Keri Keri Wind Farm

Biodiversity Development Assessment Report

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Acciona Energy Australia Global Pty Ltd

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Keri Keri Wind Farm

Biodiversity Development Assessment Report

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ACRONYMS AND ABBREVIATIONS

Name	Description
ALA	Atlas of Living Australia
ANOSIM	Analysis of Similarity
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BBAMP	Bird and Bat Adaptive Management Plan
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCD	Biodiversity Conservation Division (NSW)
BC Regulation	*Biodiversity Conservation Regulation 2017* (NSW)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
BSAL	Biophysical Strategic Agricultural Land
CEEC	Critically Endangered Ecological Community
CRM	Collision Risk Modelling
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cwlth)
DECCW	Department of Environment, Climate Change and Water (NSW)
DP	Deposited Plan
DPE	Department of Planning and Environment (NSW)
DPI	Department of Primary Industries (NSW)
DPHI	Department of Planning Housing and Infrastructure
EEC	Endangered Ecological Community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ha	Hectares
HBT	Hollow bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
kV	Kilovolts
LGA	Local Government Area
m	Metres
MW	Megawatts
MWh	Megawatt-hours
MNES	Matters of National Environmental Significance

Name	Description
NA	Nature Advisory Pty Ltd
NEM	National Electricity Market
NGH	NGH Environmental Pty Ltd
nMDS	Non-metric Multidimensional Scaling
NSW	New South Wales
O&M	Operations and Maintenance
OEH	Office of Environment and Heritage (NSW)
OSOM	Oversized and Overmass
PCT	Plant Community Type
PMST	Protected Matters Search Tool
PP	Pinch Point
REZ	Renewable Energy Zone
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SVTM	State Vegetation Type Map
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VIS	Vegetation Integrity Score
VMP	Vegetation Management Plan
VZ	Vegetation Zone
WTG	Wind Turbine Generator

DECLARATIONS

Certification under clause 6.15 Biodiversity Conservation Act 2016

I, Mark Aitkens, certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the ***Biodiversity Conservation Act 2016*** (BC Act).

Signature:	
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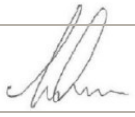
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Conflict of Interest

I, Mark Aitkens, declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interest of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature:	
Date:	17 April 2024

BAM Assessor Accreditation Number: BAAS17034

EXECUTIVE SUMMARY

OVERVIEW

Acciona Energy Australia Global Pty Ltd ('Acciona' or 'Applicant') proposes to construct, operate, maintain, and decommission the Keri Keri Wind Farm (the Project) within the rural locality of Keri Keri, New South Wales (NSW). The Applicant is seeking development approval under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act) as a State Significant Development (SSD) requiring preparation of a Biodiversity Development Assessment Report (BDAR) as the Project has potential to have a significant impact on biodiversity values (s7.14 of the *Biodiversity Conservation Act 2016* (BC Act)).

THE PROJECT

The Project is a linear development covering a total area of 4,228.7 hectares (ha), which comprises a Disturbance Footprint of 1,137 ha (i.e., area of maximum direct impacts) enveloped by a 'Micrositing Corridor' of 3,091.7 ha (i.e., area where direct impact may occur if project infrastructure is microsited). Collectively this is referred to as the Subject Land (=4,228.7 ha).

The Project involves the construction, operation, maintenance and decommissioning of:

- Up to 155 Wind Turbine Generators (WTG) with a hub height of 200 metres (m) and maximum height tip height of 291.5 m (vertical tip);
- Battery energy storage system (BESS) with capacity of approximately 200 megawatt (MW) / 800 MW hours (MWh);
- Electrical reticulation, on-site substations and switchyard; and
- Other ancillary infrastructure including (but not limited to) internal access tracks, road upgrades, meteorological masts, and operation and maintenance (O&M) buildings.

METHODS

Impacts to biodiversity values have been assessed in accordance with the Biodiversity Assessment Method 2020 (BAM) (DPIE 2020). Field surveys were undertaken over nine events as follows:

- Autumn 2020:
  - 30th - 31st March 2020 (NGH Environmental Pty Ltd (NGH)), surveys included general habitat and vegetation assessments;
  - 30th March – 5th April 2020 (Nature Advisory Pty Ltd (NA)), surveys included bird utilisation surveys (BUS);

- Spring 2020:
  - 28th September - 2nd October 2020 (NGH), surveys included general habitat and vegetation assessments, vegetation integrity plots (BAM plots), targeted threatened flora transects and targeted threatened fauna surveys;
  - 12th to 16th October 2020 (NGH), surveys included BAM plots, targeted threatened flora transects and targeted threatened fauna surveys;
- Spring 2021:
  - 26th October – 12th November 2021, surveys included general habitat and vegetation assessments, vegetation integrity plots (BAM plots), targeted threatened flora transects and targeted avian area searches;
- Summer 2022:
  - 14th February – 25th February 2022: surveys included general habitat and vegetation assessments, Anabat deployment, bird utilisation surveys (BUS) and targeted threatened flora transects;
- Spring 2022:
  - 26th August – 5th September 2022: surveys included general habitat and vegetation assessments, BUS, targeted threatened flora transects, nocturnal call playback and spotlighting and nocturnal avian transects;
- Summer 2023:
  - 6th February – 9th February 2023: survey consisted of vegetation integrity plots (BAM plots);
- Winter 2023:
  - 4th September – 8th September 2023: surveys included BUS and targeted threatened flora transects;
- Spring 2023:
  - 9th October - 13th October 2023: surveys included BUS and targeted threatened flora transects; and
- Summer 2024:
  - 19th December – 21st December 2023: survey consisted of targeted threatened flora transects and vegetation integrity plots (BAM plots).

BIODIVERSITY VALUES OF THE SUBJECT LAND

The Subject Land comprises 4,195.93 ha of native vegetation cover associated with the following naturally occurring plant community types (PCTs):

- PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion;
- PCT 44 Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion;
- PCT 160 Nitre Goosefoot shrubland wetland on clays on the inland floodplains;
- PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones; and
- PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone.

A single vegetation zone was established for each PCT within the Disturbance Footprint to calculate the vegetation integrity score (VIS) via the BAM Calculator (BAM-C). The number of PCTs impacted by the Project was consequently reduced to four as the full extent of PCT 26 has been avoided. PCT 26 is the only vegetation that has alignment with a listed threatened ecological community (TEC) being *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions.*

Seven ecosystem credit species have been recorded within the Subject Land:

- Spotted Harrier (*Circus assimilis*);
- White-fronted Chat (*Epthianura albifrons*);
- Black Falcon (*Falco subniger*);
- Little Eagle (*Hieraaetus morphnoides*);
- Pink Cockatoo (*Lophochroa leadbeateri*);
- Plains-wanderer (*Pedionomus torquatus*); and
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*).

Species polygons were established for those classed as 'species credit species' in the Threatened Biodiversity Database Collection (TBDC). A species polygon was developed for four species credit species:

- Little Eagle (*Hieraaetus morphnoides*);
- Mossgiel Daisy (*Brachyscome papillosa*);
- Chariot Wheels (*Maireana cheelii*); and
- Slender Darling Pea (*Swainsona murrayana*).

No Serious and Irreversible Impact (SAII) entities were identified for the purposes of assessment under the BAM.

This BDAR also considers impacts to native vegetation along the proposed Haul Route required for the delivery of Project components to the Subject Land from the Port of Newcastle, New South Wales, and/or the Port of Adelaide (only NSW route assessed).

One named waterway is situated within the Subject Land, with the Project intersecting the ephemeral creek known as Abercrombie Creek.

No key fish habitat is present. it is considered unlikely that any listed aquatic species under the *Fisheries Management Act 1994* would be impacted by the Project.

PRESCRIBED IMPACTS

The Project is anticipated to have prescribed impacts as outlined below:

- Impacts to hydrological processes;
- Increase risk of mammal predatory species access;
- Increase risk of vehicle strike; and
- Risk of turbine strike.

Measures to mitigate these impacts will be implemented through a Construction Environmental Management Plan (CEMP), Bird and Bat Adaptive Management Plan (BBAMP), and Pest Management Control Programs.

CUMULATIVE IMPACTS

It is anticipated that the removal of native vegetation as a result of this project would contribute to the cumulative loss of vegetation in the region. The Project involves direct impacts to 1,130.93 ha of native vegetation. A review against publicly available information regarding nearby relevant projects found the Project will likely contribute to cumulative impacts during construction and operation within the existing environment.

AVOID, MINIMISE AND MITIGATE

The Project design has evolved through the course of preparing the BDAR to minimise impact on biodiversity features, including using existing access tracks to reduce habitat clearing, largely avoiding areas of remnant woodland and TECs, and avoiding identified resident raptor nests.

Mitigation measures proposed to be undertaken as part of the Project include a CEMP, BBAMP and Pest Management Control Programs. The CEMP will make provisions for clearing protocols, construction timing, and include measures to minimise soil disturbance, runoff and sediment transfer, noise, dust, and vibrations because of the Project. The Pest Management Control Programs will be developed and implemented to minimise the impacts of introduced predators on existing native fauna, with a particular focus on the Plains-wanderer. The BBAMP will intend to enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory bird and bat species because of turbine strike. Monitoring will also be incorporated into the BBAMP to identify any potential changes to the species' utilisation of the Subject Land and the surrounding landscape.

SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

No Serious and Irreversible Impact (SAII) entities were identified as likely to be impacted by the Project.

RESIDUAL IMPACTS AND BIODIVERSITY OFFSET LIABILITY

The Project has been calculated to have a direct impact on the PCTs as outlined in Table E-1.

TABLE E-1 IMPACTS THAT REQUIRE OFFSET-ECOSYSTEM CREDITS

Vegetation Zone	PCT	Condition	TEC/EC	Impact area (ha)	Number of ecosystem credits required
1	164	Moderate	No	855.73	31,315
2	163	Moderate	No	268.58	9,282
3	44	Moderate	No	4.78	102
4	160	Moderate	No	1.84	52

The residual impact calculated is the extent of assumed presence following consideration of survey results that demonstrate species absence (e.g., flora transects with no species sightings).

TABLE E-2 IMPACTS THAT REQUIRE OFFSET-SPECIES CREDITS

Common Name	Scientific Name	Loss of habitat (ha) or individuals	Number of species credits required
Little Eagle	*Hieraaetus morphnoides*	16.33	580
Mossgiel Daisy	*Brachyscome papillosa*	1,025.17	49,199
Chariot Wheels	*Maireana cheelii*	773.06	37,542
Slender Darling Pea	*Swainsona murrayana*	792.81	38,493

PREFACE

1. ASSESSMENT OVERVIEW

Environmental Resources Management Australia Pty Ltd (ERM) has been contracted by Acciona Energy Australia Global Pty Ltd ('Acciona' or the 'Applicant') to prepare a Biodiversity Development Assessment Report (BDAR) for the Keri Keri Wind Farm (the 'Project').

The Project involves the construction, operation, maintenance and decommissioning of:

- Up to 155 Wind Turbine Generators (WTG) with a hub height of 200 metres (m) and maximum height tip height of 291.5 m (vertical tip);
- Battery energy storage system (BESS) with capacity of approximately 200 megawatt (MW) / 800 MW hours (MWh);
- Electrical reticulation, on-site substations and switchyard; and
- Other ancillary infrastructure including (but not limited to) internal access tracks, road upgrades, meteorological masts, and operation and maintenance (O&M) buildings.

The Project plans to connect to the under construction NSW-SA interconnector, Project EnergyConnect currently, subject to successfully obtaining an access rights agreement.

This BDAR also considers impacts to native vegetation along the proposed Haul Route required for the delivery of Project components to the Subject Land from the Port of Newcastle, New South Wales, and/or the Port of Adelaide (only NSW route assessed).

The Project is to be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as State Significant Development (SSD). This BDAR is prepared in accordance with the Biodiversity Assessment Methd 2020 (BAM), with consideration of the Draft BBAMP Framework and BBUS Guidelines 2023, as the Biodiversity Offset Scheme (BOS) applies to the Project. It also addresses the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment (DPE; now Department of Planning, Housing and Environment, DPHI) (SSD-38358962, dated 14 April 2022). This BDAR will be submitted with the Environmental Impact Statement (EIS) prepared as part of the SSD application.

1.1 RELEVANT LEGISLATION AND POLICIES

This BDAR addresses Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM and omits Stage 3 (Improving Biodiversity Values) as this is only required for Biodiversity Stewardship Site Assessment Reports. The BDAR also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and relevant State Environmental Planning Policies (SEPPs).

1.1.1 ASSESSMENT FRAMEWORK

The Project requires approval under Part 4 of the EP&A Act. Section 1.7 of the EP&A Act specifies that the Act has effect subject to the provisions of Part 7 of *Biodiversity Conservation Act 2016* (BC Act). Part 7 of the BC Act mandates the application of the BAM (DPIE 2020a) where the Project exceeds a biodiversity offsets scheme threshold (i.e., Section 7.2 of the BC Act) and/ or is "likely to significantly affect threatened species" upon application of the test (Section 7.3 of the BC Act). In this case, these thresholds do not apply as the Project is declared SSD thus mandating the preparation of a BDAR (s7.14) in the absence of a successful BDAR waiver. The Minister for Planning is to take into consideration impacts on SAIIs and determine if any additional measures are required to minimise impacts on those entities (s7.16(3)).

1.1.2 NEED FOR A BDAR

The BOS applies to the Project as it has been declared SSD (s7.14 of the BC Act). The Applicant has engaged an independent accredited assessor without any conflicts of interest to apply the BAM to assess the impacts of the Project on biodiversity values.

1.1.3 APPLICATION OF THE BAM

This BDAR has been prepared in accordance with the relevant parts of the BAM, as required under the BC Act for development identified as "likely to significantly affect threatened species". No streamline modules were applied in preparing this BDAR. The minimum information supplied in this BDAR is in accordance with the relevant details specified in Table 24 of Appendix K of the BAM.

The BDAR is certified by the accredited assessor indicated on Page (viii) of this document as of the date corresponding with the signature. The Biodiversity Assessment Method Calculator (BAM-C) report associated with this BDAR was finalised within 14 days of the date of submission of this BDAR.

1.1.4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places – defined as matters of national environmental significance (MNES).

A referral was submitted by the Applicant to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW), (EPBC 2022/9176). The referral identified potential for significant impacts to EPBC Act listed MNES, which are likely to occur or use habitat within the Project Area and be impacted by the Project.

The Commonwealth Minister for the Environment and Water determined that the Project is likely to have a significant impact on MNES and therefore is a 'controlled action' under Part 7 of the EPBC Act. Consequently, the Project will be assessed under an Assessment Bilateral Agreement, allowing a single environmental impact assessment process for both the Commonwealth and NSW government. Supplementary SEARs have been provided where the Commonwealth has identified additional matters for consideration, the EPBC Act controlling provisions for the proposed action included:

- Listed threatened species and communities

The assessment requirements include (but are not limited to) the EIS identifying each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action and a description of the impacts, habitat, survey methodologies and avoidance, mitigation and offset measures. The threatened species and communities identified in the supplementary SEARs are provided in Table 1-1 .

TABLE 1-1 REQUIREMENTS OF SUPPLEMENTARY SEARS

Threatened Species/Community	EPBC Act Listing
Likely Significant Impact	
Natural Grasslands of the Murray Valley Plains	Critically Endangered
Plains-wanderer (*Pedionomus torquatus*)	Critically Endangered
Winged Peppercress (*Lepidium monoplocoides*)	Endangered
Chariot Wheels (*Maireana cheelii*)	Vulnerable
Mossgiel Daisy (*Brachyscome papillosa*)	Vulnerable
Potential Significant Impact	
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	Critically Endangered
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered
Weeping Myall woodlands	Endangered
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Southeastern Australia	Endangered
Flathead Galaxias (*Galaxias rostratus*)	Critically Endangered
Australian Painted Snipe (*Rostratula australis*)	Endangered
Australasian Bittern (*Botaurus poiciloptilus*)	Endangered
Corben's Long-eared Bat (*Nyctophilus corbeni*)	Vulnerable
Growling Grass Frog (*Litoria raniformis*)	Vulnerable
Grey Falcon (*Falco hypoleucos*)	Vulnerable
Malleefowl (*Leipoa ocellata*)	Vulnerable
Painted Honeyeater (*Grantiella picta*)	Vulnerable
Austrostipa metatoris	Vulnerable
Slender Darling-pea (*Swainsona murrayana*)	Vulnerable

1.2 BIODIVERSITY CREDITS AND CLASSES

The BAM uses biodiversity credits to measure:

- The residual impacts of a Project on biodiversity values; or
- Gains in biodiversity values at biodiversity stewardship sites.

In this application, the BDAR is measuring the direct impacts of the Project on biodiversity values using two kinds of credits, being 'ecosystem credits' and 'species credits'.

Each ecosystem credit is assigned up to seven attributes that are used to distinguish the type of biodiversity values represented by the credit and to determine whether a credit within a class is 'like' another credit.

Each species credit is assigned four attributes. Matching of attributes is used to apply the 'like-for-like' rules and variation rules as set out in the BC Regulation.

1.3 ACCREDITED PERSON

A BDAR, which documents the assessment and 'No Net Loss' outcomes, must be prepared by a person accredited under Section 6.10 of the BC Act. An accredited person is referred to as an assessor.

This BDAR was authored by Lorena Boyle (Accredited BAM Assessor – BAAS23027), with contributions from Robert Ashworth and Freya Robinson. The BDAR was reviewed by Mark Aitkens (Accredited BAM Assessor – BAAS17034) and Claire Hewitt (Accredited BAM Assessor – BAAS20009. The assessment provided in the report is based on the BAM-C (version 1.4.0.00) with BAM data last updated on 22/06/2023 and linked to a Development Assessment Case created in the BAM-C.

1.4 DATA AND INFORMATION USED

The full list of information sources referred to in this report is provided in Section 12. Digital shapefiles for all maps and spatial data have been submitted with this report. Information sources included (but were not necessarily limited to) the following:

- Proposal layers and concept designs provided by the Applicant;
- Land Surveys Aerial LiDAR Survey Imagery and Ground Control Survey 2023;
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Protected Matters Search Tool (PMST) (http://www.environment.gov.au/epbc/protectedmatters- search-tool);
- DCCEEW Species Profiles and Threats (SPRAT) database (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl);
- DCCEEW Directory of Important Wetlands in Australia (https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands);
- Interim Biogeographical Regionalisation for Australia (IBRA) and IBRA sub-regions v7 (http://www.environment.gov.au/land/nrs/science/ibra);
- NSW Department of Planning, Industry and Environment (DPIE) Threatened Species Database Collection (http://www.environment.nsw.gov.au/threatenedspeciesapp/);
- DPIE Guidance to assist a decision-maker to determine a serious and irreversible impact;
- NSW Biodiversity Values Map (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap);
- NSW Department of Primary Industries (DPI) Key Fish Habitat mapping;
- NSW Department of Planning and Environment (DPE) Guidance for the Biodiversity Development Assessment Report Template;

- DPE State Vegetation Type Mapping Version C1.1.M1.1 (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map);
- DPE BioNet Atlas of NSW database;
- DPE Threatened Biodiversity Data Collection (TBDC) database;
- DPE BioNet Vegetation Classification database;
- NSW Office of Environment and Heritage (OEH) BAM Calculator (BAM-C) (https://www.lmbc.nsw.gov.au/bamcalc);
- Biodiversity Assessment Method (BAM) 2020 (DPIE, 2020);
- NSW Mitchell Landscapes map and descriptions (NPWS 2003);
- Groundwater Dependent Ecosystem Atlas (BoM, 2023);
- Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH, 2018);
- Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method (NSW DPIE, 2020);
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Department of Environment and Conservation (DEC), 2004);
- Survey Guidelines for Australia's Threatened Mammals (Department of Sustainability, Environment, Water, Population & Communities (DSWP&C), 2011);
- NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE, 2020a);
- Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (DPE 2022);
- Relevant published literature on threatened biota;
- Keri Keri Wind Farm Scoping Report (ERM, 2022); and
- Preliminary Biodiversity Assessment – Spring Survey Report 2020 (NGH, 2020).

1.5 BIODIVERSITY VALUES NOT ASSESSED

The BAM does not assess biodiversity values for:

- Marine mammals;
- Wandering seabirds;
- Biodiversity that is endemic to Lord Howe Island; and/or
- Native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act)), other than the additional biodiversity impacts under clause 6.1 of the BC Regulation (referred to as prescribed impacts in the BAM).

This BDAR does not include an assessment of these matters. The extent of category 1-exempt land is outlined in the following section.

1.6 CATEGORY 1-EXEMPT LAND

The Subject Land comprises rural zoned land and is thus regulated under the *Local Land Services Act 2013* (LLS Act). Under the LLS Act, three land categories are defined relating to vegetation clearing:

- Category 1 – 'Exempt land', land not subject to clearing approval;
- Category 2 – 'Regulated Land', land on which clearing of native vegetation may be carried out with or without approval in accordance with an 'allowable activity' or 'code' under the LLS Act, and
- 'Excluded Land' – Land not categorised in the Regulatory Maps and to which the LLS Act does not apply.

The Draft Native Vegetation Regulatory (NVR) Map (accessed 21st November 2023) identifies the Subject Land as containing Category 2-regulated lands. No map review has been sought as part of this BDAR. The clearing of vegetation across the Subject Land will be subject to approval and has been considered throughout this BDAR in accordance with the BAM.

1.7 STRUCTURE OF THE BDAR

A BDAR requires completion of Stages 1 and 2 of the BAM (DPIE 2020a). These stages are outlined below.

- Stage 1 establishes a consistent approach to assessing the biodiversity values of land; and
- Stage 2 outlines the guidance and requirements to apply the hierarchy of avoid, minimise and offset for assessing direct, indirect or prescribed impacts on biodiversity values arising from the proposed development, activity, clearing or biodiversity certification. Stage 2 also provides guidance on the use of mitigation measures where there is uncertainty on the timing or extent of impacts.

Section structuring in this BDAR follows the corresponding BAM sections to assist readability for compliance with the BAM. Thus, in omitting the Stage 3 assessment, the BDAR section structuring ends with the last section in Stage 2 (Section 10 Applying the no net loss standard).

Documents appended to this BDAR include:

- Appendix A – Haul Route Assessment;
- Appendix B – BAM Plot Data;
- Appendix C – Biodiversity Credit Report; and
- Appendix D – Bat Call Analysis Report Summer 2022.

1.8 BDAR VERSION HISTORY

This BDAR has been prepared in accordance with the BAM 2020 through contributions made by accredited and non-accredited persons since 2020. Contributors to the preparation of the BDAR are listed on Page 2 of this BDAR.

Version 1 of this BDAR (current version) assesses the impact of the Project by way of:

- Proposal design: The Project involves the construction, operation, maintenance and decommissioning of a wind farm, with up to 155 WTGs, together with associated and ancillary infrastructure. This BDAR additionally assesses upgrades required along the two potential Haul Routes between the Port of Adelaide and the Port of Newcastle and the Project.
- Mitigation: Mitigation measures proposed to be undertaken as part of the Project include a:
    - Bird and Bat Adaptive Management Plan (BBAMP)
    - Construction Environmental Management Plan (CEMP)
    - Pest Management Control Programs

The BBAMP will intend to enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory species because of turbine strike. Monitoring will also be incorporated into the BBAMP to identify any potential changes to the species' utilisation of the Subject Land and the surrounding landscape.

The CEMP will make provisions for clearing protocols, construction timing, and include measures to minimise soil disturbance, runoff and sediment transfer, artificial light, noise, dust, and vibrations because of the Project.

The Pest Management Control Programs will be developed and implemented to minimise the impacts of introduced predators on existing native fauna, with a particular focus on the Plains-wanderer.

Amendments to Version 1 have potential to affect the offset liability generated.

STAGE 1: BIODIVERSITY ASSESSMENT

2. INTRODUCTION

The Project is situated about 30 kilometres (km) southeast of Balranald, and 75 km southwest of Hay in the Murray River Local Government Area (LGA). The Project is located within the South West Renewable Energy Zone (REZ) and is directly south of the Sturt Highway on land that is predominately used for sheep grazing and cropping. The Project extends over an area of approximately 18,012 hectares (ha) across 66 freehold land parcels (Project Area).

The under-construction Project EnergyConnect intersects the Project Area. Project EnergyConnect is a new 900 km TL (interconnector) that will connect power grids across three (3) Australian states between Wagga Wagga in NSW and Robertstown in SA, with a connection to Red Cliffs in VIC. The Applicant intends to bid for Access Rights to this interconnector. The 330 kV overhead TL will connect the Project to Project EnergyConnect.

For the purposes of the BDAR, the term 'Disturbance Footprint' is used hereafter to refer to the area likely to be directly impacted during the construction and operational phases of the Project. The 'Subject Land' refers to the Disturbance Footprint and an enveloping 'Micrositing corridor', which is defined as a 100 m buffer to the Disturbance Footprint. The extent of the Subject Land is shown in Figure 2-1 and Figure 2-2.

2.1 PROPOSED DEVELOPMENT

2.1.1 DEVELOPMENT OVERVIEW

The Applicant is seeking SSD consent under Part 4, Division 4.7 of the EP&A Act for the construction and operation of the Project. The Project is a proposed wind farm which will consist of up to 155 turbine locations. The proposed layout of the Project is shown in Figure 2-3.

The blade and tower components of the wind turbines for the Project will require transport from either the Port of Newcastle or Port of Adelaide to the Subject Land both of which have been considered in this assessment.

From the Port of Newcastle, there are two routes involved in the hauling of components between the port and the Project, one for the transport of blades and components under 5.25 m loaded and height (Route 1), and another for the transport of high loads up to 5.9 m (Route 2). Route 1 heads south-west along the Hume Highway, continuing west before travelling along the Sturt Highway, passing through Wagga Wagga and Hay before reaching Keri Keri. Route 2 travels north-west to Dubbo, south-west through Forbes and West Wyalong via the Newell Highway and heading west along the Sturt Highway at Gillenbah. These routes are shown in Figure 2-4.

From the Port of Newcastle, the Applicant proposes to undertake upgrades and modifications to 13 identified pinch points (Pinch Points 1 to 13) along Route 1 and an additional 2 pinch points along Route 2 (Pinch Points 14 and 15) to ensure the route is suitable for the required haul.

Four of these pinch points involve the removal or trimming of vegetation, one has been determined to not require assessment under the BAM for removal of planted vegetation.

From the Port of Adelaide, considering only the route from the NSW/VIC border, there are two proposed routes. Route 1 heads from Robinvale along Sea Lake Road, onto Murray Valley Highway, Sturt Highway and then onto Keri Keri Road. Route 2 heads from Mildura along Seventh Street, onto the Sturt Highway then on to Keri Keri Road. These routes are shown in Figure 2-5. Route 1 requires the upgrade of five pinch points, three of which are consistent with the Port of Newcastle routes (Pinch Points 11, 12 and 13) to ensure the route is suitable for the required haul (Pinch Points 16 and 17). Route 2 does not introduce any additional pinch points for assessment. One pinch point along Route 1 (Pinch Point 17) involves the trimming or removal of vegetation. This vegetation has been assessed as planted native vegetation that does not require assessment under the BAM or BOS.

A due diligence assessment, comprised of a desktop and field survey, was conducted to identify which pinch points contained biodiversity values that could be impacted by the required works. The due diligence report is attached as Appendix A. The due diligence concluded that the removal of native vegetation requiring to be assessed under the BOS and reported within this BDAR is limited to pinch points associated with site access (PP 11, 12 and 13).

2.1.2 LOCATION

The Project is located within the South West Renewable Energy Zone (REZ) and is directly south of the Sturt Highway on land that is predominately used for sheep grazing and cropping. The Project extends over an area of approximately 18,012 ha (Project Area).

The Subject Land is land to which the BAM is applied and includes the area of direct impacts and any additional areas where the Project is likely to have indirect impacts. In this assessment, the Subject Land is described as the proposed area of disturbance (the 'Disturbance Footprint') enveloped by a Micrositing corridor (i.e., 100 m buffer to Subject Land). The Subject Land is contained across 66 freehold land parcels, the Lot and DP Details are listed in Table 2-1 .

Additional areas of impact assessed in this BDAR includes lands requiring vegetation removal along the proposed haul route (i.e., 'Haul Route Pinch Points').

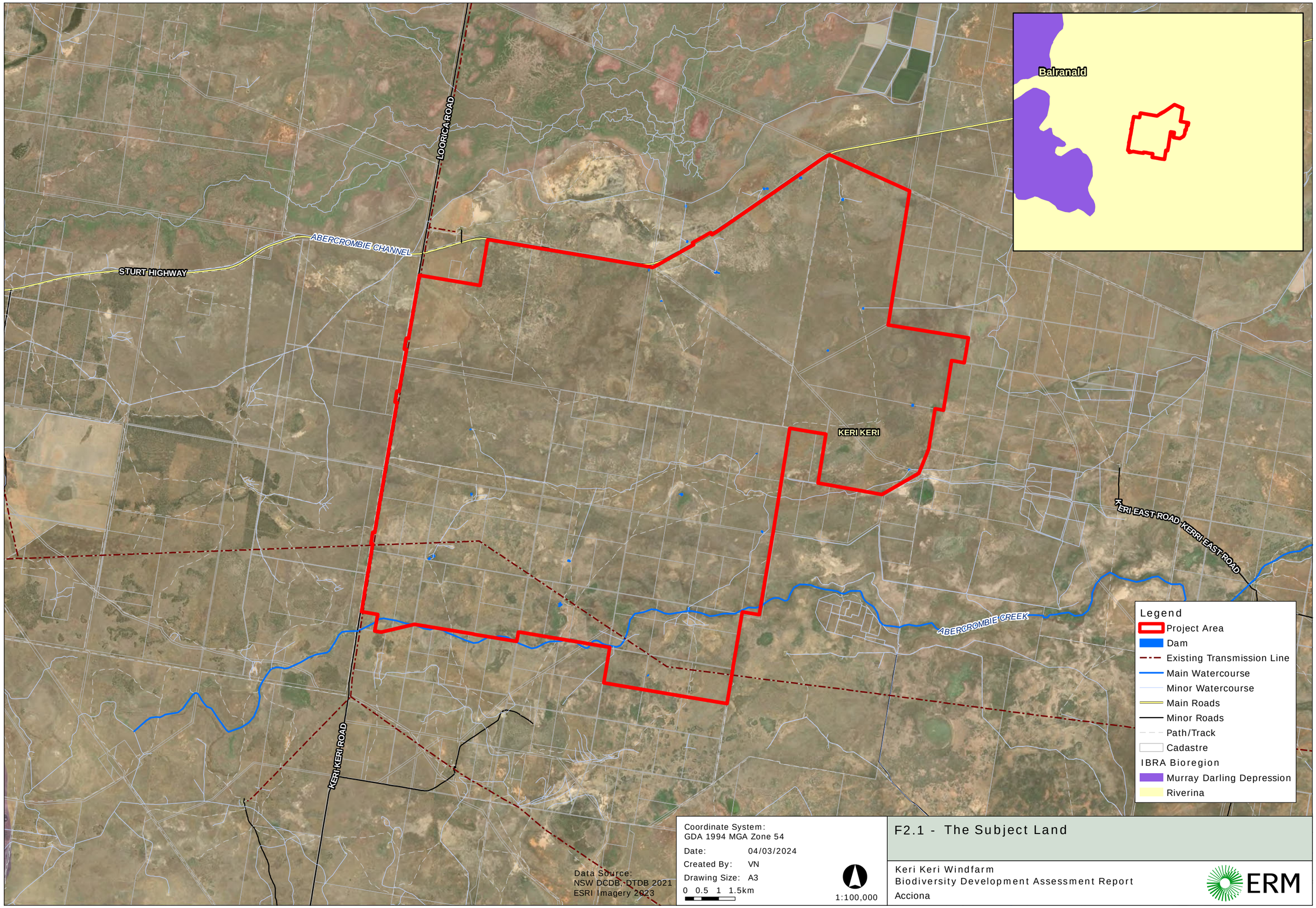
TABLE 2-1 PROJECT AREA LOT AND DP DETAILS

Lot	DP	Title
Subject Land		
9, 12, 13, 14, 54, 55, 56, 57, 58, 83, 84, 85, 86, 87	751231	Freehold
32, 33, 34, 35, 36, 37, 38, 39, 40, 47, 48, 49, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 82, 84, 93, 94	756546	Freehold
77, 78, 79, 80, 81, 82, 85	756558	Freehold
11	1120173	Freehold
1, 19	751175	Freehold

The Assessment Area for a linear development, such as the Wind Farm, is all lands within a 500 m radius of the Subject Land as shown in Figure 2-2. The Assessment Area comprises areas of agricultural land, Yanga State Conservation Area, Keri Keri Road and the Sturt Highway. The Subject Land is situated approximately 50 km south-east of Yanga National Park. The Assessment Area does not extend into residential or commercial areas.

Major transport corridors in proximity to the Project include:

- The Sturt Highway located along the northern boundary of the Project that connects Balranald to Adelaide, as well as Sydney and Melbourne via the Hume Highway; and
- Yanga Way which connects Balranald to Swan Hill and Bendigo via the Murray Valley Highway.

