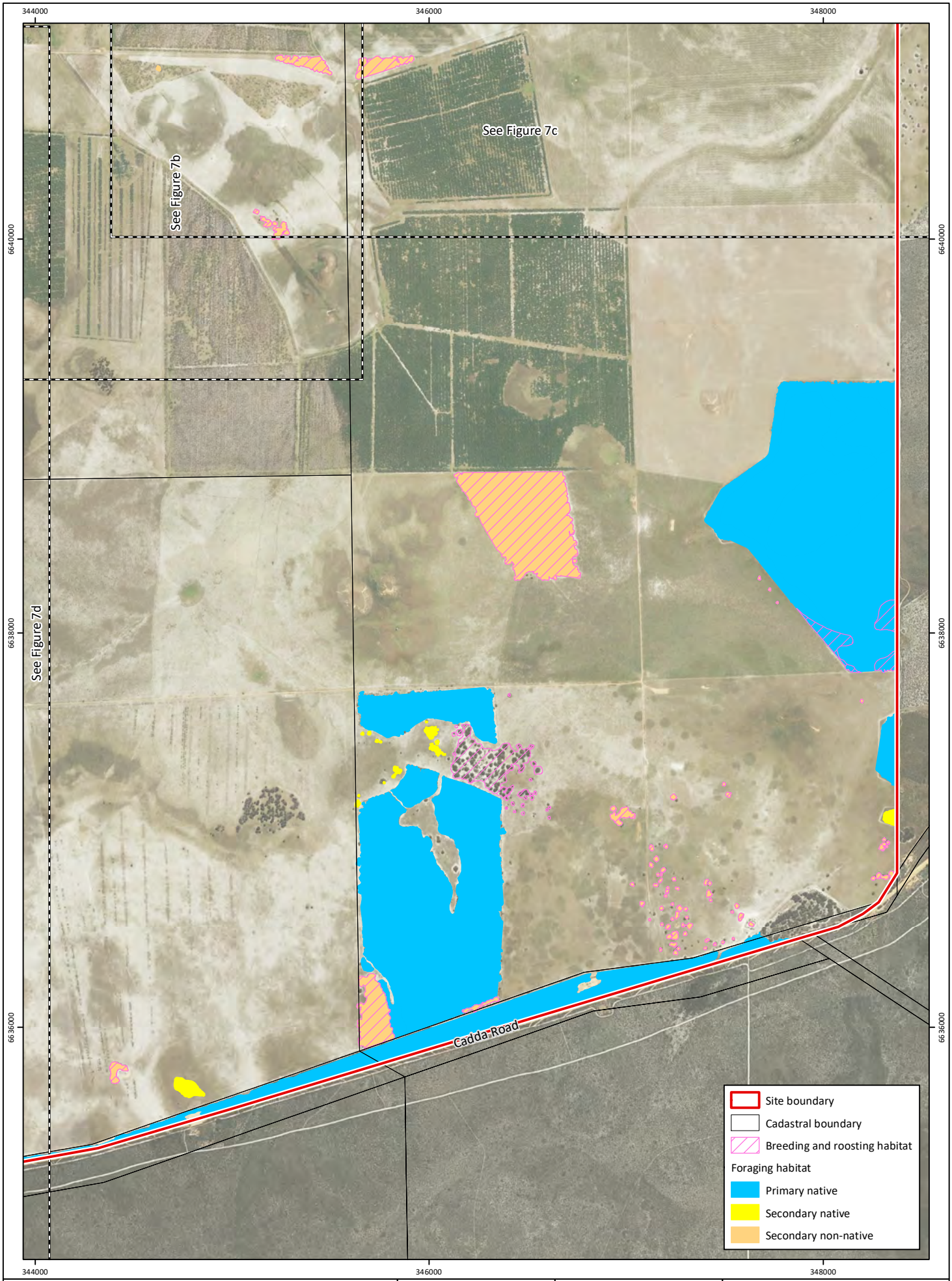

Figure 7e: Carnaby's Black Cockatoo Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Parron Wind Farm Development Support
Client:	Zephyr Energy Pty Ltd

Plan Number:
EP23-085(02)--F21a

Drawn:	GAR
Date:	28/08/2024
Checked:	AJU
Approved:	RAW
Date:	28/08/2024

N

0 250 500
Metres

Scale: 1:25,000@A4

GDA2020 MGA Zone 50

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Appendix A

Additional Information

Conservation Significant Fauna

Threatened and priority fauna

Fauna species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, fauna species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as 'threatened', 'migratory' or 'marine' as described in **Table 1**.

Migratory species comprise birds recognised under international treaties including:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA)
- China Australia Migratory Bird Agreement 1998 (CAMBA)
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA)
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

Fauna species listed as threatened and migratory are protected in Australia as 'matters of national environmental significance' (MNES) under the EPBC Act.

Table 1: Definitions of conservation significant fauna species pursuant to the EPBC Act

Conservation Code	Category
X	Threatened Fauna –Extinct There is no reasonable doubt that the last member of the species has died.
EW[#]	Threatened Fauna –Extinct in the Wild Taxa which are known only to survive in cultivation, captivity or as a naturalised population outside its past range, or taxa which have not been recorded in its known and/or expected habitat despite appropriate exhaustive surveys.
CR[#]	Threatened Fauna – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN[#]	Threatened Fauna – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU[#]	Threatened Fauna – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
Migratory[#]	Migratory Fauna All migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and All native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Ma	Marine Fauna Species in the list established under s248 of the EPBC Act

[#]matters of national environmental significance (MNES) under the EPBC Act

In Western Australia, fauna taxa may be classed as 'threatened', 'extinct', or 'specially protected' under the *Biodiversity Conservation Act 2016* (BC Act), which is enforced by Department of Biodiversity Conservation and Attractions (DBCA) (DBCA 2019a). The definitions of these categories are provided in **Table 2**.

Table 2: Definitions of specially protected fauna schedules under the BC Act (DBCA 2019a)

Category	Conservation Code	Definition
Threatened	CR	Critically endangered Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
	EN	Endangered Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
	VU	Vulnerable Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Extinct	EX	Extinct Species where there is no reasonable doubt that the last member of the species has died.
	EW	Extinct in the wild Species that is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form. Note that no species are currently listed as EW.
Specially protected	MI	Migratory species Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth Includes birds that subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds.
	CD	Species of special conservation interest (conservation dependent fauna) Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
	OS	Other specially protected species Fauna otherwise in need of special protection to ensure their conservation.

Fauna species that may be threatened or near threatened but lack sufficient information to be legislatively listed may be added to the DBCA's *Priority Fauna List* (DBCA 2018b). Species listed under priorities 1-3 comprise possible threatened species that do not meet survey criteria or are otherwise data deficient. Species listed under priority 4 are those that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons (DBCA 2019a).

Priority fauna species are considered during State approval processes. Priority fauna categories and definitions are listed in **Table 3** (DBCA 2019a).

Table 3: Definitions of priority fauna categories on DBCA's Priority Fauna List (DBCA 2019a)

Conservation Code	Category
P1	Priority 1 – Poorly known Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	Priority 2 – Poorly known Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	Priority 3 – Poorly known Species that are known from several locations and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	(a) Priority 4 – Rare species Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Priority 4 – Near Threatened Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Priority 4 – Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Black cockatoos

Three threatened species of black cockatoo occur on the Swan Coastal Plain (referred to herein collectively as 'black cockatoos'):

- *Zanda*[1] *latirostris* (Carnaby's black cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Zanda*[1] *baudinii* (Baudin's black cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

There are a range of regional studies and spatial datasets available which provide information on black cockatoo records and potential habitat mapping. These are detailed below.

Species distribution and breeding range

Broad-scale maps are available for the modelled distribution of Baudin's black cockatoo, Carnaby's black cockatoo and forest red-tailed black cockatoo (DSEWPaC 2011; DoEE 2016a, b).

The modelled distribution maps also include 'known breeding areas' and 'predicted breeding range' for Baudin's black cockatoo and 'breeding range' and 'non-breeding range' for Carnaby's black cockatoo.

No breeding range modelling is available for forest red-tailed black cockatoo but the species is known to breed mainly in the jarrah forest region (DBCA 2017a) and in small populations on the Swan Coastal Plain within the Baldivis, Stake Hill, Lake McLarty and Capel area and increasingly in the Perth metropolitan area (DAWE 2022).

Breeding habitat

Department of Environment and Conservation (DEC, now Department of Biodiversity, Conservation and Attractions (DBCA)) and fauna experts, have identified and mapped Carnaby's black cockatoo habitat on the Swan Coastal Plain and Jarrah Forest regions (Glossop *et al.* 2011). This dataset includes mapping of Carnaby's black cockatoo breeding sites based on point records of breeding from a range of sources. Breeding sites were classified as 'confirmed' where eggs or chicks were recorded and 'possible' where observations relating to Carnaby's black cockatoo breeding that did not include actual records of eggs or chicks (e.g. chewed hollows or records of breeding or nesting behaviour by an expert observer).

A 12 km buffer applies to each site to 'reflect the flexible use of these areas by cockatoos and to indicate the important zone for access to potential feeding habitat' (Glossop *et al.* 2011). Glossop *et al.* (2011) state that the areas mapped in the dataset are not a comprehensive record of Carnaby's black cockatoo breeding and that many nesting sites are not known.

While this dataset only applies to Carnaby's black cockatoo, the information it contains is also applicable for Baudin's black cockatoo and forest red-tailed black cockatoo as they have similar

[1] Previously *Calyptorhynchus*

breeding habitat requirements. That is, breeding sites that are suitable for Carnaby's black cockatoo may also be suitable for Baudin's black cockatoo and forest red-tailed black cockatoo, if located within their distribution/breeding ranges.

BirdLife Australia also maintain a database of confirmed black cockatoo breeding sites which is accessible via a paid search system. BirdLife Australia have advised that their database is comprised of data collected during surveys by staff and volunteers of which most (>99%) surveys are of Carnaby's black cockatoo. They have also advised that the dataset is not comprehensive and that an absence of known nests does not necessarily indicate a lack of breeding activity.

The Carnaby's black cockatoo recovery plan also identifies 13 'important bird areas' for Carnaby's black cockatoo, which are identified as 'sites of global bird conservation importance' (DPaW 2013). These 'important bird areas' comprise sites supporting at least 20 breeding pairs or 1% of the population regularly utilising an area in the non-breeding part of the range.

Confirmed roost sites

BirdLife Australia undertakes annual monitoring of black cockatoo overnight roost sites as part of the annual 'Great Cocky Count' community-based survey. Information gathered from these monitoring events provides roost locations and recorded black cockatoo number (Birdlife Australia 2023).

Native foraging habitat

Glossop *et al*. (2011) also mapped 'areas requiring investigation as Carnaby's black cockatoo feeding habitat' for the Swan Coastal Plain and Jarrah Forest regions, based on regional vegetation mapping that may contain plant species known to be foraged upon by Carnaby's black cockatoo. Note that this dataset does not include observations or point records of Carnaby's black cockatoo feeding. This dataset represents areas of vegetation that may potentially provide foraging habitat for Carnaby's black cockatoo.

In order to account for clearing of native vegetation that has occurred since the Glossop *et al.* (2011) dataset was created and to incorporate updated vegetation mapping and information on foraging behaviour of Carnaby's black cockatoo, Emerge have revised this dataset to represent the most up to date information available. Furthermore, Emerge have used a similar methodology to Glossop et al. (2011) to define potential foraging habitat for Baudin's black cockatoo and forest-red tailed cockatoos.

Specifically, DBCA (2021), DBCA (2019b) and DPIRD (2018) regional vegetation complex mapping was used to determine which areas of remnant vegetation support plant species known to be foraged upon by Carnaby's black cockatoo, Baudin's black cockatoo or forest red-tailed cockatoos. Where these vegetation complexes intersect remnant vegetation mapped by DPIRD (2020) they were considered to represent potential foraging habitat for Carnaby's black cockatoo, Baudin's black cockatoo and/or forest red-tailed cockatoo.