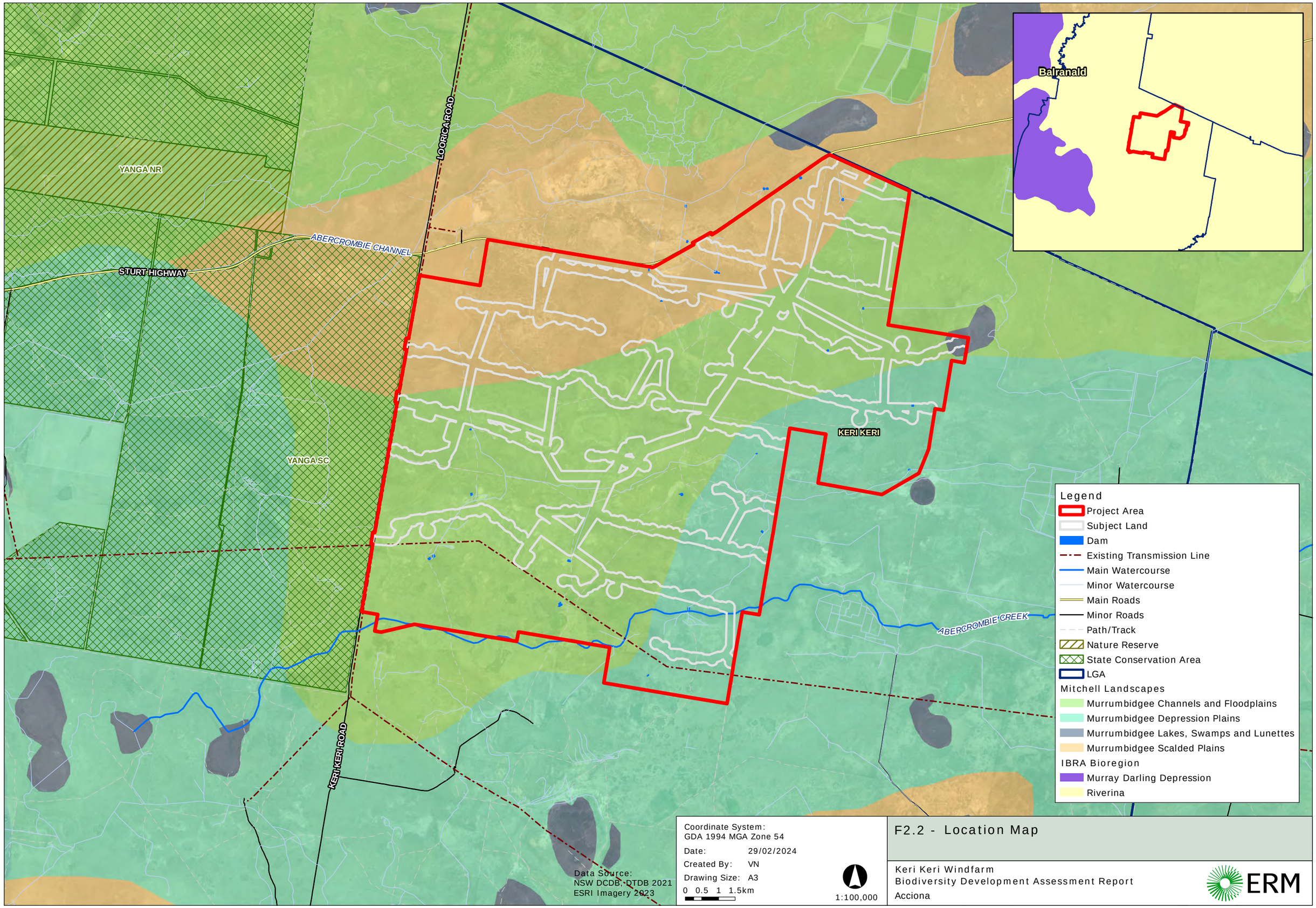


F2.1 - The Subject Land

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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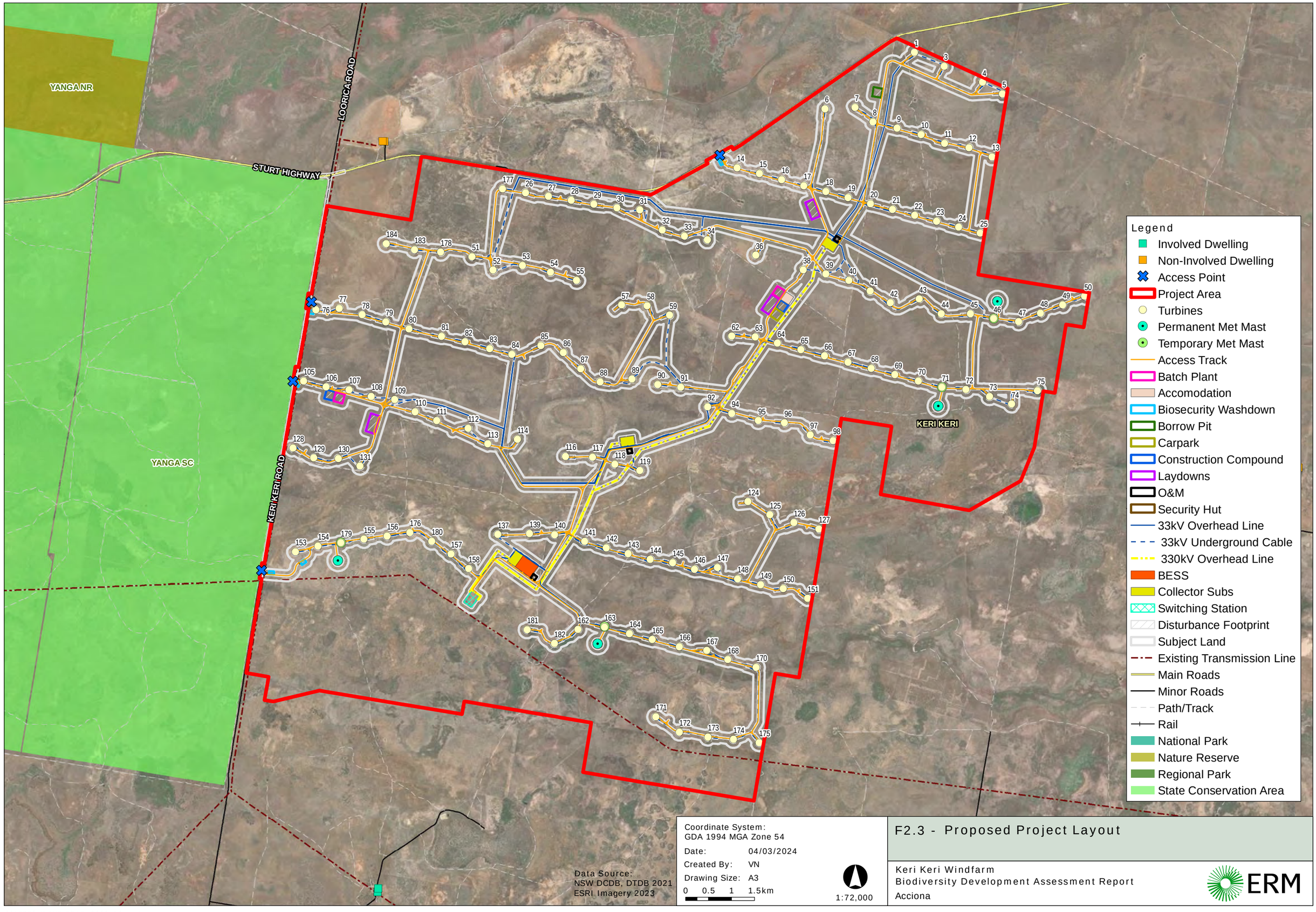


F2.2 - Location Map

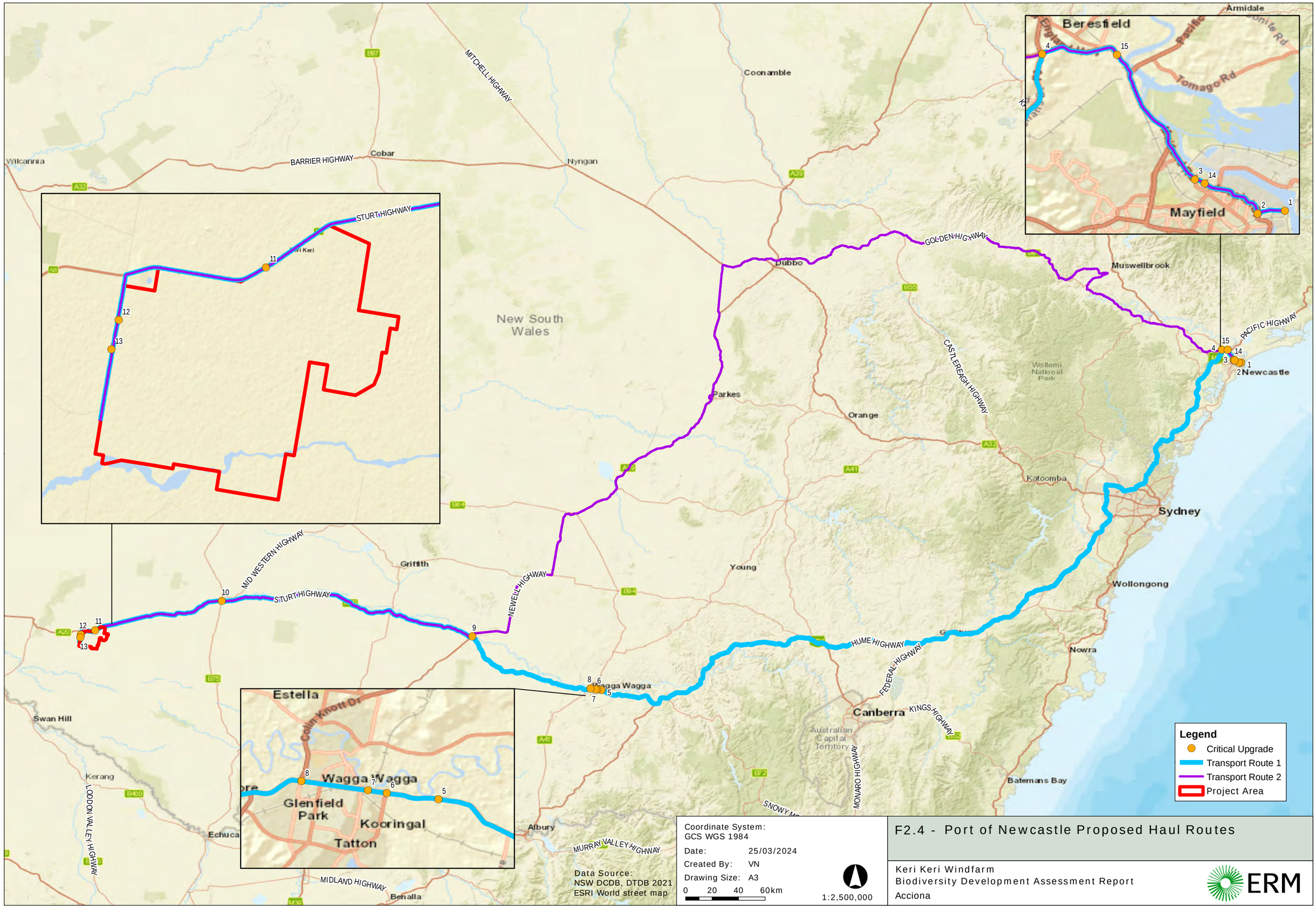
Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

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0617753_KKWF_BDAR_G003_R2.mxd

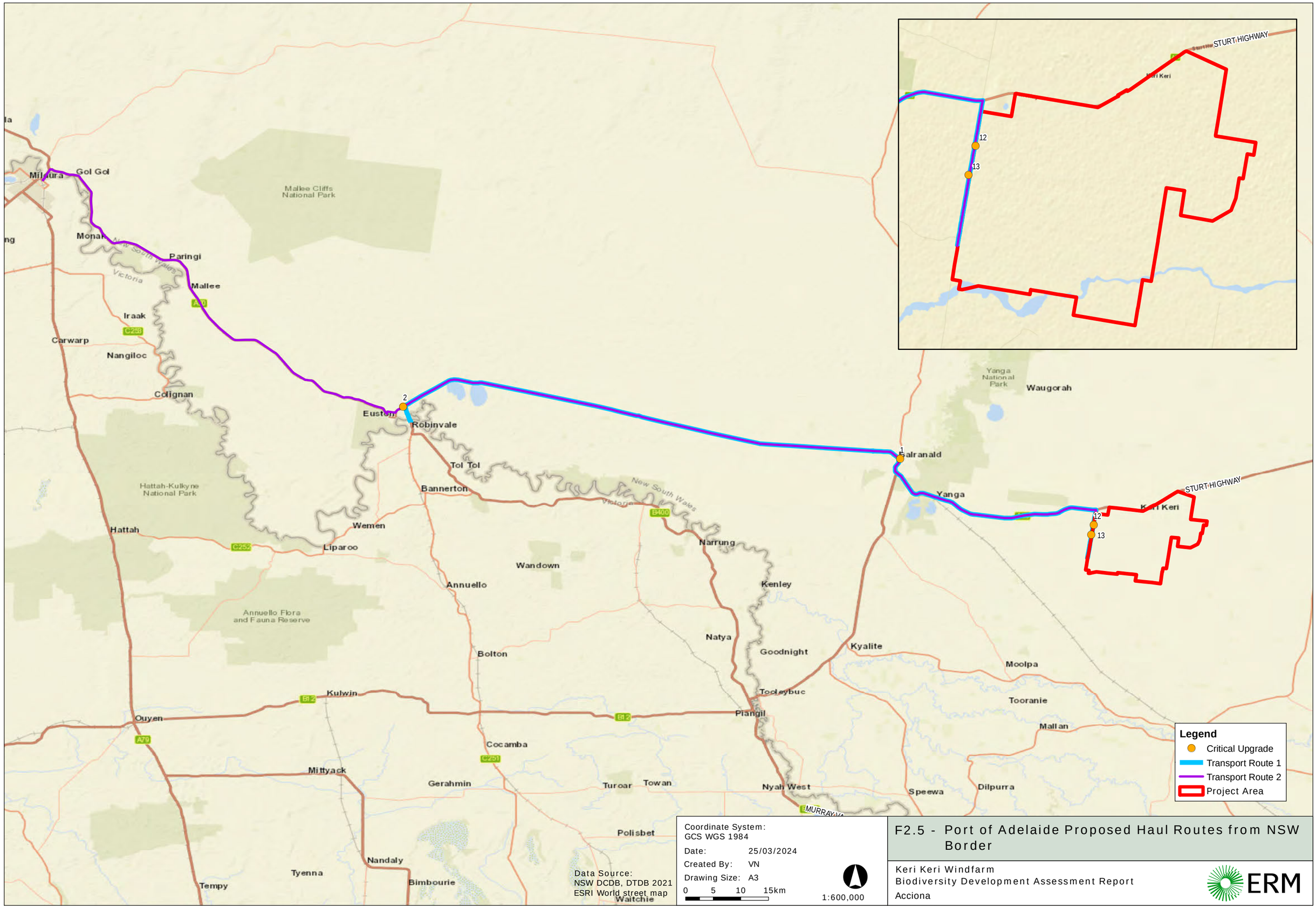


F2.4 - Port of Newcastle Proposed Haul Routes

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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F2.5 - Port of Adelaide Proposed Haul Routes from NSW Border

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Biodiversity Development Assessment Report
Acciona

ERM

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2.1.3 DISTURBANCE FOOTPRINT AND THE SUBJECT LAND

The Disturbance Footprint has an area of 1,137 ha and is nested within the Subject Land, which covers a total area of 4,228.7 ha. The Disturbance Footprint represents the potential impacts associated with the construction and operation of the Project and is presented in Figure 2-1.

The Project assessed will involve the construction and operation of up to 155 WTGs. Each WTG consists typically of composite metals and individual flanged sections which are bolted together. The WTGs consist of a concrete foundation, tower, nacelle, rotor hub and blades. The Project layout for which approval is sought is shown in Figure 2-3 with components further discussed in Table 2-2 .

TABLE 2-2 PROJECT COMPONENTS

Project Component	Description	Quantity
Project Footprint		
Project Area	Total area to which the Application applies	18,012 ha
Disturbance Footprint	The area of land that is directly impacted by the Project including: all temporary and permanent disturbance areas; and all areas where vegetation may be removed during project construction and operation. This is also referred to as the 'clearing corridor' for which the conceptual area of proposed ground disturbance is assessed in this EIS. The clearing corridor is buffered by a 100 m 'micro-siting corridor' which is regarded in technical assessments but is not considered as the total disturbance area.	Up to 1,137 ha
Permanent Disturbance Footprint	The area of land that will be subject to permanent alteration as a result of the Project's infrastructure until decommissioning. This is generally associated with areas for the WTG hardstands, met masts, BESS, O&M facilities, substations, switchyard, biosecurity wash bays, security huts, and internal roads. These areas will not be suitable for agricultural use.	Up to 574 ha
WTGs		
Rotor diameter	183 m	155 WTGs
Blade length	91.5 m	
Uppermost blade tip	291.5 m	
Tower (hub) height	200 m	
WTG hardstand	Approx. 2.83 ha per WTG required for construction. Approx. 0.67 ha per WTG during operation after rehabilitation.	
Ancillary Infrastructure		
New 330 kV transmission line	Towers up to 70 m high, spaced approx. 500 m (subject to terrain), with 60 m easement	20.0 km
Underground 33 kV lines	Trenching for underground electrical lines will be approx. 0.6 m wide per circuit by 1.0 m deep.	175.3 km

Project Component	Description	Quantity
Overhead 33 kV lines	Where ground conditions are not suitable for open cut trench installation, overhead single circuit electricity lines will be installed using concrete poles, with 30 m easement	64.5 km
33/330 kV Substation	200 m x 300 m + 35 m APZ all sides	3
Switchyard	200 m x 300 m + 35 m APZ all sides	1
200 MW/800 MWh BESS	400 m x 300 m + 35 m APZ all sides	1
O&M Facility including carpark	100 m x 100 m + 35 m APZ all sides	3
Security hut	20 m x 20 m near each site access point	4
Biosecurity wash bays	70 m x 110 m near each site access point	4
New internal access tracks and drainage	Approximately 15 m wide formation including 5.5 m roadway plus shoulders and drainage as required.	148.3 km
Transport route and site access	Site access off Keri Keri Road and Sturt Highway. Upgrades will be required at several locations along the route.	N/A
Permanent meteorological masts (with concrete footings for mast and guy wires)	Sensor height at 159 m on approximately 3 m x 3 m concrete foundation.	4
Temporary Facilities		
Concrete batching plants	150 m x 100 m + 15 m batters	2
Laydown Areas	200 m x 150 m + 15 m batters	3
Borrow pit	200 m x 200 m + 15 m batters	1
Construction compound (site office, car parking and storage areas)	100 m x 100 m + 15 m batters	2
Temporary meteorological masts (with concrete footings for mast and guy wires)	Sensor height at 159 m on approximately 3 m x 3 m concrete foundation.	4
APZ requirements	• Min. 20 m per meteorological mast • Min. 20 m all sides of buildings	N/A
Other Project elements		
Duration and start of construction phase	• Commencing late 2027 for approximately 24 months • Peak construction activities to occur over approximately 12 months • Mechanical completion: Late 2029 • Testing/commissioning completion: Late 2029	
Construction hours	• Monday to Friday: 7.00 am to 6.00 pm; • Saturday: 8.00 am to 6.00 pm; and • No works on Sunday or public holidays.	
Construction workforce	Up to 650 FTE	
Duration of operation phase	30 years	

Project Component	Description	Quantity
Operational workforce	Approximately 12 long-term service and maintenance jobs will be created during Project operation.	
Decommissioning	2060 or later subject to approval	
Capital investment	$2.8 billion AUD	
Net reduction in greenhouse gas emissions	2.6 million tonnes CO^2 equivalent per annum	

Additional infrastructure will generally be constructed and utilised within the Subject Land, including geotechnical, visual enhancement plantings, fencing, creek crossings, water management, sediment and erosion control structures and access roads.

The proposed Haul Route disturbance is delineated separately to the Subject Land. The works proposed for the Haul Route are provided in

Table 2- Table 2-3 and are further discussed in Appendix A. Pinch points 1 through 13 are associated with Port of Newcastle Route 1 and pinch points 14 and 15 are associated with Port of Newcastle Route 2. Pinch points 16 and 17 are associated with the haul route from Mildura to the Subject Land.

TABLE 2-3 HAUL ROUTE PROPOSED WORKS

PP	Proposed Works
1	Hardstand will need to be added to the left entry and exit of the corner. The existing culvert will need to be extended. Some signs will need to be relocated and or made removable and some fence and gate will need to be relocated.
2	The first right hand turn through George Street will need a sign made removable and a disused pole on the overhang removed. On the inside of the corner hardstand will need to be added, a sign made removable, and a light pole and traffic signal relocated. On the outside tailswing the disused pole next to the railway line will need to be removed.
3	A light pole on the inside of the corner will need to be relocated outside swept path, and two signs will need to be made removable or relocated. Traffic islands to be replaced with painted lines to be trafficable.
4	2x light poles to be removed or relocated on the outside of corner for tail swing. Signs to be relocated/removed. Kerb and gutter to be modified to be trafficable for trailer.
5	Sign to be removed in the middle of the roundabout. Roundabout made trafficable.
6	Sign to be removed in the middle of the roundabout. Handstand to be installed on roundabout and roundabout made trafficable.
7	The truck will need to cut across the centre of the roundabout. The existing pavement is ok to drive on without any extra work. 2x signs to be removed in the middle of the roundabout.
8	Signs to be removed in the middle of the roundabout. Roundabout made trafficable.
9	Several signs to be relocated or made removable. Power pole to be relocated out of swept path. Vegetation to be removed or trimmed for blade oversail. Traffic island to be removed and replaced with paint to make trafficable.
10	Existing shoulder on entry to be made trafficable. Hardstand bypass installed through roundabout parallel with existing easement. Vegetation to be removed or trimmed. Several signs relocated or made removable.

PP	Proposed Works
11	A site entrance is proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
12	Hardstand to be installed and signs and all obstacle relocated or removed. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic. Keri keri Rd and All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
13	3 x site entrances are proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
14	The lowest traffic signal on route is at the intersection of Steel River Blvd. Trucks that exceed 5.3 metres will need to travel in the right-hand lane. Clearance in the right end lane is 6.0 metres. Base towers (6.1m) will need to be lowered for travel through this intersection
15	This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.9 metres should not be exceeded. Base towers (6.1m) will need to be lowered before travelling under this structure.
16	This is a very tight corner that cuts back on itself. A very large amount of hardstand is required. The new alignment will need a lot of fil to bring it level with the highway. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.
17	This section is very tight and will require the truck to continue into the park on the outside of the corner. A large area of hardstand will be required along with the removal of 5x trees, 2x light poles and 11x signs. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.

2.2 METHODOLOGY

2.2.1 SITE CONTEXT METHODS

2.2.1.1 LANDSCAPE FEATURES

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken between March 2020 and December 2023 sought to verify the following landscape features (in accordance with Sections 4.2 and 4.3 of the BAM):

- IBRA bioregions and subregions, NSW landscape region and area (ha);
- Native vegetation extent and cleared areas within the buffer area;
- Rivers and streams (classified according to stream order);
- Wetlands within, adjacent to and downstream of the site;
- Connectivity features;
- Areas of geological significance and soil hazard features;
- Site context components, including:
    - Identification of method applied (i.e. linear or site-based); and
    - Percent native vegetation cover in the landscape (development site and biodiversity stewardship site).

2.2.1.2 NATIVE VEGETATION COVER

A desktop assessment was initially conducted to determine the extent (ha) of vegetation cover on the Subject Land and within the Assessment Area (500 m buffer). The following resources were used:

- Land Surveys Aerial LiDAR Survey Imagery and Ground Control Survey 2023;
- Historic imagery (Historical Imagery (nsw.gov.au)); and
- SEED (Geocortex Viewer for HTML5 (nsw.gov.au)).

Surveys conducted between 2020 and 2023 confirmed the extent and condition of native vegetation cover on the Subject Land, with surveys completed in October and November 2023 confirming native vegetation cover across Haul Route pinch points.

Native vegetation in the Assessment Area yet situated outside of the Subject Land was not ground-truthed and relies on state vegetation mapping that may be outdated and/or inaccurate. Consequently, there may be some minor additions or omissions to the actual extent of native vegetation as defined in the BAM.

2.2.2 NATIVE VEGETATION, THREATENED ECOLOGICAL COMMUNITIES AND VEGETATION INTEGRITY

2.2.2.1 EXISTING INFORMATION

The State Vegetation Type Map (SVTM) (DPE, 2022a) and BioNet Vegetation Classification (BioNet VIS) system were reviewed to identify plant community types (PCTs) and threatened ecological communities (TECs) likely to be present within the Subject Land, and across the Haul Route pinch points. This was used as the basis for more detailed site-specific vegetation mapping.

2.2.2.2 MAPPING NATIVE VEGETATION EXTENT

Native vegetation and vegetation community delineation and mapping across the Subject Land involved review and field validation of the SVTM over several field survey events throughout 2020 and 2023. Field survey efforts were initially undertaken at a higher scale across the broader Project Area prior to site selection followed by a refined survey design in 2023.

Each field event detailed above included plot-based vegetation integrity surveys (BAM Plots) and/or rapid survey of vegetation at locations where distinct PCTs could be observed within the Subject Land, noting the extent and structure of the existing vegetation, and dominant species within each stratum. Signs of disturbance, such as clearing, fire damage, grazing and weed invasion, were also noted where applicable.

Vegetation survey events are provided below:

- Autumn 2020 – 30th to 31st March 2020 (NGH);
- Spring 2020 – 28th September to 2nd October and 12th to 16th October 2020 (NGH);
- Spring 2021 – 26th October to 12th November and 22nd November to 2nd December 2021;
- Summer 2023 – 6th to 9th February 2023; and
- Spring 2023 – 9th to 13th October 2023.

Areas of native vegetation which could be validated as a PCT were identified and delineated in the field, and their condition determined. Identification of PCTs within the Subject Land was confirmed with reference to the community profile descriptors identified within the DPE mapping and the NSW BioNet VIS.

Haul Route

The Desktop Review included analysis of the following online resources:

- IBRA and IBRA sub-regions v7 (http://www.environment.gov.au/land/nrs/science/ibra);
- NSW Mitchell Landscapes map v3.1 (SEED) and descriptions (NPWS 2003); and
- DPE State Vegetation Type Mapping Version C1.1.M1.1 (SEED) (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map Accessed 02 July 2023).

A one-day preliminary vegetation and habitat survey was undertaken on:

- 9 October 2023 by four ecologists to assess the haul route from the Port of Adelaide from the NSW border; and
- 10 November 2023 by two ecologists to assess the haul route from the Port of Newcastle.

The purpose of the field survey was to identify the presence of important biodiversity values within the Study Area, including:

- The likely presence of threatened fauna and flora species;
- Threatened ecological communities; and
- Habitat and resources considered important for threatened species or ecological communities.

Surveys were undertaken via a meander of the Study Area. Survey methodologies were designed to rapidly assess biodiversity values and to record native and non-native vegetation and features of ecological value present. Opportunistic sightings of fauna were also recorded throughout the survey period.

Comprehensive and targeted flora or fauna surveys were not undertaken as part of the current survey.

2.2.2.3 VEGETATION ZONES

A vegetation zone (VZ) is an area of native vegetation comprising a PCT in a similar (homogeneous) condition state. The VZs were defined during field assessments across the Subject Land in Summer and Spring 2023. Table 2-4 summarises the plot requirements based on the size and number of vegetation zones within the Disturbance Footprint.

TABLE 2-4 BAM PLOT DETAILS

Vegetation Zone	PCT	Condition	Code	Area (ha) within Disturbance Footprint	Minimum Plots Required	Plots Used in Assessment
VZ1	164	Moderate	PCT164_Moderate	855.73	7	31
VZ2	163	Moderate	PCT163_Moderate	268.58	7	8
VZ3	44	Low	PCT44_Low	4.78	2	2
VZ4	160	Moderate	PCT160_Moderate	1.84	1	1

BAM plots were located within the Disturbance Footprint as much as practicable. The location of BAM Plots is shown in Figure 2-6 . However, due to refinements of the Project layout, there are instances where plots are no longer located within the Disturbance Footprint. Where BAM plots were not located within the Disturbance Footprint, they were located within a contiguous/representative patch of vegetation suitable for collection of data commensurate with the impacted vegetation zones. This allows for the vegetation integrity scores to be included in the BAM-C to provide consistency with the area impacted in the Disturbance Footprint.

2.2.2.4 PLOT-BASED VEGETATION SURVEY

Method

BAM Plots were conducted in accordance with s.4.2.1 of the BAM. BAM plots were established by walking a random distance into the vegetation zone and establishing the plot on a random bearing. The plot-based vegetation integrity surveys were used to calculate the vegetation integrity score (VIS) of the VZ. Each BAM Plot was established around a central 50 m transect and each included:

- A 20 m x 20 m plot sampled for the presence of flora species. The plots were carefully examined to identify all flora species present. This search continued until it was confident that all flora species within the plot were detected. Data collected for each species included:
  - Stratum and layers in which each species occurs;
  - Growth form for each species;
  - Scientific and common name for each species;
  - Percentage foliage cover (PFC) across the plot, of each species rooted in or overhanging the plot;

- Abundance rating for each species;
- One 1000 m² (20 m x 50 m) plot to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs; and
- Five 1 m² sub-plots to assess average litter cover (and other groundcover components).

BAM Plot location data is shown in Figure 2-6 .

BAM Plot Classification

Floristic plot data obtained from BAM plots was quantitatively assessed using the Bray-Curtis similarity (dissimilarity) index (Bray-Curtis Index). This analysis was performed using the percent cover values for each species in each plot. The Bray-Curtis Index is bounded between 0 and 1. Where 0 is assigned it means the two sites have the same species composition and where 1 is assigned it means the two sites do not share any species. A pairwise Bray-Curtis index matrix was generated from PRIMER Version 7 with PERMANOVA Version 1.0.3 (Plymouth Marine Laboratory, Plymouth United Kingdom, Clarke and Gorley 2006). A dummy variable was added (value 0.2) following a square root transformation of percent cover values.

An agglomerative hierarchical clustering analysis (CLUSTER analysis) was performed to classify plot data into groups of similarity at the 5% significance level (i.e., SIMPROF groups). SIMPROF analyses of a priori unstructured (Single sample from each of several sites) were also performed to test for statistical evidence of genuine clusters (plot data groupings).

A SIMPROF permutation test was also performed to determine if the SIMPROF groups represent meaningful structure. The test statistic used is the average absolute departure π (Pi) of the real profile from the mean of the permuted ones (i.e. positive and negative deviations are all counted as positive). The SIMPROF groups have meaningful structure where $p < 5\%$, with $p = 0.1\%$ indicating a highly significant result.

A SIMPER analysis of the SIMPROF groups was performed to identify the characteristic species of those groups in preparation of PCT assignment. Characteristic species were reported for each group and related to PCT descriptions to assign the best fit PCT. A non-metric multidimensional scaling (nMDS) plot was produced to geographically represent plot data similarity with similarity contours to aid interpretation.

2.2.3 THREATENED FLORA SURVEY METHODS

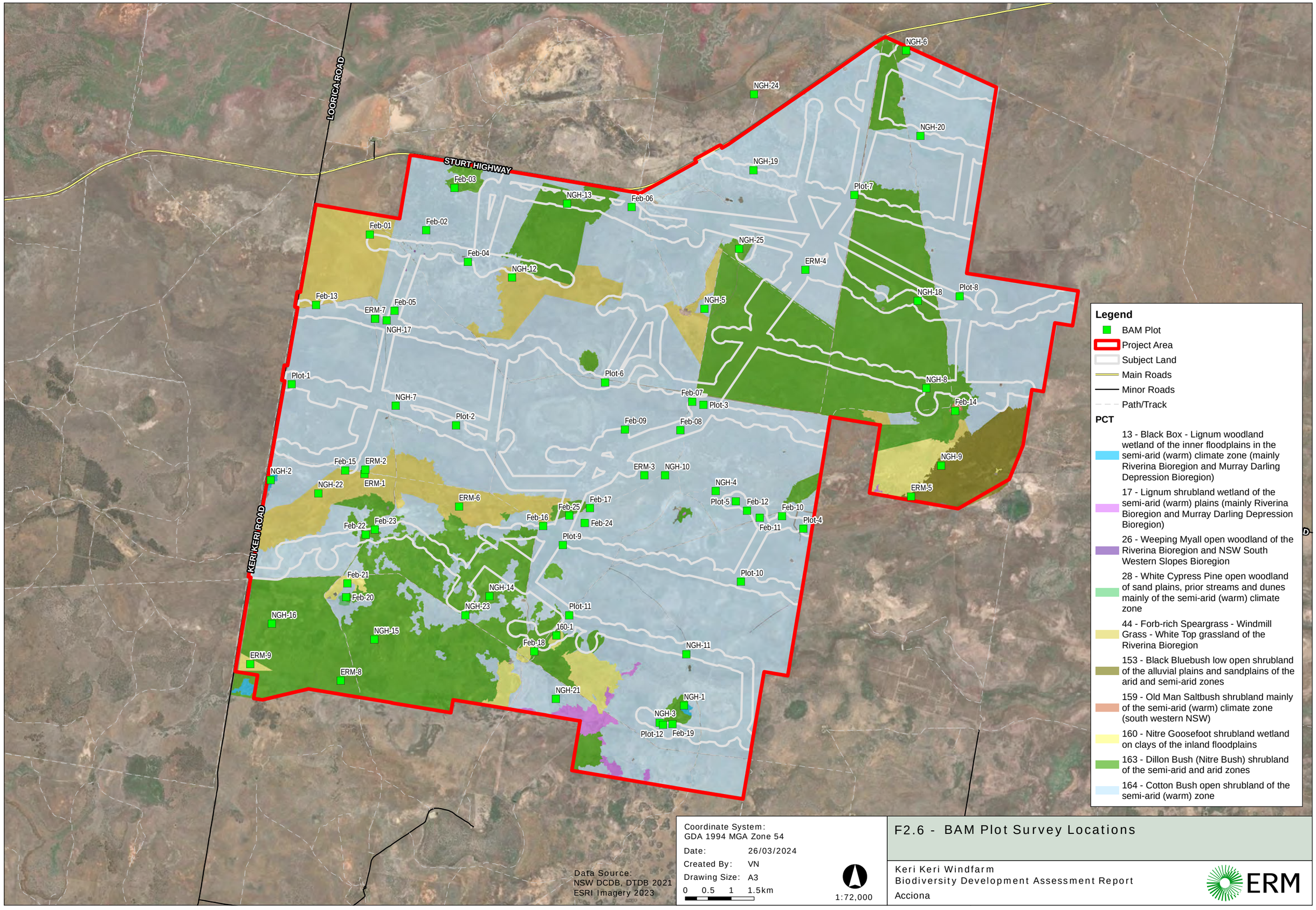
2.2.3.1 REVIEW OF EXISTING INFORMATION

Consultation of the BAM-C, BioNet Atlas Database and Atlas of Living Australia (ALA) were performed prior to the flora surveys conducted for this BDAR. Threatened flora sightings recorded within the Subject Land were further investigated and considered throughout this BDAR.

Desktop review and field surveys within the Subject Land included the assessment of habitat constraints and microhabitats and their suitability for predicted species credit flora species.

2.2.3.2 HABITAT CONSTRAINTS ASSESSMENT

Desktop review and field surveys within the Subject Land included the assessment of habitat constraints and microhabitats and their suitability for predicted species credit flora species.



F2.6 - BAM Plot Survey Locations

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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2.2.3.3 FIELD SURVEYS

The BAM-C identifies candidate species that require seasonal targeted searches to be undertaken across the Subject Land in accordance with the BAM and relevant guidelines.

Targeted field surveys were undertaken in habitat throughout the broader Project Area prior to refinement of the current Subject Land. The Project Area includes the Subject Land. Threatened flora survey effort is shown in Figure 2-7.

The following targeted flora survey events were completed across the Project Area and Subject Land:

- Spring 2020 – 28th September to 2nd October and 12th to 16th October 2020 (NGH);
- Spring 2021 – 26th October to 12th November and 22nd November to 2nd December 2021;
- Summer 2022 – 14th to 25th February 2022;
- Spring 2022 – 26th August to 5th October 2022;
- Winter 2023 – 4th to 9th September 2023;
- Spring 2023 – 9th to 13th October 2023; and
- Summer 2023 – 19th to 21st December 2023.

During these survey events, targeted parallel transect searches were performed on foot in accordance with the method described in *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020c). This involved the walking of parallel lines spaced 15 m apart assuming at least 7.5 m visual coverage either side of the walked line. Table 2-5 provides a summary of the flora species credit species surveyed for within the Subject Land.

TABLE 2-5 THREATENED FLORA SURVEY SUMMARY

Scientific Name	Common name	Associated PCT	Recommended Survey Period	Survey Method
Brachyscome papillosa	Mossgiel Daisy	44*, 160, 163, 164	September - November	Parallel field traverse in associated PCTs within Subject Land
Lepidium monoplocoides	Winged Peppercress	160 and 163	September - December	Parallel field traverse in associated PCTs within Subject Land
Leptorhynchos orientalis	Lanky Buttons	44*	September – November	Parallel field traverse in associated PCTs within Subject Land
Maireana cheelii	Chariot Wheels	44* and 164	September - December	Parallel field traverse in associated PCTs within Subject Land
Sclerolaena napiformis	Turnip Copperburr	44*	September - December	Parallel field traverse in associated PCTs within Subject Land
Swainsona murrayana	Slender Darling Pea	44*, 163 and 164	September	Parallel field traverse in associated PCTs within Subject Land

Scientific Name	Common name	Associated PCT	Recommended Survey Period	Survey Method
Swainsona plagiotropis	Red Darling Pea	44*	September	Parallel field traverse in associated PCTs within Subject Land
Swainsona sericea	Silky Swainson-pea	44*	September - November	Parallel field traverse in associated PCTs within Subject Land

* The extent of PCT 44 in the Disturbance Footprint is classified as containing degraded habitat (see below).

Threatened flora survey effort was not met for two flora candidate species, Mossgiel Daisy (*Brachyscome papillosa*) and Slender Darling Pea (*Swainsona murrayana*). Both species have been recorded within the Subject Land and for areas of the Disturbance Footprint that were not sufficiently surveyed, presence has been assumed within remaining areas of suitable habitat.

Microhabitats and Degraded habitat

Under Section 5.2.2 of the BAM 2020, species credit species can be excluded from further assessment, and therefore targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the Subject Land. Furthermore, under Section 5.2.3 of the BAM, a candidate species credit species can be considered unlikely to occur on the Subject Land (or within specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the Subject Land (or specific vegetation zone).

The extent of PCT 44 within the Disturbance Footprint is predominantly limited to the northwestern corner of the Subject Land adjacent areas identified in the Draft Native Vegetation Map as Category 1 Exempt lands. This part of the Disturbance Footprint has been exposed to routine agricultural land use including, but not restricted to, livestock grazing and management. The intensity of grazing related impacts is relatively high in this part of the Subject Land.

Floristic data obtained from two BAM plots located in PCT 44 reflect this land use history. Plot data identifies a high relative abundance of exotic flora as broadly characterised below:

- Plot 1: Total flora cover was estimated to be 23.5% with 8.3% being exotic; and
- Plot 2: Total flora cover was estimated to be 42.7% with 25.7% being exotic.

Exotic species observed included Sea Lavender (5 to 15%), Ryegrass (0.1 to 5%; n=2), Pattersons Curse (0.1 to 0.3%; n=2), unidentified Asteraceae weed (0.2 to 3%; n=2), Oats (0.1%; n=1), *Vulpia* spp. (0.1%; n=1), Ward's Weed (0.1%; n=1), Arabian Grass (5%; n=1), *Sisymbrium erysimoides* (0.1%; n=1), small ice plant (0.1%; n=1) and Silene spp. (0.1%; n=1).

Some of the native species observed are indicative of disturbed conditions (e.g., colonizing species) and/or indicative of livestock grazing (e.g., presence of unpalatable grasses). These include *Salsola australis* (0.5 to 10%; n=2), Black Rolypoly (0.2 to 1%; n=2) and *Austrostipa scabra* (0.2 to 0.3%; n=2).

A photograph of one of the BAM plots is provided below.

PHOTOGRAPH 2-1 TYPICAL CHARACTER OF LOW CONDITION PCT 44 WITHIN THE SUBJECT LAND



Parallel transects were performed in the Subject Land during late August and September 2022 included searches in patches of PCT 44. Two candidate flora species were observed during these surveys, being Chariot Wheels and *Swainsona murrayana,* with neither of these species found in PCT 44.

Areas of PCT 44 in a higher condition state located outside the disturbance footprint (i.e., are avoided and not to be directly impacted) were surveyed in September 2023. Some of these patches were found to contain the Mossgiel Daisy (*Brachyscome papillosa*), presumably due to their less degraded condition. No areas of low condition PCT 44 were found to contain this candidate flora species. An example of low condition PCT 44 surveyed in September 2023 (after considerable rainfall) is shown in the following photograph (note presence and cover of exotic grass species).

PHOTOGRAPH 2-2 TYPICAL CHARACTER OF LOW CONDITION PCT 44 WITHIN THE SUBJECT LAND (SEPTEMBER 2023)



For the reasons outlined above, it is considered that the habitat in patches of PCT 44 impacted by the Project are in a degraded condition (i.e., exotic flora cover and livestock grazing), with no evidence of candidate flora species found in these patches. For the purposes of this assessment, it is considered that the degraded patches of PCT 44 within the Disturbance Footprint are not likely to comprise individuals of candidate flora species identified as associated with this PCT.

LOORICA ROAD

STURT HIGHWAY

KERI KERI ROAD

Legend

- Project Area
- Subject Land
- Transect 2020
- Transect Dec 2021
- Transect Aug 2022
- Transect Oct 2023
- Transect Sep 2023
- Transect Dec 2023
- Main Roads
- Minor Roads
- Path/Track

PCT

- 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
- 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
- 44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
- 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones
- 159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)
- 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains
- 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
- 164 - Cotton Bush open shrubland of the semi-arid (warm) zone

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 26/03/2024
Created By: VN
Drawing Size: A3

0 0.5 1 1.5km

1:72,000

F2.7 - Targeted Threatened Flora Survey Effort

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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2.2.4 THREATENED FAUNA SURVEY METHODS

2.2.4.1 REVIEW OF EXISTING INFORMATION

The BAM-C, BioNet Atlas Database and Atlas of Living Australia (ALA) were reviewed prior to the fauna surveys conducted for this BDAR. All threatened fauna sightings recorded over the Subject Land were further investigated and considered throughout this BDAR.

2.2.4.2 HABITAT CONSTRAINTS ASSESSMENT

Desktop assessments and field surveys within the Subject Land included assessment of habitat constraints and microhabitats and their suitability for predicted species credit fauna species. This included desktop assessment of the Assessment Area for features such as caves and waterways and field inspection of microhabitats including leaf litter, stick nests and hollowing-bearing trees within the Subject Land.

2.2.4.3 FIELD SURVEYS

Targeted field surveys were undertaken in habitat throughout the broader Project Area prior to refinement of the current Subject Land.

The following targeted fauna survey events were completed across the broader Project Area and Subject Land:

- Autumn 2020 – 30th March to 5th April 2020 (Nature Advisory);
- Spring 2020 – 28th September to 2nd October and 12th to 16th October 2020 (NGH);
- Spring 2021 – 26th October to 12th November and 22nd November to 2nd December 2021;
- Summer 2022 – 14th to 25th February 2022;
- Spring 2022 – 26th August to 5th September 2022;
- Winter 2023 – 4th September to 8th September 2023; and
- Spring 2023 - 9th October - 13th October 2023.

Requirements for targeted surveys include the survey months specified in the BAM-C, as well as the survey effort and methods described in the TBDC and relevant survey guidelines. Relevant survey guidelines considered include the following:

- BAM 2020 (DPIE, 2020a);
- 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH, 2018);
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Department of Environment and Conservation (DEC), 2004);
- Survey Guidelines for Australia's Threatened Mammals (Department of Sustainability, Environment, Water, Population & Communities (DSWP&C), 2011);
- NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE, 2020b); and
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE 2022b).

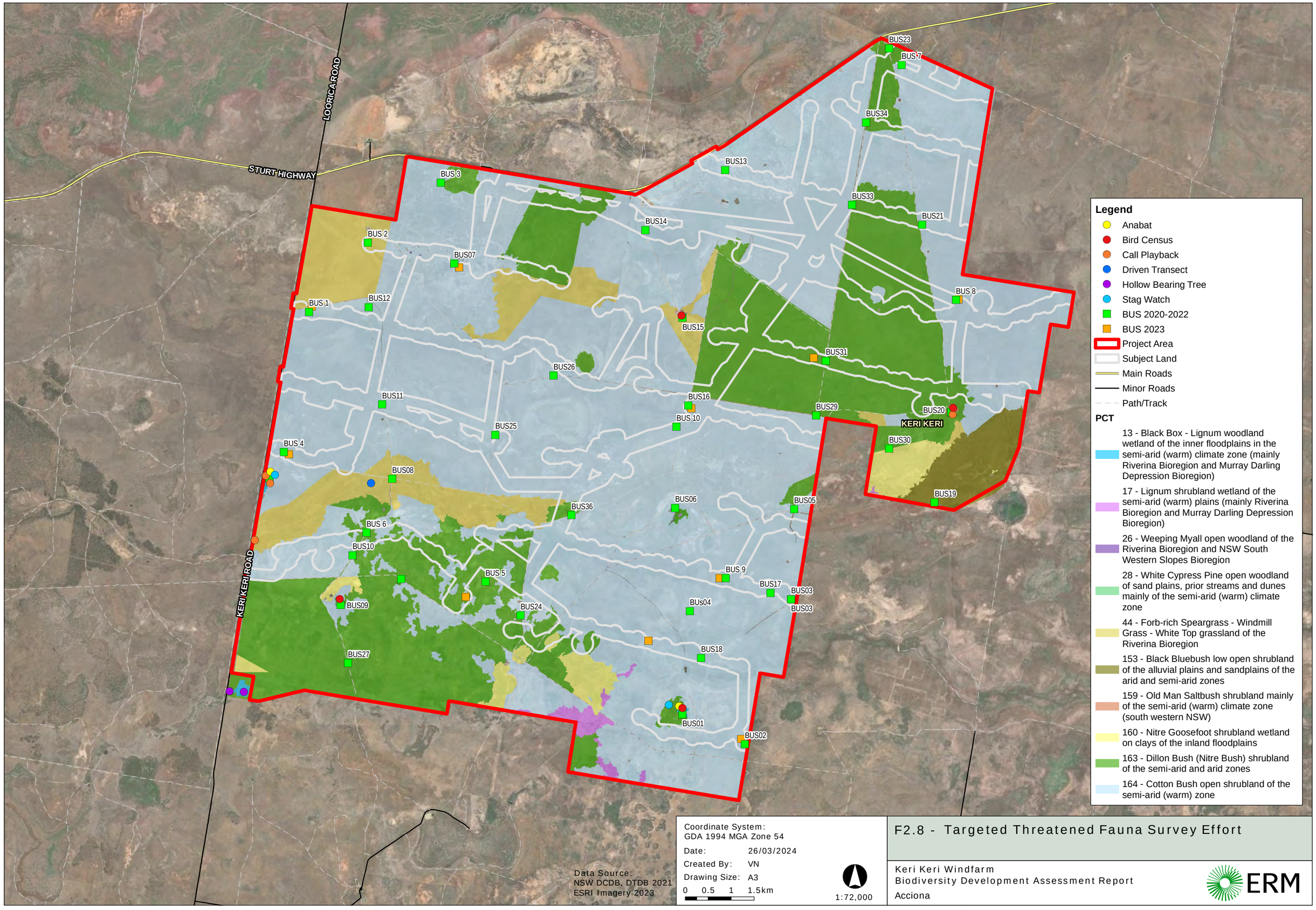
Survey effort across the Subject Land and areas of the Project Area are shown in Figure 2-8 and detailed in Table 2-6 .

TABLE 2-6 FAUNA FIELD SURVEY EFFORT SUMMARY

Target Species	Method	Project Area Effort	Subject Land Effort
Australian Bustard (*Ardeotis australis*)	**Diurnal Driven Transects:** diurnal surveys from the vehicle were conducted along roads through grassland PCT 44 and adjacent areas, using the point count method over 500 m, stopping every 100 m to record for 10 minutes, noting all bird species observed. It is noted these species were searched for during all traversing of the site across the nine survey events by teams of two to six ecologists.	• 20 survey hours during Spring 2020 • 4 survey hours during Spring 2022	• 20 person hours during Spring 2020 • 8 person hours during Spring 2022 • Additionally, teams of up to six ecologists traversed the Subject Land and surrounds and conducted BUS over nine survey events, making opportunistic species records. • No Australian Bustard observations made.
Pink Cockatoo (*Lophochroa leadbeateri*)	**General Habitat Assessment:** Opportunistic observations were taken, noting the presence of various habitat features with consideration to species microhabitats. Systematic survey for appropriate breeding hollows, suitable for use by Pink Cockatoo were conducted. This involved walking through woodland areas during day light hours and noting HBTs that meet the breeding criteria of at least 8 m above the ground and greater than 8.5 cm hollow opening. Observations of signs of species presence (bark stripping, scratches, pellets), suitable roosting and nesting sites recorded within each survey site location.	• Habitat assessments completed noting areas of suitable habitat opportunistically throughout.	• Habitat assessments completed noting areas of suitable habitat opportunistically throughout. • No hollows suitable for breeding of the species were detected within the Subject Land.
	Point Count Method: evening and morning diurnal transects were conducted. Surveys were conducted using the point count method over 500 m, stopping every 100 m to record for 10 minutes, noting all bird species observed. It is noted these species were searched for during all traversing of the site and while conducting BUS across the nine survey events by teams of two to six ecologists.	• 16 survey hours during Spring 2020	• Teams of up to six ecologists traversed the Subject Land and surrounds and conducted BUS over nine survey events, making opportunistic species records. • This species has been opportunistically observed throughout survey events.

Target Species	Method	Project Area Effort	Subject Land Effort
Plains-wanderer (*Pedionomus torquatus*)	**General Habitat Assessment:** Opportunistic observations were taken, noting the presence of various habitat features with consideration to species microhabitats. Desktop assessment of Important Habitat Mapping online. Observations of signs of species presence (bark stripping, scratches, pellets), suitable roosting and nesting sites recorded within each survey site location.	• Habitat assessments completed noting areas of suitable habitat opportunistically throughout.	• Habitat assessments completed noting areas of suitable habitat opportunistically throughout. • No important habitat mapping for the species occurs within the Subject Land therefore species not believed to breed within the Subject Land.
	Point Count Method: evening and morning diurnal transects were conducted. Surveys were conducted using the point count method over 500 m, stopping every 100 m to record for 10 minutes, noting all bird species observed.	• 12 survey hours during Spring 2020 • 1 survey hour during Summer 2022 • 4 survey hours during Spring 2022	• 12 survey hours during Spring 2020 • 1 survey hour during Summer 2022 • 4 survey hours during Spring 2022 • One Plains wanderer individual was observed during diurnal transects in Summer 2022.
	Nocturnal Driven Transects: Nocturnal spotlight surveys from the vehicle, using a Fauna Tech spotlight which projected 100 m into surrounding vegetation, were also conducted. Nocturnal surveys were conducted along roads through grassland PCT 44 and adjacent areas, using the point count method over 500 m, stopping every 100 m to record for 10 minutes, noting all bird species observed. It is noted these species were searched for during all traversing of the site and while conducting BUS across the nine survey events by teams of two to six ecologists.	• 3 survey hours during Spring 2020 • 4 survey hours during Spring 2022	• 3 survey hours during Spring 2020 • 4 survey hours during Spring 2022
Microbats	**Echolocation Call Detectors:** Titley Anabat echolocation call detection devices were placed in proximity to water sources, treed areas, or beside a 'flyway', pointing toward microbat expected flight path and programmed to record from dusk to dawn. Bat call analysis was completed by Green Tape Solutions, analysed using Anabat Insight, with results presented in Appendix D.	• 7 devices deployed for 7 nights in Summer 2022	• 2 devices deployed for 4 nights in Spring 2020 and 8 devices deployed for 7 nights in Summer 2022. • A definite call from the Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) was detected. • A possible call from the Southern Myotis (*Myotis macropus*) was detected.

Target Species	Method	Project Area Effort	Subject Land Effort
Resident Raptors and Migratory species	**Bird Utilisation Surveys (BUS):** The Bird Utilisation Surveys (BUS) were undertaken consistent with the requirements for a 'Level One' bird risk assessment in accordance with Best Practice Guidelines for Wind Energy Developments in Australia issued by the Clean Energy Council (2018) and AusWind (2005) Wind Farm and Birds: Interim Standards for Risk Assessment. Fixed-point bird counts were undertaken at survey points for up to 30 minutes, at different times of day. During this period, all bird species and numbers of individual birds were recorded. The species, the number of birds, the height of the bird when first observed, and the approximate distance of the birds from the observer were documented.	• 35 BUS surveys points were surveyed between Autumn 2020 and Spring 2022 • 21 BUS survey points were repeatedly surveyed in Winter and Spring 2023	• 148 BUS surveys were conducted between Autumn 2020 and Spring 2022 for a minimum of 15 minutes. • 231 BUS surveys were conducted between Winter and Spring 2023
Amphibians	**General Habitat Assessment:** Opportunistic observations were taken, noting the presence of various habitat features with consideration to species microhabitats. Mapping and inspection of suitable habitat including dams and streams, aquatic and semi-aquatic habitat.	• General habitat assessments conducted in Spring 2020 and Summer 2022	• 2 dams with potentially suitable habitat were identified in Summer 2022
	Amphibian Aural-visual Survey: Spotlighting and active searching was undertaken during the survey. The margins (within ~30 m) of the waterbody were carefully searched for active frogs using torches. Advertisement calls were broadcast to elicit a response from any adult males present.	• 3.5 survey hours in Summer 2022	• 3.5 survey hours in Summer 2022 • No threatened amphibian species were detected.



Legend

- Anabat
- Bird Census
- Call Playback
- Driven Transect
- Hollow Bearing Tree
- Stag Watch
- BUS 2020-2022
- BUS 2023
- Project Area
- Subject Land
- Main Roads
- Minor Roads
- Path/Track

PCT

- 13 - Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- 17 - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- 26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
- 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
- 44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
- 153 - Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones
- 159 - Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)
- 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains
- 163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
- 164 - Cotton Bush open shrubland of the semi-arid (warm) zone

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 26/03/2024
Created By: VN
Drawing Size: A3

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F2.8 - Targeted Threatened Fauna Survey Effort

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2.2.5 WEATHER CONDITIONS

Weather conditions during the field survey events were appropriate for detection of target flora and fauna. A summary of the recorded conditions on the subject land during the survey periods is provided in Table 2-7 .

TABLE 2-7 WEATHER CONDITIONS DURING THE PROJECT SURVEY PERIODS

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
Autumn 2020			
30/03/2020	13.9	25.3	2.4
31/03/2020	9.2	27.0	0
01/04/2020	14.2	24.5	0
02/04/2020	17.6	22.0	30.0
03/04/2020	13.0	25.0	0
04/04/2020	13.1	18.7	21.2
05/05/2020	14.6	20.4	1.0
Spring 2020			
28/09/2020	4.9	19.4	0
29/09/2020	6.5	22.7	0
30/09/2020	12.6	22.0	2.0
01/10/2020	7.0	23.0	0
02/10/2020	10.1	31.6	0
12/10/2020	7.6	29.6	0
13/10/2020	10.7	32.4	0
14/10/2020	12.6	32.5	0
15/10/2020	14.9	34.1	0
16/10/2020	15.1	22.9	0
Spring 2021			
26/10/2021	8.9	26.2	0
27/10/2021	13.6	32.6	0
28/10/2021	17.5	31.7	0
29/10/2021	13.0	21.1	0
30/10/2021	5.6	20.4	0
31/10/2021	6.5	25.1	0
01/11/2021	10.7	28.4	0
02/11/2021	14.9	33.0	0
03/11/2021	18.5	23.1	5.2

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
04/11/2021	16.0	22.1	12.0
05/11/2021	13.5	30.0	0
06/11/2021	18.2	30.0	0
07/11/2021	14.9	26.9	6.6
08/11/2021	10.9	24.6	0
09/11/2021	11.5	26.8	0
10/11/2021	16.4	21.3	0
11/11/2021	10.9	16.9	0
12/11/2021	10.2	12.9	15.8
22/11/2021	12.1	29.4	0
23/11/2021	18.2	26.4	0
24/11/2021	18.1	28.9	10.2
25/11/2021	18.6	25.1	2.2
26/11/2021	12.2	25.1	10.4
27/11/2021	13.6	25.0	0
28/11/2021	14.7	27.5	0
29/11/2021	14.0	30.6	0
30/11/2021	17.4	33.6	0
01/12/2021	19.2	35.0	0
02/12/2021	18.6	36.9	3.0
Summer 2022			
14/02/2022	23.4	39.5	0
15/02/2022	20.0	39.4	0
16/02/2022	21.6	39.5	0
17/02/2022	17.1	28.5	0
18/02/2022	13.3	27.0	0
19/02/2022	11.9	30.4	0
20/02/2022	13.9	32.1	0
21/02/2022	13.9	27.1	0
22/02/2022	13.8	32.6	0
23/02/2022	16.1	34.5	1.0
24/02/2022	22.4	34.7	0
25/02/2022	20.6	33.7	0
Spring 2022			

Date	Min Temperature (°C)	Max Temperature (°C)	Rainfall (mm)
26/08/2022	6.9	18.0	0
27/08/2022	7.5	20.6	0
28/08/2022	6.2	25.0	0
29/08/2022	13.4	23.5	0.2
30/08/2022	6.4	17.2	6.6
31/08/2022	1.9	16.4	0.2
01/09/2022	2.9	17.4	0
02/09/2022	5.0	15.5	0
03/09/2022	2.2	16.9	0
04/09/2022	4.3	18.4	0
05/09/2022	3.4	17.1	0
Summer 2023			
06/02/2023	14.5	32.5	0
07/02/2023	13.8	34.8	0
08/02/2023	13.5	33.5	0
09/02/2023	9.2	35.7	0
Winter 2023			
04/09/2023	8.5	23.2	0
05/09/2023	3.8	13.5	0
06/09/2023	-	17.4	0
07/09/2023	2.5	-	0
08/09/2023	7.8	18.8	1.2
09/09/2023	2.0	21.2	1.0
Spring 2023			
09/10/2023	11.4	26.2	0
10/10/2023	11.2	25.1	0
11/10/2023	7.6	30.0	0
12/10/2023	15.6	20.4	0
13/10/2023	7.0	20.5	0
Summer 2023			
19/12/2023	19.5	27.1	0
20/12/2023	9.6	-	0
21/12/2023	-	32.5	0

Source: Bureau of Meteorology – Balranald, NSW Daily Weather Observations (Station No. 049002). Online resource: http://www.bom.gov.au/climate/dwo/IDCJDW2007.latest.shtml

2.2.6 LIMITATIONS

The field and desktop assessments undertaken to inform this report provide a detailed overview of the biodiversity values of the Subject Land; however, results are limited by the state and condition of native vegetation communities investigated at the time of survey.

Variation in flora composition and structure has been observed during survey events, likely due to natural seasonal variation, severe weather/climatic events (e.g., drought and floods), land use history, pest vertebrate/invertebrate impacts and any associated interaction effects. However, observer differences are also likely noting the involvement of several observers over the course of all investigations (i.e., ecologists employed at Nature Advisory, NGH and ERM).

The classification of native vegetation within the Subject Land has been assigned the best fit PCT by using a quantitative analysis of BAM plot data and corresponding comparative analysis with the BioNet Vegetation Classification database by an experienced practitioner. This process involved the consideration of BAM plot data obtained from several seasons, years and by several observers. The influence of broad ecotones generated from several environmental and anthropogenic influences has also been considered in this analysis. The corresponding PCT mapping has been guided by the quantitative analysis of floristic survey data, field observations and analysis of aerial imagery.

Fauna and flora diversity within the Subject Land should not be seen to be comprehensive, but rather a representation of sampling effort at the time of survey events. The potential for false negatives (i.e., not seeing a species that is present), was limited by use of industry published guidelines applicable to the assessment. The inclusion of seasonal and multiple year sampling has reduced the likelihood of not detecting species relevant to this assessment. Section 8.4 discusses findings of similar developments in the area to provide insight into false negatives.

Targeted field surveys for threatened flora and fauna have been conducted in habitat throughout the Project Area, prior to refinement of the current Subject Land. The Project Area includes the Subject Land. A period of several seasons or years is often needed to identify all the species present in an area, especially as some species are only apparent at certain times of the year (orchids or migratory birds) and require specific weather conditions for optimal detection.

These potential limitations have been addressed by adopting a cautionary approach (assumed presence), applied where habitat was identified, or species were predicted to utilise habitat components at some stage during their life cycle.

2.2.7 LICENCING

Regarding the flora and fauna surveys conducted in this BDAR, ERM operated under the Scientific Licence of SL100196 and Animal Ethics Accreditation number 53055.

3. SITE CONTEXT

3.1 LANDSCAPE FEATURES

The following site context features have been identified from an inspection of the Subject Land (Table 3-1) and Haul Route (Table 3-2) along with GIS assessment of available relevant digital mapping layers and aerial imagery.

TABLE 3-1 SUBJECT LAND LANDSCAPE FEATURES

Landscape feature	Description
IBRA Bioregions and Subregions	The Subject Land and Assessment Area occur within the Murrumbidgee IBRA subregion (RIV02), of the Riverina IBRA Bioregion (RIV) (Figure 2-1).
NSW Landscape Regions (Mitchell)	The Subject Land is situated across four NSW Landscape Regions (Figure 2-2): • Murrumbidgee Channels and Floodplains • Murrumbidgee Scalded Plains • Murrumbidgee Depression Plains • Murrumbidgee Lakes, Swamps and Lunettes The Murrumbidgee Channels and Floodplains (Mbc) landscape description has been selected for the Subject Land as it has the largest occurrence across the Subject Land. It is described as "Quaternary alluvium on seasonally inundated floodplains, active and inactive channels, billabongs, levees and swamps of the Murrumbidgee River and its effluent streams. Relief to 10m. Includes scalded alluvial flats, broad elevated floodplains and associated relict channels; isolated sandy rises, relief to 5m. Grey and brown clay with occasional areas of low sandy rise. Open forest of river red gum (*Eucalyptus camaldulensis*), river cooba (*Acacia stenophylla*), cooba (*Acacia salicina*), lignum (*Muehlenbeckia cunninghamii*), nitre goosefoot (*Chenopodium nitrariaceum*) with numerous grasses along the channels and floodplain. Black box (*Eucalyptus largiflorens*) woodland with lignum, nitre goosefoot, thorny saltbush (*Rhagodia spinescens*), old man saltbush (*Atriplex nummularia*) and annual saltbushes (*Atriplex* sp.) on more distal floodplains and back plains. Cumbungi (*Typha orientalis*), common reed (*Phragmites australis*) and nardoo (*Marsilea drummondii*) in flooded depressions. (NPWS, 2003).
Rivers, streams, estuaries and wetlands	The Subject Land is located south of the Murrumbidgee River and Uara Creek. NSW Hydrography mapping (Figure 2-2) shows that one first order ephemeral creek intersects the Subject Land, which is known as Abercrombie Creek. Aquatic habitat associated with Abercrombie Creek and its associated canals/drains are assessed in Section 3.1.1. There are no Ramsar Wetlands or Important Wetlands as listed in the Directory of Important Wetlands of Australia located within the Subject Land. Swamps and inundation areas are present across the broader Project Area, particularly along the western boundary of the site, these wetlands have been mapped in Figure 2-2 and avoided by the Project. One wetland associated PCT occurs within the Subject Land being PCT 160 - Nitre Goosefoot shrubland wetland on clays of the inland floodplains. Farm dams occur throughout the Subject Land (Figure 2-2). These artificial features possess relatively low vegetation quality with limited emergent or submerged vegetation, however, still provide a valuable resource for fauna.

Landscape feature	Description
Habitat connectivity	The Subject Land is predominantly treeless and a mosaic of shrubland and grassland with grazing occurring, therefore providing little connectivity for native species that require wooded areas for habitat connection. Isolated paddock trees present provide a low level of habitat connectivity to nearby patches of woodland. For species that utilise shrubland and grassland, the Subject Area has potential to provide habitat connectivity to the adjacent Yanga Nature Reserve and State Conservation Area however, fencing, overgrazing and land management practices reduce the value of this (Figure 3-1).
Karst, caves, crevices, cliffs, rocks or other geological features of significance	The presence of habitat features including karst, caves, crevices and cliffs or other areas of geological significance were assessed throughout the Subject Land during detailed field surveys. There are no karsts, caves, crevices, cliffs or other geological features of significance within the Subject Land.
Soil hazard features	A search of the eSPADE database found that there are no known significant soil hazard features within the Subject Land. A search of the ASC Soil Type Map reveals that the Vertosol soil type dominates the Subject Land. Vertosols are categorised as clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular peds. Although many soils exhibit gilgai microrelief, this feature is not used in their definition. A search of the NSW Environment Protection Authority Contaminated Sites Register returned no results for the Murray River Council LGA for current or former Declarations of Significantly Contaminated Land.
Areas of outstanding biodiversity value	The Subject Land is not identified as an area of outstanding biodiversity value, as identified under the BC Act.
Additional landscape features identified in SEARs	No additional landscape features were identified in the SEARs.

TABLE 3-2 HAULAGE ROUTE LANDSCAPE FEATURES

Landscape feature	Description for each pinch point		
	Pinch Point 09	**Pinch Point 10**	**Pinch Point 11, 12 and 13**
IBRA Bioregions and Subregions	PP09 occurs within the Lower Slopes IBRA Subregion of the NSW South Western Slopes IBRA Bioregion.	PP10 occurs within the Murrumbidgee IBRA Subregion, of the Riverina IBRA Bioregion	PP11, 12 and 13 occur within the Murrumbidgee IBRA subregion, of the Riverina IBRA Bioregion.
NSW Landscape Regions (Mitchell)	PP09 occurs within the Murrumbidgee-Tarcutta Channels and Floodplains Mitchell Landscape	PP10 is situated across two Mitchell Landscapes: • Murrumbidgee Scalded Plains • Murrumbidgee Channels and Floodplains	PP 11 and 12 are situated across the Murrumbidgee Scalded Plains Mitchell Landscape. PP 13 is likely to be situated within the Murrumbidgee Channels and Floodplains Mitchell Landscape
Rivers, streams, estuaries and wetlands	The Murrumbidgee River is situated in close proximity (approximately 260 m) to PP09	The Murrumbidgee River is situated in close proximity (approximately 470m) to PP10	PP 11, 12 and 13 are situated approximately 10 km north of the Abercrombie Creek and 10 km south of Uara Creek.
Habitat connectivity	The vegetation near PP09 forms part of a stand of roadside remnant vegetation	PP10 contains vegetation that is isolated to within the roundabout and has no connectivity to nearby native vegetation without being separated by a road.	The Alternate Route is largely positioned along existing tracks through chenopod and sparse acacia shrublands. This habitat is considered to have low connectivity values.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	No Karst, caves, crevices, cliffs, rocks or other geological features of significance are present	No Karst, caves, crevices, cliffs, rocks or other geological features of significance are present	No additional karst, caves, crevices, cliffs, rocks or other geological features of significance are present.
Soil hazard features	PP09 is on Dermosols soil type. Dermosols are non texture contrast soils that can vary from stony hard setting soils to friable deeper profiles.	PP10 is on Vertosol soil type. Vertosols are categorised as clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular peds.	PP11, 12 and 13 are on Vertosol soil type. Vertosols are categorised as clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular peds.
Areas of outstanding biodiversity value	Not applicable	Not applicable	Not applicable

3.1.1 AQUATIC HABITAT

The Subject Land is located south of the Murrumbidgee River and Uara Creek, NSW. Hydrography mapping (Figure 2-2) shows that Abercrombie Creek, an ephemeral first order waterway, intersects the southern portion of the Subject Land. Wetland communities are present across the southern portion of the Project Area. During field survey events between 2020 and 2022 all natural creek lines were observed to be dry, presenting as minor depressions no greater than 1 m in relief; however, inundation of gilgais across the Subject Land was observed. During the 2023 surveys, all mapped wetlands were inundated because of substantial rainfall and flooding across the site in previous months. These habitats were observed to support a variety of water birds. The Project design was amended to avoid a large majority of wetland habitat.

The creek line vegetation presents at times dominated by Lignum (*Muehlenbeckia florulenta*), Canegrass (*Eragrostis australasica*) and Nitre Goosefoot (*Chenopodium nitrariaceum*), common of low-lying depressions of the Hay Plains, with chenopod shrublands also occurring. These features are ephemeral, likely to only form water passage during and post heavy rainfall events. It is noted that no woody debris nor instream aquatic vegetation was observed across the creek lines within the Subject Land.

The NSW DPI Fisheries Spatial Data Portal was reviewed to determine aquatic values and potential presence of threatened species in the Subject Land listed under the EPBC Act, BC Act as well as the NSW *Fisheries Management Act 1994* (FM Act). As a result, the Subject Land is not considered to consist of mapped Key Fish Habitat; however, Abercrombie Creek is mapped as providing habitat for the following threatened fish:

- Flathead Galaxias (*Galaxias rostratus*) listed as Critically Endangered under the EPBC Act, BC Act and FM Act; and
- Silver Perch (*Bidyanus bidyanus*) listed as Critically Endangered under the EPBC Act, and Vulnerable under the BC Act and FM Act.

These listed species have been assessed in Section 3.1.1.1. The Subject Land is situated within the distribution of the Lower Murray River endangered ecological community (EEC). All native fish and aquatic invertebrates in natural creeks within this distribution form part of the EEC. This EEC is further discussed in Section 3.1.1.2.

3.1.1.1 AQUATIC THREATENED SPECIES LIKELIHOOD OF OCCURANCE ASSESSMENT

A likelihood of occurrence assessment was undertaken for threatened aquatic entities across the Subject Land, informed by desktop sources (PMST and BioNet search results within 10 km) and the field survey results. Desktop sources identified several aquatic threatened species listed under the EPBC Act and BC Act that have been recorded previously or are predicted to occur within a 10 km buffer of the Subject Land. The likelihood of occurrence approach refines the desktop generated list using site-specific and species-specific habitat information.

The assessment ranks the likelihood of the species occurring within the Subject Land through analysis of species distribution information and the presence of specific habitat attributes as identified through the desktop analysis and field survey.

The criteria applied are outlined in Table 3-3. The likelihood of occurrence assessment is provided in Table 3-4.

No threatened aquatic species are considered known or likely to occur within the Subject Land. As such, in accordance with the *Threatened Species Assessment Guidelines: the Assessment of Significance* (DPI 2008), an assessment of significance for threatened species matters listed under the *Fisheries Management Act 1994* is not required.

TABLE 3-3 LIKELIHOOD OF OCCURANCE CRITERIA

Factor	Preferred habitat exists	Suitable habitat exists[1]	Habitat does not exist[2]
Records within Subject Land	Known	Known	Known
Records in the locality[3]	Likely	Potential	Unlikely
No records in the locality, but Subject Land is within known distribution	Potential	Unlikely	Unlikely
No records in the locality, and Subject Land is outside of distribution	Unlikely	Unlikely	Unlikely

[1] Habitat may be considered suitable, but not preferred.
[2] Based on sources reviewed and/or field survey results.
[3] 'Locality' refers to a 10 km buffer of the Subject Land.

TABLE 3-4 AQUATIC THREATENED SPECIES LIKELIHOOD OF OCCURANCE ASSESSMENT

Habitat	ALA/BioNet Records	Distribution	Likelihood
Flathead Galaxias (*Galaxias rostratus*)			
Flathead Galaxias are found in still or slow-moving water bodies such as wetlands and lowland streams. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.	No records within the Subject Land or Locality	The Flathead Galaxias is only known from the southern half of the Murray-Darling Basin system. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan River catchments.	The Flathead Galaxias is considered **unlikely** to occur within the Subject Land as the suitable habitat in the form of slow-moving waterbodies is not present and there is a lack of records in the locality.
Silver Perch (*Bidyanus bidyanus*)			
Silver Perch formerly utilised a diversity of habitats within the Murray-Darling system. The species were consistently reported by anglers and researchers to show a general preference for faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin.	No records within the Subject Land or Locality	Current core habitat is defined as the Murray River, from the base of Mulwala Weir through to Torrumbarry Weir, through to Euston Weir, and then through to the South Australian border; the lower reaches of the Darling River, from the base of the Menindee Lake weirs through to its junction with the Murray River; and the Edwards/Wakool anabranch system. Silver perch occurrences outside of this core habitat in the Border Rivers and in the Namoi and Lachlan catchments are in wholly and mostly stocked impoundments which do not recruit.	The Silver Perch is considered **unlikely** to occur within the Subject Land as the suitable habitat in the form of fast-flowing waterbodies is not present and there are a lack of records in the locality.

3.1.1.2 THREATENED AQUATIC ECOLOGICAL COMMUNITIES

The Lower Murray River EEC is a community that includes all native fish and aquatic invertebrates within all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries' anabranches. Excluded from this recommendation are the Lachlan River and the Darling River and their tributaries, and artificial canals, water distribution and drainage works, farm dams and off-stream reservoirs (DPI, 2007).

The Lower Murray River EEC occurs in a lowland riverine environment, characterised by meandering channels and wide floodplains. The land is generally flat to gently sloping. In their natural state, these lowland rivers experienced extremely variable water flows, ranging from floods to droughts. The EECs drainage system has been greatly modified since European settlement, through activities such as river regulation, agricultural practices and the introduction of non-native species (DPI, 2007).

The creek lines across the Subject Land as presented in Figure 2-2 are within the distribution of the EEC; however, largely present as degraded, dried creek beds with a lack of native fish and aquatic invertebrates. In the event the ephemeral creek lines were inundated post heavy rainfall events it remains unlikely that the creek lines present within the Subject Land would return to a condition that was sufficient to support the assemblage of native species required to consider the waterway under the EEC listing. The prolonged history of clearing of riparian vegetation and agricultural processes including stock access and alterations to the hydrological regime have degraded this creek line beyond suitability for the EEC. Measures to avoid impact to this habitat will be undertaken in accordance with the Department's *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013) (DPI, 2013) and *Fish Passage Requirements for Waterway Crossings* (DPI, 2003).

3.2 NATIVE VEGETATION COVER AND PATCH SIZE

The assessment of site context involved the application of the site-based method. The following landscape attributes were assessed in the following sections:

- Percent native vegetation cover in the landscape; and
- Patch size.

The following sections outline the results of these assessments.

3.2.1 NATIVE VEGETATION COVER

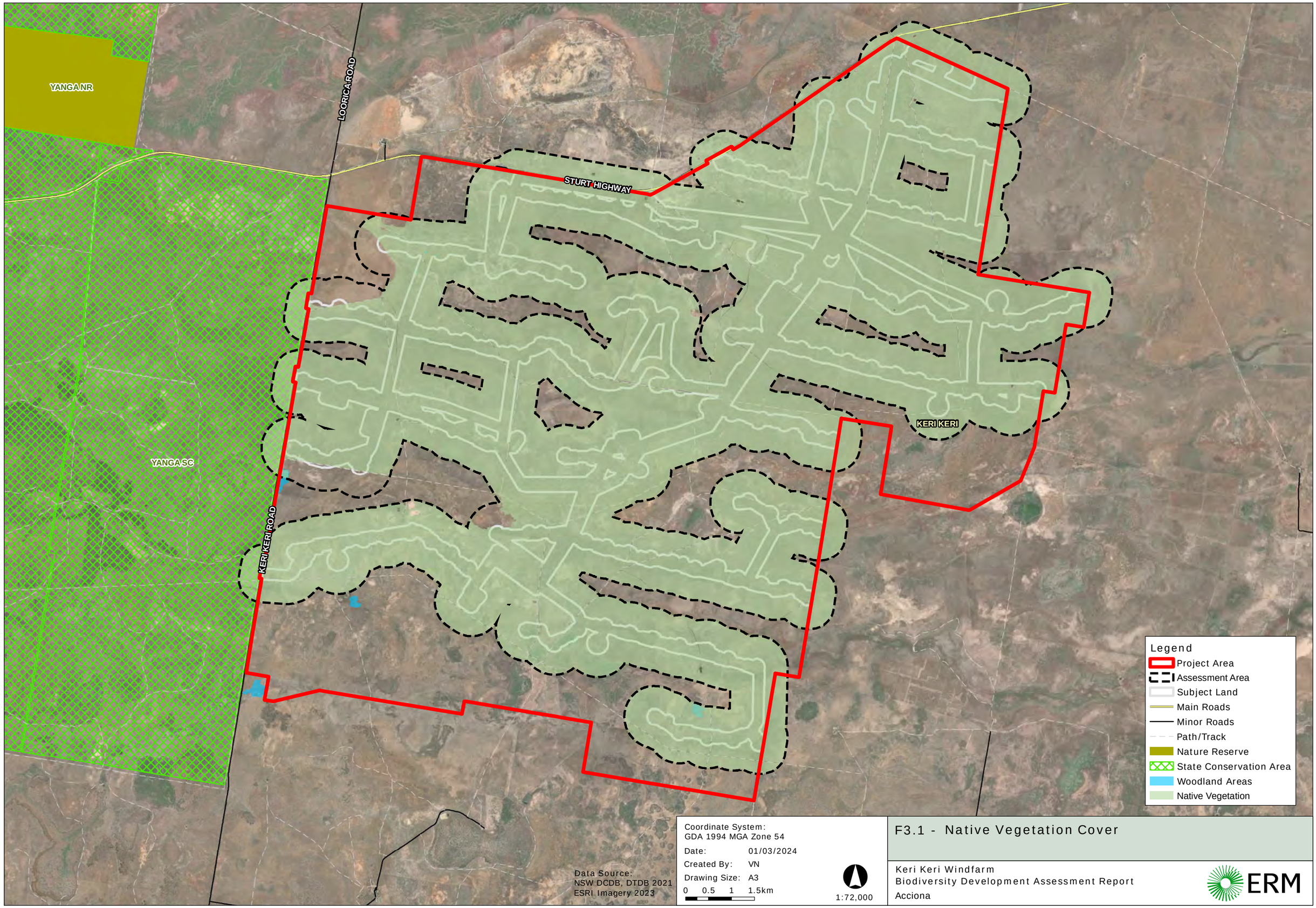
The extent of native vegetation across the Subject Land is provided in Figure 3-1 and summarised in Table 3-5, which includes the parameters used in the BAM-C for percentage of native vegetation cover and the cover class which was found to be >70%.