Pine plantations also provide an important food source for Carnaby's black cockatoo, but were not included in the original Glossop et al. (2011) dataset. Mapping of pine plantations is available from the Forest Products Commission (Forest Products Commission 2020) and was considered in the assessment of Carnaby's black cockatoo foraging habitat.

Pest fauna

A number of legislative and policy documents exist in relation to pest fauna management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding pest fauna management in Western Australia and lists declared pest species.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017b) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 7**. DBCA maintains a dataset of the *Geomorphic Wetlands of the Swan Coastal Plain* (DBCA 2018a).

Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017b)

Level of inundation	Geomorphology			
	Basin	Flat	Channel	Slope
Permanently inundated	Lake	-	River	-
Seasonally inundated	Sumpland	Floodplain	Creek	-
Seasonally waterlogged	Dampland	Palusplain	-	Paluslope

Literature

The main literature used for identifying fauna and fauna habitats is listed in **Table 8** below.

Table 8: Standard literature used for identifying fauna species and habitats.

Conservation Code	Category
Birds	Johnstone and Storr (1998b), Johnstone and Storr (1998a), Pizzey and Knight (2012), Slater *et al.* (2003)
Mammals	Menkhorst and Knight (2011), Triggs (2003)
Amphibia	Tyler and Doughty (2009), Bush *et al.* (2002)
Reptiles	Bush *et al.* (2002), Wilson and Swan (2021)

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Appendix B

Database search results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 20-Nov-2023

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	53
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	16
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	15
Key Ecological Features (Marine):	None
Biologically Important Areas:	1
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Natural		
Lesueur National Park	WA	Listed place

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Aphelocephala leucopsis		
Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
[Numenius madagascariensis](#)		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Rostratula australis](#)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
[Sternula nereis nereis](#)		
Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
[Zanda latirostris listed as Calyptorhynchus latirostris](#)		
Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area
MAMMAL		
[Bettongia penicillata ogilbyi](#)		
Woylie [66844]	Endangered	Species or species habitat likely to occur within area
[Dasyurus geoffroii](#)		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
[Macroderma gigas](#)		
Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area
[Parantechinus apicalis](#)		
Dibbler [313]	Endangered	Species or species habitat may occur within area
PLANT		
[Acacia forrestiana](#)		
Forest's Wattle [17235]	Vulnerable	Species or species habitat known to occur within area
[Acacia splendens](#)		
Splendid Wattle, Dandaragan Wattle [81510]	Endangered	Species or species habitat known to occur within area
[Acacia wilsonii](#)		
Wilson's Wattle [65228]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat known to occur within area
Banksia catoglypta [85021]	Vulnerable	Species or species habitat known to occur within area
Banksia mimica Summer Honeypot [82765]	Endangered	Species or species habitat may occur within area
Banksia serratuloides subsp. perissa Northern Serrate Dryandra [82767]	Critically Endangered	Species or species habitat known to occur within area
Caladenia hoffmanii Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area
Caleana dixonii listed as Paracaleana dixonii Sandplain Duck Orchid [87944]	Endangered	Species or species habitat known to occur within area
Chamelaucium lullfitzii listed as Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [92777]	Endangered (listed as Chamelaucium sp. Gingin	Species or species habitat may occur within area
Conospermum densiflorum subsp. unicephalatum One-headed Smokebush [64871]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat may occur within area
Eremophila scaberula Rough Emu Bush [16729]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Eucalyptus absita Badgingarra Box [24260]	Endangered	Species or species habitat known to occur within area
Eucalyptus argutifolia Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus crispata Yandanooka Mallee [24268]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus dolorosa Dandaragan Mallee, Mount Misery Mallee [56709]	Endangered	Species or species habitat may occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat may occur within area
Eucalyptus johnsoniana Johnson's Mallee [14516]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus lateritica Laterite Mallee [6271]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat known to occur within area
Eucalyptus pruiniramis Midlands Gum, Jingymia Gum [56403]	Endangered	Species or species habitat known to occur within area
Eucalyptus suberea Cork Mallee, Mount Lesueur Mallee [5529]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Grevillea batrachioides Mt Lesueur Grevillea [21735]	Endangered	Species or species habitat known to occur within area
Grevillea christineae Christine's Grevillea [64520]	Endangered	Species or species habitat likely to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
Grevillea humifusa Spreading Grevillea [61182]	Endangered	Species or species habitat known to occur within area
Hakea megalosperma Lesueur Hakea [10505]	Vulnerable	Species or species habitat known to occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat likely to occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat known to occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
Patersonia spirifolia Spiral-leaved Patersonia [83927]	Endangered	Species or species habitat likely to occur within area
Petrophile nivea [75847]	Vulnerable	Species or species habitat may occur within area
Ptychosema pusillum Dwarf Pea [11268]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Spirogardnera rubescens		
Spiral Bush [15667]	Endangered	Species or species habitat known to occur within area
Tetratheca nephelioides		
[83217]	Critically Endangered	Species or species habitat likely to occur within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area
REPTILE		
Egernia stokesii badia		
Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat known to occur within area
SHARK		
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Unknown	
Commonwealth Land - [51994]	WA
Commonwealth Land - [52115]	WA
Commonwealth Land - [51489]	WA

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Badgingarra	National Park	WA
Boothendarra	Nature Reserve	WA
Coomallo	Nature Reserve	WA
Drovers Cave	National Park	WA
Hill River	Nature Reserve	WA
Lesueur	National Park	WA
Nambung	National Park	WA
Southern Beekeepers	Nature Reserve	WA
Twyata	Nature Reserve	WA
Unnamed WA29719	Nature Reserve	WA

Protected Area Name	Reserve Type	State
Unnamed WA29901	Conservation Park	WA
Unnamed WA33287	Nature Reserve	WA
Unnamed WA41986	Conservation Park	WA
Unnamed WA48717	Conservation Park	WA
Unnamed WA51272	Conservation Park	WA
Wongonderrah	Nature Reserve	WA

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Atlas Mineral Sands Project	2021/9056		Assessment
Jurien East Road Upgrade, 3 km NNE Jurien Bay, WA	2020/8740		Post-Approval
Waddi Wind Farm	2023/09639		Assessment
Controlled action			
Atlas Mineral Sands Mine	2020/8813	Controlled Action	Completed
Brand Highway Widening and Passing Lanes Project 34.83-164.3 SLK	2017/7864	Controlled Action	Post-Approval
Not controlled action			
Cooljarloo Mine Falcon Extension	2007/3556	Not Controlled Action	Completed
Development of the Badgingarra Wind Farm	2008/4065	Not Controlled Action	Completed
Development of the Dandaragan Wind Farms	2011/6006	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Northern Looping project, Karratha to Gingin	2005/2251	Not Controlled Action	Completed
Waddi Wind and Solar Farm, near Dandaragan, WA	2018/8352	Not Controlled Action	Completed
Not controlled action (particular manner)			
Transmission Line Rebuild and Extension	2009/5105	Not Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		(Particular Manner)	
UIL Energy 2D Seismic Survey, Perth Basin, WA	2015/7554	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Badgingarra Wind Farm	2007/3529	Referral Decision	Completed
Transmission Line Rebuild and Extension	2009/4972	Referral Decision	Completed

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Sterna dougallii		
Roseate Tern [817]	Foraging	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Category	Species name
AMPHIBIA	*Crinia glauerti*
	Crinia insignifera
	Crinia pseudinsignifera
	Crinia sp.
	Heleioporus albopunctatus
	Heleioporus albopunctatus Gray, 1841
	Heleioporus eyrei
	Heleioporus psammophilus
	Heleioporus sp.
	Limnodynastes dorsalis
	Litoria adelaidensis
	Litoria moorei
	Myobatrachus gouldii
	Neobatrachus kunapalari Mahony and Roberts, 1986
	Neobatrachus pelobatoides
	Pseudophryne guentheri
	Pseudophryne guentheri Boulenger, 1882
BIRDS	*Acanthagenys rufogularis*
	Acanthiza apicalis
	Acanthiza chrysorrhoa
	Acanthiza inornata
	Acanthiza uropygialis
	Acanthorhynchus superciliosus
	Accipiter cirrocephalus
	Accipiter fasciatus
	Accipiter fasciatus subsp. fasciatus
	Acrocephalus australis
	Actitis hypoleucos
	Aegotheles cristatus
	Aegotheles cristatus subsp. cristatus

Anas castanea
Anas gracilis
Anas platyrhynchos
Anas rhynchotis
Anas superciliosa
Anhinga novaehollandiae
Anthochaera carunculata
Anthochaera lunulata
Anthus australis
Anthus australis subsp. australis
Apus pacificus
Aquila audax
Ardea alba
Ardea modesta
Ardea pacifica
Ardeotis australis
Arenaria interpres
Arenaria interpres subsp. interpres
Artamus cinereus
Artamus cyanopterus
Artamus personatus
Aythya australis
Barnardius zonarius
Biziura lobata
Cacatua pastinator
Cacatua pastinator subsp. butleri
Cacatua roseicapilla
Cacatua roseicapilla subsp. assimilis
Cacatua sanguinea
Cacatua sanguinea subsp. westralensis
Cacatua tenuirostris
Cacomantis flabelliformis

Cacomantis pallidus
Calamanthus campestris
Calamanthus campestris subsp. montanellus

Calamanthus cautus
Calidris acuminata
Calidris alba
Calidris canutus
Calidris ferruginea
Calidris melanotos
Calidris ruficollis
Calidris subminuta
Calidris tenuirostris
Calyptorhynchus banksii subsp. samueli
Calyptorhynchus sp.
Calyptorhynchus sp. 'white-tailed black cockatoo'
Charadrius leschenaultii
Charadrius mongolus
Charadrius rubricollis
Charadrius ruficapillus
Chenonetta jubata
Cheramoeca leucosterna
Cheramoeca leucosternus
Chroicocephalus novaehollandiae
Chrysococcyx basalis
Chrysococcyx lucidus subsp. plagosus
Cincloramphus cruralis
Cincloramphus mathewsi
Circus approximans
Circus assimilis
Cladorhynchus leucocephalus

Colluricincla harmonica
Colluricincla harmonica subsp. rufiventris
Columba livia
Coracina novaehollandiae
Corvus bennetti
Corvus coronoides
Corvus coronoides subsp. perplexus
Coturnix pectoralis
Coturnix ypsilophora
Cracticus nigrogularis
Cracticus tibicen
Cracticus torquatus
Cracticus torquatus subsp. torquatus
Cuculus pallidus
Cygnus atratus
Dacelo novaeguineae
Daphoenositta chrysoptera
Daphoenositta chrysoptera subsp. pileata
Dicaeum hirundinaceum
Dromaius novaehollandiae
Egretta garzetta
Egretta novaehollandiae
Egretta sacra
Elanus axillaris
Elanus caeruleus subsp. axillaris
Elseyornis melanops
Eolophus roseicapillus
Eopsaltria georgiana
Eopsaltria griseogularis
Epthianura albifrons
Epthianura aurifrons
Epthianura tricolor

Erythrogonys cinctus
Falco berigora
Falco berigora subsp. berigora
Falco cenchroides
Falco cenchroides subsp. cenchroides
Falco hypoleucos
Falco longipennis
Falco peregrinus
Fulica atra
Fulmarus glacialoides
Gallirallus philippensis
Gallirallus philippensis subsp. mellori
Gavicalis virescens
Gelochelidon nilotica
Geophaps plumifera
Gerygone fusca
Gerygone fusca subsp. fusca
Glossopsitta porphyrocephala
Glyciphila melanops
Grallina cyanoleuca
Gygis alba
Haematopus fuliginosus
Haematopus longirostris
Haliaeetus leucogaster
Haliastur sphenurus
Hieraaetus morphnoides
Himantopus himantopus
Hirundo neoxena
Hirundo nigricans
Hydroprogne caspia
Lalage tricolor
Larus dominicanus