TABLE 3-5 NATIVE VEGETATION COVER IN THE ASSESSMENT AREA

Description	Value
Assessment Area	14,774.31 ha
Total area of native vegetation cover	14,306.40 ha
Percentage of native vegetation cover	97%
Class (0-10, >10-30, >30-70 or >70%)	>70%

3.2.2 PATCH SIZE

Patch size is defined in the BAM as an area of intact native vegetation that occurs on the development site and includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site. The patch size of the native vegetation on the Subject Land has been calculated as >100 ha.



F3.1 - Native Vegetation Cover

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4. NATIVE VEGETATION, THREATENED ECOLOGICAL COMMUNITIES AND VEGETATION INTEGRITY

4.1 NATIVE VEGETATION EXTENT

This section of the BDAR identifies native vegetation occurring on the Subject Land (Figure 3-1) in accordance with the requirements of Section 5 of the BAM. This section describes PCTs on the Subject Land, including:

- Vegetation formation and class;
- Area (ha) for each vegetation type (PCT);
- Species relied upon for identification of vegetation type;
- Justification of evidence used to identify a PCT (as outlined in Paragraph 5.2.1.12 of the BAM);
- TEC status (as outlined in Paragraphs 5.2.1.14 – 5.2.1.15 of the BAM); and
- Estimate of percent cleared value of PCT (as outlined in Paragraph 5.2.1.16 of the BAM).

This section also includes the results of vegetation integrity assessments completed on the Subject Land, including:

- Mapping vegetation zones (in accordance with Subsection 5.3.1 of the BAM);
- Patch size;
- Assessing vegetation integrity using benchmark data (in accordance with Subsection 5.3.3 of the BAM);
- Survey effort (as described in Subsection 5.3.4 of the BAM);
- Determining the current vegetation integrity score (in accordance with Appendix 6 of the BAM) including:
    - Composition condition score;
    - Structure condition score;
    - Function condition score; and
    - VI score.

4.1.1 MAPPED NATIVE VEGETATION

Ground-verified vegetation mapping was conducted over the Subject Land and for most of the Assessment Area. Changes were made to the SVTM (DPE, 2022a), including the reassignment and reshaping of polygons to better fit the occurrence of PCTs across the Subject Land.

4.1.2 AREAS THAT ARE NOT NATIVE VEGETATION

No areas were re-allocated to non-native vegetation across the Subject Land.

A small area of the Haul Route, situated at PP11 in Hay NSW, was re-allocated to non-native vegetation. PCT 164 is mapped on the SVTM (DPE, 2022a), occurring within a median strip to the east of the Sturt Hwy and Cobb Hwy roundabout; however, the area was dominated (> 50% cover) by non-native species at the time of assessment. This vegetation will not be impacted by the passing of Project components. This is further discussed in Appendix A.

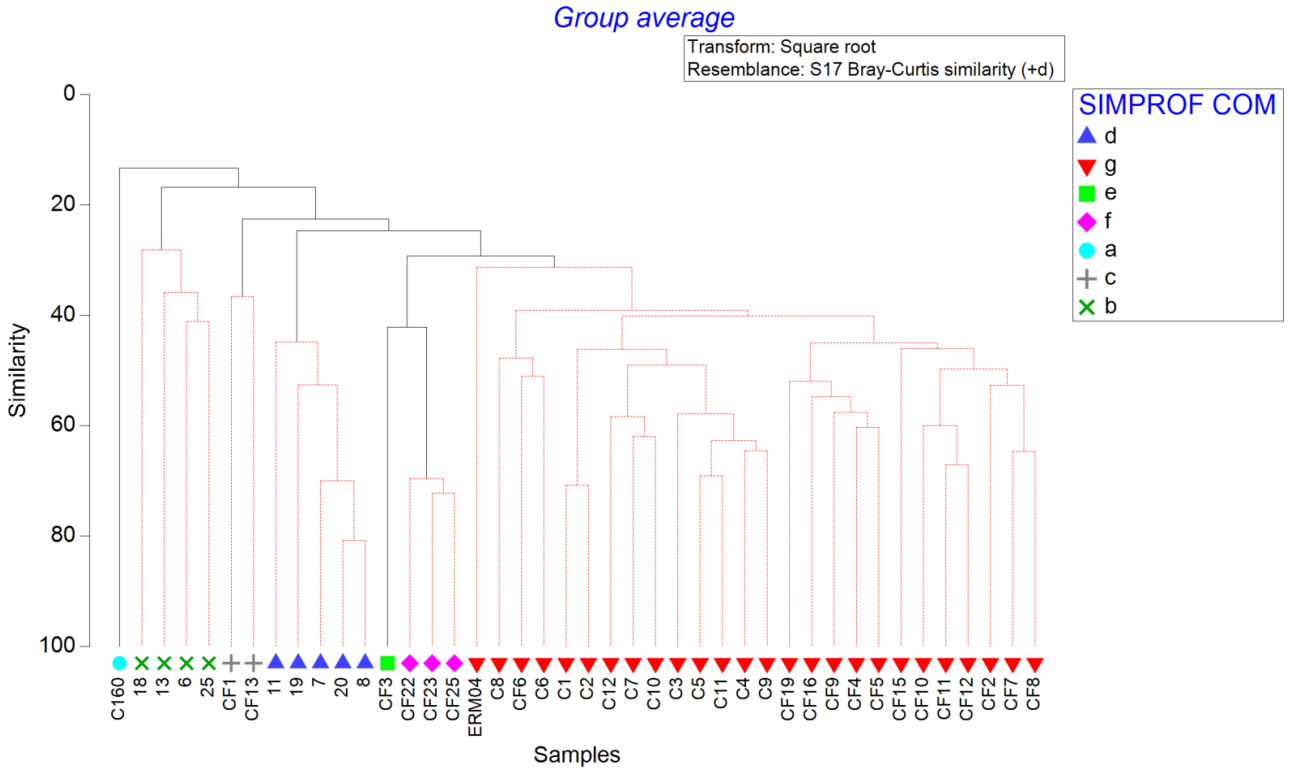
4.1.3 VEGETATION CLASSIFICATION

The 42 BAM plots used in this assessment were classified using the Bray-Curtis similarity index to produce a resemblance matrix used to aid in PCT identification within the Subject Land. Various analytical routines used included:

- A hierarchical cluster analysis (CLUSTER analysis) incorporating a SIMPROF analysis to identify statistically similar BAM plot groups;
- A non-metric multidimensional scaling plot (nMDS) (to graphically show BAM plot relatedness); and
- An Analysis of Similarities to calculate the Global R Statistic and test for differences between unordered SIMPROF groups.

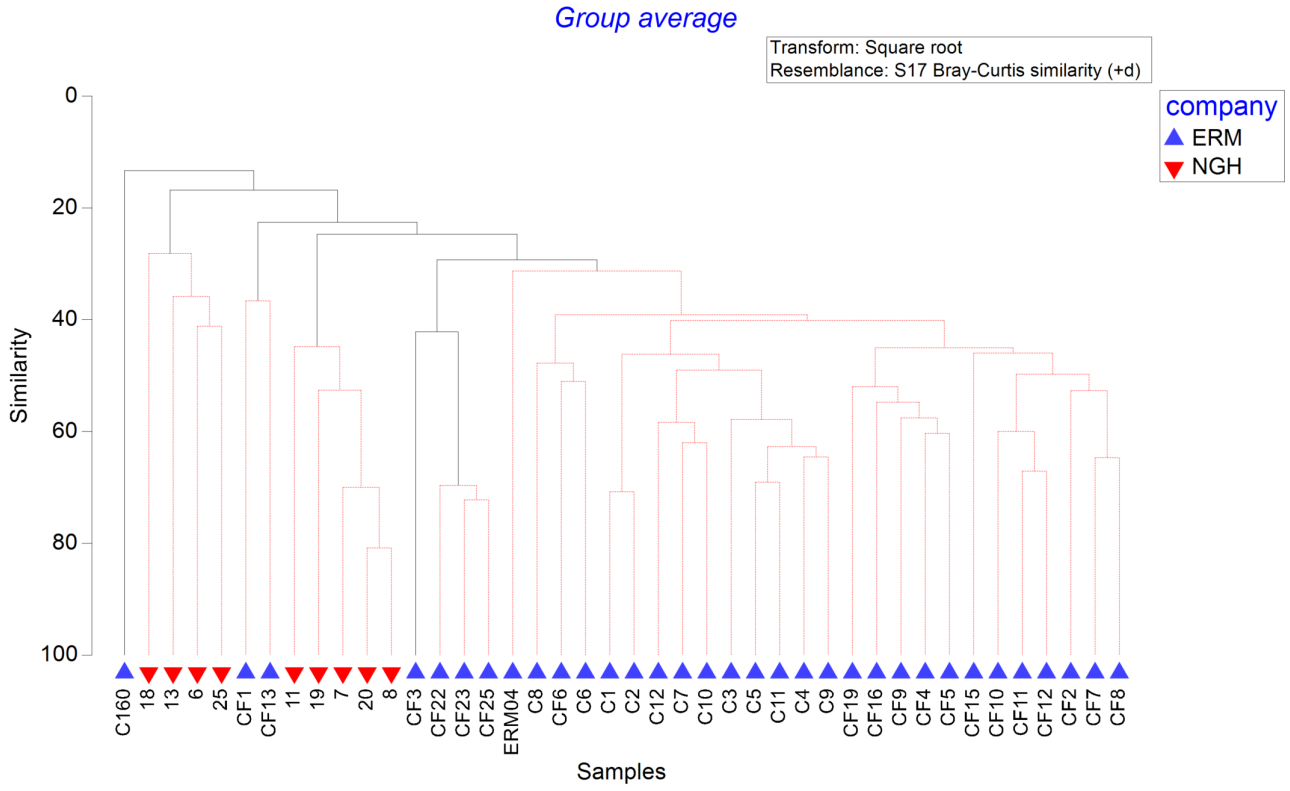
The dendrogram produced from the CLUSTER analysis is shown in Chart 4-1 displaying seven SIMPROF groups at the 5% significance level (red lines denoting SIMPROF groups).

CHART 4-1 DENDROGRAM OF THE BAM PLOT DATA BY SIMPROF GROUPS



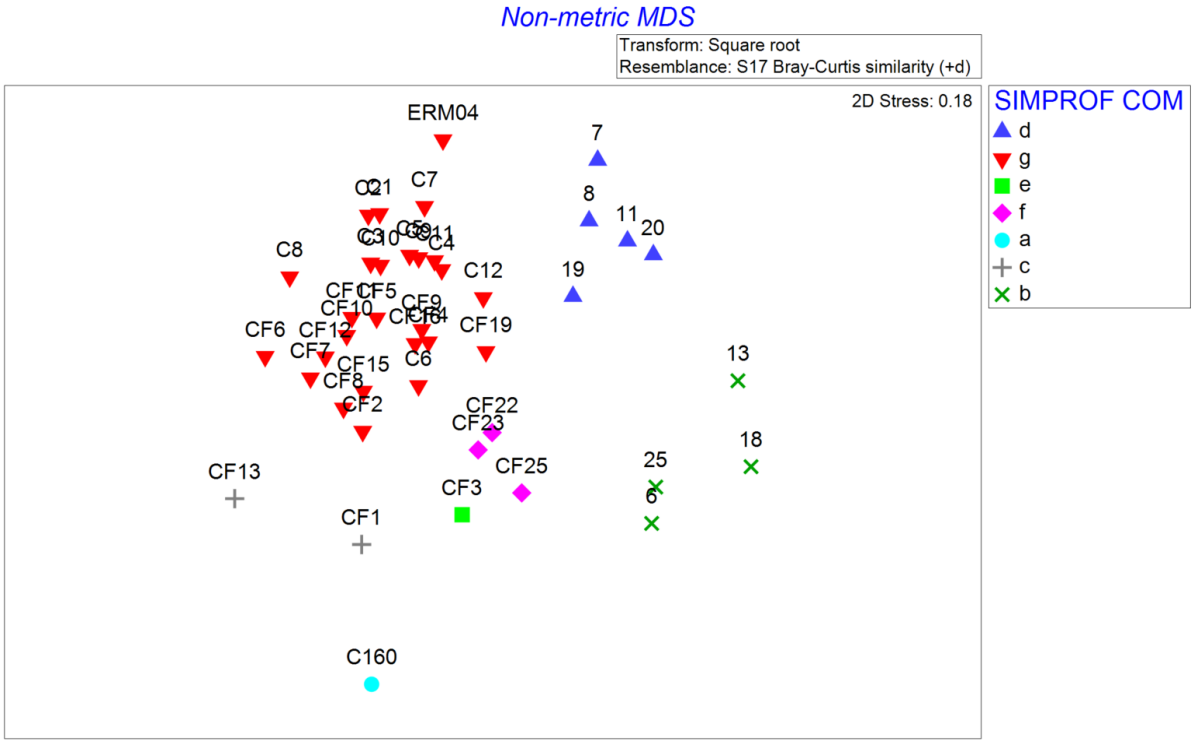
The effect of seasonal/year/observer bias is shown in the dendrogram shown in Chart 4-2 where BAM plot by company s symbolized (i.e., distinguish between NGH and ERM observers). This dendrogram shows a clustering effect by observer (with surveys separated by season and year by differing observers).

CHART 4-2 DENDROGRAM OF THE BAM PLOT DATA BY OBSERVER



The nMDS plot showing the SIMPROF groups is displayed in Chart 4-3 with acceptable stress (i.e., 0.18).

CHART 4-3 NMDS PLOT OF BAM PLOTS BY SIMPROF GROUPS



The SIMPROF groups have meaningful structure as none of the calculated permutated statistics were greater than or equal to Pi (i.e., Sample Statistic (Pi) is 4.021 (p = 0.1%)).

The SIMPER output for each CLUSTER group with two or more plots is provided in Table 4-1 Note Groups A and E have only one plot each and are therefore not reported in the table as an assessment of similarity cannot be conducted when there are less than two samples in a group.

This table lists the flora species that characterise each of the SIMPROF groups and has been used as the basis for interpreting the Dendrogram and nMDS plots and ultimately discerning PCTs on the Subject Land.

TABLE 4-1 SIMPER ANALYSIS OF CLUSTER GROUPS

Species	Average Abundance	Average Similarity	Sim/SD	Contribution %	Cumulative %
Group a: Less than 2 samples in group					
Groub b: Average similarity 32.22					
Nitraria billardierei	2.62	7.6	0.9	23.58	23.58
Erodium crinitum	1.3	3.35	6.18	10.4	33.98
Plantago cunninghamii	0.89	1.86	2.98	5.78	39.76
Austrostipa scabra	0.32	1.58	7.64	4.9	44.66
Erodium cicutarium	0.32	1.58	7.64	4.9	49.56
Rhodanthe stuartiana	1.03	1.58	7.64	4.9	54.45
Sclerolaena brachyptera	0.32	1.58	7.64	4.9	59.35
Calotis hispidula	0.24	0.83	0.9	2.56	61.91
Convolvulus erubescens	0.24	0.83	0.9	2.56	64.48
Sisymbrium erysimoides	0.41	0.83	0.9	2.56	67.04
Calotis scabiosifolia	0.24	0.82	0.9	2.55	69.58
Sida trichopoda	0.24	0.82	0.9	2.55	72.13
Group c: Average similarity 36.07					
Limonium lobatum	3.05	9.76	SD=0!	27.06	27.06
Rhodanthe floribunda	1	4.37	SD=0!	12.1	39.17
Salsola australis	1.93	3.09	SD=0!	8.56	47.73
Austrostipa scabra	0.5	1.95	SD=0!	5.41	53.14
Chloris truncata	0.72	1.95	SD=0!	5.41	58.55
Cirsium vulgare	1.09	1.95	SD=0!	5.41	63.97

Species	Average Abundance	Average Similarity	Sim/SD	Contribution %	Cumulative %
Sclerolaena muricata	0.72	1.95	SD=0!	5.41	69.38
Echium plantagineum	0.43	1.38	SD=0!	3.83	73.21
Group d: Average similarity 55.32					
Rhodanthe stuartiana	4.83	17.2	1.42	31.08	31.08
Maireana aphylla	3.66	15.98	2.36	28.89	59.98
Nitraria billardierei	1.42	4.81	1.15	8.7	68.67
Plantago drummondii	1.52	3.45	0.77	6.25	74.92
Group e: Less than 2 samples in group					
Group f: Average similarity 70.06					
Sclerolaena tricuspis	2.24	16.63	18.05	23.73	23.73
Nitraria billardierei	2.07	14.07	8.99	20.08	43.81
Maireana aphylla	0.8	5.26	18.05	7.5	51.31
Rhodanthe floribunda	0.86	4.01	2.96	5.72	57.03
Sclerolaena brachyptera	0.92	3.31	2.01	4.73	61.76
Pimelea curviflora	0.4	2.67	4.84	3.82	65.58
Bulbine semibarbata	0.32	2.35	18.05	3.36	68.93
Chloris truncata	0.32	2.35	18.05	3.36	72.29
Group g: Average similarity 42.15					
Maireana aphylla	2.97	9.23	1.34	21.89	21.89
Rhodanthe floribunda	2.96	8.9	1.82	21.13	43.02
Austrostipa scabra	2.53	5.87	1.12	13.93	56.95
Rytidosperma setaceum	1.41	3.25	0.83	7.72	64.67
Nitraria billardierei	0.95	1.42	0.58	3.36	68.03
Plantago drummondii	0.57	1.36	1.58	3.23	71.26

Broadly, the dendrogram indicates high floristic composition and/or structural variability. This is likely a function of factors such as anthropogenic land use (i.e., grazing/ cropping impacts), climatic events such as drought/flooding and historic pest plagues (e.g., European rabbit). Interpretation of the Dendrogram (Chart 4-2), SIMPER analysis and nMDS plot also identify potential for some of the variation to be function of observer bias and/or year/season of sampling.

SIMPROF Group G has the highest number of member BAM plots with an average similarity of 42.15%. It is characterized by shrub – forb – grass species with Blue Cotton Bush (*Maireana aphylla*), *Rhodanthe floribunda* and *Austrostipa scabra* having high average percent cover scores. SIMPROF Group D is similar in having a high average per cent cover of Blue Cotton Bush (*Maireana aphylla*) but is less grassy and differs to SIMPROF Group G in having *Rhodanthe stuartiana* rather than *Rhodanthe floribunda.* These differences are interpreted as being related to seasonal/ annual variation compounded by land use (i.e., sheep grazing intensity) as well as observer bias (i.e., differences in some species identifications). Noting these differences, the nMDS plot and pairwise SIMPER analysis supports the aggregation of SIMPROF Groups G and D into a single floristic unit.

For the same reasons indicated above (i.e., observer differences and survey timing (i.e., 2020 versus 2022/2023)), the flora composition of SIMPROF Groups B and F are similar and are to be treated as a single flora group. These SIMPROF Groups are characterized by Dillion Bush (*Nitraria billardierei*) with the other in common contributing species including *Sclerolaena brachyptera.* Species differences are likely seasons/ year and observer driven (e.g., presence of annuals and species identification differences). Group E is at least 40% similar to Group B and is aggregated for this reason. The pairwise SIMPER analysis confirms these interpretations.

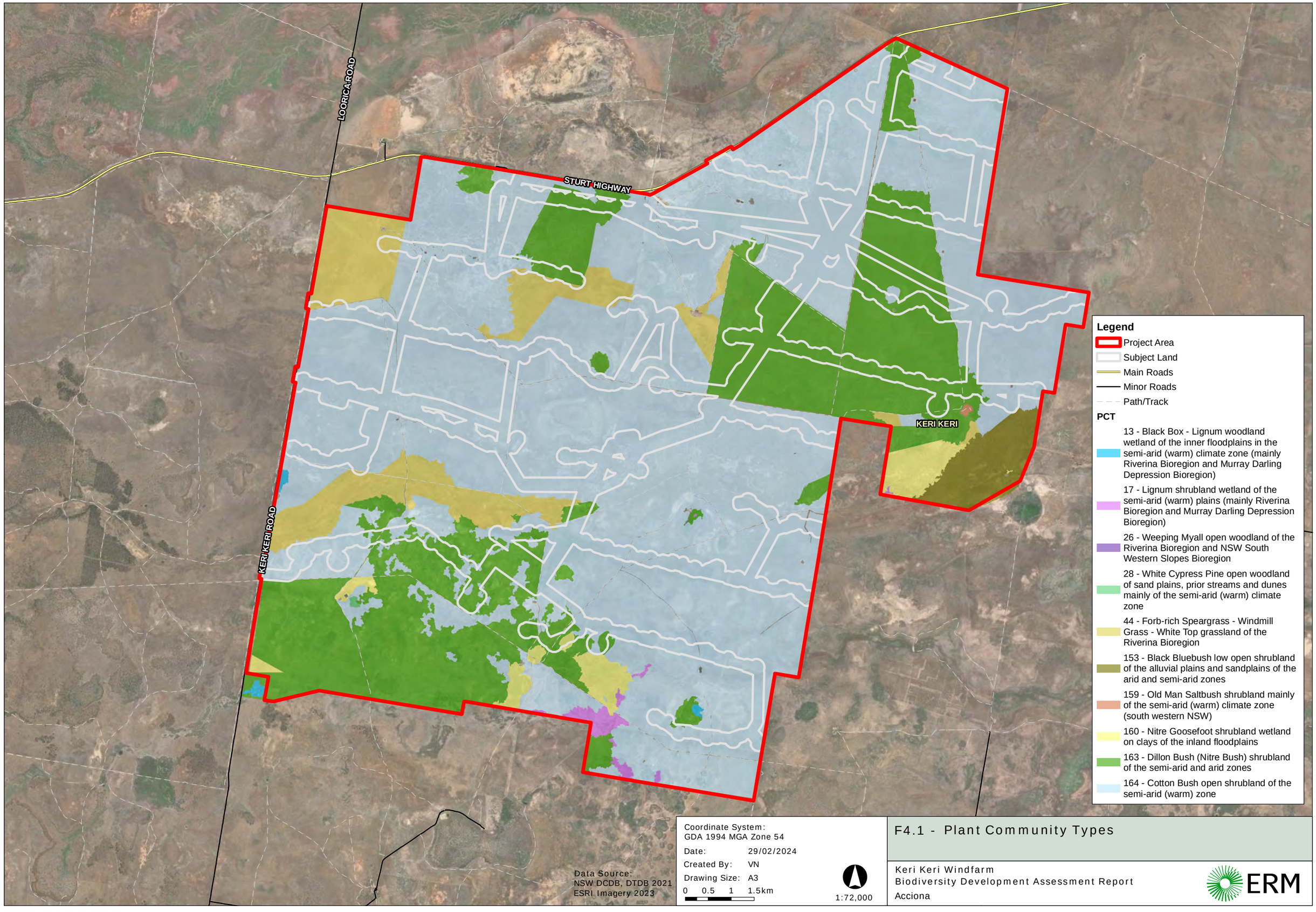
Finally, Group C and Group A have significantly different flora composition that cannot be explained by the previously mentioned factors, thus are indicative of separate PCTs. The per cent cover of exotic species present in Group C indicates a highly disturbed vegetation type, with the relatively unpalatable *Austrostipa scabra* supporting this conclusion (e.g. indicative of long-term livestock grazing).

4.1.4 PLANT COMMUNITY TYPES

Table 4-2 identifies the PCTs present within the Subject Land with extent shown in Figure 4-1 and corresponding vegetation zones shown in Figure 4-2. A detailed description of each PCT as it presents within the Subject Land is provided in Table 4-3 (PCT 26), Table 4-4 (PCT 44), Table 4-5 (PCT 160), Table 4-6 (PCT 163) and Table 4-7 (PCT 164).

TABLE 4-2 PCTS IDENTIFIED WITHIN THE SUBJECT LAND

PCT ID	SIMPROF Group	PCT name	Subject Land area (ha)	Disturbance Footprint area (ha)
26	N/A	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	0.55	0
44	C	Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion	38.58	4.78
160	A	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	5.92	1.84
163	B, E, F	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	880.21	268.58
164	D, G	Cotton Bush open shrubland of the semi-arid (warm) zone	3,270.67	855.73
Total area			**4,195.93**	**1,130.93**

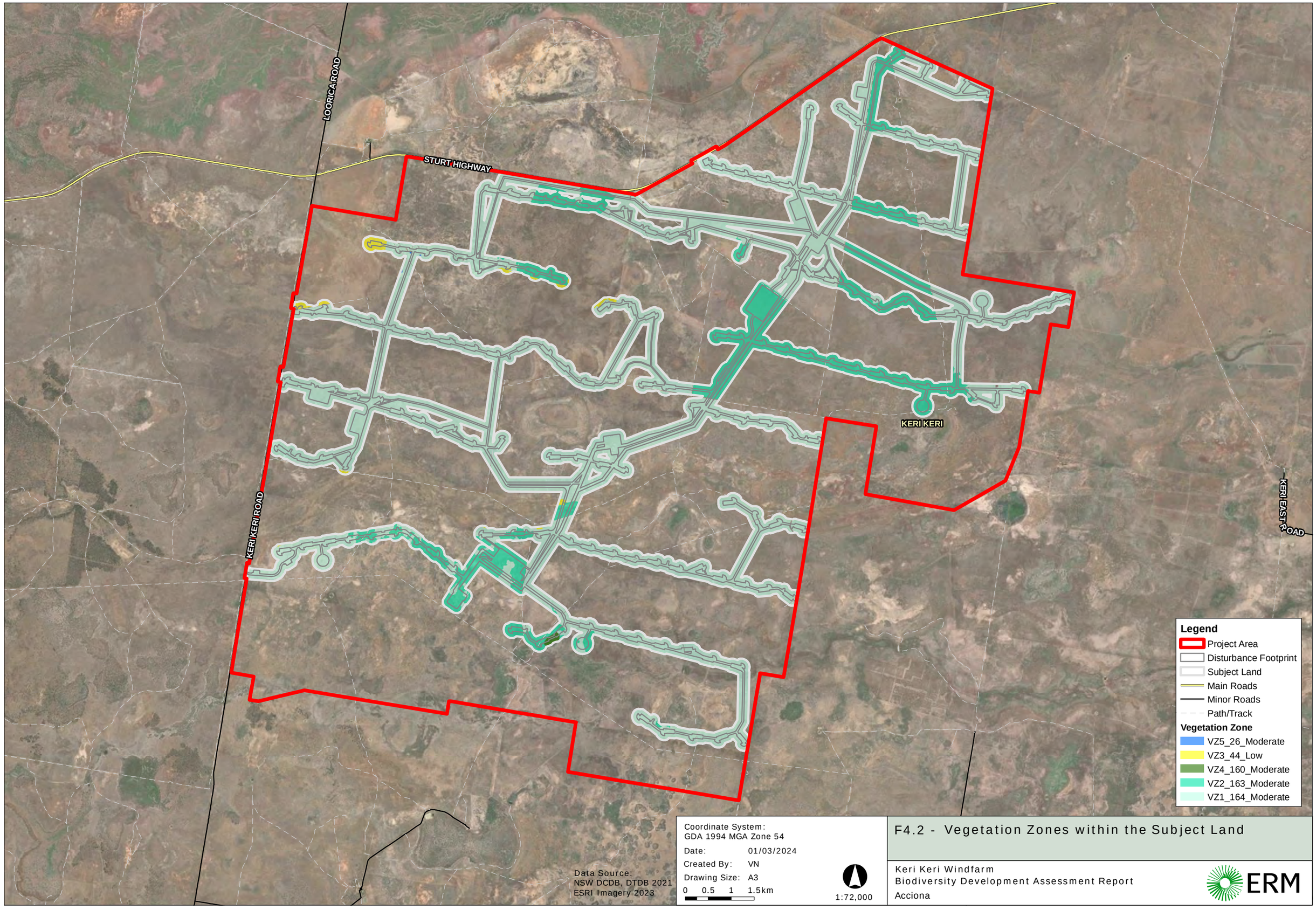


F4.1 - Plant Community Types

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

0617753_KKWF_BDAR_G007_R1.mxd



F4.2 - Vegetation Zones within the Subject Land

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Biodiversity Development Assessment Report
Acciona

ERM

0617753_KKWF_BDAR_G008_R1.mxd

TABLE 4-3 PCT 26 DESCRIPTION

PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	
PCT ID	26
PCT name	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
Vegetation formation	Semi-arid Woodlands (Grassy sub-formation)
Vegetation class	Riverine Plain Woodlands
TEC Status	PCT 26 is associated with: • Weeping Myall Woodlands – Endangered (EPBC Act) (part) • Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – Endangered (BC Act) (part)
Percent cleared value	90.00%
BioNet VIS PCT Description	Mid-high open woodland up to 8 m high dominated by Weeping Myall (*Acacia pendula*). Other tree species include Belah (*Casuarina cristata*), while Black Box (*Eucalyptus largiflorens*) and River Red Gum (*Eucalyptus camaldulensis*) may occur in depressions. Chenopod shrubs may be common or absent. They include *Rhagodia spinescens, Maireana decalvans, Atriplex nummularia, Chenopodium nitrariaceum, Hakea leucoptera, Santalum lanceolatum, Exocarpos aphyllus* and *Maireana aphylla*. The ground cover may be dense or sparse depending on rainfall. It is dominated by grass species such as *Austrodanthonia caespitosa, Austrodanthonia setacea, Austrostipa aristiglumis, Austrostipa scabra, Austrostipa nodosa* and *Sporobolus caroli*. Saltbush species include *Atriplex spinibractea, Atriplex leptocarpa* and *Atriplex semibaccata*. Forb species include *Alternanthera denticulata, Myriocephalus rhizocephalus, Centipeda cunninghamii, Rhodanthe corymbiflora* and *Vittadinia cuneata var. cuneata*. Occurs on brown clays or loam soils on alluvial plains mainly in the Riverina and NSW South-western Slopes Bioregions of south-western NSW.
Description within Subject Land	PCT 26 was only found as two very small patches within the Subject Land. It was distinguished by the presence of Weeping Myall (*Acacia pendula*) in contrast to the surrounding chenopod shrublands that do not contain any tree species. In comparison to other patches of woodland in the broader Project Area, the patches of PCT 26 consisted of Myall (*Acacia* pendula) as the canopy species, where other woodland patches are comprised of Black Box (*Eucalyptus largiflorens*) (PCT 13) and White Cypress Pine (*Callitris columellaris*) (PCT 28).
Associated species present	Weeping Myall (*Acacia pendula*), Nitre Goosefoot (*Chenopodium nitrariaceum*), Cotton Bush (*Maireana aphylla*), Hairy Bluebush (*Maireana pentagona*)
Vegetation Zones	One distinct condition state for areas mapped as PCT 26 occurs within the Subject Land, as outlined below: • Moderate condition, herein labelled as Vegetation Zone 5 (VZ5) This PCT does not occur within the Disturbance Footprint.

PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion

PHOTOGRAPH 4-1 PCT 26, VEGETATION ZONE 5

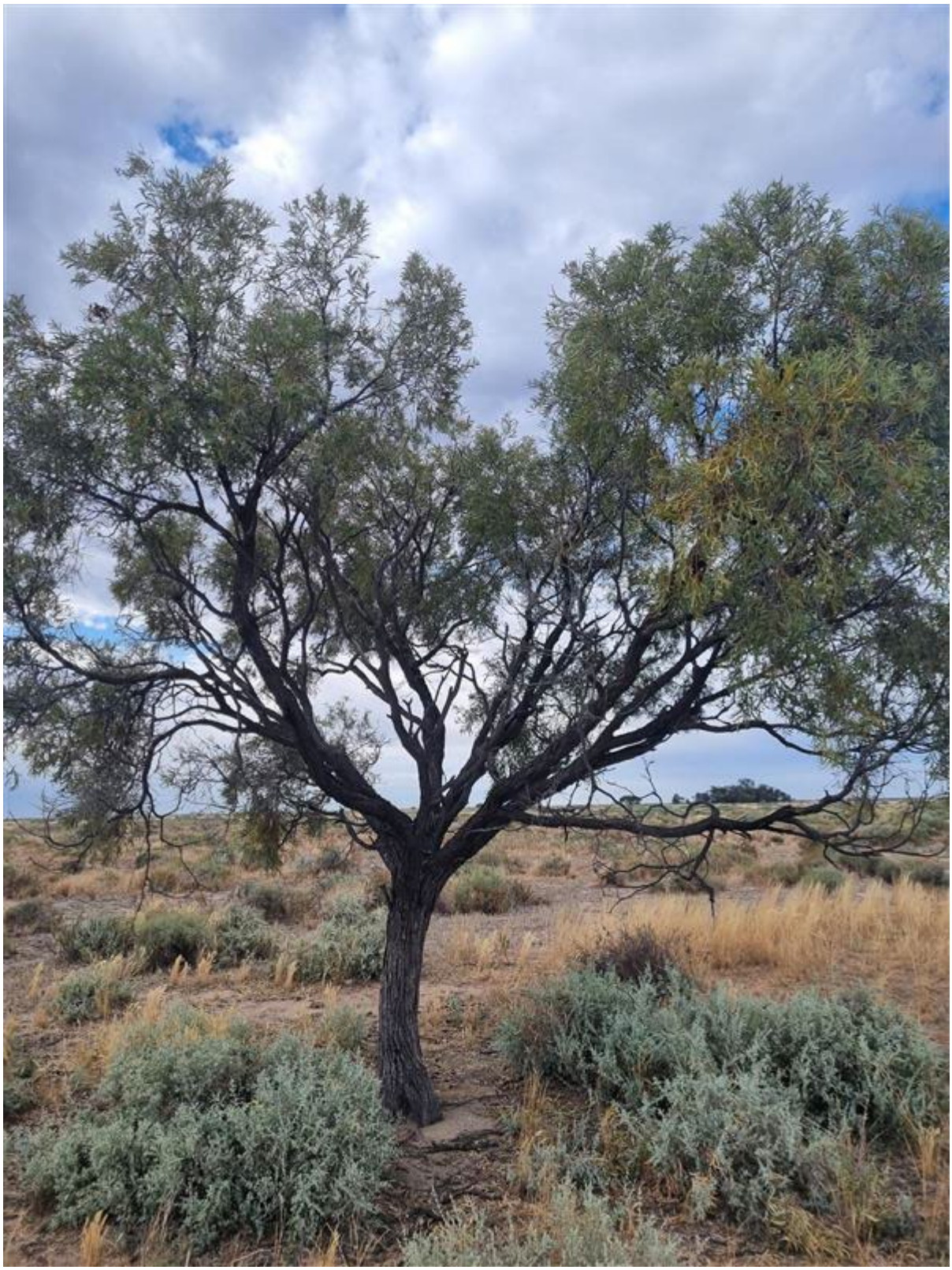


TABLE 4-4 PCT 44 DESCRIPTION

PCT 44 Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	
PCT ID	44
PCT name	Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
Vegetation formation	Grasslands
Vegetation class	Riverine Plain Grasslands
TEC Status	PCT 44 is associated with: • Natural Grasslands of the Murray Valley Plains – Critically Endangered (EPBC Act) (part)
Percent cleared value	73.00%
BioNet VIS PCT Description	Open to closed grasslands usually about 0.3 m high composed of speargrass (*Austrostipa nodosa*), Windmill Grass (*Chloris truncata*) and Whitetop Wallaby Grass (*Austrodanthonia caespitosa*) with forbs including a range of daisies such as *Leucochrysum molle* and *Calotis scabiosifolia* and legumes such as *Swainsona* spp. The bluebush species *Maireana pentagona* and *Maireana excavata* are often present as scattered low shrubs. Some annual exotic species such as Rye Grass (*Lolium* spp.) and Wild Oats (*Avena* spp.) can dominate cover in Spring then die off leaving native perennial grasses as dominants. This community is "disclimax" in that the grassland of today was probably mixed with chenopod shrublands prior to European settlement.
Description within Subject Land	PCT 44 is sparse across the Subject Land and is mostly limited to the north-west corner of the Project Area, known to be prone to inundation and highly disturbed by grazing. The cover of vegetation was generally sparse and dominated by non-native species including *Limonium lobatum, Cirsium vulgare* and *Echium* plantagineum. Native species observed within the PCT include *Austrostipa scabra, Chloris truncata, Rhodanthe floribunda, Sclerolaena muricata* and *Salsola* australis. *Nitraria billardierei* (Dillon Bush) and other chenopod shrubs sometimes occurred and at times it was difficult to distinguish the boundaries between PCT 44 and adjacent areas of PCT 164 and PCT 163. PCT 44 being a derived grassland led to decisions where marginal areas of PCT 164/PCT 163/PCT 44 were found we tended towards a decision-making process that solidified the chenopod shrubland community as still persisting, albeit in a much reduced and degraded manner. PCT 44 was often a light wispy grassland community associated with scalds, and often around areas that have experienced heavy grazing regimes and are in proximity to dams.
Associated species present	Rough Speargrass (*Austrostipa scabra*), Ringed Wallaby Grass (*Rytidosperma caespitosa*), Windmill Grass (*Chloris truncata*), *Rhodanthe* and *Sida* spp.
Vegetation Zones	One distinct condition state for areas mapped as PCT 44 occurs within the Subject Land, as outlined below: • Low condition, herein labelled as Vegetation Zone 3 (VZ3)

PCT 44 Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion

PHOTOGRAPH 4-2 PCT 44, VEGETATION ZONE 3



PHOTOGRAPH 4-3 PCT 44, VEGETATION ZONE 3



TABLE 4-5 PCT 160 DESCRIPTION

PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains	
PCT ID	160
PCT name	Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Vegetation formation	Freshwater Wetlands
Vegetation class	Inland Floodplain Shrublands
TEC Status	PCT 160 is associated with: • Artesian Springs Ecological Community in the Great Artesian Basin – Critically Endangered (BC Act) (part)
Percent cleared value	40.00%
BioNet VIS PCT Description	Tall shrubland to two metres high, dominated by Nitre Goosefoot (*Chenopodium nitrariaceum*) often with Black Roly Poly (*Sclerolaena muricata*). Low shrubs include *Sclerolaena stelligera*, Soft Horns (*Malacocera tricornis*) and *Atriplex semibaccata*; forb species include *Omphalolappula concava, Harmsiodoxa blennodioides* and *Oxalis perennans*. Exotic species may be common including the grasses *Hordeum leporinum, Hordeum marinum, Lolium perenne* and *Avena fatua*. Common exotic forbs include *Brassica tournefortii; Cirsium vulgare; Echium plantagineum; Erodium cicutarium, Hedypnois rhagadioloides subsp. cretica* and *Medicago polymorpha*. Tall shrubs of Cooba (*Acacia salicina*) and River Cooba (*Acacia stenophylla*) may be present. Occurs on cracking clay or sandy clay soils in lake beds, low lying plains, drainage depressions and alluvial plains subject to flooding in the arid and semi-arid zones of far western NSW. Widespread but usually found in discrete stands. In some places this community may be derived from a previous Old Man Saltbush shrubland as it generally occurs in highly disturbed sites. Grades into Lignum communities in wetter sites where drainage is impaired.
Description within Subject Land	PCT 160 is mapped in small areas of the Subject Land in small depressions along Abercrombie Creek in the south of the Subject Land. These areas were easily defined by a clear dominance of *Chenopodium nitrariaceum* (Nitre Goosefoot) and Lignum (*Duma florulenta*, which was not found as abundant in other PCTs across the site. Other common species present included *Sclerolaena muricata, Hordeum* and *Medicago* species.
Associated species present	*Chenopodium nitrariaceum* (Nitre Goosefoot), Lignum (*Duma florulenta*
Vegetation Zones	One distinct condition state for areas mapped as PCT 160 occurs within the Subject Land, as outlined below: • Moderate condition, herein labelled as Vegetation Zone 4 (VZ4)

PHOTOGRAPH 4-4 PCT 160, VEGETATION ZONE 4



PHOTOGRAPH 4-5 PCT 160, VEGETATION ZONE 4



TABLE 4-6 PCT 163 DESCRIPTION

PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	
PCT ID	163
PCT name	Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
TEC Status	PCT 163 is associated with: • Artesian Springs Ecological Community in the Great Artesian Basin – *Critically Endangered* (BC Act) (part)
Percent cleared value	26.00%
BioNet VIS PCT Description	Low to mid-high open to sparse shrubland dominated by Dillon Bush (*Nitraria billardierei*) with Cotton Bush (*Maireana aphylla*) and Thorny Saltbush (*Rhagodia spinescens*). The ground cover may be sparse or dense depending on the season. It includes low shrubs such as Giant Redburr (*Sclerolaena tricuspis*), *Sclerolaena divaricata* and *Sclerolaena obliquicuspis*, Cannonball Burr (*Dissocarpus paradoxus*), *Salsola tragus* subsp. *tragus, Atriplex lindleyi* and *Atriplex holocarpa*. Grasses may dominate a site and they include the wallaby grasses *Austrodanthonia setacea* and *Austrodanthonia caespitosa,* Rough Spear Grass (*Austrostipa scabra*). A high proportion or the ground cover may be composed of weed species including *Hordeum* spp., *Bromus* spp. *Cucumis myriocarpus* subsp. *leptodermis* and medics (*Medicago* spp.). Dillon Bush (*Nitraria billardierei*) shrubland occurs in heavily disturbed sites and is probably a derived community possibly from previous Bladder Saltbush ID157) and Old Man Saltbush shrubland communities that were heavily modified by heavy grazing by domestic stock and rabbits. Dillon Bush shrubland also occurs on lands that have been cropped in the past.
Description within Subject Land	PCT 163 within the Subject Land is concentrated in the north-east and south-west whilst being absent through the middle (east to west) where the soil profile changes. It is characterised by a dominance of *Nitraria billardierei* (Dillon Bush) and *Sclerolaena tricuspis* in the shrub layer, although *Maireana aphylla* (Cotton Bush) continues to occur in lower densities as well as Thorny Saltbush (*Rhagodia spinescens*). The ground layer is dominated by a mix of forbs and grasses including *Austrostipa scabra, Atriplex lindleyi and Sclerolaena brachyptera* as the most frequent occurrences. Soils ranged from grey, brown and red-brown cracking clay and clay loam.
Associated species present	*Nitraria billardierei* (Dillon Bush), *Sclerolaena tricuspis* (Giant Redburr), *Maireana aphylla* (Cotton Bush), *Rhagodia spinescens* (Thorny Saltbush), *Sclerolaena muricata* (Black Roly Poly), *Austrostipa scabra* (Rough Speargrass), *Rytidosperma caespitosa* (Ringed Wallaby Grass), *Atriplex lindleyi* (Eastern Flat-top Saltbush), *Enchylaena tomentosa* (Ruby Saltbush), *Salsola australis, Einadia nutans* (Climbing Saltbush), *Sclerolaena brachyptera* (Short-winged Copperburr), *Walwhalleya proluta, Austrostipa elegantissima* (Feather Speargrass)
Vegetation Zones	One distinct condition state for areas mapped as PCT 163 occurs within the Subject Land, as outlined below: • Moderate condition, herein labelled as Vegetation Zone 2 (VZ2)

PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones

PHOTOGRAPH 4-6 PCT 163, VEGETATION ZONE 2



PHOTOGRAPH 4-7 PCT 163, VEGETATION ZONE 2



TABLE 4-7 PCT 164 DESCRIPTION

PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone	
PCT ID	164
PCT name	Cotton Bush open shrubland of the semi-arid (warm) zone
Vegetation formation	Arid Shrublands (Chenopod sub-formation)
Vegetation class	Riverine Chenopod Shrublands
TEC Status	PCT 164 has no associated BC Act or EPBC Act listed TECs
Percent cleared value	8.00%
BioNet VIS PCT Description	Low to mid-high sparse to mid-dense shrubland usually about 0.8 m high dominated by Cotton Bush (*Maireana aphylla*) with occasional remnant shrubs of Bladder Saltbush (*Atriplex vesicaria* s.l.). Smaller shrubs include copperburrs (*Sclerolaena muricata, Sclerolaena tricuspis* and *Sclerolaena bicornis*) and annual saltbushes (*Atriplex lindleyi, Atriplex leptocarpa*). The sparse ground cover contains native forbs such as paper daisies (Rhodanthe spp.), *Minuria cunninghamii*, and *Calotis scabiosifolia* var. *scabiosifolia* and grasses such as Austrodanthonia caespitosa. Often contains a very high cover of weed species including *Hordeum* spp., *Bromus* spp., *Vulpia* spp., Medicago spp., *Avena fatua* and *Lolium perenne*.
Description within Subject Land	PCT 164 occupies a majority of the Subject Land. The community presents as an open chenopod shrubland, dominated by *Maireana aphylla* (Cotton Bush) and the grasses, *Rytidosperma caespitosum* and *Austrostipa scabra.* A mix of characteristic forbs and small shrubs were also present. Soils were grey, brown and red-brown cracking clay and clay loam. PCT 164 was fairly variable across the site, and it is likely that this variation is in constant flux due to grazing regimes. Areas were sometimes hard to distinguish from grassland PCT 44 and Dillon Bush shrubland PCT 163. The distinguishing species, Cotton Bush, was used to determine PCT occurrence throughout the Subject Land.
Associated species present	*Nitraria billardierei* (Dillon Bush), *Sclerolaena tricuspis* (Giant Redburr), *Maireana aphylla* (Cotton Bush), *Rhagodia spinescens* (Thorny Saltbush), *Sclerolaena muricata* (Black Roly Poly), *Austrostipa scabra* (Rough Speargrass), *Rytidosperma caespitosa* (Ringed Wallaby Grass), *Atriplex lindleyi* (Eastern Flat-top Saltbush), *Enchylaena tomentosa* (Ruby Saltbush), *Salsola australis, Einadia nutans* (Climbing Saltbush), *Sclerolaena brachyptera* (Short-winged Copperburr), *Walwhalleya proluta, Austrostipa elegantissima* (Feather Speargrass), *Osteocarpum acropterum* (Bonefruit), Soft Horns (*Malacocera tricornis*), Bush Minuria (*Minuria cunninghamii*), *Sclerolaena bicornis*, *Plantago cunninghamii* (Sago-weed)
Vegetation Zones	One distinct condition state for areas mapped as PCT 164 occurs within the Subject Land, as outlined below: • Moderate condition, herein labelled as Vegetation Zone 1 (VZ1)

PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone

PHOTOGRAPH 4-8 PCT 164, VEGETATION ZONE 1



PHOTOGRAPH 4-9 PCT 164, VEGETATION ZONE 1



4.1.4.1 HAULAGE ROUTE

The haul route was assessed for the presence of native vegetation that aligns with NSW PCTs via rapid vegetation assessments. Noting no vegetation integrity surveys were undertaken in accordance with the BAM (2020).

Based on a review of the SVTM three PCTs are mapped across the Pinch Points:

- PP09 – PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion
- PP11 and 13 - PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone
- PP12 – PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone

As a result of the field verification surveys, PCT 28 has been discounted due to a lack of characteristic canopy species and the vegetation has been confirmed to comply with PCT 164.

Areas where trimming or removal of vegetation is required that has been deemed planted native vegetation not requiring assessment under the BOS and BAM (Pinch Points 10 and 17) are both mapped as PCT 0 - non-native vegetation under the SVTM.

4.1.5 THREATENED ECOLOGICAL COMMUNITIES

Three EPBC Act TECs were identified as part of the desktop assessment in the Protected Matters Search Tool as having the potential to occur within the Subject Land. An additional two TECs listed under either the BC Act and/or EPBC Act are associated with PCTs present within the Subject Land. Consideration of these TECs is provided in Table 4-8 .

TABLE 4-8 THREATENED ECOLOGICAL COMMUNITIES INVESTIGATION

TEC	BC Act	EPBC Act	Associated PCT	Recorded within the Subject Land
Artesian Springs Ecological Community in the Great Artesian Basin	Critically Endangered	-	PCT 160, 163	No – Subject Land is situated outside distribution, TEC is restricted to north-western NSW.
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	-	Endangered	-	No – No associated PCTs nor record of key diagnostic species, Buloke, recorded within the Subject Land.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Southeastern Australia	-	Endangered	-	No – No associated PCTs nor key diagnostic species, Grey Box (*Eucalyptus 75acrocarpa*), recorded within the Subject Land.
Natural Grasslands of the Murray Valley Plains	-	Critically Endangered	PCT 44	No – Further discussed in Section 2.2.3.
Weeping Myall Woodlands Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-	Endangered	Endangered	PCT 26	Yes – patches of associated PCT 26 meet the criteria for the BC Act listed EEC. The criteria for the EPBC Act listed TEC is not met.

TEC	BC Act	EPBC Act	Associated PCT	Recorded within the Subject Land
Darling Depression, Riverina and NSW South Western Slopes bioregions				Further discussed in Section 4.1.5.2

The Natural Grasslands of the Murray Valley Plains TEC was not deemed to occur in the Subject Land as discussed in Section 4.1.5.1. Weeping Myall Woodland EEC has been confirmed to occur within the Subject Land. This is further discussed in Section 4.1.5.2.

4.1.5.1 NATURAL GRASSLANDS OF THE MURRAY VALLEY PLAINS TEC

The Natural Grasslands of the Murray Valley Plains TEC is listed as 'Critically Endangered' under the EPBC Act and at current, has no associated TEC under the BC Act. A substantial part of the ecological community lies within Victoria, in which it is listed under the *Flora and Fauna Guarantee Act* (FFG Act) as the threatened Northern Plains Grassland ecological community and this listing does not extend into the Murray-Darling Depression IBRA Bioregion.

The TEC is characterised by native perennial tussock grasses with broad-leaved herbs interspersed between the tussocks and a lack of woody vegetation. The ecological community may display as a herb or forbland depending on seasonal conditions and forbs may be in equal or higher abundance to grasses. Soils on which the ecological community occurs is mostly restricted to heavy-textured grey, brown and red clays (TSSC 2012).

Within the Subject Land, the EPBC Act listed TEC has been assessed against the 48.06 ha of PCT 44 – Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion present. To be considered part of the EPBC Act listed TEC patches must meet the key diagnostic characteristics described in Table 4-9 , as per TSSC, 2012.

As described by the TSSC 2012, the naming of this TEC has intentionally used the term 'natural' to emphasise that the grassland community must be naturally occurring and not derived from another vegetation formation. The comparison of species between Tables 1(A) and 1(B) within the key diagnostic characteristics assessment is used to determine whether an area is a naturally occurring grassland or a derived community. The species in Table 1(A) are those more frequent in the grassland community and that are generally absent or sparse in those derived from chenopod shrublands, while the species in Table 1(B) are not considered to be the TEC. The BAM plots conducted within PCT 44 of the Subject Land show that only three species from Table 1(A) are present, compared to 17 from Table 1(B), indicating a chenopod shrubland derived community.

Due to the location of the Subject Land and the species composition within and surrounding the patches of PCT 44, it is evident that these grasslands are derived from chenopod shrublands and therefore do not conform with the Natural Grasslands of the Murray Valley Plains TEC.

TABLE 4-9 KEY DIAGNOSTIC CHARACTERISTICS FOR THE NATURAL GRASSLANDS OF THE MURRAY VALLEY PLAINS TEC

Key Diagnostic Characteristic	Response
In the Riverina Bioregion, Murray Darling Depression Bioregion or NSW South Western Slopes Bioregion?	Yes – but in the Murrumbidgee sub-region the northern most extent of the community and the Subject Land is beyond the predicted distribution
On a landscape of flat alluvial lowland plains with heavy-textured grey, brown and red clays?	Yes – the Subject Land is predominately Vertosols however, patches of PCT 44 mostly occur on the band of Rudosols running through the Subject Land
Characteristic genera are present: Grasses – *Rytidosperma, Austrostipa, Chloris* and *Enteropogon species* Forbs – *Arthropodium, Bulbine, Calotis, Chrysocephalum, Leptorhynchos, Minuria, Ptilotus, Rhodanthe, Sida and Swainsona* species Small shrubs - Atriplex and Maireana species	Yes – three grass genera (*Rytidosperma*, *Austrostipa* and *Chloris*), six forb genera (*Bulbine*, *Calotis, Leptorhynchos, Minuria, Rhodanthe* and *Sida*) and two small shrub genera (*Atriplex* and *Maireana*) present
Trees and large shrubs > 1 m are generally absent to sparse?	Yes – none present
Presence or past records of 'diagnostic' indicator fauna species such as the Plains-wanderer, Striped Legless Lizard, Hooded Scaly-foot or Curl Snake within the patch?	Yes – Plains-wanderer observed. No records or observations of the other indicator fauna species
The following applies to grasslands occurring in NSW in the Murrumbidgee IBRA subregion:	
There are more species present from Table 1(A) than in Table1(B)?	No – 3 species from Table 1(A): • *Bulbine bulbosa* • *Linum marginale* • *Myriocephalus rhizocephalus* 17 species from Table 1(B): • *Atriplex lindleyi* • *Austrostipa scabra* • *Bulbine semibarbata* • *Calotis hispidula* • *Chenopodium nitrariaceum* • *Einadia nutans* • *Malacocera tricornis* • *Nitraria billardierei* • *Rhagodia spinescens* • *Sclerolaena brachyptera* • *Sclerolaena diacantha* • *Sclerolaena muricata* • *Sclerolaena stelligera* • *Sclerolaena tricuspis* • *Sida intricata* • *Sida trichopoda* • *Zygophyllum glaucum*
Is there reliable evidence that a patch was once a woodland or shrubland with > 10% cover of trees and shrubs > 1 m? (If yes, patch is not considered part of the ecological community)	No – historical images dating back to the 1960's shows no evidence of tall shrubs or trees

Key Diagnostic Characteristic	Response
Soil type and landscape position corresponds with the ecological community and not other vegetation types?	No – the soil type and landscape position correspond with the chenopod shrubland and derived grassland communities of the area
Outcome	**Patches of PCT 44 within the Subject Land do not conform with the Natural Grasslands of the Murray Valley Plains TEC**

4.1.5.2 MYALL WOODLAND IN THE DARLING RIVERINE PLAINS, BRIGALOW BELT SOUTH, COBAR PENEPLAIN, MURRAY-DARLING DEPRESSION, RIVERINA AND NSW SOUTH WESTERN SLOPES BIOREGIONS

The Weeping Myall Woodland EEC listed under the EPBC Act as endangered is described as an open to closed woodland to 12 m tall that is either dominated or co-dominated by *Acacia pendula* (Weeping Myall). It is known to occur on inland alluvial plains across New South Wales and Queensland, west of the Great Dividing Range, on black, brown, red-brown or grey clay and clay loam soils. To be considered as a patch of Weeping Myall Woodland under the EPBC Act, the patch must be dominated (> 50%) by living or dead *Acacia pendula*, have at least 5% canopy cover and be greater than 0.5 ha in size (TSSC, 2009). The patches present within the Subject Land do not meet the minimum size of 0.5 ha and therefore are not considered to be present.

The Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions EEC listed under the BC Act describes the community that is either dominated or co-dominated by *Acacia pendula* that displays as either an open, closed or sparse low shrubland or woodland. The understorey generally consists of chenopod shrubs, grasses and herbs. The community occurs as patches across eastern parts of the Murray-Darling alluvial plains on red-brown, grey and brown soils in areas of rainfall between 375 and 500 mm.

There are no defined criteria under the BC Act listing for consideration and therefore any stands where *Acacia pendula* is dominant or co-dominant are to be treated as the EEC. 0.55 ha of this community occurs in the Subject Land as PCT 26; however, this has been completely avoided by the Disturbance Footprint. While the community will not be subject to any direct impacts, indirect impacts have been assessed and are discussed in Section 8.2.

4.1.6 VEGETATION ZONES

VZ were identified and delineated based on confirmed PCTs with similar levels of disturbance to growth form groups and/or extent of exotics. Four VZs were identified within the Disturbance Footprint a listed below:

- VZ 1 – PCT 164 of moderate condition;
- VZ 2 – PCT 163 of moderate condition;
- VZ 3 – PCT 44 of moderate condition; and
- VZ 4 – PCT 160 of moderate condition.

One vegetation zone, VZ 5, is present in the Micrositing corridor only and it is not present within the Disturbance Footprint and has therefore not been considered in the BAM-C. Details on vegetation zones and BAM plot requirements are provided in Table 4-10 and vegetation zones within the Subject Land are presented in Figure 4-2.

4.1.6.1 PATCH SIZE

Patch size of each vegetation zone was determined based on BAM Subsection 4.3.1. Patch sizes were assigned to vegetation zones within the Subject Land using ArcGIS to select boundaries depicted in the vegetation mapping for the Subject Land and aerial imagery. In accordance with the BAM, patch size area was assigned to each vegetation zone as a class, being < 5ha, 5–24 ha, 25–100 ha or ≥ 100 ha. The patch size for all zones was ≥ 100 ha.

The patches extend onto adjoining land beyond the footprint of the Subject Land. Patch size of each vegetation zone was determined to be greater than 100 ha, the maximum patch size to be entered into the BAM-C.

TABLE 4-10 VEGETATION ZONES AND PATCH SIZES

Vegetation zone ID	PCT ID	Condition/ other defining feature	Area (ha) in Disturbance Footprint	Patch size class	No. vegetation integrity plots required	No. vegetation integrity plots completed/used in assessment	Plot IDs of vegetation integrity plots used in assessment
VZ1	164	Moderate	855.73	>100 ha	7	31	Feb-02 Plot-1 Feb-04 Plot-2 Feb-05 Plot-3 Feb-06 Plot-4 Feb-07 Plot-5 Feb-08 Plot-6 Feb-09 Plot-7 Feb-10 Plot-8 Feb-11 Plot-9 Feb-12 Plot-10 Feb-15 Plot-11 Feb-16 Plot-12 Feb-19 NGH-7 ERM-04 NGH-8 NGH-11 NGH-19 NGH-20
VZ2	163	Moderate	268.58	>100 ha	7	8	Feb-03 NGH-6 Feb-22 NGH-13 Feb-23 NGH-18 Feb-25 NGH-25
VZ3	44	Moderate	4.78	>100 ha	2	2	Feb-01 Feb-13
VZ4	160	Moderate	1.84	>100 ha	1	1	160-01
VZ5	26	Moderate	0	>100 ha	N/A	N/A	N/A

4.1.7 VEGETATION INTEGRITY SCORES

The vegetation integrity score (VIS) is calculated in the online BAM Calculator (BAM-C) using the BAM plot data (i.e., composition, structure and function values (Appendix B) for each vegetation zone mapped within the Disturbance Footprint. The relevant BAM-C workings are summarized in Table 4-11.

TABLE 4-11 VEGETATION INTEGRITY SCORES

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?
VZ1	98.5	96.7	-	97.6	No
VZ2	97.8	86.8	-	92.2	No
VZ3	98	18.7	-	42.8	No
VZ4	86	65.5	-	75.1	No

4.2 BIRD COMMUNITY COMPOSITION

4.2.1 HABITAT

A relatively homogenous landform characterises the Subject Land (i.e., plain) and, with relatively consistent variation in vegetation structure (i.e., scattered low chenopod shrubs and tussocky groundcover), represent the main factors in defining bird habitat and associated composition. Dry chenopod shrublands and grasslands define that habitat values of the Subject Land, with the availability of water resources being seasonal and typical of a semi-arid climate.

The sparse occurrence of woody vegetation (i.e., trees and/or tall shrub canopy strata) means that many bird species reliant on hollows and/or tree canopies as part of their lifecycle are likely to have a patchy distribution and limited to the western boundary of the Project where canopy species occur. Similarly, water dependent species are also rare to absent as the flat plain that charactersies the Subject Land is generally dry with inundation being periodic and limited to lands with low relief.

Non-passerine bird species (birds not within the order Passeriformes) are most likely to benefit from the prevailing habitat characteristics of the Subject Land. Species likely to be observed include raptors, quails and allies, pigeons and doves, cockatoos and parrots, swifts and Emu. If observed, non-passerine species reliant on microhabitat offered by areas of wetland or a tree canopy would likely be transient such as grebes, pelicans and allies, herons and allies, ducks and allies, waders and gulls, cuckoos and kingfishers.

Smaller and/or generalist passerine species most likely to be observed in the Subject Land include crows, ravens, magpies, wrens and pipits. The presence of anthropogenic features such as fencelines, posts and dams would provide localised favourable conditions for some smaller passerine species such as larks, robins, wagtails, thornbills and finches. Non-passerine granivores such as parrots would also benefit from the presence of closed depressions like farm dams.

While trees and tall shrubs that typically support the lifecycle of passerine species do occur in the locality, the habitat that these features offer are typically restricted to proximal drainages located outside the Subject Land. Thus, passerine bird species that do occur in the Subject Land are either likely to have large home ranges (i.e., highly mobile) or are present in areas where tree cover is located nearby.

4.2.1.1 RESIDENT RAPTOR HABITAT

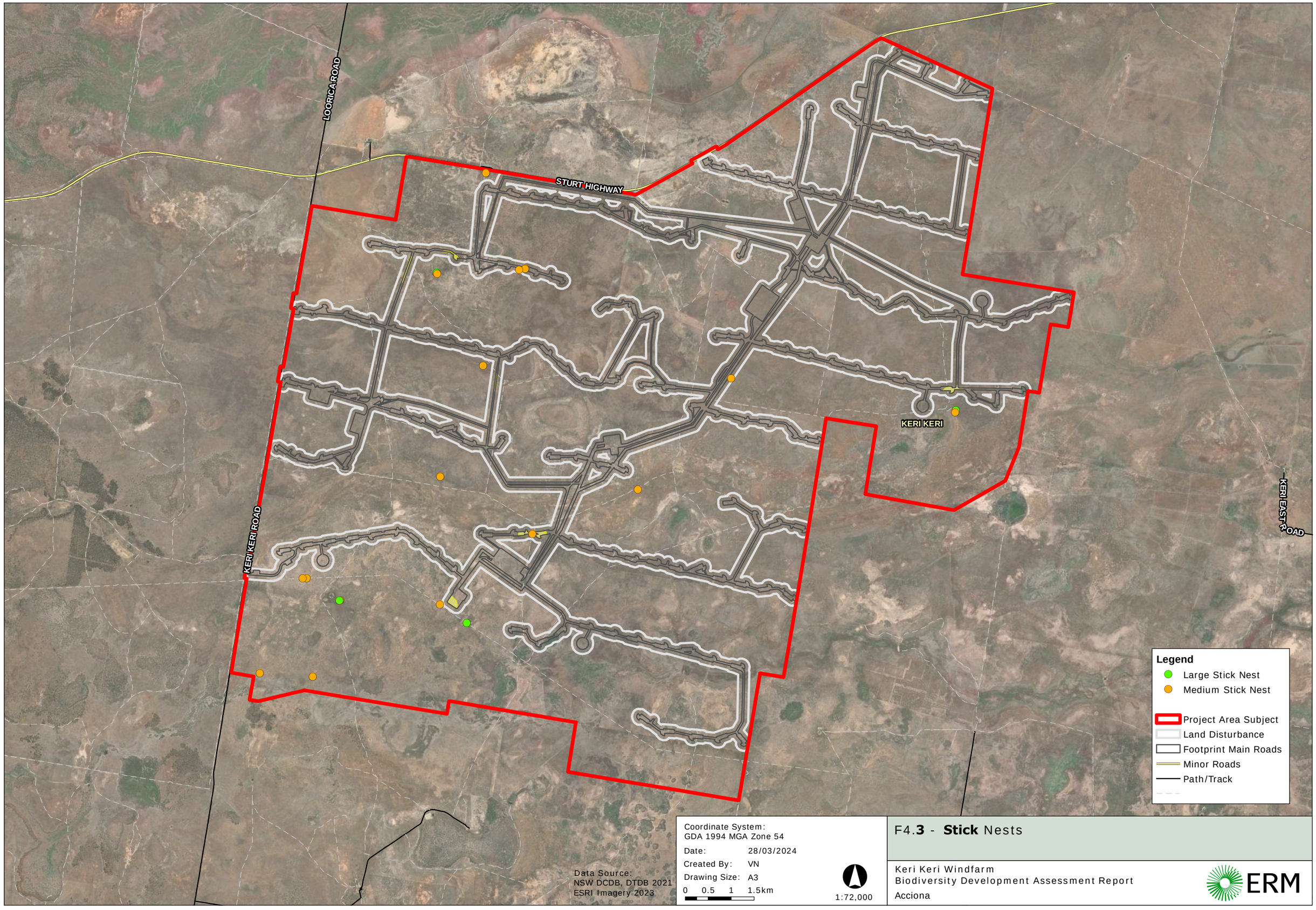
As per Section 6.1.5 of the BAM, the likely habitat for resident raptor species has been determined. This aligns with broad habitat types identified across the landscape. Broad habitat types have been grouped based on Keith (2004) vegetation class as presented in Table 4-12 . Woodland habitat has been observed to support resident raptor nesting sites, and as discussed in Section 7.1.1 relatively high levels of raptor activity. Avian activity was observed to dissipate in relation to proximity of woodland patches, with a decline in abundance evident at survey sites > 300 m from a woodland patch. The highly mobile raptor species are likely to utilise remaining grassland, shrubland, non-native vegetation and man-made structures (transmission towers) across the Subject Land to support foraging and nesting behaviours.

As all habitat across the Subject Land conforms with raptor habitat, resident raptors are anticipated to inhabit the entirety of the site.

TABLE 4-12 RAPTOR HABITAT TYPES

Broad Habitat Type	Vegetation Class (Keith 2004)	Extent in Subject Land (ha)	Extent in Disturbance Footprint (ha)
Grasslands	Riverine Plain Grasslands	40.72	5.14
Shrublands	Inland Floodplain Shrublands	15.10	4.76
	Riverine Chenopod Shrublands	4,139.47	1,121.04
Non-native Vegetation	Non-native Vegetation	32.80	8.09

A census of stick nest locations has also been collated and is shown in Figure 4-3 with the location of Wedge-tailed Eagle and likely Little Eagle nests also shown.



F4.**3** - **Stick** Nests

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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4.2.1.2 LISTED BIRD SPECIES

Threatened and/or migratory avian species observed within the Project Area are detailed in Table 4-13 and observation points are shown in Figure 4-4 .

TABLE 4-13 THREATENED FAUNA SPECIES OBSERVED

Common Name	Scientific Name	BC Act Listing	EPBC Act Listing	Number of Sightings
Little Eagle	*Hieraaetus morphnoides*	V	-	4 observations of 1 individual and 1 observation of 3 individuals
Black Falcon	*Falco subniger*	V	-	1 observation of 1 individual
Pink Cockatoo	*Lophochroa leadbeateri*	V	-	9 observations totaling 98 individuals observed
White-fronted Chat	*Epthianura albifrons*	V	-	Frequent observations totaling over 100 individuals
Spotted Harrier	*Circus assimilis*	V	-	7 observations of 1 individual
Plains-wanderer	*Pedionomus torquatus*	E	CE	1 observation of 1 individual
Blue-winged Parrot	*Neophema chrysostoma*	V	V	1 observation of 1 individual
Fork-tailed Swift	*Apus pacificus*	-	Mi	1 observation of 13 individuals and 1 observation of 30 individuals

LOORICA ROAD

STURT HIGHWAY

KERI KERI

KERI KERI ROAD

KERI EAST ROAD

Legend

Ecosystem Credit Species Observations:

- Black Falcon
- Pink Cockatoo
- Plains-wanderer
- Spotted Harrier
- White-fronted Chat

Threatened Species Observation:

- Blue-winged Parrot
- Fork-tailed Swift
- Little Eagle
- Project Area
- Disturbance Footprint
- Subject Land
- Main Roads
- Minor Roads
- Path/Track

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 26/03/2024

Created By: VN

Drawing Size: A3

0 0.5 1 1.5km

1:72,000

F4.4 - Listed Bird Sightings throughout the Project

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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4.3 BAT COMMUNITY COMPOSITION

Bat call analysis undertaken by Green Tape Solutions have identified fourteen species of microbat calls determined as either 'definite', 'probable' or 'possible' within the Project Area (Table 4-14).

TABLE 4-14 BAT CALL ANALYSIS RESULTS

Scientific Name	Common Name	BC Act	EPBC Act	Confirmed Presence
Austronomus australis	White-striped Freetail Bat	-	-	Definite
Chalinolobus gouldii	Gould's Wattled Bat	-	-	Definite
Chalinolobus morio	Chocolate Wattled Bat	-	-	Definite
Myotis macropus	Southern Myotis	V	-	Possible
Nyctophilus geoffroyi	Lesser Long-eared Bat	-	-	Possible
Nyctophilus gouldi	Gould's Long-eared Bat	-	-	Possible
Ozimops planiceps	South-eastern Freetail Bat	-	-	Definite
Ozimops ridei	Ride's Free-Tailed Bat	-	-	Definite
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Definite
Scotorepens balstoni	Inland Broad-nosed Bat	-	-	Definite
Scotorepens greyii	Little Broad-nosed Bat	-	-	Definite
Vespadelus darlingtoni	Large Forest Bat	-	-	Probable
Vespadelus regulus	Southern Forest Bat	-	-	Possible
Vespadelus vulturnus	Little Forest Bat	-	-	Possible

Eight microbat species were confirmed definite following the survey period, with an additional one probable call identified and five species calls possibly recorded. One listed threatened species, Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) 'Vulnerable' under the BC Act, has been confirmed to be present.

Southern Myotis (*Myotis macropus*) calls were potentially detected; however, these cannot be confirmed due to moderate to high probability of confusion with species of similar calls.

These results provide a preliminary assessment of bat community composition across the broader Project Area. Further assessment will be undertaken pre-construction and potential impacts to bat community composition will be assessed further in the Bird and Bat Adaptive Management Plan (BBAMP).

5. HABITAT SUITABILITY FOR THREATENED SPECIES

5.1 HABITAT SUITABILITY

Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. The TBDC identifies the threatened species assessed for ecosystem credits. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.

'Species credit species', also referred to as 'Candidate species', are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence. These species are identified in the TBDC. A targeted survey or an expert report is required to confirm the presence or absence of these species on the Subject Land. Alternatively, for a development, activity, clearing or biodiversity certification proposal only, the Applicant may elect to assume the species is present.

In some circumstances the TBDC may identify a threatened species that requires assessment for ecosystem credits and species credits (referred to as dual credit species). For dual credit species, part of the habitat is assessed as a species credit (e.g., breeding habitat or land mapped on an important habitat map for a species). The remaining habitat components for the species are assessed as an ecosystem credit (e.g., foraging habitat).

For a small number of threatened species, a habitat constraint may refer to a mapped location (Important Mapped Area) that identifies areas that are considered important for those species. Maps currently available relevant to the Subject Land include important areas for breeding of the Plains-wanderer (*Pedionomus torquatus*). These maps have been reviewed and it has been determined that the Subject Land does not form part of the important habitat mapping for this species. However, the Plains-wanderer has been observed within the Project Area and foraging habitat is considered to occur within the Subject Land and targeted surveys are not required.

The following sections identify the ecosystem credit species, species credit species and dual credit species relevant to this BDAR.

5.1.1 ECOSYSTEM CREDIT SPECIES

The ecosystem credit species predicted to occur on or use the Subject Land as advised by the BAM-C are listed in Table 5-1. No ecosystem credit species have been excluded from further assessment.

TABLE 5-1 PREDICTED ECOSYSTEM CREDIT SPECIES

Common name	Scientific name	Listing status		Species retained for further assessment	Associated PCT	Sensitivity to gain class
		BC Act	EPBC Act			
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Yes	160	Moderate
Australian Painted Snipe	*Rostratula australis*	E	E	Yes	160	Moderate
Black Falcon	*Falco subniger*	V	-	Yes	44, 160, 163, 164	Moderate
Blue-billed Duck	*Oxyura australis*	V	-	Yes	160	Moderate
Brolga	*Grus rubicunda*	V	-	Yes	160, 163	Moderate
Diamond Firetail	*Stagonopleura guttata*	V	-	Yes	44	Moderate
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	Yes	44, 160, 163, 164	Moderate
Freckled Duck	*Stictonetta naevosa*	V	-	Yes	160	Moderate
Grey Falcon	*Falco hypoleucos*	V	V	Yes	44, 160, 163, 164	Moderate
Little Eagle (Foraging)	*Hieraaetus morphnoides*	V	-	Yes	44, 160, 163, 164	Moderate
Little Pied Bat	*Chalinolobus picatus*	V	-	Yes	160, 163, 164	High
Magpie Goose	*Anseranas semipalmata*	V	-	Yes	160, 163	Moderate
Pink Cockatoo (Foraging)	*Lophochroa leadbeateri*	V	-	Yes	163	Moderate
Pied Honeyeater	*Certhionyx variegatus*	V	-	Yes	163	Moderate
Plains-wanderer (Foraging)	*Pedionomus torquatus*	E	CE	Yes	44	High
Redthroat	*Pyrrholaemus brunneus*	V	-	Yes	163	Moderate

Common name	Scientific name	Listing status		Species retained for further assessment	Associated PCT	Sensitivity to gain class
		BC Act	EPBC Act			
Spotted Harrier	*Circus assimilis*	V	-	Yes	44, 160, 163, 164	Moderate
White-bellied Sea-Eagle (Foraging)	*Haliaeetus leucogaster*	V	-	Yes	44, 160, 163, 164	High
White-fronted Chat	*Epthianura albifrons*	V	-	Yes	44, 160, 163, 164	Moderate
White-throated Needletail	*Hirundapus caudacutus*	-	V	Yes	44, 160	High
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	Yes	160	High

5.1.2 SPECIES CREDIT SPECIES

The species credit species (candidate species) identified by the BAM-C are listed in Table 5-1 and Table 5-3 .

TABLE 5-2 PREDICTED FLORA CANDIDATE SPECIES

Common Name	Scientific Name	Listing status		Species retained for further assessment	Associated PCTs
		BC Act	EPBC Act		
Austral Pillwort	*Pilularia novae-hollandiae*	E	-	No (geographical)	44
Bindweed	*Convolvulus tedmoorei*	E	-	No (vagrant)	44, 160, 163, 164
Chariot Wheels	*Maireana cheelii*	V	V	Yes	44, 164
Claypan Daisy	*Brachyscome muelleroides*	V	V	No (geographical)	44
Lanky Buttons	*Leptorhynchos orientalis*	E	-	No (degraded habitat)	44
Menindee Nightshade	*Solanum karsense*	V	V	No (vagrant)	160
Mossgiel Daisy	*Brachyscome papillosa*	V	V	Yes	44, 160, 163, 164
Red Darling Pea	*Swainsona plagiotropis*	V	V	No (degraded habitat)	44
Silky Swainson-pea	*Swainsona sericea*	V	-	No (degraded habitat)	44
Slender Darling Pea	*Swainsona murrayana*	V	V	Yes	44, 163, 164
Small Scurf-pea	*Cullen parvum*	E	-	No (degraded habitat)	44
Turnip Copperburr	*Sclerolaena napiformis*	E	E	No (degraded habitat)	44
Winged Peppercress	*Lepidium monoplocoides*	E	E	Yes	160, 163

TABLE 5-3 PREDICTED FAUNA SPECIES CREDIT SPECIES

Common name	Scientific name	Listing status		Dual credit species	Species retained for further assessment	Associated PCTs
		BC Act	EPBC Act			
Australian Bustard	*Ardeotis australis*	E	-	No	Yes	44, 160, 163, 164
Koala (Breeding)	*Phascolarctos cinereus*	E	E	No	No	160
Little Eagle (Breeding)	*Hieraaetus morphnoides*	V	-	No	Yes	44, 160, 163, 164
Pink Cockatoo (Breeding)	*Lophochroa leadbeateri*	V	-	Yes	No	163
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	No	No	164
Plains-wanderer (Breeding)	*Pedionomus torquatus*	E	CE	Yes	No	44
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	-	No	No	44, 160, 163, 164

5.1.3 EXCLUDED THREATENED SPECIES

Modification to the BAM-C generated list is appropriate where one or more of the following factors is relevant to the species:

- Disturbance;
- Vagrancy;
- Geographical limitations; and
- Absence of habitat constraints.