Larus novaehollandiae subsp. novaehollandiae

Larus pacificus
Leipoa ocellata
Lichenostomus leucotis
Lichenostomus ornatus
Lichenostomus penicillatus
Lichenostomus virescens
Lichmera indistincta
Lichmera indistincta subsp. indistincta
Limosa lapponica
Limosa lapponica subsp. menzbieri
Limosa limosa
Lophoictinia isura
Macronectes giganteus
Malacorhynchus membranaceus
Malurus lamberti
Malurus lamberti subsp. assimilis
Malurus leucopterus
Malurus leucopterus subsp. leuconotus
Malurus pulcherrimus
Malurus sp.
Malurus splendens
Malurus splendens subsp. splendens
Manorina flavigula
Megalurus gramineus
Megalurus gramineus subsp. gramineus
Melanodryas cucullata
Melithreptus brevirostris
Melopsittacus undulatus
Merops ornatus
Microcarbo melanoleucos

Microeca fascinans
Milvus migrans
Morus serrator
Neophema petrophila
Ninox connivens
Ninox novaeseelandiae
Ninox novaeseelandiae subsp. boobook
Numenius phaeopus
Nycticorax caledonicus
Nymphicus hollandicus
Oceanites marinus subsp. dulciae
Ocyphaps lophotes
Onychoprion anaethetus
Oreoica gutturalis
Oxyura australis
Pachycephala pectoralis
Pachycephala pectoralis subsp. fuliginosa
Pachycephala rufiventris
Pachycephala rufiventris subsp. rufiventris
Pandion cristatus
Pandion haliaetus subsp. cristatus
Pardalotus punctatus
Pardalotus striatus
Pelecanoides urinatrix subsp. exsul
Pelecanus conspicillatus
Petrochelidon ariel
Petrochelidon nigricans
Petroica boodang
Petroica cucullata
Petroica goodenovii
Pezoporus flaviventris
Phalacrocorax carbo

Phalacrocorax sulcirostris
Phalacrocorax varius
Phaps chalcoptera
Phaps elegans
Phylidonyris melanops
Phylidonyris niger
Phylidonyris nigra
Phylidonyris novaehollandiae
Platalea flavipes
Platycercus icterotis subsp. icterotis
Platycercus icterotis subsp. xanthogenys
Platycercus zonarius
Platycercus zonarius subsp. semitorquatus
Platycercus zonarius subsp. zonarius
Plegadis falcinellus
Pluvialis fulva
Pluvialis squatarola
Podargus strigoides
Podiceps cristatus
Poliocephalus poliocephalus
Polytelis anthopeplus
Polytelis anthopeplus subsp. westralis
Pomatostomus superciliosus
Pomatostomus superciliosus subsp. ashbyi
Porphyrio porphyrio
Porzana fluminea
Porzana tabuensis
Puffinus assimilis subsp. assimilis
Puffinus pacificus
Purnella albifrons
Pyrrholaemus brunneus
Recurvirostra novaehollandiae

Rhipidura albiscapa
Rhipidura fuliginosa subsp. preissi
Rhipidura leucophrys
Rhipidura leucophrys subsp. leucophrys
Sericornis frontalis
Sericornis frontalis subsp. maculatus
Smicrornis brevirostris
Stercorarius antarcticus
Sterna anaethetus subsp. anaethetus
Sterna bergii
Sterna caspia
Sterna dougallii
Sterna dougallii subsp. gracilis
Sterna fuscata subsp. nubilosa
Sterna nereis subsp. nereis
Sterna paradisaea
Sternula nereis
Sternula nereis subsp. nereis
Stictonetta naevosa
Stiltia isabella
Stipiturus malachurus
Strepera versicolor
Streptopelia chinensis
Streptopelia senegalensis
Sugomel niger
Tachybaptus novaehollandiae
Tadorna tadornoides
Taeniopygia guttata
Thalasseus bergii
Thinornis rubricollis
Threskiornis molucca
Threskiornis spinicollis

Todiramphus pyrrhopygia
Todiramphus sanctus
Todiramphus sanctus subsp. sanctus
Tribonyx ventralis
Tringa brevipes
Tringa glareola
Tringa nebularia
Turnix varia
Turnix varius
Turnix velox
Tyto alba
Vanellus tricolor
Zanda latirostris
Zosterops lateralis
Zosterops lateralis subsp. gouldi

INVERTEBRATES

Acariformes sp.
Acarina 001
Adoxotoma chinopogon Simon, 1909
Adoxotoma chionopogon
Adversaeschna brevistyla
Aedes alboannulotus
Aedes camptorhynchus
Aedes sp.
Aedes sp. 4 (SAP)
Aeolosoma sp. 1 (PSS)
Aeshnidae sp.
Aganippe sp.
Agraptocorixa eurynome
Agraptocorixa parvipunctata
Ainudrilus sp. WA30 (nr nharna)
Alboa worooa
Allodessus bistrigatus

Alona rectangula novaezealandiae
Alona rigidicaudis
Amblyomma triguttatum
Aname mainae
Aname tepperi
Anax papuensis
Anisops baylii
Anisops gratus
Anisops hyperion
Anisops sp.
Anisops thienemanni
Anopheles annulipes s.l.
Anopheles sp.
ant sp.
Antichiropus sulcatus
Antichiropus whistleri
Antiporus gilberti
Antiporus sp.
Apocyclops dengizicus
Araneae sp.
Araneus cyphoxis
Araneus eburneiventris
Araneus senicaudatus
Archiargiolestes pusillus
Argiope protensa
Arrenurus (Micruracarus) sp. 1 (SAP)
Artoria schizocoides
Artoria sp. 3
Artoria taeniifera
Artoriopsis expolita
Asadipus muckera
Asadipus phaleratus

Asteron-complex sp. 5
Austracantha minax
Australocamptus near sp. 5 (SAP)
Australocyclops australis
Australocypris insularis
Australutica sp. 1
Austrochiltonia subtenuis
Austrolestes aleison
Austrolestes analis
Austrolestes annulosus
Austrolestes io
Austrosaga spinifer
Austrosimulium furiosum
Austrotrombella sp. nov. (SAP)
Backobourkia collina
Backobourkia heroine
Baetidae sp.
Baiami tegenarioides
Baiami volucripes
Ballarra longipalpus
Bassianobdella sp.
Bdelloidea med-large contracted of RJS (SAP)
beetle sp.
Bennelongia barangaroo lineage
Bennelongia sp.
Berosus approximans
Berosus discolor
Berosus majusculus
Berosus nutans
Berosus sp.
Bezzia sp. 2 (SAP)
Bigenditia zuytdorp

Boeckella triarticulata
Bothriembryon perobesus
Bothriembryon sp. nov. 'Gingin Brook'
Buddelundia sp. B38
Buddelundia sp. B39
Caboncypris kondininensis
Caenidae sp.
Calamoecia clitellata
Calamoecia clittellata
Calamoecia sp. 342 (ampulla variant) (CB)
Calanoida sp.
Candonocypris novaezelandiae
Capitella sp.
Cavasteron sp. 1
Ceinidae sp.
Cephalodella gibba
Ceratopogonidae sp.
Cercophonius granulosus
Cercophonius sp.
Cercophonius sulcatus
Cherax quinquecarinatus
Chironominae sp.
Chironomus aff. alternans (V24) (CB)
Chironomus occidentalis
Chironomus tepperi
Cladopelma curtivalva
Cladotanytarsus sp. A (SAP)
Cletocamptus aff deitersi
Cletocamptus dietersi
Cloeon sp.
Clynotis albobarbatus
Coenagrionidae sp.

Corduliidae sp.
Corixidae sp.
Cormocephalus novaehollandiae
Cormocephalus strigosus
Corynoneura sp. (V49) (SAP)
Coxiella sp.
Cryptochironomus griseidorsum
Culex (Culex) australicus
Culex globocoxitus
Culex sp.
Culicidae sp.
Culicoides sp.
Curculionidae sp.
Cypretta baylyi
Cyprideis australiensis
Cyprididae sp.
Cyprinotus cingalensis (ex edwardi)
Daphnia carinata
Daphnia cf. carinata (SAP)
Daphnia jollyi
Daphnia truncata
Daphnia wardi
Dasyhelea sp.
Diacypris compacta
Diacypris spinosa
Dicrotendipes pseudoconjunctus
Dineutus australis
Dingosa murata
Diplacodes bipunctata
Dipoena sp. 2
Dolichopodidae sp.
Dolichopodidae sp. B (SAP)

Dunhevedia crassa
Dytiscidae sp.
earthworm sp.
Empididae sp.
Enchytraeidae jcs1
Enchytraeidae jcs2
Enchytraeidae jcs4
Enchytraeidae jcs5
Enchytraeidae jcs6
Enchytraeidae sp.
Enochrus elongatulus
Ephydridae sp.
Ephydridae sp. 20
Ephydridae sp. 3 (SAP)
Ephydridae sp. 6 (SAP)
Eretes australis
Ethmostigmus curtipes
Ethmostigmus rubripes
Euasteron juliannae
Eucyclops australiensis
Eucyrtops riparia
Eulimnadia sp.
Euoplos mcmillani
Exocelina ater
Eylais sp.
fly 001
fly 004
fly 005
fly 006
fly 007
fly sp.
Forcypomyia sp.

Forcypomyia sp. 2 (SAP)
Gamasomorpha sp. 4
Gamasomorpha sp. 7
Gamasomorpha sp. 9
Geogarypus taylori
Glyptophysa sp
Gmogola sp. B
Goddardobdella elegans
Grayenulla australensis Zabka, 1992
Gripopterygidae sp.
Grymeus sp. 9
Gymnometriocnemus spp. (not V44 or V45)
Gyrinidae sp.
Habronestes australiensis
Habronestes sp. 9
Halicyclops sp. 1 (nr ambiguus) (SAP)
Haliplidae sp.
Haliplus fuscatus
Haliplus sp.
Haloniscus searlei
Hellyethira litua
Hemicordulia tau
Hemisaga vepreculae
Henicops dentatus
Heterocypris incongruens
Heterocypris tatei
Hirudinea sp.
Hogna crispipes
Hogna kuyani
Holocnemus pluchei
Holoplatys chudalupensis Zabka, 1991
Hyderodes sp.

Hydrachna nr. approximata (SAP)
Hydrachna sp.
Hydrometra strigosa
Hydrophilidae sp.
Hydrophilus sp.
Hydroptilidae sp.
Hylaeus globuliferus
Hyphydrus elegans
Hypomegalopsalis tanisphyros
Idiommata blackwalli
Idiosoma nigrum
Idiosoma sigillatum
Ilyocypris australiensis
Ilyodromus sp 573 (SAP)
Indolpium sp. B15
Insulodrilus lacustris s.l.
Ischnura aurora aurora
Ischnura heterosticta heterosticta
Isometroides vescus
Isopeda leishmanni
Kennethia cristata
Kennethia sp.
Keratella australis
Keratella cf. quadrata (SAP)
Keratella procurva
Keratella slacki
Kiefferulus intertinctus
Laetesia mollita
Lamponata daviesae Platnick, 2000
Lamponina scutata
Lamponina sp. 2
Lancetes lanceolatus

Laophontidae sp. 2
Larsia albiceps
Latonopsis brehmi
Latrodectus hasseltii
Latrodectus hasseltii Thorell, 1870
Lecane bulla
Lecane ichthyoura (ex ercodes subsp.)
Lecane ludwigi form appendiculata
Lecane sp. nov. a (Little 3 Springs) (SAP)
Lepadella cf. patella (SAP)
Lepadella sp. nov. (Little 3 Springs) (SAP)
Lepidoptera (non-pyralid)
Lepidoptera (non-pyralid) sp. 3 (SAP)
Lepidoptera sp.
Leptocaris nr brevicornis
Leptoceridae sp.
Leptus minno
Lestidae sp.
Libellulidae sp.
Limbodessus inornatus
Limbodessus shuckhardi
Limbodessus sp.
Limnesia sp.
Limnocythere mowbrayensis
Limnocythere sp.
Limnophyes vestitus (V41)
Limnoxenus sp.
Limnoxenus zelandicus
Lychas sp.
Lychas sp. 5
Lycidas sp. 1
Lycidas sp. 3

Lycidas sp. 4
Lycosa ariadnae
Lycosa australicola
Lycosa sp. 1
Lycosa sp. 25
Lycosa sp. 6
Lynceus sp.
Lynceus tatei
Macrothrix breviseta
Macrothrix sp.
Manayunkia n. sp.
Maratus pavonis
Maratus sp.
Margaromma sp. 1
Margaromma sp. 2
Masasteron sampeyae
Matilda sp. 2
Megapodagrionidae sp.
Megaporus howittii
Megaporus sp.
Melita kauerti
Meridiecyclops baylyi
Merridinia sp. 2
Mesochra baylyi
Mesochra nr flava
Mesochra parva
Mesocyclops brooksi
Mesostigmata sp.
Mesovelia hungerfordi
Mesovelia sp.
Microcyclops varicans
Micronecta gracilis

Micronecta robusta
Micropholcomma? sp. 4
Microvelia (Austromicrovelia) peramoena
Microvelia (Pacificovelia) oceanica
Microvelia sp.
Missulena granulosa
Missulena hoggi
Missulena sp. 1
Moina australiensis
Moina cf. micrura (SAP)
Monohelea sp. 3 (SAP)
Muscidae sp.
Muscidae sp. A (SAP)
Myandra bicincta
Myrmopopaea sp.
Mytilocypris ambiguosa
Mytilocypris mytiloides
Naididae (ex Tubificidae)
Naidinae (ex Naididae)
Necterosoma darwini
Necterosoma penicillatus
Necterosoma regulare
Necterosoma sp.
Nematoda sp.
Neostorena sp. 12
Neostorena sp. 14
Neostorena sp. 2
Neostorena sp. 21
Neostorena sp. 3
Nephila edulis
Nicodamus mainae
Nitocra reducta

Nitocra sp. 4 (SAP)
Nitocra sp. 5 (nr reducta) (SAP)
Nostera sp. 10
Nostera sp. 5
Notalina spira
Notiasemus glauerti
Notonectidae sp.
Nunciella aspera
Oecetis sp.
Ogyris otanes
Oligochaeta sp.
Oniscidae sp.
Onychocamptus bengalensis
Onychohydrus scutellaris
Onychohydrus sp.
Opisthopora sp.
Opopaea sp. 1
Opopaea sp. 13
Opopaea sp. 17
Opopaea sp. 18
Opopaea sp. 5
Oribatida sp.
Oribatida sp. JCS1
Orthetrum caledonicum
Orthocladiinae SO3 sp. A (SAP)
Orthocladiinae sp.
Ozarchaea westraliensis
Palaemonetes australis
Palaemonidae sp.
Paracyclops chiltoni
Paracymus pygmaeus
Paralimnadia sp. a (nr badia) (SAP)

Paralimnophyes pullulus (V42)
Paramerina levidensis
Paranacaena littoralis
Paraplatoides sp. 1
Pararchaea sp. 2
Parartemia extracta
Parastacidae sp.
Parastenocarididae sp.
Paroster niger
Paroster sp.
Pellenes bitaeniata
Pescecyclops sp. 1 (nr stagnalis in Morton)
Pescecyclops sp. 434 (Stuart's original arnaudi sensu Sars)
Pescecyclops sp. 442=462=465=CB2 (salinarum in Morton)
Pezidae sp.
Phasmodes jeeba
Phenasteron longiconductor
Phenasteron longiconductor Baehr & Jocqu???, 2001
Philosciidae sp.
Phreatoicidae sp.
Physidae sp.
Pinkfloydia harveii
Planorbidae sp.
Platycypris baueri
Platynectes aenescens
Platynectes decempuntatus var polygrammus
Pleuroxus inermis
Polyarthra dolichoptera
Polypedilum nubifer
Potamothrix bavaricus
Procladius paludicola
Procladius villosimanus

Protochelifer cavernarum
Pseudolampona boree Platnick, 2000
Pseudopallene ambigua
pseudoscorpion sp.
Psychodinae sp. 2 (SAP)
Pyralidae sp.
Raveniella arenacea
Raveniella cirrata
Recifella sp. JCS
Reticypris clava
Reticypris sp.
Rhantus suturalis
Richardsonianidae sp.
Saldidae sp.
Sarscypridopsis aculeata
Sarscypridopsis sp. 165
Sciomyzidae sp.
Scirtidae sp.
Sigara mullaka
Simocephalus elizabethae
Simuliidae sp.
Simulium ornatipes
spider sp.
springtail 003
springtail sp.
Staphylinidae sp.
Sternopriscus multimaculatus
Sternopriscus sp.
Stratiomyidae sp.
Supunna funerea
Supunna picta
Symphytognatha fouldsi

Synemon gratiosa
Synsphyronus callus
Syrphidae sp.
Tabanidae sp.
Tamopsis circumvidens
Tanypodinae sp.
Tanytarsus barbitarsis
Tanytarsus fuscithorax/semibarbitarsus
Tanytarsus sp. E (SAP)
Tardigrada sp.
Tasmanicosa leuckartii
Tasmanocoenis tillyardi
Teyl sp. 1
Teyl sp. 10
Teyl sp. 16
Thereuopoda lesueurii
Thienemanniella sp. (V19) (SAP)
Tipulidae type C (SAP)
Trichocerca similis
Triplectides australis
Urodacus armatus
Urodacus hartmeyeri
Urodacus hoplurus
Urodacus novaehollandiae
Urodacus sp. 10
Veliidae sp.
Venator immansueta
Venator koyuga
Wandella barbarella Gray, 1994
white ant sp.
Xanthagrion erythroneurum
Zachria flavicoma

	Zebraplatys keyserlingi
Mammals	*Balaenoptera acutorostrata*
	Bettongia penicillata subsp. ogilbyi
	Canis lupus
	Canis lupus subsp. dingo
	Cercartetus concinnus
	Chalinolobus gouldii
	Chalinolobus morio
	Dugong dugon
	Eubalaena australis
	Felis catus
	Hydrurga leptonyx
	Isoodon fusciventer
	Isoodon obesulus
	Macroderma gigas
	Macropus fuliginosus
	Macropus irma
	Macropus robustus subsp. erubescens
	Macropus sp.
	Megaptera novaeangliae
	Mus musculus
	Mus musculus Linnaeus, 1758
	Neophoca cinerea
	Notamacropus eugenii subsp. derbianus
	Notamacropus irma
	Nyctophilus geoffroyi
	Oryctolagus cuniculus
	Parantechinus apicalis
	Phascogale tapoatafa subsp. wambenger
	Potorous platyops
	Pseudomys albocinereus
	Pteropus scapulatus

Rattus fuscipes
Rattus rattus
Sminthopsis crassicaudata
Sminthopsis dolichura
Sminthopsis dolichura Kitchener, Stoddart and Henry, 1984
Sminthopsis fuliginosus
Sminthopsis gilberti
Sminthopsis granulipes
Sminthopsis granulipes Troughton, 1932
Sminthopsis griseoventer
Sminthopsis griseoventer subsp. boullangerensis
Sminthopsis griseoventer subsp. griseoventer
Stenella coeruleoalba
Tachyglossus aculeatus
Tadarida australis
Tarsipes rostratus
Tarsipes rostratus Gervais and Verraux, 1842
Tursiops aduncus
Tursiops truncatus
Vespadelus regulus
Vulpes vulpes

REPTILES

Aclys concinna
Acritoscincus trilineatus
Anilios australis
Antaresia stimsoni subsp. stimsoni
Aprasia repens
Aprasia sp.
Aspidites ramsayi
Brachyurophis fasciolatus subsp. fasciolatus
Brachyurophis semifasciata
Brachyurophis semifasciatus
Chelodina colliei

Christinus marmoratus
Crenadactylus ocellatus subsp. ocellatus
Cryptoblepharus buchananii
Cryptoblepharus plagiocephalus
Ctenoph sp B SAP
Ctenophorus adelaidensis
Ctenophorus adelaidensis subsp. chapmani
Ctenophorus maculatus
Ctenophorus maculatus subsp. griseus
Ctenophorus maculatus subsp. maculatus
Ctenotus australis
Ctenotus catenifer
Ctenotus fallens
Ctenotus fallens Storr, 1974
Ctenotus gemmula
Ctenotus gemmula subsp. (Swan Coastal Plain subpop.)
Ctenotus impar
Ctenotus lancelini
Ctenotus pantherinus
Ctenotus pantherinus subsp. calx
Ctenotus pantherinus subsp. pantherinus
Ctenotus schomburgkii
Cyclodomorphus branchialis
Cyclodomorphus celatus
Cyclodomorphus sp.
Delma australis
Delma concinna
Delma concinna subsp. concinna
Delma fraseri
Delma grayii
Demansia psammophis
Demansia psammophis subsp. reticulata

Dermochelys coriacea
Diplodactylus alboguttatus
Diplodactylus alboguttatus Werner, 1910
Diplodactylus granariensis
Diplodactylus ornatus
Diplodactylus ornatus Gray, 1845
Diplodactylus polyophthalmus
Diplodactylus pulcher
Diplodactylus sp.
Echiopsis curta
Egernia kingii
Egernia multiscutata
Egernia multiscutata Mitchell and Behrndt, 1949
Egernia napoleonis
Egernia stokesii subsp. badia
Gehyra variegata
Hemiergis quadrilineata
Hydrophis elegans
Lerista christinae
Lerista christinae Storr, 1979
Lerista distinguenda
Lerista elegans
Lerista lineopunctulata
Lerista planiventralis
Lerista planiventralis subsp. decora
Lerista praepedita
Lialis burtonis
Liopholis multiscutata
Liopholis pulchra subsp. longicauda
Lucasium alboguttatum
Lucasium alboguttatus
Menetia greyii

Menetia greyii Gray, 1845
Moloch horridus
Moloch horridus Gray, 1841
Morelia spilota imbricata
Morelia spilota subsp. imbricata
Morethia lineoocellata
Morethia obscura
Morethia obscura Storr, 1973
Morethia sp.
Neelaps bimaculatus
Neelaps calonotos
Parasuta gouldii
Parasuta nigriceps
Pletholax gracilis
Pletholax gracilis Cope, 1864
Pletholax gracilis subsp. gracilis
Pogona minor
Pogona minor subsp. minima
Pogona minor subsp. minor
Pseudechis australis
Pseudonaja affinis subsp. affinis
Pseudonaja mengdeni
Pygopus lepidopodus
Ramphotyphlops australis
Ramphotyphlops pinguis
Rankinia adelaidensis
Rankinia adelaidensis subsp. adelaidensis
Simoselaps anomalus
Simoselaps bertholdi
Simoselaps littoralis
Strophurus michaelseni
Strophurus spinigerus

Strophurus spinigerus subsp. inornatus
Strophurus spinigerus subsp. spinigerus
Tiliqua occipitalis
Tiliqua rugosa
Tiliqua rugosa subsp. rugosa
Underwoodisaurus milii
Varanus gouldii
Varanus tristis