Fourteen species have been excluded from the assessment as outlined below:

- One species excluded based on the absence of Important Mapped Areas for the species across the Subject Land:
  - Plains-wanderer (*Pedionomus torquatus*);
- Two species excluded based on TBDC listed geographical constraints:
  - Austral Pillwort (*Pilularia novae-hollandiae*);
  - Claypan Daisy (*Brachyscome muelleroides*);
- Four species excluded based on TBDC listed habitat constraints:
  - Koala (*Phascolarctos cinereus*);
  - Pink-tailed Legless Lizard (*Aprasia parapulchella*);
  - Pink Cockatoo (*Lophochroa leadbeateri*);
  - White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
- Two species were excluded because of vagrancy:
  - Bindweed (*Convolvulus tedmoorei*);
  - Menindee Nightshade (*Solanum karsense*);

- Five species were excluded because of habitat degradation (PCT 44):
  - Lanky Buttons (*Leptorhynchos orientalis*);
  - Red Darling Pea (*Swainsona plagiotropis*);
  - Silky Swainson-pea (*Swainsona sericea*);
  - Small Scurf-pea (*Cullen parvum*); and
  - Turnip Copperburr (*Sclerolaena napiformis*).

Further assessment was undertaken for the remaining species.

Justification for the exclusion of threatened species in this assessment is provided in Table 5-4.

TABLE 5-4 JUSTIFICATION FOR EXCLUSION

Common Name	Scientific Name	Justification for Exclusion
Austral Pillwort	*Pilularia novae-hollandiae*	Subject Land is not situated east of Deniliquin, NSW.
Bindweed	*Convolvulus tedmoorei*	The normal distribution of the species is north of the Subject Land and outside the Murrumbidgee IBRA subregion. As shown in Figure 5-5, species records indicate a central Australian distribution across a broad area referred to as channel country (i.e., the catchment associated with Lake Eyre). The Subject Land is situated over 150 km west from the sole Murrumbidgee IBRA subregion collection, which is over 50 years old (1969). This record, which has not been confirmed since 1969, is the most southeastern extent of the species with no other collections occurring in the Murrumbidgee IBRA subregion. NSW SC (2002) notes the species is known from only two collections, made in 1969 and 1971. BioNet records show occurrences near Broken Hill, NSW, approximately 350 km northwest of the Subject Land in the Barrier Range and Barrier Range Outwash IBRA subregions. Other records also exist in the Louth Plains IBRA subregion and Sturt Stoney Desert IBRA subregion.
Claypan Daisy	*Brachyscome muelleroides*	Subject Land is not situated east of the Cobb Highway.
Menindee Nightshade	*Solanum karsense*	The normal distribution of the species is north of the Subject Land and outside the Murrumbidgee IBRA subregion. As shown in, species records indicate a far western NSW distribution across a broad area between the lakes north of Balranald and Broken Hill with incidence strongly aligned to the immediate floodplains and lakes of the Darling and Lachlan River systems. The Subject Land is situated at least 45 km southeast of the nearest record, which is in the South Olary Plain IBRA subregion. This record is over 100 years old. The next closest record is approximately 50km to the northwest on the boundary between the Lachlan and Murrumbidgee IBRA subregions, which is over 24 years old (2000). These records, which lie outside or on the border of the Murrumbidgee IBRA subregion have not been

Common Name	Scientific Name	Justification for Exclusion
		reconfirmed since and represent most southeastern extent of the species. There are no other collections occurring in the Murrumbidgee IBRA subregion. The core occurrence of this species is in the Menindee IBRA subregion, which is at least 250km to the northwest of the Subject Land.
Lanky Buttons	*Leptorhynchos orientalis*	PCT association limited to PCT 44. PCT 44 is in a low condition state within the Disturbance Footprint (i.e., degraded). Higher condition patches of potential habitat are avoided.
Red Darling Pea	*Swainsona plagiotropis*	PCT association limited to PCT 44. PCT 44 is in a low condition state within the Disturbance Footprint (i.e., degraded). Higher condition patches of potential habitat are avoided.
Silky Swainson-pea	*Swainsona sericea*	PCT association limited to PCT 44. PCT 44 is in a low condition state within the Disturbance Footprint (i.e., degraded). Higher condition patches of potential habitat are avoided.
Small Scurf-pea	*Cullen parvum*	PCT association limited to PCT 44. PCT 44 is in a low condition state within the Disturbance Footprint (i.e., degraded). Higher condition patches of potential habitat are avoided.
Turnip Copperburr	*Sclerolaena napiformis*	PCT association limited to PCT 44. PCT 44 is in a low condition state within the Disturbance Footprint (i.e., degraded). Higher condition patches of potential habitat are avoided.
Koala	*Phascolarctos cinereus*	Subject Land does not contain Koala use trees.
Pink-tailed Legless Lizard	*Aprasia parapulchella*	Subject Land does not contain Rocky areas, nor is it situated within 50 m of rocky areas.
Pink Cockatoo (Breeding)	*Lophochroa leadbeateri*	Subject Land does not contain living or dead trees with hollows greater than 10 cm diameter.
Plains-wanderer	*Pedionomus torquatus*	Subject Land does not occur within species 'Important Mapped Areas'.
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	Subject Land does not contain living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.

5.2 HABITAT SURVEYS: CANDIDATE SPECIES CREDIT SPECIES

A targeted survey or an expert report is required to confirm the presence of these species on the Subject Land. Alternatively, for a development activity, the Applicant may elect to assume the species is present.

5.2.1 CANDIDATE SPECIES OCCURRENCE

Presence of a species can be determined based on the following:

- Assumed presence within the Subject Land;
- An Important Mapped Area (for dual credit species);
- Targeted threatened species surveys; or

- An expert report.

Table 5-5 details candidate species assessed as not occurring within the Disturbance Footprint.

TABLE 5-5 THREATENED SPECIES EFFORT

Species	Effort / Justification
Small Scurf-pea *Cullen parvum*	Targeted flora surveys for *Cullen parvum* were completed in associated PCTs (PCT 44). PCT 44 within the Subject Land and Disturbance Footprint is limited and therefore survey efforts within the appropriate season outside of the Subject Land are being considered to determine absence of the species. Despite the survey effort, no records of the species were observed. The nearest recent records (2014) of this species are located approximately 130 km south-east and 200 km east of the Subject Land. The species is restricted to the edge of creeks and gullies in box-gum and red gum communities that are not known to the Subject Land. Based on survey effort completed across the Subject Land, substantial distance from known records and degraded state of the habitat present within the Disturbance Footprint, the species is not considered to be impacted by the Project.
Winged Peppercress *Lepidium monoplocoides*	Targeted flora surveys for *Lepidium monoplocoides* were completed in associated PCTs (PCT 160 and 163). Despite the survey effort, no records of the species were observed. The nearest recent records are located approximately 45 km west (2005) and 50 km east (2023) from the Subject Land. The species is known to prefer mallee scrub and open-woodland, commonly dominated by *Allocasuarina leuhmannii, Eucalyptus largiflorens* or *Eucalyptus populnea*, habitat which is not present within the Subject Land. Based on survey effort completed across the Subject Land, substantial distance from recent records and lack of suitable habitat, the species is not considered to occur within the Subject Land.
Lanky Buttons *Leptorhynchos orientalis*	Targeted flora surveys for *Leptorhynchos orientalis* were completed in associated PCTs (PCT 44). PCT 44 within the Subject Land and Disturbance Footprint is limited and therefore survey efforts within the appropriate season outside of the Subject Land are being considered to determine absence of the species. Despite the survey effort, no records of the species were observed. The nearest recent records (2015, 2016) of the species are located approximately 200 km east of the Subject Land. The species is known to occur in woodland or grassland, sometimes on the margin of swamp and is threatened by cropping, over-grazing and weed invasion. The grasslands present in the Subject Land are highly disturbed and in low condition and therefore unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from known records and degraded state of the habitat present within the Disturbance Footprint, the species is not considered to be impacted by the Project.

Species	Effort / Justification
Turnip Copperburr *Sclerolaena napiformis*	Targeted flora surveys for *Sclerolaena napiformis* were completed in associated PCTs (PCT 44). PCT 44 within the Subject Land and Disturbance Footprint is limited and therefore survey efforts within the appropriate season outside of the Subject Land are being considered to determine absence of the species. Despite the survey effort, no records of the species were observed. The current NSW populations of Turnip Copperburr are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. There is one recent record (2018) approximately 70 km south-east of the Subject Land. Noting also, the EPBC distribution map for the species does not intersect the Subject Land. The species is known to occur in grasslands and Buloke woodlands. The grasslands present in the Subject Land are highly disturbed and in low condition and therefore unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from known records and degraded state of the habitat present within the Disturbance Footprint, the species is not considered to be impacted by the Project.
Menindee Nightshade *Solanum karsense*	Targeted flora surveys for *Solanum karsense* were completed in associated PCTs (PCT 160). PCT 160 within the Subject Land and Disturbance Footprint is limited and therefore survey efforts within the appropriate season outside of the Subject Land are being considered to determine absence of the species. Despite the survey effort, no records of the species were observed. The nearest known record of the species (2009) is located 130 km north-east of the Subject Land noting also, the EPBC distribution map for the species does not intersect the Subject Land. The species is known to occur in proximity to floodplain lakes, depressions, and Black Box swamps. Based on survey effort completed across the Subject Land, substantial distance from recent records and lack of suitable habitat, the species is not considered to occur within the Subject Land.
Red Darling-pea *Swainsona plagiotropis*	Targeted flora surveys for *Swainsona plagiotropis* were completed in associated PCTs (PCT 44). PCT 44 within the Subject Land and Disturbance Footprint is limited and therefore survey efforts within the appropriate season outside of the Subject Land are being considered to determine absence of the species. Despite the survey effort, no records of the species were observed. The nearest recent record (2021) is approximately 150 km east of the Subject Land noting also, the EPBC distribution map for the species does not intersect the Subject Land. The species is generally restricted to the Jerilderie area in areas of grassland and roadsides with unimproved pasture that are lightly grazed. The grasslands present in the Subject Land are highly disturbed and in low condition and therefore unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from known records and degraded state of the habitat present within the Disturbance Footprint, the species is not considered to be impacted by the Project.

Species	Effort / Justification
Silky Swainson-pea *Swainsona sericea*	Targeted flora surveys for *Swainsona sericea* were completed in associated PCTs (PCT 44). PCT 44 within the Subject Land and Disturbance Footprint is limited and therefore survey efforts within the appropriate season outside of the Subject Land are being considered to determine absence of the species. Despite the survey effort, no records of the species were observed. The nearest recent record (2022) is approximately 70 km east of the Subject Land. The species has been found very rarely in surveys of the Riverina, most records in the region are historical (over 20 years old). The species occurs in grassland and eucalypt woodland habitats. The grasslands present in the Subject Land are highly disturbed and in low condition and therefore unlikely to support the species. Based on survey effort completed across the Subject Land, substantial distance from known records and degraded state of the habitat present within the Disturbance Footprint, the species is not considered to be impacted by the Project.
Australian Bustard *Ardeotis australis*	Survey effort for Australian Bustard across the Subject land has consisted of 20 person hours during Spring 2020 and 8 person hours during Spring 2022, performed as driven diurnal surveys along roads through suitable habitat, using the point count method over 500 m, stopping every 100 m to record for 10 minutes, noting all bird species observed. Additionally, teams of up to six ecologists traversed the Subject Land and surrounds and conducted BUS over nine survey events, making opportunistic species records. Despite the survey effort, no records of the species were observed. There are two recent records of the species (2017, 2018) within 25 km of the Subject Land, observed along the Sturt Highway. In NSW, the species is generally restricted to the north-west region and breeding is known to only occur in this area. Records outside of this area are attributed to vagrancy. Survey effort is considered sufficient to detect presence of the species within the Subject Land however, ongoing monitoring and consideration within the BBAMP is required.

5.2.1.1 ASSUMED PRESENCE

Targeted threatened flora surveys were completed across the Subject Land, presence for threatened flora has been assumed in areas where survey was not completed to the level of requirement as detailed in the BAM. Three species credit species are assumed to be present across the Subject Land.

Species assumed to be present are provided below:

- Chariot Wheels (*Maireana cheelii*) (excluding PCT 44 due to degraded habitat);
- Mossgiel Daisy (*Brachyscome papillosa*) (excluding PCT 44 due to degraded habitat); and
- Slender Darling Pea (*Swainsona murrayana*) (excluding PCT 44 due to degraded habitat).

Additional targeted surveys during the response to submissions phase is proposed for the above species to delineate the extent of occupied habitat.

5.2.1.2 PRESENT THREATENED SPECIES

Fourteen threatened species have been determined to occur within the Subject Land, with an additional one species assumed to be present (*Swainsona murrayana*, recorded within the Project Area) and one microbat species 'possible' (*Myotis macropus*). These species are detailed in Table 5-6.

Species polygons are required to be prepared in accordance with the BAM for each species credit species present, or assumed to be present, within the Subject Land. Species polygons have been developed for four species and are based on the species polygon specifications outlined in the TBDC and relevant guidelines for the species detailed in Table 5-7 . Species Polygons are presented in Figure 5-1 (Chariot Wheels), Figure 5-2 (Slender Darling Pea), Figure 5-3 (Mossgiel Daisy) and Figure 5-4 (Little Eagle).

Targeted threatened flora transects were undertaken across the Subject Land. Species polygons have excluded areas surveyed where no individuals were recorded. The area of exclusion was developed based on flora transect lines, with a buffer of 7.5 m applied. The applied buffer is based on 15 m transects for open vegetation, with 7.5 m being the line of sight from each transect line (NSW DPIE, 2020).

This assessment has not utilised expert reports in place of any threatened species surveys.

It is noted that three listed species not populated by the BAM-C were detected across the Subject Land. Fork-tailed Swifts, a migratory species listed under the EPBC Act, Southern Myotis that had a possible detection by Anabat devices but has no associated PCTs within the Subject Land, and the Blue-winged Parrot which became listed in NSW in late 2023 and is yet to be incorporated into the BAM-C, TBDC and BioNet Atlas.

Table 5-1 lists the species credit species that have been assessed as occurring within the Disturbance Footprint. None of the remaining candidate species credit species, or their habitat components (e.g., hollow bearing trees) were detected within the Subject Land during targeted surveys.

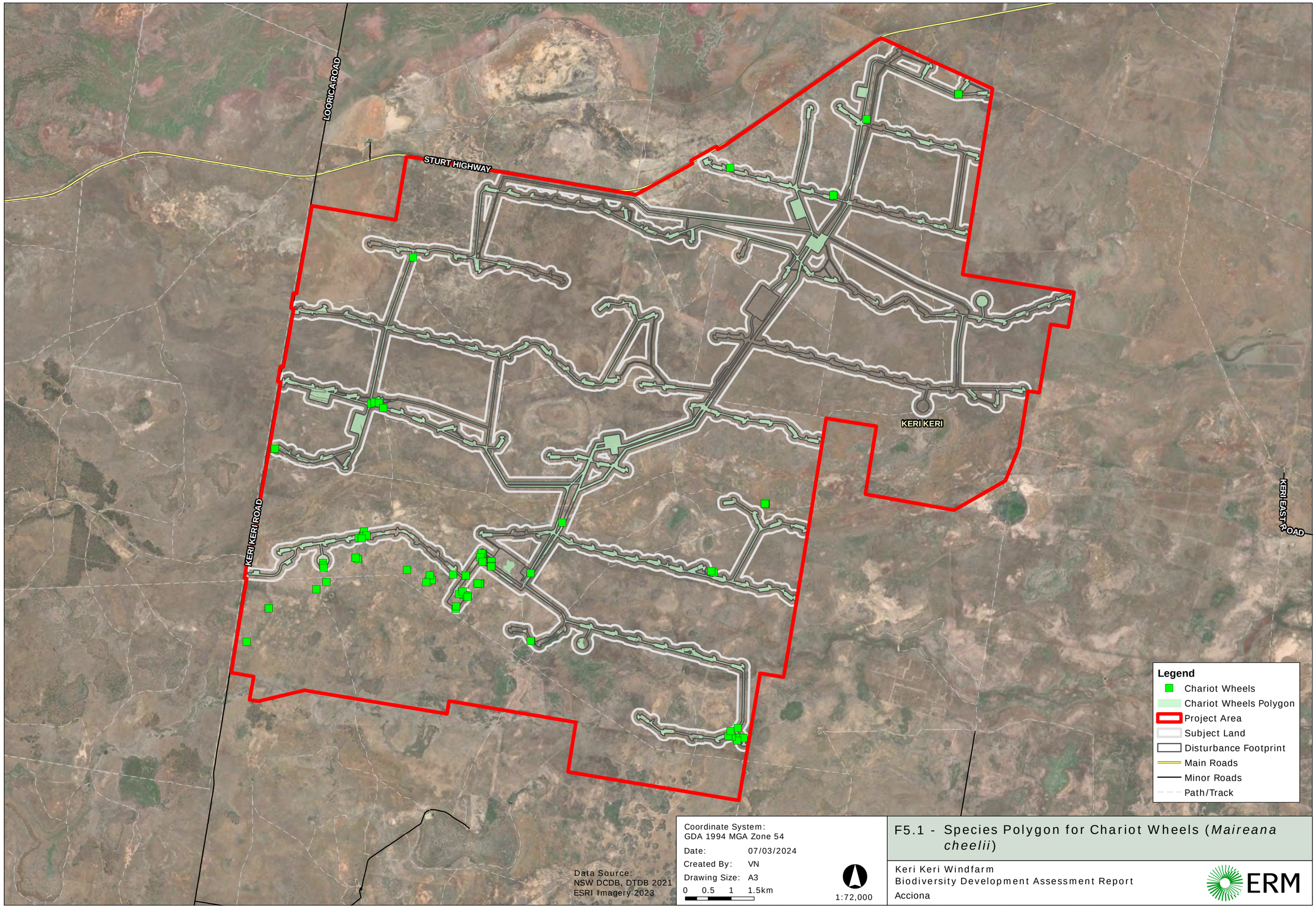
TABLE 5-6 PRESENT AND ASSUMED THREATENED SPECIES

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Candidate Species							
Little Eagle	*Hieraaetus morphnoides*	V	-	1.5	No	Recorded across the Project Area above a range of PCTs, with up to three individuals present at one time.	Any medium to large stick nest has been mapped as potential breeding habitat for the Little Eagle and a 300 m buffer applied to create the species polygon.
Chariot Wheels	*Maireana cheelii*	V	V	2.0	No	Recorded in association with claypans across Subject Land in PCTs 163 and 164 and assumed present in all unsurveyed claypans.	Chariot Wheels were observed across the Subject Land and broader Project Area within claypan microhabitats associated with PCTs 163 and 164. Species Polygons have been developed taking the local microhabitat features into consideration and applying a 30 m buffer to records to account for potential seasonal variation. The Species Polygon is based on the above buffer, in addition to unsurveyed areas of all claypans where the species is assumed to be present.
Slender Darling Pea	*Swainsona murrayana*	V	V	2.0	No	Recorded in PCT 163 in the broader Project Area, assumed present in all unsurveyed areas of associated PCTs 163 and 164.	Species polygon has been developed by assuming presence in all areas of unsurveyed associated PCTs in a non-degraded state (163, 164). Unsurveyed areas are defined as any area not surveyed within the correct season, by applying a buffer of 15 m (observers range of view) to areas that have been surveyed and removing these from total area.
Mossgiel Daisy	*Brachyscome papillosa*	V	V	2.0	No	Recorded within Subject Land in PCTs 163 and 164 and assumed present in all unsurveyed areas of associated PCTs 160, 163 and 164.	Species polygon has been developed by assuming presence in all areas of unsurveyed associated PCTs in a non-degraded state (163, 164). Unsurveyed areas are defined as any area not surveyed within the correct season, by applying a buffer of 15 m (observers range of view) to areas that have been surveyed and removing these from total area.

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Ecosystem Credit Species							
Black Falcon	*Falco subniger*	V	-	N/A	No	Recorded during several survey events within and in proximity to the Subject Land.	N/A
Little Eagle	*Hieraaetus morphnoides*	V	-	N/A	No	Recorded during several survey events within and in proximity to the Subject Land.	N/A
Pink Cockatoo	*Lophochroa leadbeateri*	V	-	N/A	No	Recorded flying over during survey events in 2021 within and in proximity to the Subject Land.	N/A
Plains-wanderer	*Pedionomus torquatus*	E	CE	N/A	No	Recorded opportunistically in October 2021 in PCT 44 outside of the Subject Land.	N/A
Spotted Harrier	*Circus assimilis*	V	-	N/A	No	Recorded during survey events in 2023 displaying hunting behaviours within and in proximity to the Subject Land.	N/A

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity	Record Notes	Species Polygon
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*	V	-	N/A	No	Definite recording on 7 Anabat recorders in Summer 2022 (Appendix D).	N/A
Blue-winged Parrot	*Neophema chrysostoma*	V	V	N/A	No	One individual recorded in October 2023	N/A No guidance for the assessment of this species has been released in NSW, in the interim we are assessing this species as an ecosystem species.
White-fronted Chat	*Epthianura albifrons*	V	-	N/A	No	Recorded within open chenopod shrublands across the Subject Land during all survey events.	N/A
Other listed species							
Fork-tailed Swift	*Apus pacificus*	-	Mi	N/A	No	Recorded flying over the Project	N/A
Southern Myotis	*Myotis Macropus**	V	-	N/A	No	Possible recording on 6 Anabat recorders in Summer 2022 (Appendix D)	Species Polygons for the Southern Myotis are developed where recordings are situated within 200 m boundary of associated PCTs. No associated PCTs are present within the Subject Land, nor suitable breeding/roosting habitat in proximity to possible recordings within the Subject Land.

**Possible: call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.*

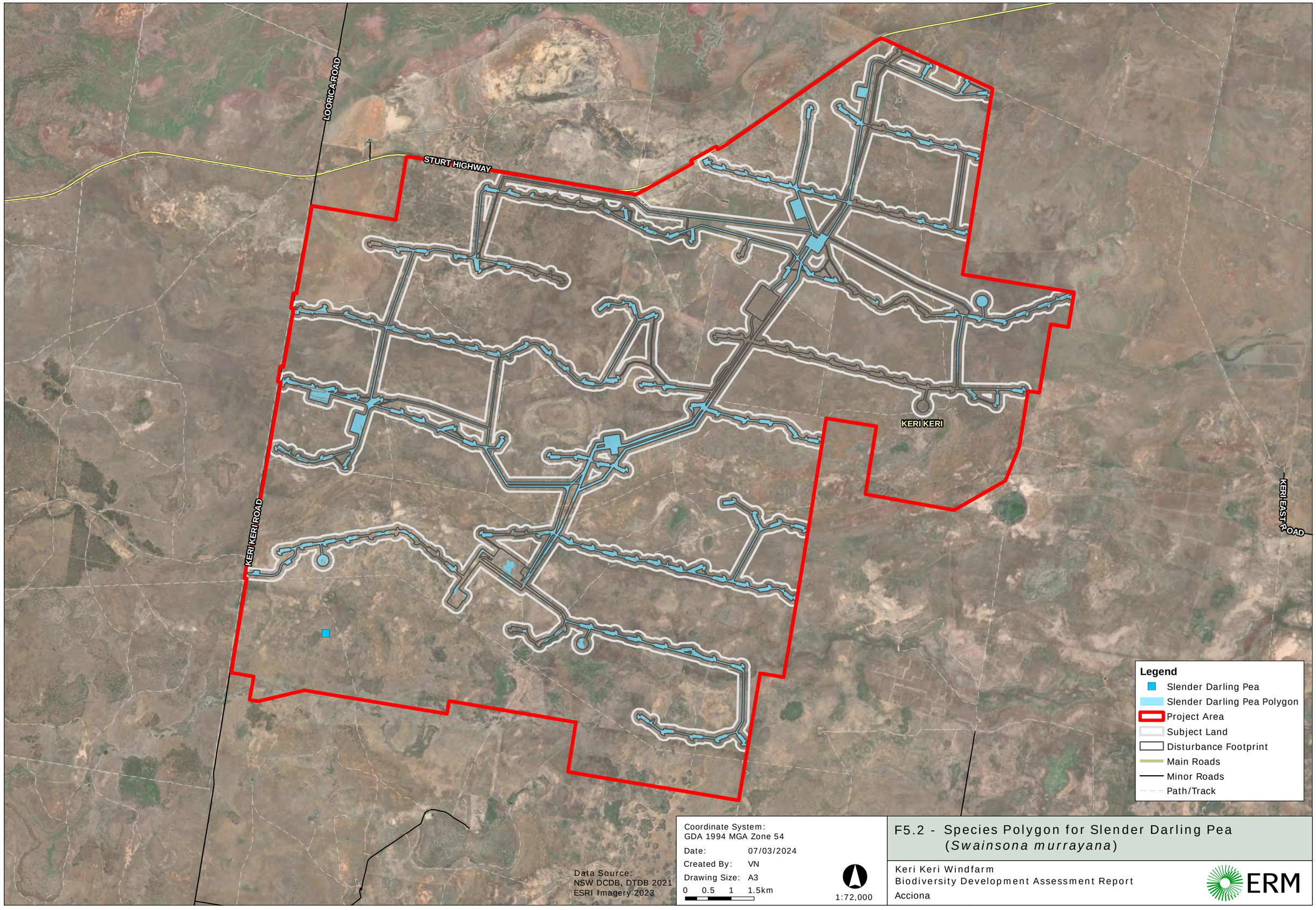


F5.1 - Species Polygon for Chariot Wheels (*Maireana cheelii*)

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

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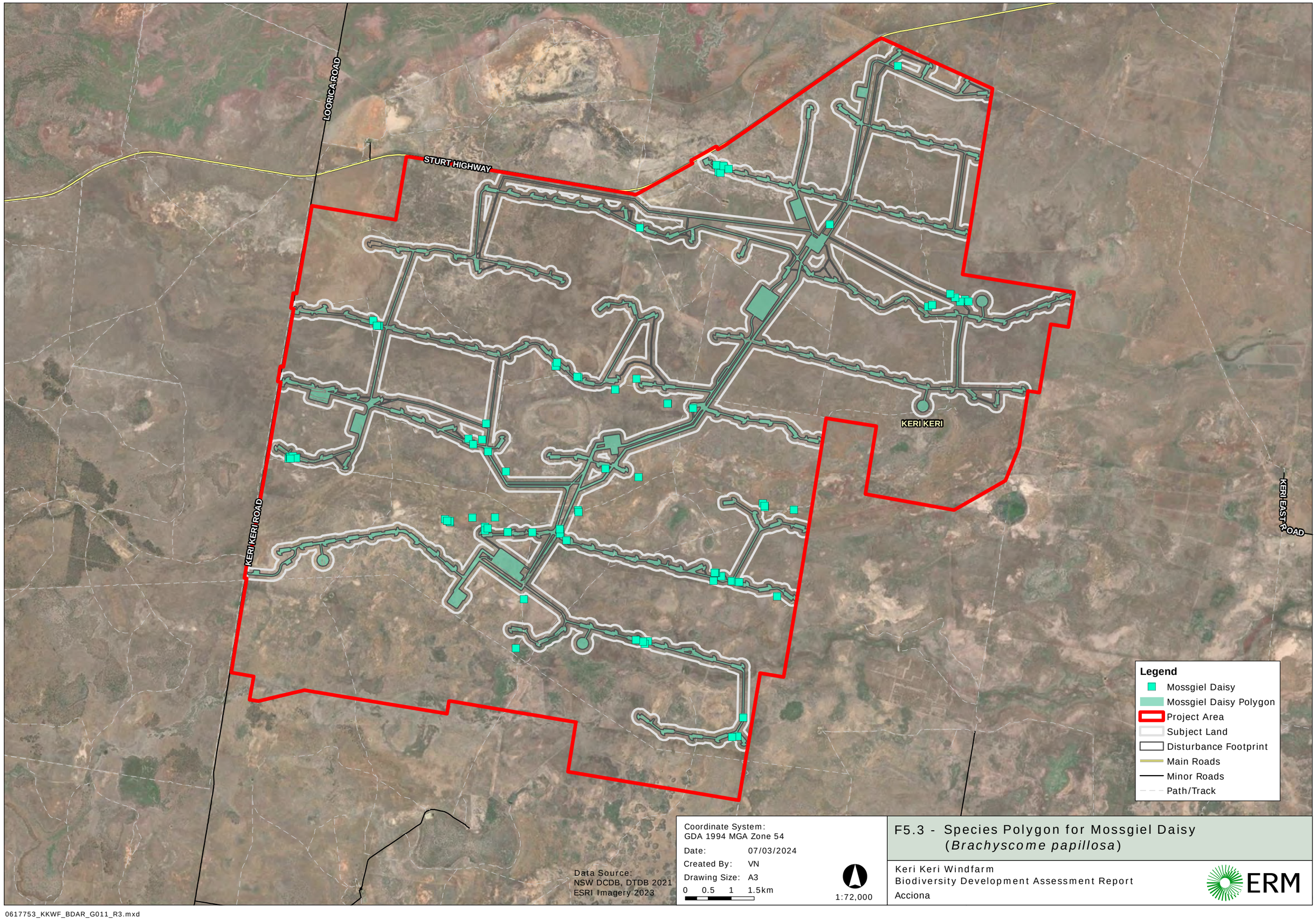


F5.2 - Species Polygon for Slender Darling Pea (*Swainsona murrayana*)

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ERM

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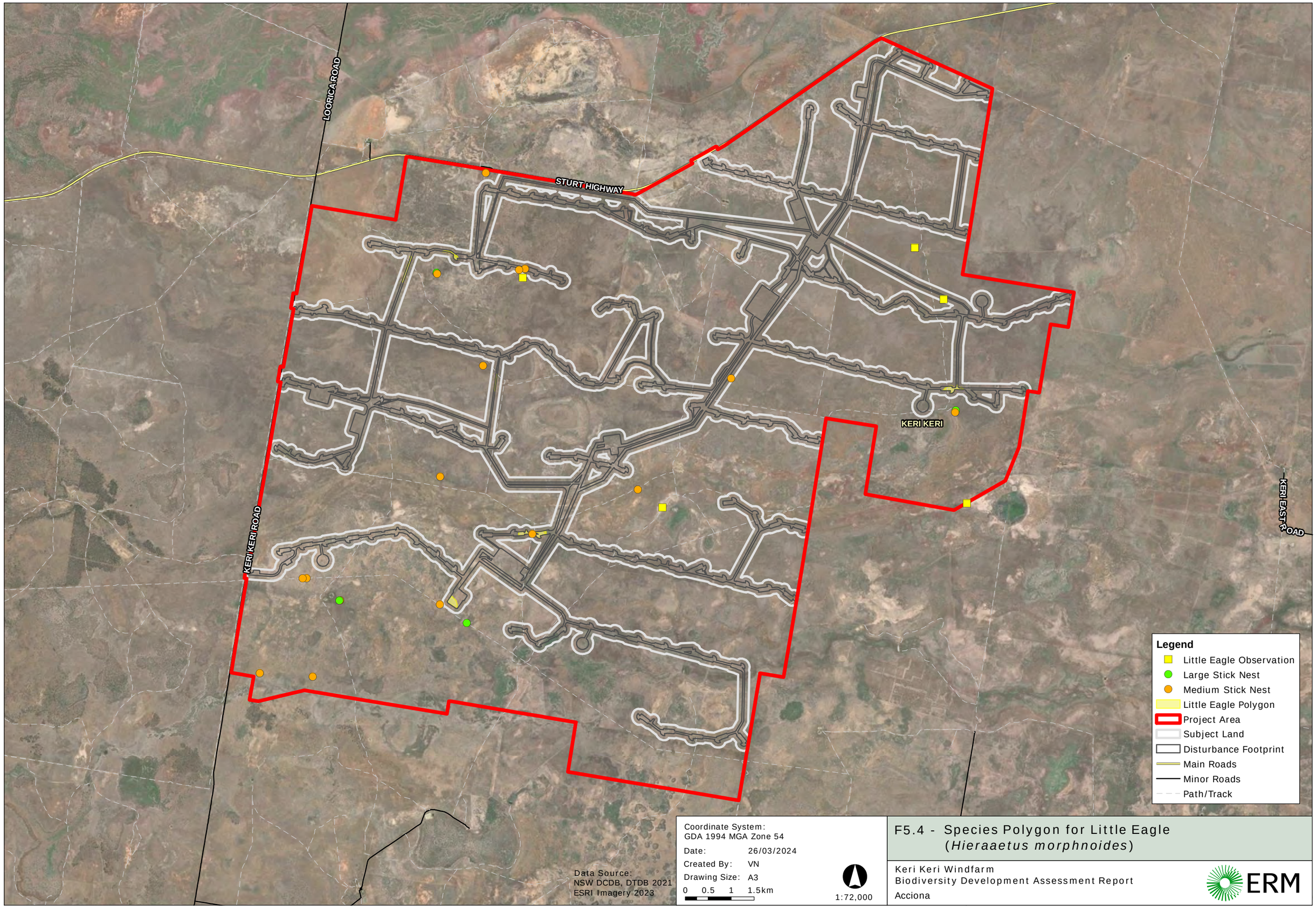


F5.3 - Species Polygon for Mossgiel Daisy (*Brachyscome papillosa*)

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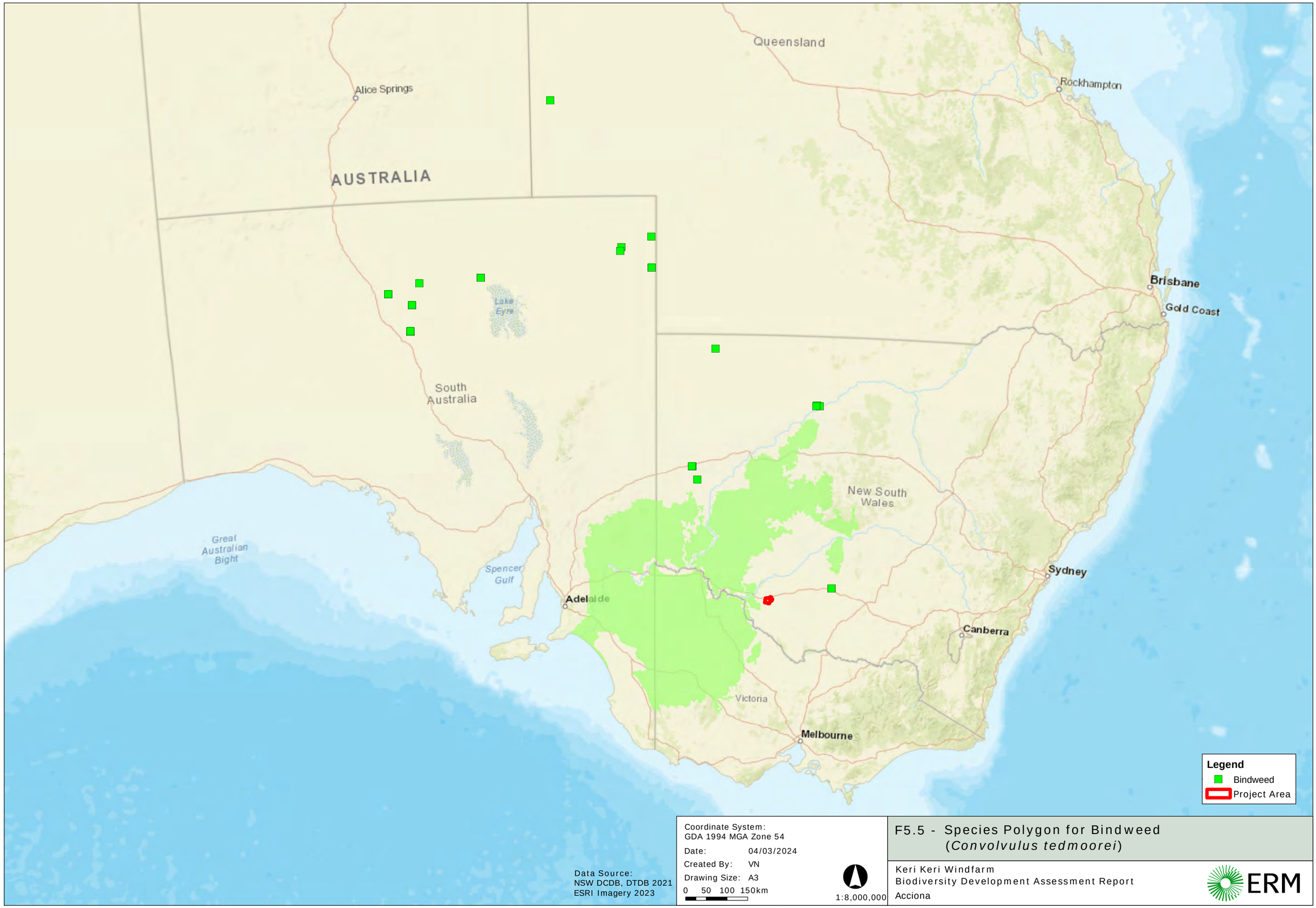


F5.4 - Species Polygon for Little Eagle (*Hieraaetus morphnoides*)

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ERM

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Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54
Date: 04/03/2024
Created By: VN
Drawing Size: A3
0 50 100 150km

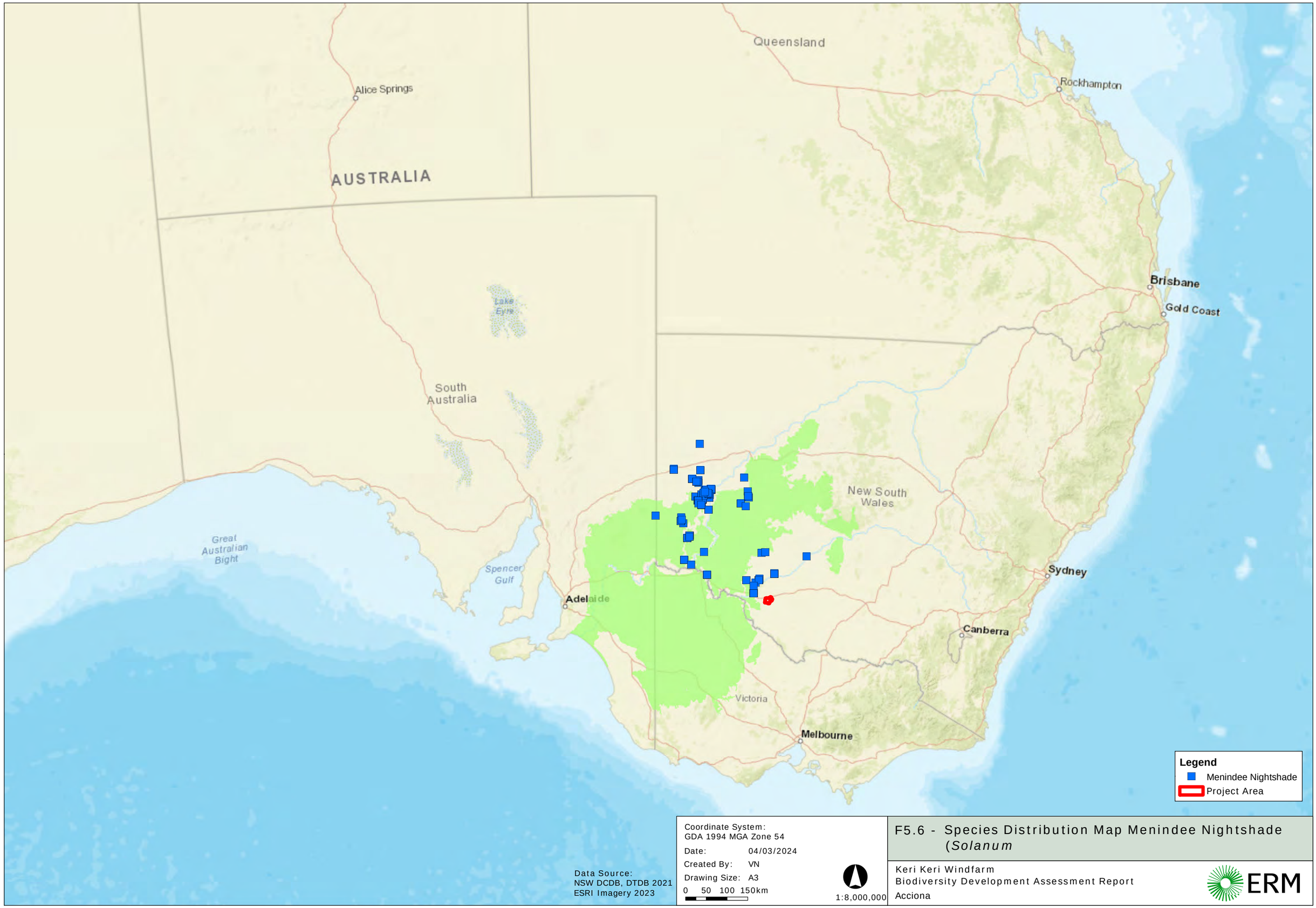
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F5.5 - Species Polygon for Bindweed (*Convolvulus tedmoorei*)

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Biodiversity Development Assessment Report
Acciona

ERM

0617753_KKWF_BDAR_G013_R2.mxd



Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54
Date: 04/03/2024
Created By: VN
Drawing Size: A3
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F5.6 - Species Distribution Map Menindee Nightshade (*Solanum*

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5.3 SUPPLEMENTARY SEARS REQUIREMENTS

Supplementary SEARs provided by the Commonwealth, identified additional matters for consideration, as listed in Table 5-7 . Table 6-1 discusses the methods used to determine presence and impact of the Project to the identified threatened entities.