Appendix C

Conservation Significant Species and Likelihood of Occurrence Assessment

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Birds					
Actitis hypoleucos	Common sandpiper	MI	MI	Edge of sheltered waters salt or fresh, e.g. estuaries, mangrove creeks, rocky coasts, near-coastal saltlakes (including saltwork ponds), river pools, lagoons, claypans, drying swamps, flood waters, dams and sewage ponds. Preferring situations where low perches are available (Johnstone & Storr 1998).	Nil
Aphelocephala leucopsis	Southern whiteface	-	VU	Relatively undisturbed open woodlands and shrublands with low tree densities, with an understory of grasses or herbaceous litter cover. They require hollows and crevices in living or dead trees for roosting and nesting (DCCEEW 2023).	Nil
Apus pacificus	Pacific swift	MI	MI	Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Pizzey & Knight 2012).	Moderate
Arenaria interpres	Ruddy turnstone	MI	MI	Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	Nil

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Calidris acuminata	Sharp-tailed sandpiper	MI	MI	Occurs in tidal mudflats, saltmarshes and mangroves, as well as, shallow fresh, brackish or saline inland wetlands. It is also known from floodwaters, irrigated pastures and crops, sewage ponds, saltfields (Pizzey & Knight 2012).	Nil
Calidris canutus	Red knot	EN	EN (MI	Mud and sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds (Pizzey & Knight 2012).	Nil
Calidris ferruginea	Curlew sandpiper	CR	CR (MI	Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater lakes and swamps. Also beaches and near-coastal sewage ponds (Johnstone & Storr 1988).	Nil
Calidris melanotos	Pectoral sandpiper	MI	MI	Mainly fresh waters (swamps, lagoons, river pools, irrigation channels and sewage ponds); also samphire flats around estuaries and saltlakes (Johnstone & Storr 1998).	Nil
Calidris ruficollis	Red-necked stint	MI	MI	Tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands (coastal and inland), saltfields, sewage ponds (Pizzey and Knight 2012).	Nil
Charadrius leschenaultii	Great sand plover	VU	VU (MI	Wide sandy or shelly beaches, sandpits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dune wilderness, bare paddocks, seldom far inland (Pizzey & Knight 2012).	Nil

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Falco peregrinus	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Moderate
Leipoa ocellata	Malleefowl	VU	VU	Scrubs and thickets of Eucalyptus spp., Melaleuca lanceolata and Acacia linophylla; also other dense litter-forming shrublands. Attracted to fallen wheat in stubbles and along roads (Johnstone and Storr 1998).	Nil
Limosa lapponica	Bar-tailed godwit	MI (&	MI	Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork and sewage ponds) (Johnstone and Storr 1998).	Nil
Motacilla cinerea	Grey wagtail	MI	MI	In Australia mostly near running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields and airfields (Pizzey & Knight 2012).	Nil
Ninox connivens connivens	Barking owl (southwest subpo	P3	-	Open forests, woodlands, dense scrubs, foothills, river red gums, and other large trees near watercourses penetrating otherwise open country. Also Melaleuca woodlands, mangroves, rainforests and deciduous vine scrubs (Johnstone and Storr 1998; Pizzey & Knight 2012).	Nil
Numenius madagascariensis	Eastern curlew	CR	CR (MI)	Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (including saltwork ponds) (Johnstone and Storr 1998).	Nil

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Pezoporus flaviventris	Western ground parrot	CR	CR	Low, dry or swampy near-coastal heathland. (DCCEEW 2023).	Nil
Pluvialis squatarola	Grey Plover	MI	MI	Mudflats, saltmarsh, tidal reefs and estuaries, rarely inland (Pizzey and Knight 2012).	Nil
Rostratula australis	Australian painted snipe	EN	EN	Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Marchant and Higgins 1993).	Nil
Sterna dougallii	Roseate tern	MI	MI	Offshore waters, islands, coral reefs, sand cays, beaches, tidal inlets (Pizzey & Knight 2012).	Nil
Sternula nereis nereis	Australian fairy tern	VU	VU	Sheltered blue-water seas close to land, estuaries (when free of silt) and near-coastal lakes (Johnstone and Storr 1998).	Nil
Thalasseus bergii	Crested tern	MI	MI	Mainly blue-water seas (especially within 3 km of land), including southern estuaries in summer and autumn (when free of silt); also tidal creeks in north, but not penetrating far into larger estuaries (DCCEEW 2023).	Negligible
Tringa glareola	Wood sandpiper	MI	MI	Mainly shallow fresh waters (lagoons, swamps, claypans, river pools, dams, bore overflows and sewage ponds); occasionally brackish swamps, rarely saltlakes and estuaries (Pizzey & Knight 2012).	Negligible
Tringa nebularia	Common greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes, wetlands, claypans (fresh and saline), commercial saltfields, sewage ponds (Pizzey & Knight 2012).	Negligible

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Zanda baudinii	Baudin's black cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding Corymbia calophylla, Banksia spp., Hakea spp., and to fruiting apples and pears (Johnstone and Storr 1998).	Nil
Zanda latirostris	Carnaby's black cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998).	High
Invertebrates					
Austrosaga spinifer	spiny katydid	P2	-	Unknown.	Nil
Hylaeus globuliferus	Woollybush bee	P3	-	Males are territorial and may be found perched on the growing tips of Adenanthos sp., Banksia sp. or Jacksonia sp. Has also been recorded visiting the flowers of Grevillea sp. (PaDIL 2022).	Moderate
Idiosoma gardneri	Mt Lesueur shield-backed trap	P2	-	Only one recorded specimen. Found in Lesueur National Park, likely has similar biology to Idiosoma sigillatum (Rix et al. 2018).	Moderate
Mammals					
Bettongia penicillata ogilbyi	Woylie	CR	EN	Woodlands and adjacent heaths with a dense understorey of shrubs, particularly Gastrolobium spp. (TSSC 2018).	Nil

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Dasyurus geoffroii	Chuditch	VU	VU	Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along roadsides in the wheatbelt (DEC 2012).	Nil
Isoodon fusciventer	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	Nil
Macroderma gigas	Ghost bat	VU	VU	Requires undisturbed roost caves or mineshafts, usually complex systems with several openings (Menkhorst and Knight 2011).	Nil
Notamacropus irma	Western brush wallaby	P4	-	Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	Moderate
Parantechinus apicalis	Dibbler	EN	EN	Old-growth mallee heath in coastal southwest and Escape Island off Jurien Bay (Menkhorst and Knight 2011).	Nil
Reptiles					
Egernia stokesii badia	Western Spiny-tailed Skink	VU	EN	Generally widespread though patchy distribution in dry to semi-arid habitats. E.s badia subspecies occupies hollow crevices and hollow timber in the southwest interior of WA and on Dirk Hartog Island. All known localities are east of Brand Highway (Wilson and Swan 2021)	Low
Neelaps calonotos	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2010).	Moderate

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Note: CR=critically endangered, EN=endangered, VU=vulnerable, CD=conservation dependent, MI=migratory, OS=other specially protected, P1=Priority 1, P2=Priority 2. P3=Priority 3. P4=Priority 4. Species with a high or moderate likelihood to occur within the site are shaded green.					

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Appendix D

Black Cockatoo Foraging Plant Species

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Acacia baileyana	Cootamundra wattle	Secondary	-	-	Groom 2011
Acacia pentadenia	Karri wattle	Secondary	-	-	Groom 2011
Acacia saligna	Orange wattle	Secondary	-	-	Groom 2011
Agonis flexuosa	Peppermint tree	Secondary	-	-	Groom 2011
Allocasuarina fraseriana	Sheoak	Secondary	Secondary	Secondary	Johnstone & Storr 1998; Johnstone *et al.* 2010; Johnstone 2017; DoEE 2017
Allocasuarina spp.		Secondary	-	Secondary	Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Anigozanthos flavidus	Tall kangaroo paw	-	Secondary	-	Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017
Araucaria heterophylla	Norfolk island pine	Secondary	-	-	Groom 2011; DoEE 2017
Banksia ashbyi	Ashby's banksia	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Banksia attenuata	Slender banksia	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia baxteri	Baxter's banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia carlinoides	Pink dryandra	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia coccinea	Scarlet banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia dallanneyi	Couch honeypot dryandra	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia ericifolia	Heath-leaved banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia fraseri		Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia gardneri	Prostrate banksia	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia grandis	Bull banksia	Primary	Secondary	-	Saunders 1980; Johnstone & Storr 1998; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia hookeriana	Hooker's banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia ilicifolia	Holly banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; Johnstone & Storr 1998; DoEE 2017
Banksia kippistiana		Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia leptophylla		Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia lindleyana	Porcupine banksia	Primary	Secondary	-	Johnstone *et al.* 2010; DoEE 2017

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Banksia littoralis	Swamp banksia	Primary	Secondary	-	Saunders 1980; Groom 2011Johnstone & Storr 1998; Johnstone *et al.* 2010; DoEE 2017
Banksia menziesii	Firewood banksia	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia mucronulata	Swordfish dryandra	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia nivea	Honeypot dryandra	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Banksia nobilis	Golden dryandra	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Banksia praemorsa	Cut-leaf banksia	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia prionotes	Acorn banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia prolata		Primary	Secondary	-	Johnstone *et al.* 2010; DoEE 2017
Banksia quercifolia	Oak-leaved banksia	Primary	Secondary	-	Johnstone & Storr 1998; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia sessilis	Parrot bush	Primary	Secondary	-	Saunders 1980; Johnstone & Storr 1998; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia speciosa	Showy banksia	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia spp.		Primary	Secondary	-	Saunders 1979; DSEWPaC 2012; DoEE 2017
Banksia squarrosa	Pingle	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Banksia tricuspis	Pine banksia	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia undata	Urchin dryandra	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia verticillata	Granite banksia	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Brassica campestris	Canola	Secondary	-	-	Groom 2011; DoEE 2017
Callistemon spp.		Secondary	Secondary	-	Johnstone *et al.* 2010; DoEE 2017
Callistemon viminalis	Captain cook bottlebrush	Secondary	-	-	Groom 2011
Callitris sp.		Secondary	-	-	Johnstone *et al.* 2010; Groom 2011
Carya illnoinensis	Pecan	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; Groom 2014; DoEE 2017
Casuarina cunninghamiana	River sheoak	Secondary	-	-	Groom 2011
Citrullus lanatus	Pie or afghan melon	Secondary	-	-	Johnstone *et al.* 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Corymbia calophylla	Marri	Primary	Primary	Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Saunders 1979; Johnstone & Kirkby 2008
Corymbia citriodora	Lemon scented gum	Secondary	Secondary	Secondary	Johnstone *et al.* 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017
Corymbia ficifolia	Red flowering gum	Secondary	-	-	Groom 2011
Corymbia haematoxylon	Mountain marri	Secondary	-	Secondary	Groom 2011; DoEE 2012; DoEE 2017
Corymbia maculata	Spotted gum	-	-	-	-
Darwinia citriodora	Lemon-scented darwinia	Secondary	Secondary	-	Groom 2011; Johnstone *et al.* 2010
Diospryros sp.	Sweet persimmon	Secondary	Secondary	-	Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eremophila glabra	Tarbush	Secondary	-	-	Groom 2011
Erodium aureum		Secondary	-	-	Groom 2011
Erodium botrys	Long storksbill	Secondary	Secondary	-	Groom 2011; Johnstone & Storr 1998; Johnstone *et al.* 2010
Erodium spp.		Secondary	Secondary	-	Johnstone *et al.* 2010; DoEE 2017
Eucalyptus caesia	Silver princess	Secondary	-	Secondary	Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017
Eucalyptus camaldulensis	River red gum	-	-	Secondary	DoEE 2012; DoEE 2017
Eucalyptus decipiens	Red heart/moit	-	-	Secondary	Johnstone 2017
Eucalyptus diversicolor	Karri	-	-	Primary	Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998
Eucalyptus erythrocorys	Illyarrie	Secondary	-	Secondary	DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone *et al.* 2010
Eucalyptus gomphocephala	Tuart	Secondary	-	Secondary	Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus grandis	Flooded gum, rose gum	-	-	Secondary	DoEE 2012; DoEE 2017
Eucalyptus lehmannii	Bushy yate	-	-	Secondary	Johnstone 2017
Eucalyptus leucoxylon	Yellow gum	Secondary	-	-	Groom 2014

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Eucalyptus loxophleba	York gum	Secondary	-	-	Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus marginata	Jarrah	Primary	Secondary	Primary	Saunders 1980; Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone 2017
Eucalyptus patens	Blackbutt	Primary	-	Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Groom 2011
Eucalyptus pleurocarpa	Tallerack	Secondary	-	-	Groom 2011
Eucalyptus preissiana	Bell-fruited mallee	Secondary	-	-	Groom 2011
Eucalyptus robusta	Swamp mahogany	Secondary	-	-	Johnstone *et al.* 2010; Groom 2011
Eucalyptus salmonophloia	Salmon gum	Primary	-	-	Johnstone *et al.* 2010; Groom 2011; DSEWPaC 2012; DSEWPaC 2012; DoEE 2017
Eucalyptus staeri	Albany blackbutt	-	-	Secondary	Johnstone & Storr 1998
Eucalyptus todtiana	Coastal blackbutt	Secondary	-	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011; Johnstone & Kirkby 2008
Eucalyptus wandoo	Wandoo	Primary	Secondary	Primary	Saunders 1980; Johnstone *et al* . 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Ficus sp.	Fig	Secondary	-	-	Groom 2011
Grevillea armigera	Prickly toothbrushes	Primary	-	-	Groom 2011
Grevillea bipinnatifida	Fuschia grevillea	Primary	-	-	Groom 2011
Grevillea hookeriana	Red toothbrushes	Primary	-	-	Groom 2011
Grevillea hookeriana subsp. api	Black toothbrushes	Primary	-	-	Groom 2011
Grevillea paniculata	Kerosene bush	Primary	-	-	Groom 2011
Grevillea paradoxa	Bottlebrush grevillea	Primary	-	-	Groom 2011
Grevillea petrophiloides	Pink poker	Primary	-	-	Groom 2011
Grevillea robusta	Silky oak	Primary	-	-	Johnstone *et al.* 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Grevillea spp.		Primary	-	-	Saunders 1979; Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017
Grevillea wilsonii	Native fuchsia	-	Secondary	-	Johnstone *et al.* 2010
Hakea auriculata		Primary	-	-	Saunders 1980; Groom 2011
Hakea candolleana		Primary	-	-	Groom 2011
Hakea circumalata	Coastal hakea	Primary	-	-	Groom 2011
Hakea commutata		Primary	-	-	Groom 2011
Hakea conchifolia	Shell-leaved hakea	Primary	-	-	Groom 2011
Hakea costata	Ribbed hakea	Primary	-	-	Groom 2011
Hakea cristata	Snail hakea	Primary	Secondary	-	Groom 2011; Johnstone *et al.* 2010
Hakea cucullata	Snail hakea	Primary	-	-	Groom 2011
Hakea cyclocarpa	Ramshorn	Primary	-	-	Saunders 1980; Groom 2011
Hakea eneabba		Primary	-	-	Groom 2011
Hakea erinacea	Hedgehog hakea	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011
Hakea falcata	Sickle hakea	Primary	-	-	Groom 2011
Hakea flabellifolia	Fan-leaved hakea	Primary	-	-	Groom 2011
Hakea gilbertii		Primary	-	-	Saunders 1980; Groom 2011
Hakea incrassata	Golfball or marble hakea	Primary	-	-	Johnstone *et al.* 2010; Groom 2011
Hakea lasiantha	Woolly flowered hakea	Primary	-	-	Johnstone *et al* . 2010; Groom 2011
Hakea lasianthoides		Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011
Hakea laurina	Pin-cushion hakea	Primary	-	-	Johnstone *et al.* 2010; Groom 2011
Hakea lissocarpha	Honeybush	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011
Hakea marginata		-	Secondary	-	Johnstone *et al.* 2010
Hakea megalosperma	Lesueur hakea	Primary	-	-	Groom 2011
Hakea multilineata	Grass leaf hakea	Primary	-	-	Groom 2011
Hakea neospathulata		Primary	-	-	Groom 2011
Hakea obliqua	Needles and corks	Primary	-	-	Saunders 1980; Groom 2011
Hakea oleifolia	Dungyn	Primary	-	-	Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Hakea pandanicarpa subsp. crassifolia	Thick-leaved hakea	Primary	-	-	Groom 2011
Hakea petiolaris	Sea urchin hakea	Primary	-	-	Groom 2011
Hakea polyanthema		Primary	-	-	Groom 2011
Hakea preissii	Needle tree	Primary	-	-	Groom 2011
Hakea prostrata	Harsh hakea	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011
Hakea psilorrhyncha		Primary	-	-	Groom 2011
Hakea ruscifolia	Candle hakea	Primary	Secondary	-	Saunders 1980; Groom 2011; Johnstone *et al.* 2010
Hakea scoparia	Kangaroo bush	Primary	-	-	Groom 2011
Hakea smilacifolia		Primary	-	-	Groom 2011
Hakea spp.		Primary	Secondary	-	Saunders 1979; DSEWPaC 2012; DoEE 2017
Hakea stenocarpa	Narrow-fruited hakea	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011
Hakea sulcata	Furrowed hakea	Primary	-	-	Groom 2011
Hakea trifurcata	Two-leaved hakea	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011
Hakea undulata	Wavy-leaved hakea	Primary	Secondary	-	Saunders 1980; Johnstone *et al.* 2010; Groom 2011
Hakea varia	Variable-leaved hakea	Primary	Secondary	-	Saunders 1980; Groom 2011
Harpephyllum caffrum	Kaffir plum	-	-	Secondary	Johnstone 2017
Helianthus annuus	Sunflower	Secondary	-	-	Johnstone *et al.* 2010; Groom 2011
Hibiscus sp.	Hibiscus	Secondary	-	-	Groom 2011
Isopogon scabriusculus		Secondary	-	-	Groom 2011
Jacaranda mimosifolia	Jacaranda	Secondary	Secondary	-	Johnstone *et al.* 2010; Groom 2011
Jacksonia furcellata	Grey stinkwood	Secondary	-	-	Groom 2011
Kingia australis	Kingia	-	Secondary	-	Johnstone *et al.* 2010
Lambertia inermis	Chittick	Secondary	-	-	Johnstone & Storr 1998; Groom 2011
Lambertia multiflora	Many-flowered honeysuckle	Secondary	-	-	Saunders 1980; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Liquidamber styraciflua	Liquid amber	Primary	-	Secondary	Johnstone *et al.* 2010; Groom 2011; Groom 2014; Personal observation
Lupinus sp.	Lupin	Secondary	-	-	Saunders 1980; Groom 2011
Macadamia integrifolia	Macadamia	Primary	Secondary	-	Johnstone *et al.* 2010; Grooms 2011; Groom 2014
Malus domestica	Apple	Secondary	Secondary	-	Johnstone *et al* . 2010; Johnstone & Storr 1998; DSEWPaC 2012; DoEE 2017; Groom 2011
Melaleuca leuropoma		Secondary	-	-	Saunders 1980; Groom 2011
Melia azedarach	Cape lilac or white cedar	Secondary	-	Primary	Johnstone *et al.* 2010; Groom 2011
Mesomeleana spp.		Secondary	-	-	Johnstone *et al.* 2010; Groom 2011
Olea europea	Olive	-	-	Secondary	Johnstone 2017
Persoonia longifolia	Snottygobble	-	-	Secondary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017
Pinus canariensis	Canary island pine	Primary	-	-	Johnstone *et al.* 2010; Groom 2011
Pinus caribea	Caribbean pine	Primary	-	-	Johnstone *et al.* 2010; Groom 2011
Pinus pinaster	Pinaster or maritime pine	Primary	-	-	Groom 2011
Pinus radiata	Radiata pine	Primary	Secondary	-	Johnstone *et al.* 2010; Groom 2011
Pinus spp.		Primary	Secondary	-	Johnstone & Storr 1998; Saunders 1979; Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017
Protea 'Pink Ice'		Secondary	-	-	Groom 2011
Protea repens		Secondary	-	-	Groom 2011
Protea spp.		Secondary	-	-	Johnstone *et al.* 2010
Prunus amygdalus	Almond tree	Secondary	-	-	Johnstone & Storr 1998; Johnstone *et al.* 2010; Groom 2011; DoEE 2017
Pyrus communis	European pear	-	Secondary	-	Johnstone & Storr 1998; Johnstone *et al.* 2010; DSEWPaC 2012; DoEE 2017
Quercus spp.	Oak	-	Secondary	-	Johnstone *et al.* 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Raphanus raphanistrum	Wild radish	Secondary	-	-	Groom 2011; DoEE 2017
Reedia spathacea		-	Secondary	-	Johnstone *et al.* 2010
Rumex hypogaeus	Doublegee	Secondary	-	-	Saunders 1980
Stenocarpus sinuatus		Secondary	-	-	Johnstone *et al.* 2010
Syzygium smithii	Lilly pilly	Secondary	-	-	Groom 2014
Tipuana tipu	Tipu or rosewood tree	Primary	-	-	Groom 2011, Groom 2014
Xanthorrhoea preissii	Grass tree	Secondary	Secondary	-	Groom 2011; Johnstone *et al.* 2010
Xylomelum occidentale	Woody pear	Secondary	-	-	Groom 2014

CBC=Carnaby's black cockatoo, BBC=Baudin's black cockatoo and FRTBC=Forest red-tailed black cockatoo

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Appendix E

Black Cockatoo Roost Counts

Table 1: White-tailed black cockatoo recorded in roosts within 12 km of the site

Roost ID	Year and number of individuals									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
DANBADR001	NS	NS	NS	NS	NS	205	NS	2	0	0
DANHILR001	250	0	0	0	0	70	NS	0	0	0
DANHILR002	NS	11	NS	0	0	0	NS	NS	NS	0
DANHILR003	131	NS	NS	0	NS	NS	NS	NS	0	0
DANHILR004	NS	NS	NS	NS	16	NS	NS	0	0	0
DANHILR005	NS	NS	NS	NS	NS	NS	NS	NS	200	0

NS = Not surveyed

Appendix F

Camera Trap Data

Table 1: Camera trap data

Camera Number	Easting	Northing	Deployment Date	Retrieval Date	Number of Camera Nights	Number of Camera Days	Capture Event 1	Capture Event 2
Camera 1	345953.51	6636458.82	18/09/2023	22/09/2023	4	5	-	-
Camera 2	347720.75	6638354.35	18/09/2023	22/09/2023	4	5	-	-
Camera 3	342880.38	6644044.03	20/09/2023	22/09/2023	2	3	0010037 (Emu)	-
Camera 4	346288.96	6637092.7	19/09/2023	22/09/2023	3	4	020005 (Western Grey Kangaroo)	0020027 (Honeypossum)
Camera 5	347892.3	6639094.13	18/09/2023	22/09/2023	4	5	-	-

Appendix G

Bat Recorder Data

Assessment of Bat Species from the Badgingarra area

Completed by Brenden Metcalf (Jan 30th 2024)

Microbat echolocation calls were recorded from four different locations in the Badgingarraarea (Western Australia) using two recording units.

Recording details (locations and dates)

Recorder ID	Location	Records	Lattitude	Longtitude
EBAT1	A	20/09/23 6:13pm - 21/09/23 6:09am	-30.3690	115.3996
	B	21/09/23 6:44pm - 22/09/23 6:07am	-30.37420	115.3478
EBAT2	C	20/09/23 6:13pm - 21/09/23 6:10am	-30.37050	115.417
	D	21/09/23 6:14pm - 22/09/23 6:07am	-30.32530	115.3656

Calls were assessed using a cluster analysis (Kaleidoscope software, Wildlife Acoustics) and low-quality calls were discarded. Cluster groups were compared to known voucher calls and where possible identified to species.