Field surveys concluded that three of the threatened flora species (*Maireana cheelii, Brachyscome papillosa* and *Swainsona murrayana*) are present and will be impacted by the Project. The remaining two threatened flora species identified have been concluded to not occur within the Project Area. One threatened fauna species (*Pedionomus torquatus*) is known to occur within the Project Area, with foraging habitat subject to impacts by the Project. The remaining eight fauna species are concluded to not occur within the Project Area.

Potential presence of two TECs were assessed against the EPBC Act criteria and were found not to conform with the key criteria for the communities and the remaining three TECs are concluded to not occur within the Project Area.

TABLE 5-7 SUPPLEMENTARY SEARS OUTCOMES

Threatened Species/Community	EPBC Act Listing	Survey Method	Outcome
Likely Significant Impact			
Natural Grasslands of the Murray Valley Plains	CE	• Rapid vegetation assessment • BAM Plots	Areas of PCT 44 associated with the TEC have been assessed against the EPBC Act listing criteria and have been found not to confirm with the TEC (see Section 4.1.5.1).
Plains-wanderer (*Pedionomus torquatus*)	CE	• Targeted threatened fauna survey • BUS	Plains-wanderer has been found to occur within the Project Area. Areas of suitable habitat have been mostly avoided by the Project and habitat has been determined as foraging habitat only (i.e., no Important Habitat Mapping occurs, indicating no breeding habitat is present). Higher condition state occurrence of PCT 44 have been avoided.
Winged Peppercress (*Lepidium monoplocoides*)	E	• Targeted threatened flora surveys • BAM Plots	Targeted threatened flora surveys and BAM plots have been conducted in PCTs associated with the species and are sufficient to conclude absence of the species.
Chariot Wheels (*Maireana cheelii*)	V	• Targeted threatened flora surveys • BAM Plots	Chariot Wheels has been found to occur across the Subject Land and impacts have been avoided where possible. Direct impact resulting from the clearing of vegetation will occur as a result of the Project.
Mossgiel Daisy (*Brachyscome papillosa*)	V	• Targeted threatened flora surveys • BAM Plots	Mossgiel Daisy has been found to occur across the Subject Land and impacts have been avoided where possible (e.g. avoid higher condition states of PCT 44). Direct impact resulting from the clearing of vegetation will occur as a result of the Project.
Potential Significant Impact			
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	CE	• Rapid vegetation assessment • BAM Plots	No PCTs associated with this TEC occur within the Subject Land. No key characteristic species of the TEC have been recorded.
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	E	• Rapid vegetation assessment • BAM Plots	No PCTs associated with this TEC occur within the Subject Land. No key characteristic species of the TEC have been recorded.

Threatened Species/Community	EPBC Act Listing	Survey Method	Outcome
Weeping Myall woodlands	E	• Rapid vegetation assessment • BAM Plots	Small patches of Weeping Myall woodlands have been found to occur within the Subject Land. These patches have been assessed against the EPBC Act listing criteria and have been found not to confirm with the TEC (see Section 4.1.5.2).
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Southeastern Australia	E	• Rapid vegetation assessment • BAM Plots	No PCTs associated with this TEC occur within the Subject Land. No key characteristic species of the TEC have been recorded.
Flathead Galaxias (*Galaxias rostratus*)	CE	• Likelihood of Occurrence Assessment	A likelihood of occurrence assessment was conducted for the species and found the species unlikely to occur (see Section 3.1.1.1).
Australian Painted Snipe (*Rostratula australis*)	E	• Likelihood of Occurrence Assessment	A likelihood of occurrence assessment was conducted for the species and found the species unlikely to occur (see Section 3.1.1.1).
Australasian Bittern (*Botaurus poiciloptilus*)	E	• BUS	BUS surveys across the Subject Land have been conducted in accordance with relevant guidelines are considered adequate to detect the species. No observation of the species has been recorded within the Project Area.
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	• Anabat deployment	7 Anabat devices were deployed across the Project Area in areas of suitable habitat for bat species and recorded for 7 nights. No detection of species presence was recorded.
Growling Grass Frog (*Litoria raniformis*)	V	• Habitat Assessments • Amphibian Aural-Visual Surveys	Areas of potential suitable habitat have been assessed across the Project Area and were refined to two dams. Aural-visual surveys in accordance with the relevant guidelines were conducted and did not detect species presence.
Grey Falcon (*Falco hypoleucos*)	V	• BUS	BUS surveys across the Subject Land have been conducted in accordance with relevant guidelines are considered adequate to detect the species. No observation of the species has been recorded within the Project Area.
Malleefowl (*Leipoa ocellata*)	V	• BUS	BUS surveys across the Subject Land have been conducted in accordance with relevant guidelines are considered adequate to detect the species. No observation of the species has been recorded within the Project Area.

Threatened Species/Community	EPBC Act Listing	Survey Method	Outcome
Painted Honeyeater (*Grantiella picta*)	V	• BUS	BUS surveys across the Subject Land have been conducted in accordance with relevant guidelines are considered adequate to detect the species. No observation of the species has been recorded within the Project Area.
Austrostipa metatoris	V	• Targeted threatened flora surveys • BAM Plots	Targeted threatened flora surveys and BAM plots have been conducted in areas of suitable habitat for the species and are sufficient to conclude absence of the species.
Slender Darling-pea (*Swainsona murrayana*)	V	• Targeted threatened flora surveys • BAM Plots	Slender Darling-pea has been found to occur within the Project Area and impacts have been avoided where possible. Direct impact resulting from the clearing of vegetation will occur as a result of the Project.

6. IDENTIFYING PRESCRIBED IMPACTS

Prescribed impacts are identified in Clause 6.1 of the BC Regulation. Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development on the habitat of threatened species or ecological communities associated with:
  - Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
  - Human-made structures;
  - Non-native vegetation;
- Development on areas connecting threatened species habitat, such as biodiversity corridors;
- Impacts on water quality, waterbodies and hydrological processes that sustain threatened species and TECs;
- Wind turbine strikes on protected animals; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

The BAM does not provide an approach to determine the number and class of biodiversity credits that are required for a prescribed impact. However, the additional prescribed impacts on biodiversity may be considered by a consent authority when they determine the biodiversity credits required to be retired (or other conservation measures required to be taken) under a planning approval.

An assessment of the relevance of these prescribed impacts to the Project is provided in Table 6-1 .

TABLE 6-1 ASSESSMENT OF PRESCRIBED IMPACTS

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes ☒No	Not present within the Subject Land.	N/A
Human-made structures	☐Yes ☒No	Not present within the Subject Land.	N/A
Non-native vegetation	☒Yes ☐No	Areas within the Subject Land are mapped under the LLS Act as Category 1 – 'Exempt land', land not subject to clearing approval. This vegetation is non-native vegetation and is associated with access tracks.	Non-native vegetation within the Disturbance Footprint is minimal and it is considered unlikely that the disturbance to this feature will have a significant impact on threatened species.
Habitat connectivity	☐Yes ☒No	The Subject Land has low levels of connectivity as discussed in Section 3.1.	N/A
Waterbodies, water quality and hydrological processes	☐Yes ☒No	Two farm dams are situated across the Subject Land, and the site intersects an ephemeral creek line, Abercrombie Creek, as discussed in Section 3.1. These features are not considered likely to sustain threatened species.	Threatened, migratory and resident avian and microbat species have potential to be impacted by changes to waterbodies, water quality and hydrological processes. Mitigation measures will be implemented to reduce this risk, as discussed in Section 7.2.1.
Wind turbine strikes	☒Yes ☐No	The Project involves the construction of wind turbines.	Threatened, migratory and resident avian and microbat species have potential to be impacted by wind turbine strike. A detailed assessment is provided for this impact. Mitigation measures will be implemented to reduce the risk of turbine strike, this is discussed in Section 7.2.2.
Vehicle strikes	☒Yes ☐No	The Project is located south of the Sturt Highway and east of the unsealed public road Keri Keri Road and will include the construction of internal access tracks. It is possible that fauna will venture onto these roads and access tracks, particularly during the construction phase, resulting in vehicle strikes.	Threatened avian species have been recorded across the Subject Land and broader Project Area, including the ground-dwelling Plains-wanderer. These species are at risk of vehicle strike because of the Project. Mitigation measures will be implemented to reduce the risk of vehicle strike, discussed in Section 7.2.3.

STAGE 2: IMPACT ASSESSMENT (BIODIVERSITY VALUES AND PRESCRIBED IMPACTS)

7. AVOID AND MINIMISE IMPACTS

7.1 AVOID AND MINIMISE DIRECT AND INDIRECT IMPACTS

Since the conception of this Project, the design has evolved through consideration of technical, environmental, social, and commercial constraints. A significant aspect of this design refinement was engaged with landowners, neighbours to the Project, the broader community, local government, State and Federal Agencies, and business and stakeholder groups. This engagement, along with technical studies undertaken, has helped to shape the current layout of the disturbance footprint.

7.1.1 PROJECT LOCATION AND DESIGN

7.1.1.1 STRATEGIC DEVELOPMENT CONTEXT

The Project is located in the South West REZ. The South West REZ encompasses some of Australia's best natural energy resources. The location of the South West REZ was selected based on detailed geospatial mapping, which identified areas of high renewable energy resource potential (e.g. wind speeds, solar irradiance), proximity to existing transmission infrastructure, and interactions with existing land uses. The South West REZ was declared by the Minister for Energy and Environment on 4 November 2022. The declaration begins the process of formalising the REZ under the *Electricity Infrastructure Investment Act 2020*, establishes EnergyCo as the Infrastructure Planner for the REZ, and sets the intended network capacity. The declaration of the South West REZ also supports the implementation of the AEMOs Integrated System Plan.

The Project is strategically located within the South West REZ and aligns with the strategic objectives of the South West REZ. The Project will deliver affordable clean energy, contribute to the diversification of the NSW energy sector, and facilitate the expansion of electrical transmissions capabilities and opening new parts of the NEM for energy generation. The Project has been optimised to make the most of the wind resources, allowing clean, reliable energy that can be matched with transmission and demand. The intent of the REZs is to set up renewable resource rich areas with the right infrastructure and transmission capacity to facilitate the delivery of clean energy where it is needed.

The Subject Land is situated at an optimal location to benefit from the South West REZ and can demonstrate the suitability of its location against the Wind Energy Framework for State Significant Development (DPE, 2016) outlined in Table 7-1.

TABLE 7-1 SITE SELECTION JUSTIFICATION CRITERIA

Preferable site condition	Applicability to the Project
Optimal renewable energy resources	The Project is located within an area of mapped high wind speeds. There are several other existing and proposed renewable energy projects located within the region and in close proximity to the Project Area.
Suitable land	The Project is located on relatively flat topography and low relief on RU 1 zoning which allows for the development of complementary non-agricultural land use that is compatible with the existing land uses of the Site and its surrounding areas.
Local impacts minimised	The Project is located within a remote and sparsely populated area with limited receptors in close proximity to the Project Area. The disturbance footprint incorporates a minimum buffer of 3 km between a WTG and the 11 non-involved dwellings.
Proximity to electrical network	The Project is located within the proposed EnergyConnect corridor, and a 220 kV transmission line is pre-existing within the Project Area.
Accessibility	The Project Area is easily accessible via the Sturt Highway and Keri Keri Road.

7.1.1.2 PROJECT DESIGN AND ITERATION

A preliminary constraints assessment of potential wind farm layouts was undertaken during the early Project feasibility assessment phase. The Scoping Report (ERM, 2022) submitted for the NSW request for Project SEARs identified aspects of highly sensitive Aboriginal cultural heritage and ecological areas.

The Project's disturbance footprint, which was proposed prior to completing ecological surveys to understand constraints across the Subject Land, originally consisted of an area of approximately 4,392 ha, hosting up to 176 WTGs (Figure 7-1). This proposed layout had the potential to impact stick nests seen to be utilised by raptor species, including Wedge-tailed Eagles and of potential use by Little Eagle, Black Falcon and other raptor species, as well as known populations of Chariot Wheels and Mossgiel Daisy.

As ecological surveys and vegetation community mapping progressed across the Subject Land, areas of constraint were identified and mapped. The Project Layout and Disturbance Footprint have been refined to respond to these constraints. The Subject Land has since been reduced to an area of 4,229 ha, turbines reduced to 155 and turbine layer relocated to avoid areas of high constraint in the south and north-eastern pocket of the Project Area. These amendments to the layout have reduced the area of impact to known threatened flora species populations and minimises the impact on PCT 44 that supports grassland specialist species including the Plains-wanderer, Lanky Buttons and Silky Swainson Pea.

Since Project conception, the design has evolved through consideration of technical, environmental, social, and commercial limitations. A significant aspect of this design refinement comprised engagement with landowners, neighbours to the Project, the broader community, local government, State and Federal Agencies, and business and stakeholder groups. This engagement, along with technical studies undertaken, has helped to shape the current Disturbance Footprint presented in this report.

The Project has been designed in a manner to avoid impact to remnant woodland vegetation present across the Project Area, wetland areas associated with Abercrombie Creek, resident raptor and threatened raptor nests, TECs and threatened species habitat. The avoidance of all patches of remnant woodland has reduced the potential to impact several species including birds and mammals that utilise hollows, and ground-dwelling species that require fallen timber for shelter. Remnant woodland habitat present in the Project Area was identified as having high biodiversity value for resident fauna within an otherwise open landscape, and in areas constituted threatened ecological communities. The BC Act listed EEC Myall Woodland in the Darling Riverina Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes Bioregion is confirmed within the Subject Land. The mapped extent of this TEC has been avoided by the Project design so that no direct impacts will occur. Mitigation measures will be put in place to ensure no indirect impacts are placed upon the patch of TEC.

During the field survey events it was observed that the Project Area supported several breeding raptors, with numerous large stick nests observed hosting a range of species, located in living and dead trees as well as infrastructure including transmission towers and windmills. Nankeen Kestrel (*Falco cenchroides*), Brown Falcon (*Falco berigora*), Wedge-tailed Eagle (*Aquila audax*) and Black-shouldered Kite (*Elanus asimillis*) have all been observed utilising stick nests across the Project Area. Evidence of Little Eagle (*Hieraaetus morphnoides*) breeding has been observed with a sighting of three individuals within the Project Area. As a result, all stick nests present within the Project Area have been considered as potential breeding habitat for the species and have been mapped as such, avoided where possible and incorporated into the species polygon.

One observation of Plains-wanderer (*Pedionomus torquatus*) was recorded in a patch of PCT 44, approximately 1 m beside a farm track. While there are no areas of Important Habitat Mapping for the species within the Project Area, areas of PCT 44 that have the potential to offer dispersal and foraging habitat for the species have been largely avoided. The total area of PCT 44 within the Project Area is 1,136 ha. Only 4.78 ha of PCT 44 are within the Disturbance Footprint.

The Project has been designed to maximise use of existing public and internal access tracks and access points across the Project Area where possible, minimising vegetation clearance required and preventing an increase to predatory access routes and activity. The Project design will also allow for the implementation of plain wire fencing to be used as perimeter fencing in place of barbed wire fencing, to reduce potential impacts from entanglement, particularly for the Eastern Grey (*Macropus giganteus*) and Red Kangaroo (*Macropus rufus*) and Emu (*Dromaius novaehollandiae*) known to frequently occur.

During the field survey events it was observed that wetland communities were present across the southern portion of the Project Area as presented in Figure 2-3. During the initial four (4) survey events, these habitats were consistently dry despite regular rainfall events. During the 2023 surveys, all mapped wetlands were inundated because of substantial rainfall and flooding across the site in previous months. These habitats were observed to support a variety of water birds. The Project design was amended to avoid a large majority of wetland habitat as mapped in Figure 2-3.

One ephemeral creekline intersects the Subject Land, fish passage will be provided for in the design of waterway crossings of this creekline. The design and construction of waterway crossings on the Subject Land will be undertaken in accordance with the Department's Policy and Guidelines for Fish Habitat Conservation and Management (Update 2013) and Why Do fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (2003). Further, any temporary waterway crossings will be removed immediately upon completion of the various stages of construction.

The Project design has been revised and refined for the EIS based on detailed assessments and in response to the identification and assessment of environmental limitations, constructability requirements, and consideration of the outcomes of agency, landowner, and community consultations.

Table 7-2 summarises the evolution of the Project layout and the amendment responses to key environmental and other land use limitations identified.

TABLE 7-2 PROJECT AMENDMENTS

Project Element	Project Area	Initial Layout (Scoping)	Current Layout
Subject Land	N/A	4,392 ha	4,229 ha
Disturbance footprint	N/A	1,135 ha	1,137 ha
No. of WTGs	N/A	176	155
Site Access Roads	N/A	Access via Keri Keri Road and Sturt Highway	Access via Keri Keri Road and Sturt Highway
Electrical Reticulation Network	N/A	~ 383 km of internal electrical reticulation network, comprising 350 km underground and 33 km overhead 33 kV and 132 kV	~ 239.8 km of internal electrical reticulation network, comprising 175.3 km of underground and 64.5 km of overhead 33 kV
		~ 13 km of 330 kV overhead transmission lines	~ 20.0 km of 330 kV overhead transmission lines
Weeping Myall TEC	0.65 ha	0 ha	0 ha
Woodland PCTs	15.88 ha	0 ha	0 ha

7.1.1.3 ALTERNATIVE LOCATIONS THAT WOULD AVOID OR MINIMISE IMPACTS ON BIODIVERSITY VALUES AND JUSTIFICATION FOR SELECTING THE PROPOSED LOCATION

The Project is located within the dedicated South West REZ and the Applicant does not have alternative sites proposed for this Project. A careful site selection process was undertaken for the development by the Applicant focusing on the key requirements of the Project. Initial feasibility studies of the land surrounding the currently selected Subject Land including reviews of the following aspects:

- Access to transmission line infrastructure for connection to the grid;
- Potential biodiversity and environmental limitations;
- Community and stakeholder acceptance;
- Topographic limitations;
- Land access and ownership; and
- Solar resource potential.

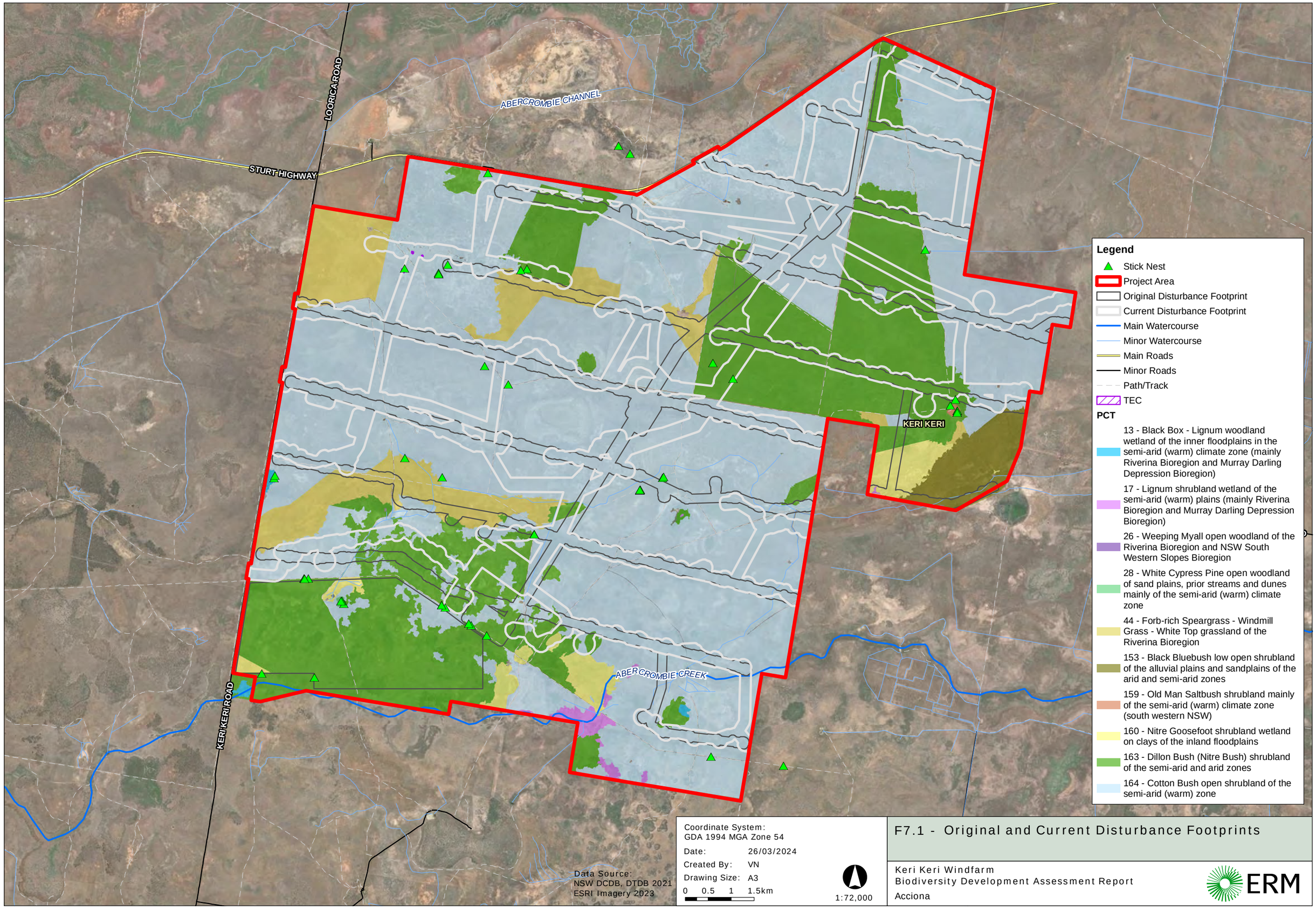
The Applicant considered several alternative sites that did not meet these criteria. The site location for the Project was selected as it ranked highest in each of these criteria at the time of assessment.

7.1.2 ALTERNATIVE HAUL ROUTES

The Haul Route due diligence assessment (Appendix A) identified the proposed transport route for oversized and overmass (OSOM) vehicles between the Port of Newcastle and the Project, or the Port of Adelaide and the Project. These transport routes are further considered by the Applicant as detailed in Appendix A.

7.1.2.1 FURTHER MEASURES TO AVOID AND MINIMISE IMPACTS

Impacts will be further avoided and minimised through several measures, designed to protect retained and adjacent vegetation and habitat during construction, operation and decommissioning phases. These measures are detailed in Section 7.2 of this BDAR.



F7.1 - Original and Current Disturbance Footprints

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7.2 AVOID AND MINIMISE PRESCRIBED IMPACTS

7.2.1 WATERBODIES, WATER QUALITY AND HYDROLOGICAL PROCESSES

Changes to drainage can affect the integrity, structure and composition of habitat and thus, have secondary impacts on the species that may rely on them. Several minor waterways occur through the Subject Land.

The Project is likely to slightly modify the current hydrological regimes of the Subject Land. However, given that the vegetation communities and threatened species occurring within the Subject Land are not reliant on specific hydrological regimes, and that they currently exist in an agricultural environment where these processes have already been altered (farm dams, channels, etc.), it is unlikely that any alteration as a result of the Project will significantly impact these vegetation communities or threatened species.

The removal of farm dams that have the potential to hold water for large parts of the year is a potentially impactful process. Avoidance of dams has been conducted throughout the design reduction phase. However, two dams remain within the Disturbance Footprint and will be subject to mitigation measures.

7.2.2 WIND TURBINE STRIKES

To minimise any potential impacts to bird and bat species, associated with operation of the WTGs, within the vicinity of the Subject Land, a BBAMP will be prepared. The BBAMP will intend to enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory species. Monitoring will also identify any potential changes to the species' utilisation of the Subject Land and the surrounding landscape.

In accordance with the draft BBAMP guidance provided by DPE (27th July 2023), the following aspects of the draft BBAMP have been detailed in the following sections:

- BBAMP objectives and consent conditions;
- Baseline data;
- Proposed monitoring program;
- Preliminary turbine risk assessment;
- Proposed trigger action response plan;
- Offsetting and compensatory means; and
- Proposed turbine strike notification process.

The final BBAMP is to be prepared in consultation with the Biodiversity Conservation Division (BCD), following approval of the Project.

7.2.3 VEHICLE STRIKES

Vehicle strikes can pose a substantial threat to wildlife, including ground-dwelling species such as the Plains-wanderer, and protected species such as Emus and Kangaroos. The Project will result in an increased vehicular presence across the Subject Land. The site is situated to the south of the Sturt Highway, and to the east of Keri Keri Road, and proposes the construction of internal access tracks. It is possible that fauna will venture onto these roads and access tracks resulting in vehicle strikes.

The highest risk period for vehicle collision is anticipated during the construction and decommissioning stages, which generate trips associated with the workforce accessing and traversing the site and the delivery/removal of raw materials and plant. During operation, vehicle movement will be considerably reduced; however, also presents potential collision hazard with a limited number of vehicles entering for routine maintenance and monitoring purposes.

The construction period is expected to take approximately 24 months, with the peak construction period expected to take 12 months. A construction workforce of approximately 650 personnel would be on-site during the peak construction phase.

Native wildlife mortality due to vehicle strike above current/ baseline levels is possible; however, if evident, is expected to be relatively low especially following implementation of mitigation measures. Vehicle movements on access tracks will be limited to 40 km/h speed limit to reduce the risk of vehicle strike to fauna. The implementation of appropriate signage and driving policies will increase driver awareness and further reduce associated risks. These measures will be addressed in the CEMP, and include examples such as on-site education, identifying and reporting hazards as they occur during construction, and setting appropriate working hours and vehicle speed limits.

7.3 BIRD AND BAT ADAPTIVE MANAGEMENT PLAN

7.3.1 OBJECTIVES AND CONSENT CONDITIONS

7.3.1.1 OBJECTIVES

The objective of the BBAMP is to minimise and manage the impact of operation of the WTGs associated with the proposed development on birds and bats that occur within the vicinity of the wind farm. Specifically, the BBAMP will:

- Detail potential mitigation measures and implementation strategies to minimise impacts to birds and bats;
- Establish an adaptive management framework for managing and mitigating impacts on birds and bats;
- Outline a monitoring program to understand the impact of the proposed development to at-risk birds and bats;
- Document an agreed decision-making framework that identifies operational-phase impact triggers leading to a management response;
- Identify any additional measures that can be used to manage impacts based on the outcomes of ongoing monitoring; and
- Aim to offset mortality impacts to listed threatened species where applicable.

The BBAMP will aim to achieve the following environmental outcomes:

- An improved understanding of the risk of turbine collision and barotrauma impacts on listed bird and bat species;
- An improved understanding of weather and how project site usage changes as a result of wind farm construction and operation;
- An improved monitoring approach for the timely identification of turbine collisions and collection and analysis of data;

- An improved approach to the timely and regular validation and update to the Collision Risk Modelling (CRM) using monitoring data, and a robust adaptive management approach; and
- Development of management and corrective actions to minimise risk of turbine collision and other impacts on threatened bird and bat species.

7.3.1.2 LEGISLATION AND POLICY REQUIREMENTS

The Department of Climate Change, Energy, the Environment and Water [DCCEEW] *Onshore Wind Farms – interim guidance on bird and bat management* (DCCEEW, 2023) states that:

The BBMP (Bird and Bat Management Plan) must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines. The BBMP must be informed by desktop and field-derived information, and best available practices, and include the following key requirements at a minimum:

- *standards for pre and post-commissioning surveys that are appropriate to the scale and environmental risks of the project;*
- *evidence of effectiveness of the methods used for other similar actions;*
- *demonstration that the proposed measures and outcomes of the BBAMP are supported by published scientific evidence; and*
- *where innovative measures are proposed, details about how desired outcomes will be met.*

In line with the *Onshore Wind Farm Guidance* (DCCEEW, 2023), specific objectives of individual species to achieve outcomes will be provided. Specific objectives include the implementation of mitigations measures against not to exceed designated thresholds. If thresholds are reached, corrective actions will be implemented.

The BBAMP will be adaptive in response to outcomes of monitoring, detection of potential species triggers that could result due to identified impacts to bird and bats from WTG collisions. This adaptive management framework will involve consultation with BCD for a management response following identification of mortality considered to meet trigger levels for at risk species.

The BBAMP will be implemented during pre-commissioning, and construction, and it is proposed to be implemented across the first two years of operation, commensurate to the level of potential risk to birds and bats resulting from the Project.

The BBAMP will aim to fulfil the requirements of Conditions of consent schedule 3, 21 and, subject to BBAMP approval by the Secretary of DPE, will be implemented during the development and initial operation of the Project.

7.3.1.3 BASELINE DATA

Baseline data collected to date to inform the BBAMP has been determined through survey events across the broader Project Area completed between 2020 and 2023, literature reviews, desktop searches and statistical analysis.

Prior to field surveys, several desktop sources were reviewed to identify ecological values that may occur within the Subject Land. Desktop analysis was also used to guide development of field survey sampling techniques, followed by a field survey program to collect data to describe on-ground conditions. The information from the desktop sources and field surveys were used to assess and document the likelihood of occurrence and potential occurrence of bird and bat species within the Subject Land.

7.3.2 BIRD AND BAT SURVEY METHODS

A summary of the survey efforts undertaken to date to inform this report were conducted between March 2020 and October 2023. The survey design, including targeted surveys for candidate species with potential to occur in the Subject Land, was developed based on the survey guidelines detailed below. Additional survey effort will be completed to inform the final BBAMP.

Anabat devices were deployed across the broader Project Area to provide microbat community data. This included the following:

- 7 devices deployed for 7 nights in Summer 2022.

Locations of the Anabat devices deployed across the Project Area are shown in Figure 7-3. The Applicant is committed to deploying an Anabat device at height on Met Masts to further inform the BBAMP.

Bird utilisation surveys (BUSs) were undertaken across the broader Project Area, which involved fixed point surveys aimed to provide data based on the species present and their height, speed and direction of flight as stipulated by the Band Model (SNH 2012, Band 2000). These survey methods are further detailed below. BUS locations surveyed between Autumn 2020 and Spring 2022 varied between 10 and 35 survey points. From Winter 2023 onwards, 21 survey points were refined, meeting the 80% grid square requirement as detailed in the methodology below. Survey locations are presented in Figure 7-2.

2020 – 2022: DAWE Onshore Wind Farms – interim guidance on bird and bat management

BUSs undertaken between 2020 and 2022 were completed in accordance with guidance by DAWE (2021), provided in the *Onshore Wind Farms – interim guidance on bird and bat management.* 35 fixed-point BUS locations were established across the Project Area, 10 of which originated in 2020 and were repeated between 2020 and 2022, and an additional 15 that were surveyed from Summer 2022. Searches were conducted between 15 and 20 minutes at each survey site per season and were primarily focused on birds most likely to be affected by the development, such as raptors (birds of prey) and large flocks of birds. Under the interim guidance, BUSs were required to be completed over each relevant season over a minimum of 24 months prior to commissioning of the wind farm.

Survey Guidelines for Australia's threatened birds (DEWHA, 2011) outlines steps that aid in determining survey effort and timing, noting a particular focus on optimal timing for surveys of 'target' taxa. With the timing of surveys critical to species detection, it is important that surveys be timed to maximise potential detection across the year. As such, BUS survey events were initially proposed over distinct seasons in NSW over a 12-month period.