High quality calls were recorded from three taxa in the study area:

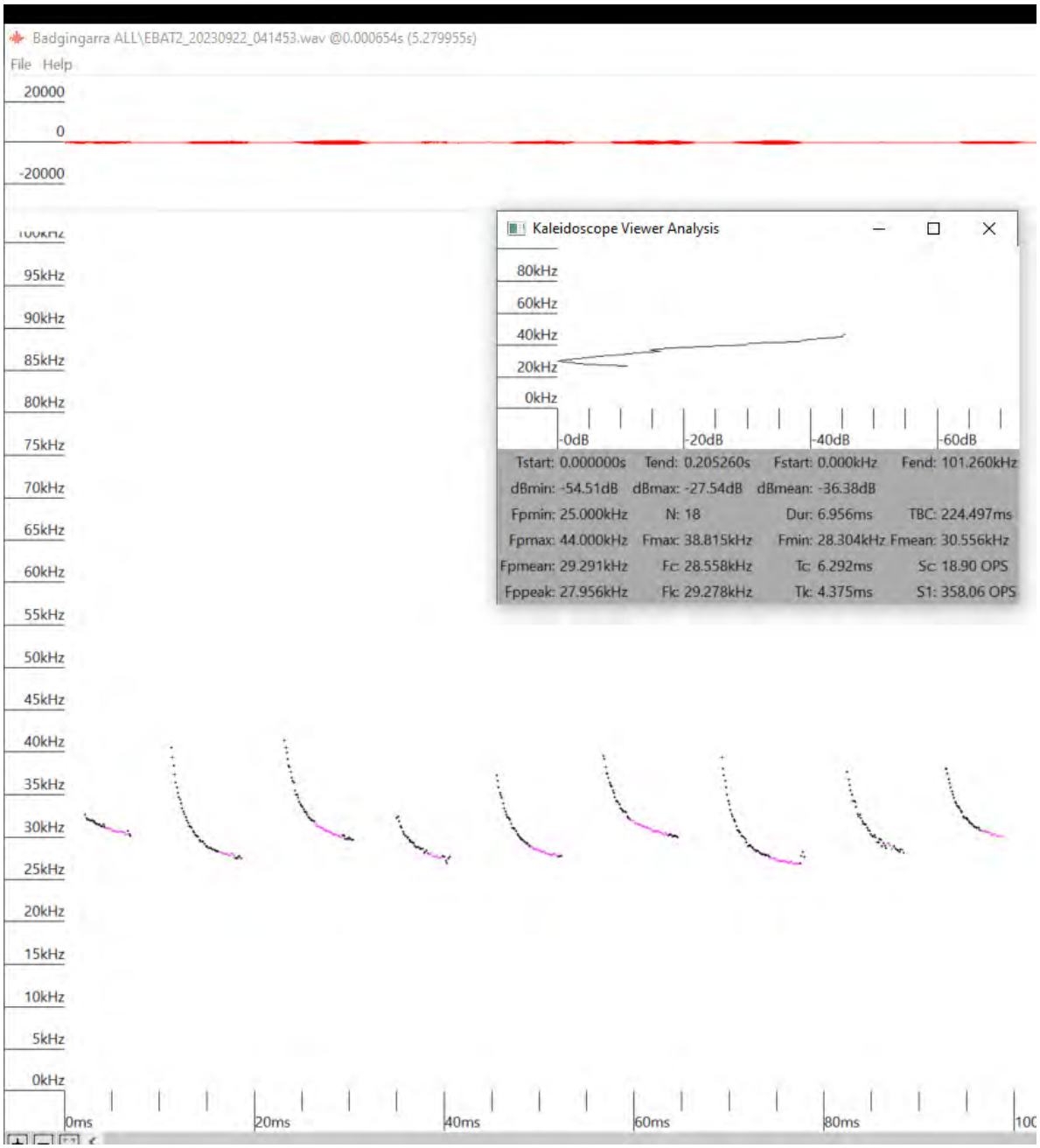
- Gould's Wattled Bat *Chalinolobus gouldii*
- Long-eared Bats *Nyctophilus spp.**
- Southern Forest Bat *Vespadelus regulus*

*Unable to separate *Nyctophilus* species based on echolocation call, but in this location it is considered most likely to be *Nyctophilus geoffroyi* – Lesser Long-eared Bat.

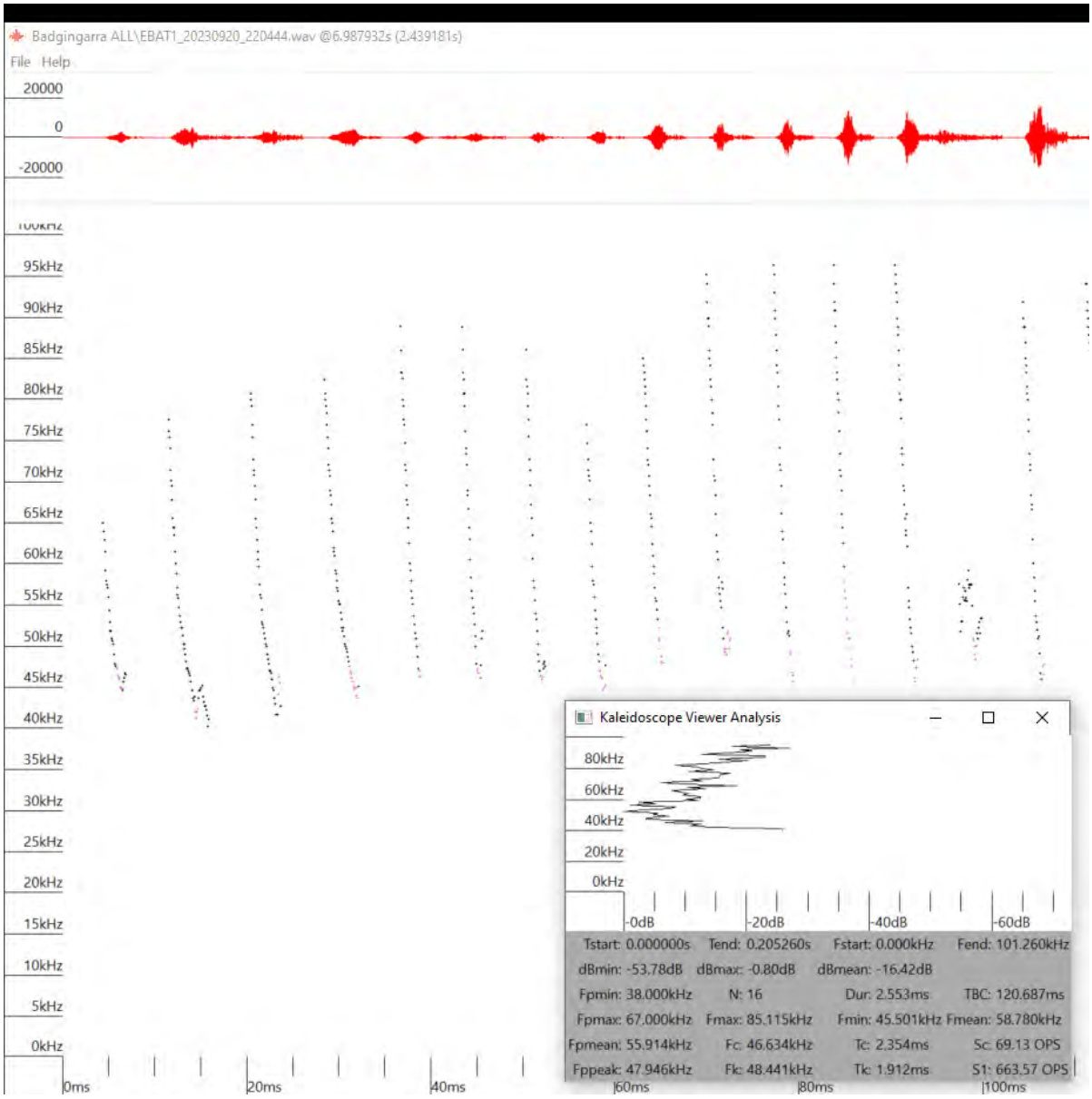
Call records for each species/Locations, showing relative abundance of species

	Location			
Species	A	B	C	D
Chalinolobus gouldii	22	1	-	132
Nyctophilus sp	22	4	-	-
Vespadelus regulus	9	10	-	5

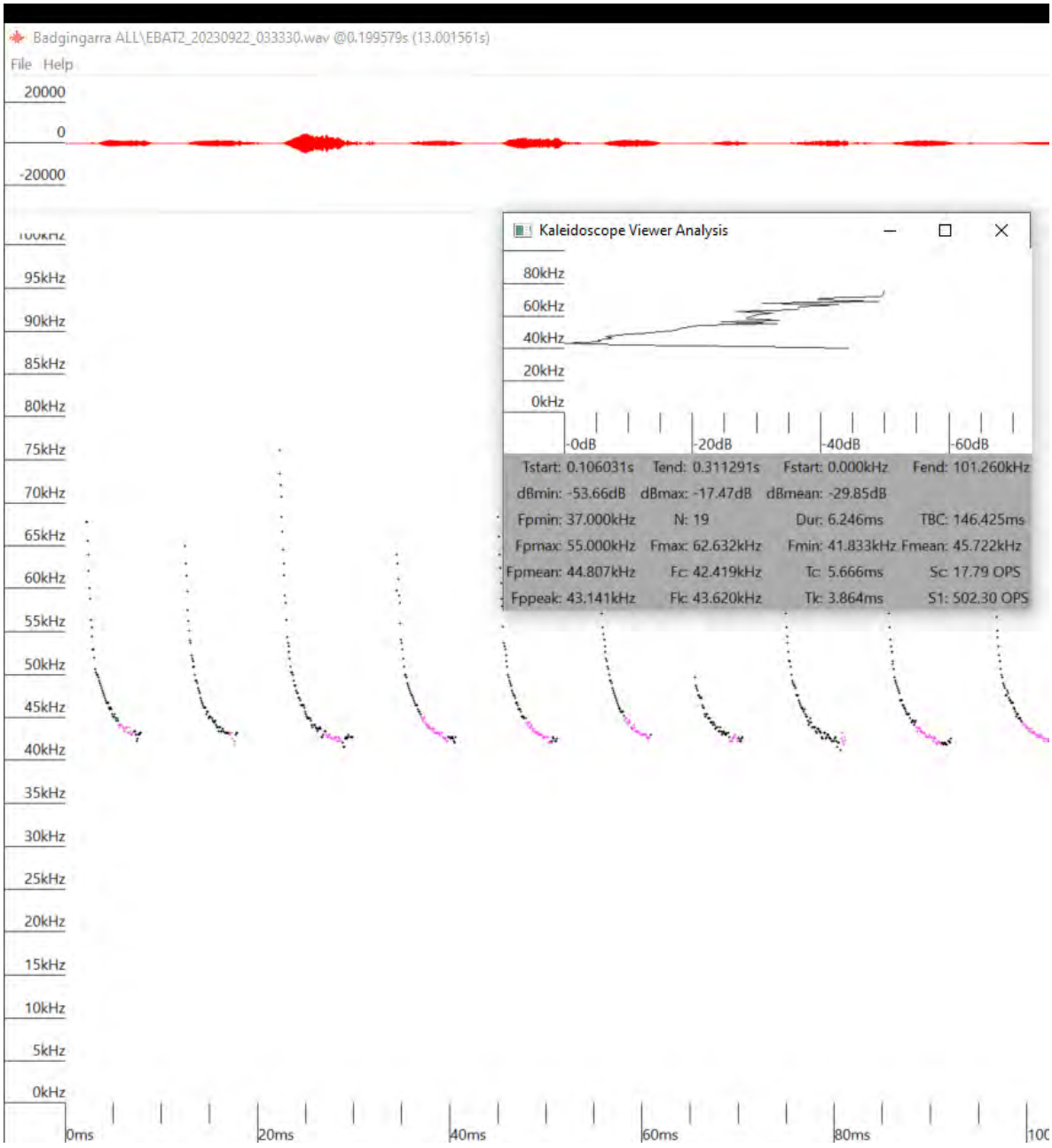
Example sonograms from species detected in the Badgingarra area



Chalinolobus gouldii – Gould's Wattled Bat



Nyctophilus sp. – Long-eared Bat



Vespadelus regulus – Southern Forest Bat

Appendix H

Species List

Species list

Parron Wind Farm Development Support

Category	Status	Species name	Common name	Record type
Birds				
		Acanthiza chrysorrhoa	Yellow-rumped thornbill	Sight
		Anas gracilis	Grey teal	Sight
		Anas superciliosa	Pacific black duck	Sight
		Anthochaera carunculata	Red wattlebird	Call
		Anthus australis	Australian pipit	Sight
		Aquila audax	Wedge-tailed eagle	Sight
		Artamus cinereus	Black-faced woodswallow	Sight
		Barnardius zonarius	Australian ringneck	Sight
		Cacatua sp.	Corella sp.	Sight
		Cacomantis flabelliformis	Fan-tailed cuckoo	Call
		Chenonetta jubata	Australian wood duck	Sight
		Chrysococcyx basalis	Horsfield's Bronze-Cuckoo	Call
		Cincloramphus cruralis	Brown songlark	Sight
		Cincloramphus mathewsi	Rufous songlark	Call
		Circus approximans	Swamp harrier	Sight
		Colluricincla harmonica	Grey shrikethrush	Call
		Corvus bennetti	Little crow	Call
		Corvus coronoides	Australian raven	Sight
		Coturnix pectoralis	Stubble quail	Call
		Cracticus nigrogularis	Pied butcherbird	Sight
		Cracticus tibicen	Australian magpie	Sight
		Dromaius novaehollandiae	Emu	Sight
		Egretta novaehollandiae	White-faced heron	Sight
		Elanus axillaris	Black-shouldered kite	Sight
		Eolophus roseicapilla	Galah	Sight
		Epthianura albifrons	White-fronted chat	Sight
		Falco cenchroides	Nankeen kestrel	Sight
		Gerygone fusca	Western gerygone	Call
		Gliciphila melanops	Tawny-crowned honeyeater	Sight
		Grallina cyanoleuca	Magpie-lark	Sight
		Hirundo neoxena	Welcome swallow	Sight

	Lichmera indistincta	Brown honeyeater	Sight
	Lophoictinia isura	Square-tailed kite	Sight
	Malurus assimilis	Purple-backed fairywren	Sight
	Malurus leucopterus	White-winged fairywren	Sight
	Malurus spendens	Splendid fairywren	Sight
	Manorina flavigula	Yellow-throated miner	Sight
	Melithreptus brevirostris	Brown-headed honeyeater	Sight
	Neophema elegans	Elegant parrot	Sight
	Ocyphaps lophotes	Crested pigeon	Sight
	Pachycephala rufiventris	Rufous whistler	Call
	Phaps chalcoptera	Common bronzewing	Sight
	Phylidonyris niger	White-cheeked honeyeater	Sight
	Rhipidura albiscrapa	Grey fantail	Call
	Rhipidura leucophrys	Willy wagtail	Sight
	Sericornis maculatus	Spotted scrubwren	Sight
	Smicrornis brevirostris	Weebill	Sight
	Tachybaptus novaehollandiae	Australasian grebe	Sight
	Threskiornis spinicollis	Straw-necked ibis	Sight
	Vanellus tricolor	Banded lapwing	Sight
EN	*Zanda latirostris*	Carnaby's black cockatoo	Foraging evidence
	Zosterops lateralis	Silvereye	Call
Mammals			
	Macropus fuliginosus	Western grey kangaroo	Sight
*	*Ovis aries*	Sheep	Sight
*	*Bos taurus*	Cow	Sight
DP	*Vulpus vulpus*	European red fox	Sight
	Tarsipes rostratus	Honeypossum	Camera
DP	*Sus scrofa*	Pig	Diggings
DP	*Oryctolagus cuniculus*	Rabbit	Sight
Reptile			
	Tiliqua rugosa	Bobtail lizard	Sight
	Pogona minor	Dwarf bearded dragon	Sight
	Pseudonaja affinis	Dugite	Sight

		Demansia reticulata	Reticulated whipsnake	Sight
Invertebrate				
	*	*Cherax destructor*	Common yabby	Anectodal

Note: * denotes introduced fauna species, DP=declared pest under the BAM Act, EN=Endangered under the BC and EPBC Acts

Appendix I

Bird Survey Site Data

Table 1: Site 5 bird survey data

Species Name	Common Name	Date and Time			
		19/09/2032	20/09/2023	21/09/2023	22/09/2023
		11:15 AM	8:10 AM	8:40 AM	10:00 AM
Anthus novaeseelandiae	Australian pipit	0	2	~10	4
Cacomantis flabelliformis	Fan-tailed cuckoo	0	0	1	0
Chrysococcyx basalis	Horsfield's bronze-cuckoo	1	1	0	0
Cincloramphus cruralis	Brown songlark	3	2	8	5
Cincloramphus mathewsi	Rufous songlark	1	1	0	1
Coracina novaehollandiae	Black-faced cuckoo shrike	0	0	2	0
Corvus coronoides	Australian raven	0	1	2	3
Coturnix pectoralis	Stubble quail	~5	4	2	2
Cracticus nigrogularis	Pied butcherbird	0	0	1	0
Cracticus tibicen	Australian magpie	2	2	7	0
Grallina cyanoleuca	Magpie-lark	3	2	3	2
Hirundo neoxena	Welcome swallow	5	4	3	2
Lichmera indistincta	Brown honeyeater	0	0	2	1
Lophoictinia isura	Square-tailed kite	0	0	0	2
Rhipidura leucophrys	Willy wagtail	0	1	1	1

Table 2: Site 6 bird survey data

Species Name	Common Name	Date and Time			
		19/09/2032	20/09/2023	21/09/2023	22/09/2023
		10:30 AM	8:35 AM	8:05 AM	10:25 AM
Anthus novaeseelandiae	Australian pipit	0	1	0	2
Cincloramphus cruralis	Brown songlark	10	6	~7	3
Corvus coronoides	Australian raven	1	0	1	0
Coturnix pectoralis	Stubble quail	~5	6	~10	1
Cracticus nigrogularis	Pied butcherbird	0	2	1	0
Cracticus tibicen	Australian magpie	1	2	5	0
Dromaius novaehollandiae	Emu	3	6	0	0
Elanus axillaris	Black-shouldered kite	0	0	1	0
Falco cenchroides	Nankeen kestrel	0	1	2	0
Grallina cyanoleuca	Magpie-lark	0	1	0	0
Malurus leucopterus	White-winged fairywren	3	3	3	3

Table 3: Site 7 bird survey data

Species Name	Common Name	Date and Time			
		19/09/2032	20/09/2023	21/09/2023	22/09/2023
		9:50 AM	9:10 AM	7:30 AM	11:10 AM
Anthus novaeseelandiae	Australian pipit	0	2	0	0
Barnardius zonarius	Australian ringneck	0	0	2	0
Cacomantis flabelliformis	Fan-tailed cuckoo	0	1	1	1
Chrysococcyx basalis	Horsfield's bronze-cuckoo	1	0	0	0
Cincloramphus cruralis	Brown songlark	~5	10	~5	3
Cincloramphus mathewsi	Rufous songlark	2	2	0	2
Corvus coronoides	Australian raven	1	2	2	3
Coturnix pectoralis	Stubble quail	5	2	3	2
Cracticus nigrogularis	Pied butcherbird	0	0	1	0
Cracticus tibicen	Australian magpie	1	2	3	2
Falco cenchroides	Nankeen kestrel	0	1	1	0
Gliciphila melanops	Tawny-crowned honeyeater	1	0	0	0
Grallina cyanoleuca	Magpie-lark	2	0	3	2
Lichmera indistincta	Brown honeyeater	0	5	2	2
Malurus leucopterus	White-winged fairywren	0	1	0	1
Manorina flavigula	Yellow-throated miner	0	3	3	0
Ocyphaps lophotes	Crested pigeon	0	0	1	0
Pachycephala rufiventris	Rufous whistler	0	1	0	0
Rhipidura leucophrys	Willy wagtail	1	1	1	1
Zosterops lateralis	Silvereye	2	0	0	0

Table 4: Site 8 bird survey data

Species Name	Common Name	Date and Time			
		19/09/2032	20/09/2023	21/09/2023	22/09/2023
		9:15 AM	9:45 AM	10:15 AM	8:40 AM
Anthochaera carunculata	Red wattlebird	0	2	0	0
Anthus novaeseelandiae	Australian pipit	0	2	2	6
Barnardius zonarius	Australian ringneck	0	0	0	1
Cincloramphus cruralis	Brown songlark	~4	4	2	5
Corvus bennetti	Little crow	1	0	0	0
Corvus coronoides	Australian raven	2	5	2	5
Coturnix pectoralis	Stubble quail	~5	1	1	2
Cracticus nigrogularis	Pied butcherbird	1	1	1	1
Cracticus tibicen	Australian magpie	3	3	4	4
Dromaius novaehollandiae	Emu	1	0	0	0
Eolophus roseicapilla	Galah	2	3	0	0
Falco cenchroides	Nankeen kestrel	0	0	0	1
Gerygone fusca	Western gerygone	0	0	1	0
Grallina cyanoleuca	Magpie-lark	2	2	2	2
Lichmera indistincta	Brown honeyeater	0	3	1	1
Manorina flavigula	Yellow-throated miner	4	~3	4	1
Threskiornis spinicollis	Straw-necked ibis	7	0	0	0

Table 5: Site 9 bird survey data

Species Name	Common Name	Date and Time			
		19/09/2032	20/09/2023	21/09/2023	22/09/2023
		8:25 AM	10:15 AM	9:50 AM	9:05 AM
Anthus novaeseelandiae	Australian pipit	0	2	3	2
Aquila audax	Wedge-tailed eagle	0	0	1	0
Cincloramphus cruralis	Brown songlark	~10	10	~5	2
Coracina novaehollandiae	Black-faced cuckoo shrike	0	0	1	0
Corvus coronoides	Australian raven	3	2	13	2
Coturnix pectoralis	Stubble quail	0	1	0	0
Cracticus nigrogularis	Pied butcherbird	0	1	1	0
Cracticus tibicen	Australian magpie	0	0	5	3
Falco cenchroides	Nankeen kestrel	0	1	1	0
Grallina cyanoleuca	Magpie-lark	0	3	2	1

Table 6: Site 10 bird survey data

Species Name	Common Name	Date and Time			
		19/09/2032	20/09/2023	21/09/2023	22/09/2023
		7:30 AM	10:50 AM	9:25 AM	9:30 AM
Anthus novaeseelandiae	Australian pipit	0	2	2	1
Barnardius zonarius	Australian ringneck	0	0	2	0
Cacatua sanguinea	Little corella	25	0	0	0
Cincloramphus cruralis	Brown songlark	~7	5	3	3
Coracina novaehollandiae	Black-faced cuckoo shrike	0	0	2	0
Corvus coronoides	Australian raven	2	15	5	7
Coturnix pectoralis	Stubble quail	1	0	2	1
Cracticus tibicen	Australian magpie	1	3	2	0
Falco cenchroides	Nankeen kestrel	0	0	2	0
Grallina cyanoleuca	Magpie-lark	2	0	0	2
Threskiornis spinicollis	Straw-necked ibis	0	0	46	8