2023: Draft Wind Farm Assessment Guidance for the Sout West REZ

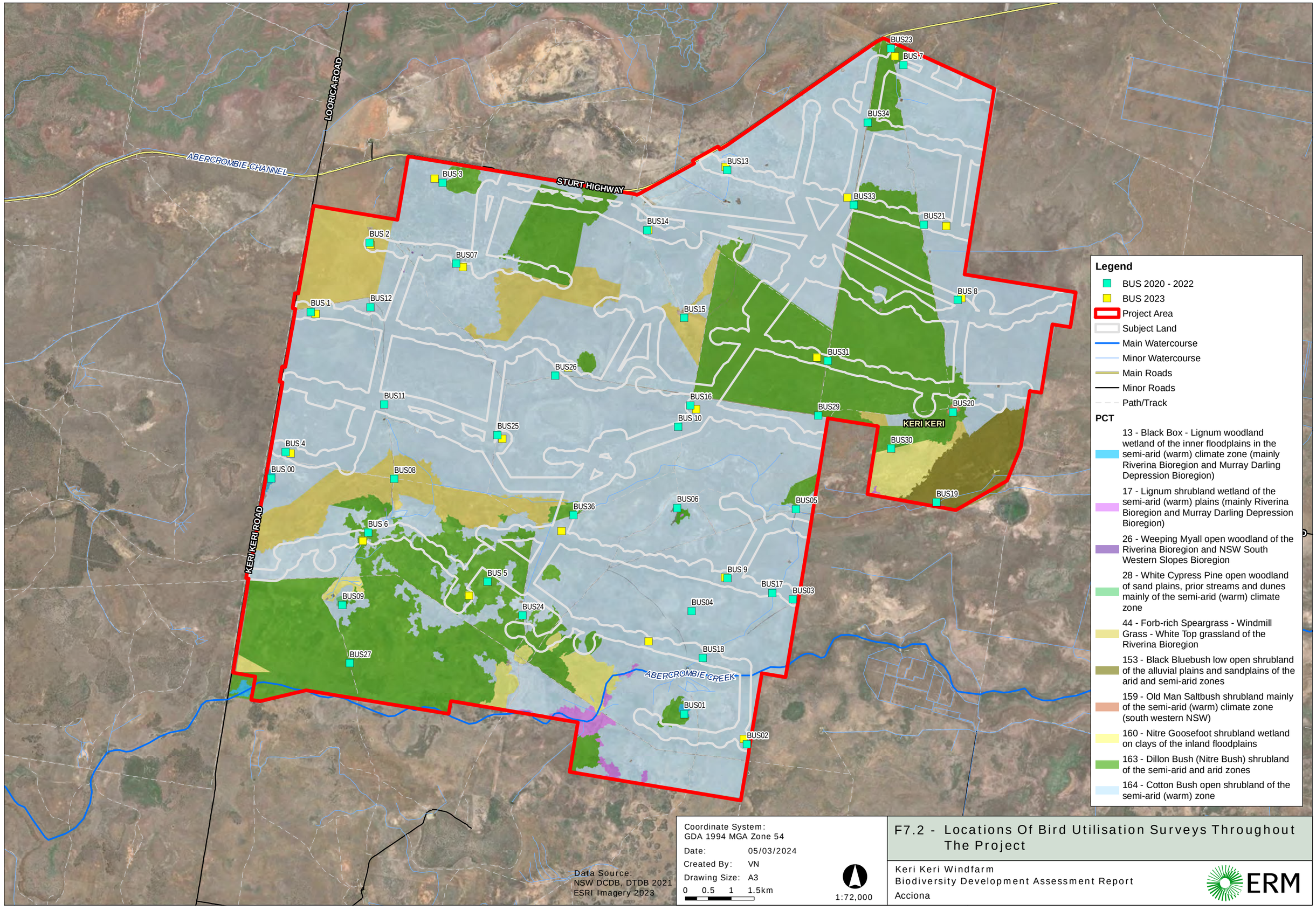
The Draft Wind Farm Assessment Guidance for the South West REZ was released in July 2023, and was inclusive of a suggested BUS method. This method was adopted and applied to the Winter and Spring 2023 BUS events. Survey locations were adjusted where required to best align with the current development layout. A 3x3 km grid was applied to the Subject Land as per the suggested method, with survey points situated within 80% of grid squares containing infrastructure. The Subject Land presents as an open landscape with flat topography allowing for high levels of visibility for avifauna in flight, it is anticipated that 80% cover via 21 survey sites will be sufficient to inform the BBAMP.

During the Winter and Spring 2023 survey event searches were conducted over 30 minutes, repeated on six (6) occasions at each survey site. The six occasions were completed over the following periods:

- 2 x Morning (sunrise to 10:00am);
- 2 x Midday (10:00am to 2:00pm); and
- 2 x Afternoon (2:00pm to sunset).

All detections were recorded, irrespective of distance from the survey site, behaviour or flight height of the observed bird/s.

This approach will be replicated during future BUS survey events to inform the BBAMP.



Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 05/03/2024
Created By: VN
Drawing Size: A3

0 0.5 1 1.5km

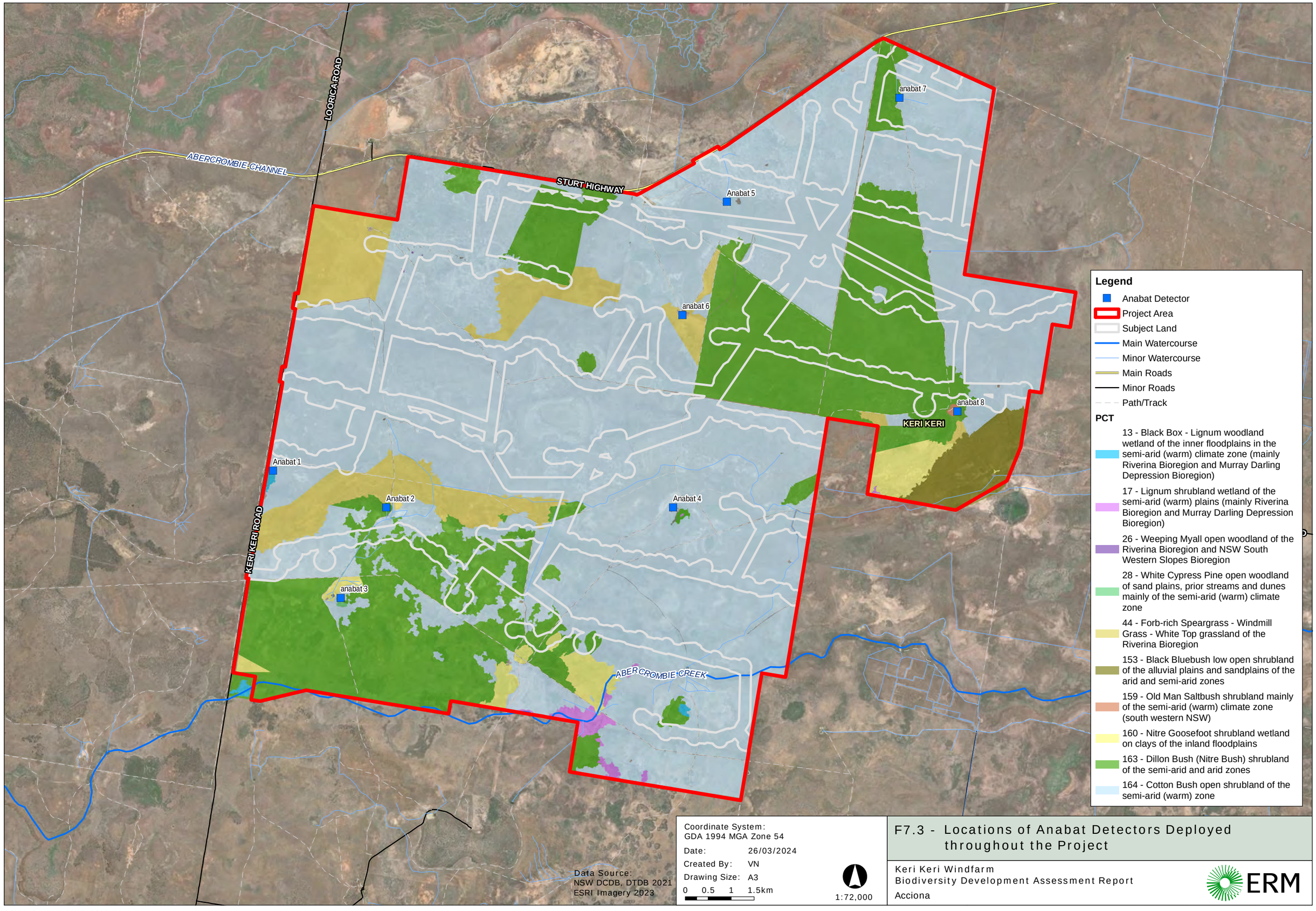
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F7.2 - Locations Of Bird Utilisation Surveys Throughout The Project

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F7.3 - Locations of Anabat Detectors Deployed throughout the Project

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7.3.3 EXCLUDED SPECIES

Impacts to species during operation of the Project are limited to direct mortality through collision with WTGs, and indirect impacts of barotrauma. Although potentially suitable habitat for listed threatened and migratory species is present throughout the Subject Land, not all species move at heights considered to be at risk of collision with WTGs and so the operation of the Project will pose a negligible risk. To identify those species for which suitable habitat is present but are not considered to be at risk of collision, a literature review was undertaken to identify the following aspects of species behavior and ecology:

- Are there documented maximum flight heights for a species that are below that of the Rotor Swept Area (RSA)?;
- Is the species known to be behaviorally restricted by the height of available canopy or shrub cover?; and
- Is the species known to rarely disperse over long distances, is behaviorally sedentary or possesses rigid territory boundaries, and does not undertake seasonal migrations?

Candidate and Ecosystem Credit Species that met these criteria were then discounted from needing to be applied to the risk matrices presented in Table 7-5 , Table 7-6 and Table 7-7 . These species are presented below in Table 7-3 .

TABLE 7-3 CANDIDATE AND ECOSYSTEM CREDIT SPECIES EXLUDED FROM COLLISION RISK ASSESSMENT

Species	EPBC Act	BC Act	Comments
Ardeotis australis Australian Bustard	-	E	The Australian bustard is a large, heavy, ground-dwelling bird typically found on dry plains, grasslands and open woodlands. The bustard is known to rarely fly, instead dispersing on foot when disturbed (Abbot, 2008). Juveniles are completely flightless and rely on camouflage. While the bustard is known to fly, spatial movement is considered to be largely intra-regional with inter-continental movement considered uncommon (Ziembicki & Woinarski, 2007). While potentially suitable habitat is present within the Subject Land, no detections have been made during targeted fauna transects or through traversing the site and therefore the species is not considered to be at risk of collision.
Certhionyx variegatus Pied Honeyeater	-	V	The pied honeyeater is a nomadic species found in arid and semi-arid ecosystems categorised by shrublands and woodlands, particularly those dominated by Erimophila, Grevillea, and Mulga (Higgins, Peter, & Steele, 2001). While song flights above the canopy have been described for the species, it is not considered to be at heights at risk of collision and so has not been included in the collision risk assessment of the BBAMP.
Epthianura albifrons White-fronted Chat	-	V	The white-fronted chat is a small ground-feeding, insectivorous passerine occurring typically occurring in open country, particularly salt-marshes and other wetlands (Jenner, French, Oxenham, & Major, 2016). While impacts to habitat may occur during construction, this species is not known to regularly fly at heights considered at risk of collision.
Pedionomus torquatus Plains-wanderer	CE	CE	The plains wanderer is ground-dwelling bird that is known to rarely fly beyond two to three meters in height. While associated habitat is present within proximity to wind turbine generators, this species is not considered at risk of collision.

Species	EPBC Act	BC Act	Comments
Pyrrholaemus brunneus Redthroat	-	V	The redthroat is a mostly ground dwelling bird occurring mostly in arid and semi-arid regions containing acacia and chenopod shrublands. Observations of foraging behavior identified that foraging heights rarely exceeded 1m and never exceeded heights of 3m. While suitable habitat may be present near wind turbine generators, the species is not considered at risk of collision.
Stagonopleura guttata Diamond Firetail	V	V	The diamond firetail is a mostly sedentary species occurring primarily in open eucalypt forest and woodland. Diamond firetails are predominantly ground feeders and are not known to fly at heights above the canopy unless disturbed. Suitable habitat is restricted to a single patch of black box woodland in the west of the Project. While this woodland patch is within 500m of a WTG, the species is unlikely to be flying at heights considered within the RSA and so is not considered at risk of collision.
Chalinolobus picatus Little Pied Bat	-	V	The little pied bat is an arid and semi-arid woodland species that is not known to forage in the low and midrange areas of the canopy (Jackson, 2003). Suitable habitat is heavily restricted to a single patch of black-box woodland in the west of the Project Area. While this woodland patch is within 500m of a WTG, the species is unlikely to be flying at heights considered within the RSA and so is not considered at risk of collision.
Saccolaimus flaviventris Yellow-bellied sheath-tailed bat	-	V	The yellow-bellied sheath-tailed bat has a widespread distribution throughout Australia but is known to be rare throughout. The species is characterized by large body size and long narrow wings and displays rapid flight with low maneuverability suitable for flight in very open areas or above the canopy. While this flight pattern may lead to an increased risk of collision and barotrauma, known flight heights are restricted to approximately 20m high (Rhodes & Hall, 1997). This is not considered to be at risk of collision with WTGs and so, although known to be present, this species has been excluded from collision risk assessment.
Myotis Macropus Southern Myotis	-	V	The southern myotis is a specialized species that utilizes a 'trawling'; foraging strategy to hunt for aquatic prey. Trawling involves individuals flying 5-100cm above a water surface before dipping to make contact with the water to rake their feet to capture aquatic invertebrates and small fish (Gonsalves & Law, 2017). The low flying foraging behaviours of the species is unlikely to put individuals at risk of collision with WTGs or barotrauma. Although known to be present the species has been excluded from the collision risk assessment.

7.3.4 VAGRANT SPECIES WITH POTENTIAL TO OCCUR

Following the survey effort completed between March 2020 and October 2023, several Candidate and Ecosystem Credit Species not listed as migratory have not been detected across the Project Area despite potentially suitable habitat being present. While these species are not considered to be present at the time of survey effort, as the Project Area remains within their known distributions there is the potential for these species to be present throughout the operational life of the project. Currently these species are not considered to be at risk of collision and so have not been applied through the risk matrices presented in Table 7-5, Table 7-6 and Table 7-7; however, are known to fly at heights consistent with those of the RSA and so a theoretical risk remains if present. These species have been categorised as vagrant species which, for the purposes of this BBAMP, is defined as those species not known to be migratory but who still disperse over large distances or are nomadic in behavior. A list of those species categorised as vagrants within this BBAMP is provided below in Table 7-4.

TABLE 7-4 VAGRANT SPECIES WITH POTENTIAL TO OCCUR

Species	EBPC Act	BC Act	Associated PCTs
Anseranas semipalmata Magpie Goose	-	V	160, 163
Botaurus poiciloptilus Australasian Bittern	E	E	160
Falco hypoleucos Grey Falcon	V	V	44, 160, 163, 164
Grus rubicunda Brolga	-	V	160
Haliaeetus leucogaster White-bellied Sea-eagle (Breeding)	-	V	44, 160, 163, 164
Oxyura australis Blue-billed Duck	-	V	160
Rostratula australis Australian Painted Snipe	E	E	160
Stictonetta naevosa Freckled Duck	-	V	160

7.3.5 PRELIMINARY TURBINE RISK ASSESSMENT

A preliminary turbine risk assessment framework has been developed, taking into account the likelihood and consequences of events including collision with WTGs and the impact of construction and operation on the proposed development causing changes in site utilisation by bird and bat species.

Before-After-Control-Impact (BACI) is recommended by DAWE (2021) as a design principle for surveys where the Subject Land is determined to support significant bird species. The aim of the BACI design is to compare environmental variables before and after a human activity and between the area affected by the development (impact) and an unaffected area (control) (Stewart-Oaten, 1986). In this instance, this would compare control and impact areas, before and after the construction of the windfarm, to determine if there are any avian impacts as a result of the development.

Collision Risk Modelling (CRM) will be undertaken in accordance with the Band CRM Method (Band, 2007) for any non-threatened raptor species and listed threatened and migratory species recorded in the Subject Land and assessed as having a potential collision risk. This will be dependent on the collection of additional data in accordance with the latest BUS guidance.

7.3.5.1 TURBINE PRELIMINARY RISK RATING

A total of 155 WTG have been proposed across the Subject Land. The current layout, shown in Figure 2-3, has been refined following preliminary ecological investigations to ensure the suitable avoidance of areas of high ecological value and habitat quality. Risk factors associated with the current turbine layout can be categorized by the proximity of turbines to important habitat features, such as woodlands and important wetlands. A preliminary risk matrix (Table 7-5) has been developed to assess turbine specific risk in relation to available habitat features.

TABLE 7-5 TURBINE PRELIMINARY RISK MATRIX

Risk	Description
Very High	***Very High*** risk based on any of the following being located within **200 m** of the proposed turbine location: • Resident threatened species habitat or non-threatened raptor species habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s likely to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)
High	***High*** risk based on any of the following being located within **500 m** of the proposed turbine location: • Resident threatened species habitat or non-threatened raptor species habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s likely to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)
Medium	***Moderate*** risk based on any of the following being located within **1000 m** of the proposed turbine location: • Resident threatened species habitat or non-threatened raptor species habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s known or predicted to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)
Low	***Low*** risk based on any of the following being located greater than **1000 m** away (or absent): • Resident threatened species habitat or non-threatened raptor habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s known or predicted to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)

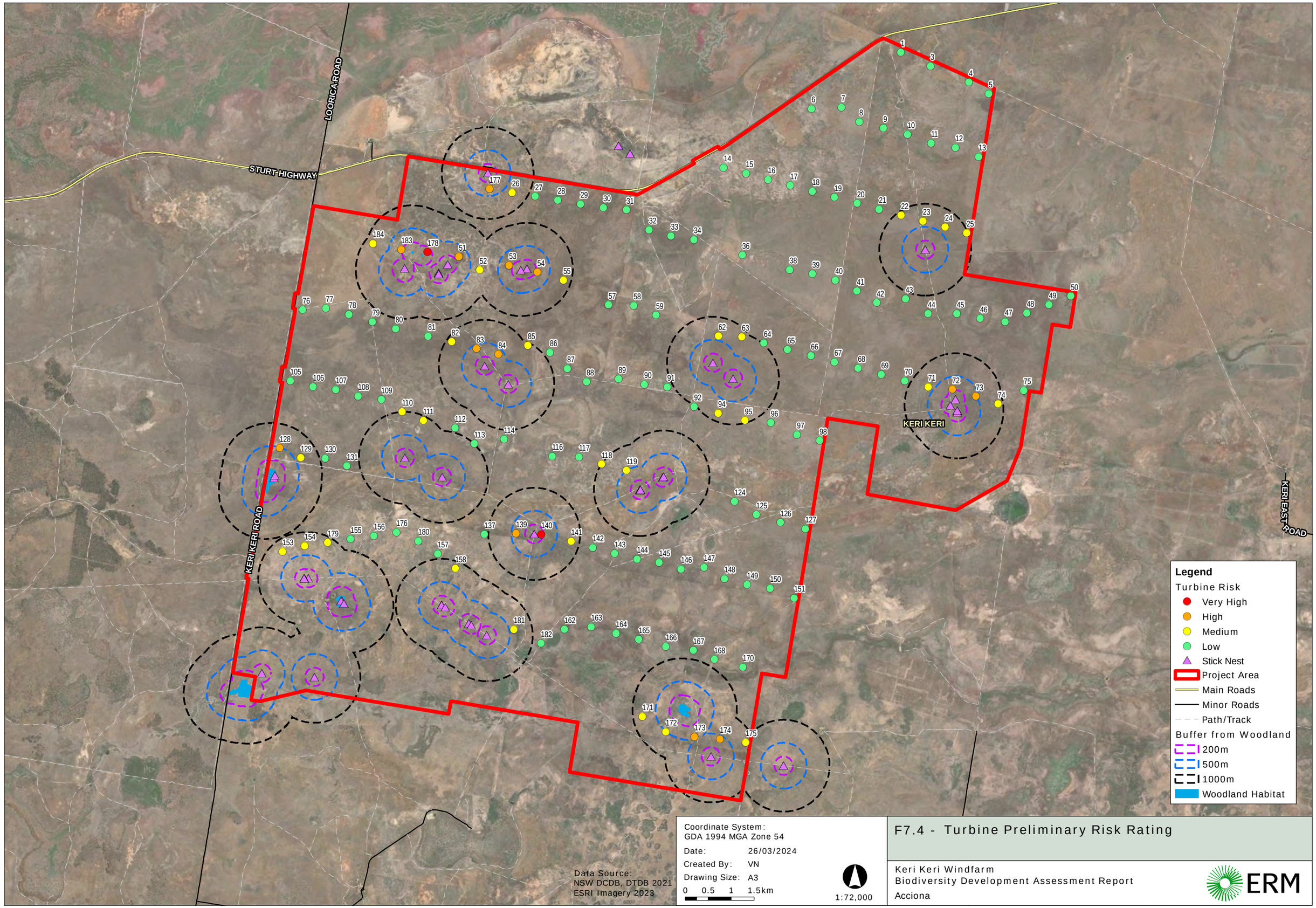
Turbines are predominantly situated within vegetation communities mapped as low open shrub-land or grassland communities with little to no canopy cover. Important habitat features are isolated to a small, fragmented, patches of remnant, open eucalypt woodland dominated by Black Box (*Eucalyptus largiflorens*) in the west of the Project Area. Small stands of Weeping Myall (*Acacia pendula*), *Allocasuarina* and *Hakea* species are patchily distributed throughout the Project Area and provide important habitat features for foraging and nesting avifauna.

Ephemeral wetlands are present; however, are largely absent of canopy. Following ground-truthing, these communities have been found to provide important foraging and breeding habitat for avifauna and bats and are associated with an increase in species diversity and site utilisation. Using the matrix presented in Table 7-5 , a preliminary risk rating for each turbine has been established and is presented in Table 7-6 and Figure 7-4.

TABLE 7-6 TURBINE PRELIMINARY RISK RATING

Turbine Number	Risk Rating	Turbine Number	Risk Rating	Turbine Number	Risk Rating	Turbine Number	Risk Rating	Turbine Number	Risk Rating
1	Low	32	Low	68	Low	106	Low	148	Low
3	Low	33	Low	69	Low	107	Low	149	Low
4	Low	34	Low	70	Low	108	Low	150	Low
5	Low	36	Low	71	Moderate	109	Low	151	Low
6	Low	38	Low	72	High	110	Moderate	153	Moderate
7	Low	39	Low	73	High	111	Moderate	154	Moderate
8	Low	40	Low	74	Moderate	112	Low	155	Low
9	Low	41	Low	75	Low	113	Low	156	Low
10	Low	42	Low	76	Low	114	Low	157	Low
11	Low	43	Low	77	Low	116	Low	162	Low
12	Low	44	Low	78	Low	117	Low	163	Low
13	Low	45	Low	79	Low	118	Moderate	164	Low
14	Low	46	Low	80	Low	119	Moderate	165	Low
15	Low	47	Low	81	Low	124	Low	166	Low
16	Low	48	Low	82	Moderate	125	Low	167	Low
17	Low	49	Low	83	High	126	Low	168	Low
18	Low	50	Low	84	High	127	Low	170	Low
19	Low	51	High	85	Moderate	128	High	171	Moderate
20	Low	52	Moderate	86	Low	129	Moderate	172	Moderate
21	Low	53	High	87	Low	130	Low	173	High

Turbine Number	Risk Rating	Turbine Number	Risk Rating	Turbine Number	Risk Rating	Turbine Number	Risk Rating	Turbine Number	Risk Rating
22	Moderate	54	High	88	Low	131	Low	174	High
23	Moderate	55	Moderate	89	Low	137	Low	175	Moderate
24	Moderate	57	Low	90	Low	139	High	176	Low
25	Moderate	58	Low	91	Low	140	Very High	177	High
26	Moderate	59	Low	92	Low	141	High	178	Very High
27	Low	62	Moderate	94	Moderate	142	Low	179	Moderate
27	Low	63	Moderate	95	Moderate	143	Low	180	Low
28	Low	64	Low	96	Low	144	Low	181	Moderate
29	Low	65	Low	97	Low	145	Low	182	Low
30	Low	66	Low	98	Low	146	Low	183	High
31	Low	67	Low	105	Low	147	Low	184	Moderate



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The BBAMP will further assess turbine risk rating (Table 7-10), informed by the risk matrix of risk level (Table 7-9) which is determined by the level of consequence (Table 7-7) and likelihood (Table 7-8).

TABLE 7-7 CONSEQUENCES OF TURBINE STRIKE CRITERIA

Minor	Moderate	Major	Severe
Protected (non-threatened) species (or no species detected).	Vulnerable species (BC Act or EPBC Act) or non-threatened at-risk species, such as Wedge-tailed Eagle and the White striped Free-tailed Bat	Endangered species (BC Act or EPBC Act)	Critically endangered species and/or a species listed as at risk of a serious and irreversible impact

TABLE 7-8 LIKELIHOOD OF TURBINE STRIKE CRITERIA

Likelihood	Description
Very Likely	***Very High*** likelihood of turbine strike based on any of the following being located within **200 m** of the proposed turbine location: • Resident threatened species habitat or non-threatened raptor species habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s likely to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)
Likely	***High*** likelihood of turbine strike based on any of the following being located within **500 m** of the proposed turbine location: • Resident threatened species habitat or non-threatened raptor species habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s likely to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)
Moderately Likely	***Moderate*** likelihood of turbine strike based on any of the following being located within **1000 m** of the proposed turbine location: • Resident threatened species habitat or non-threatened raptor species habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s known or predicted to increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)
Less Likely	***Low*** likelihood of turbine strike based on any of the following being located greater than **1000 m** away (or not detected): • Resident threatened species habitat or non-threatened raptor habitat. • Migratory or nomadic species habitual flight path • Landscape feature/s known or predicted increase bird and/or bat activity (including distance to nearest canopy, waterbodies, riparian corridors, updraft locations, caves etc.)

TABLE 7-9 RISK MATRIX OF RISK LEVEL BASED ON LIKELIHOOD AND CONSEQUENCE

Likelihood Criteria	**Consequence Criteria**			
	Severe	High	Moderate	Minor
Very Likely	Very High	Very High	Very High	High
Likely	Very High	High	High	Moderate
Moderately Likely	Very High	High	Moderate	Low
Less Likely	High	Moderate	Low	Low

TABLE 7-10 RISK ASSESSMENT SPECIFIC CRITERIA

Risk Category	**Category Criteria and Detail**
Low	• Species unlikely, or with the potential to occur within the Subject Land. • No records in the Subject Land and locality for 10 years. • No to low record count in the broader locality for 10 years (up to 150 km from Subject Land). • Flight height outside of RSA. • No to low amounts of potential habitat in the Subject Land / no impact to site utilisation.
Moderate	• Species with the potential to occur within the Subject Land. • No records in the Subject Land and locality for 10 years. • Low to moderate record count in the broader locality for 10 years (up to 150 km from Subject Land). • Flight height inside of RSA. • Limited potential habitat in the Subject Land/ no to low impact to site utilisation.
High	• Species known, likely or with the potential to occur within the Subject Land. • No to low record count in the Subject Land and locality for 10 years. • Moderate to high record count in the broader locality for 10 years (up to 150 km from Subject Land). • Flight height inside of RSA. • Limited to moderate known and potential habitat in the Subject Land / likely impact to site utilisation.
Very High	• Species known, likely or with the potential to occur within the Subject Land. • No to low amounts of records in the Subject Land and locality for 10 years. • High number of records in the broader locality for 10 years (up to 150 km from Subject Land). • Flight height inside of RSA. • Moderate to high known and potential habitat in the Subject Land / likely impact to site utilisation

7.3.5.2 ASSUMPTIONS

This approach has the following assumptions:

- That the observer will see the bird on the given day of the surveys, at the given times;
- The number of records is in line with literature on flock size, and number of records recorded within the broader locality of 150 km (from the past 10 years);
- The seasonality of observations and migratory pathways has been considered; however, it is not certain that such survey periods would capture the species flying through; and
- All sightings of individuals within the Project Area occur within the RSA.

Other factors will be incorporated to determine bird and bat species risk, including whether any site-specific information identified any WTGs are of 'high risk' to relevant species. As a result of the risk assessment, four listed threatened and/or migratory bird species, were considered to be at a very high risk of impact by the proposed development.

TABLE 7-11 COLLISION RISK ASSESSMENT

Species	Threatened Species Status		Likelihood of Event	Consequence of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Birds						
Hirundapus caudacutus White-throated Needletail	V, Mi	-	Very Likely	Moderate	**Very High**	The White-throated Needletail is a migratory species with a global distribution. Breeding in Siberia, the species is typically present in Australia between September and April where it is almost exclusively an aerial flyover with only occasional observations made of roosting behaviour. There is evidence that this species can stop to forage within elevated eucalypt forests while in Australia. No detections of the species have been made following survey effort to date however it is likely that foraging behaviour may lead to risk of collision if the species is present. Potential foraging habitat is noted to be present throughout the Project within proximity to WTGs. As a result, this species has assessed to have a **Very High** risk of collision however this species has not been sighted within the Project Area.
Apus pacificus Fork-tailed Swift	M	-	Very Likely	Minor	**Moderate**	The Fork-tailed Swift is a migratory species with a global distribution. The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia and is almost exclusively aerial. In Australia, the species is typically found over inland plans or dry, open areas and will forage at heights of less than a meter to over 300m. The species is known to be present within the Project Area with 43 individuals detected across all survey periods. Suitable foraging habitat is present within 200m of the WTGs and so this species has been assessed to have a **Moderate** risk of collision.
Hieraaetus morphnoides Little Eagle	-	V	Likely	Moderate	**High**	The little eagle has a broad range throughout mainland Australia and can be found in a variety of ecosystems with the exception to the heavily forested pars of the Great Dividing Range. It typically occurs in open woodland, grassland and arid regions particularly within close proximity to open woodland and riparian zones suitable for breeding. While hunting, the little eagle is known to soar up to 500m in search prey and will typically take prey on the ground or from

Species	Threatened Species Status		Likelihood of Event	Consequence of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						trees and shrubs in open woodlands. The species is known to be present within the Project Area with seven individuals detected across all survey periods. Suitable habitat is present within 500m of turbine locations and so this species has been assessed to possess a **High** risk rating.
Circus assimilis Spotted Harrier	-	V	Very Likely	Moderate	**Very High**	The spotted harrier typically inhabits open wooded country in tropical and temperate Australia, particularly in arid and semi-arid areas. Breeding habitat is characterized by open or remnant woodland with nests rarely being built in isolated trees. The spotted harrier is a diurnal species feeding primarily on ground active birds, mammals, and reptiles and hunting behavior is characterized by quartering, or systematic searching, of the landscape low to the ground. The species is known to be present within the Project Area with seven detections made across the survey seasons. Suitable habitat is present throughout the site and within less than 200m of the WTGs and so this species has been assessed to possess a **Very High** risk of collision.
Falco subniger Black Falcon	-	V	Very Likely	Moderate	**Very High**	The black falcon is widely distributed across mainland Australia but is typically found in arid and semi-arid zones. Hunting occurs over open wooded grasslands, saltbush plains and other areas low and open shrublands, particularly within close proximity to watercourses or remnant patches of isolated trees. While hunting the black falcon often soars for long periods of time at height and takes prey in the air or on the ground. The species is known to be present, and a single individual has been observed flying at heights considered to be at risk of collision with WTB. Potentially suitable foraging and breeding habitat is present throughout the Project Area within proximity to WTG. As such this species has been assessed to possess a **Very High** risk of collision.
Lophochroa leadbeateri	E	V	Very Likely	Major	**Very High**	The pink cockatoo occurs throughout the Murray-Darling, Eyre and Bulloo River basins and inhabits a wide range of plant communities

Species	Threatened Species Status		Likelihood of Event	Consequence of Event	Risk Rating	Comments
	EPBC Act	BC Act				
Pink Cockatoo						within arid and semi arid areas of inland Australia, particularly those within proximity to fresh water. Breeding habitat is restricted to those areas retaining large old growth woodlands with hollows with an entrance of approximately 13 to 30 cm wide. Normally found in pairs or small groups, pink cockatoos are known to form flocks of hundreds in locations where food is abundant. The species is known to be present with a total of 98 individuals observed across all survey periods. Potentially suitable habitat is within 200m of proposed turbine locations and so this species has been assessed to possess a **Very High** risk of collision.
Artamus cyanopterus cyanopterus Dusky Woodswallow	-	V	Very Likely	Moderate	**Very High**	The dusky woodswallow is a medium-sized swallow-like species that is typically found within open woodlands. The species is known to roost and flock communally, particularly during the breeding season, and forages for insects at either ground level or on the wing. The species is known to occur within proximity to the Project. Potentially suitable habitat is within 200m of proposed turbine locations and so this species has been assessed to possess a **Very High** risk of collision however this species has not been sighted within the Project Area.
Neophema chrysostoma Blue-winged Parrot	V	V	Less Likely	Moderate	**Low**	The blue-winged parrot is a semi-migratory species of which a portion of the population migrates between Tasmania and the Australian mainland, however some individuals are more sedentary. As a newly listed species, no associated PCTs are available to map potential habitat within the Project. As a granivorous species, the blue-winged parrot is unlikely to be flying at heights considered within the RSA unless undertaking long-distance migrations and, as the Project is outside of major flyways (i.e., coastal zones and axis of major river systems), this is unlikely to occur within the locality. While the species is known to be susceptible to mortalities due to WTG collision at existing Victorian wind farms, this is considered infrequent (Symbolix, 2020). The species is known to be present within the Project following a positive detection during the

Species	Threatened Species Status		Likelihood of Event	Consequence of Event	Risk Rating	Comments
	EPBC Act	BC Act				
						September 2023 survey period, however, was not observed flying at height. Woodland habitat for foraging and roosting is limited to a small patch on the Project's western edge and so is unlikely to be flying at heights considered within the RSA. As a preliminary risk assessment, the species has been assessed to possess a **Low** risk of collision.
Chalinolobus picatus Little Pied Bat	-	V	Very Likely	Moderate	**High**	The little pied bat is an arid and semi-arid woodland species that is known to forage in the low and midrange areas of the canopy (Jackson, 2003; Bewsher, De Angelis, & Hansen, 2019). Suitable habitat is heavily restricted to a single patch of black-box woodland in the west of the Project Area. While foraging heights throughout the Project may be low for the species based on the limited canopy cover, WTGs may attract bats at unanticipated levels (Florent & Bennett, 2024; Cryan, et al., 2014). As a precautionary measure this BBAMP has this species under the assumption that the species will occur within the RSA. Potentially suitable habitat is within 500m of proposed turbine locations and so this species has been assessed to possess a **High** risk of collision.
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	-	V	Likely	Moderate	**High**	The yellow-bellied sheath-tailed bat is a canopy feeder that is known to forage at heights of approximately 20-25m. Foraging heights are further reduced when foraging in open areas or forest edges (Churchill, 2008). Suitable woodland habitat is restricted to a single patch of black box woodland in the west of the Project. While foraging heights throughout the Project may be low for the species, WTGs may attract bats at unanticipated levels (Florent & Bennett, 2024; Cryan, et al., 2014). As a precautionary measure this BBAMP has this species under the assumption that the species will occur within the RSA. Potentially suitable habitat is within 500m of proposed turbine locations and so this species has been assessed to possess a **High** risk of collision.

7.4 MATHEMATICAL COLLISION RISK MODELLING

The Band Collision Risk Model (Band, 2007) will be used to predict the total number of bird collisions that may result from the Project. This method of CRM requires the input of parameters that describe species-specific biometrics, flight speeds and characteristics and the expected amount of flight activity as derived from field surveys in the Subject Land. It also requires the input of WTG specific information such as the blade size and pitch, hub height and rotor rotation period as well as the proportion of time the WTG will be operational (Band, 2007).

The CRM should use observational BUS data to determine the flight heights, frequency of time spent in the RSA for the species known to occur within the RSA. Literature may be used to determine average flock size, but observational data must be used for presence/absence of species, as well as time spent within the RSA. This follows the process of determining:

- Stage 1: the number of birds or bats colliding per annum = the number of birds or bats flying through the RSA); and
- Stage 2: the probability of the bird or bats flying through the RSA being hit (Band, Madders & Whitfield 2007).

Stage 1 depends on bird surveys at vantage points used to gather information on frequency of bird and bat flights in the RSA (Band, Madders & Whitfield 2007) and has been informed from data across survey periods across relevant seasons in the Project Area, with additional data to be collected to inform the final BBAMP. This also depends on the flock size of the species as well as the species activity during the year (e.g., whether it is diurnal or nocturnal, migratory or present all year round).

Stage 2 depends on the characteristics of the bird and bat such as length and wingspan, as well as the breadth and pitch of the WTG blades, rotation speed of the WTG and average flight speed of birds and bats identified as flying in the rotor swept volume (Band, Madders & Whitfield 2007).

7.4.1 COLLISION RISK MODEL INCLUSION CRITERIA

The following Section details the CRM and the process that was undertaken for the threatened, migratory and raptor species considered for the proposed development CRM. The species that were assessed as having a low, high, and very high risk of impact from the proposed development, as determined by the risk assessment, were considered for the CRM. The risk assessment identified the following three categories listed in Table 7-13 .

To accurately model collision risk for a species, a minimum number of observations are needed. Two BC Act listed species, the black falcon and spotted harrier, were detected flying at heights considered at risk of collision with WTGs. A paucity of suitable data is available for an accurate assessment of collision risk due to the low number of observations of either species flying at heights considered within the RSA (n=2 for spotted harrier, n=1 for black falcon). However, as both species are considered high risk due to their listed status, a preliminary assessment of collision risk has been undertaken to inform the potential impacts of the projects to the species. Caution should be taken when interpreting the estimated number of collisions presented in this draft BBAMP. While survey effort to date has identified that utilization of the site at heights within the RSA is low, the project still presents a potential risk.

The Blue-winged Parrot (listed Vulnerable under EPBC Act and BC Act), Pink Cockatoo (listed Endangered under the EBPC Act and Vulnerable under the BC Act), and Little Eagle (listed Vulnerable under BC Act) have been confirmed to be present within the Project Area following surveys to inform this BBAMP. No observations of these species have been made at heights considered within the RSA and so collision risk modelling could not be undertaken. Despite this, literature suggests that these species have potential to fly at heights considered at risk of collision by this draft BBAMP throughout their range and so mortality due to collision with WTGs is still possible. While CRM is not possible, the species have still been considered within the collision risk assessment (Table 7-12) and thresholds for impact triggers are identified in Section 7.4.3.

Three non-listed species have been identified flying at heights within the RSA but with insufficient numbers for inclusion in the collision risk model for this draft BBAMP. While these species may still be at risk of collision within the Project Area, as non are listed under either the EPBC or BC Act at the time this draft BBAMP was written, no collision risk assessment has been undertaken. These species include the White-necked Heron, Letter-winged Kite, and Black-shouldered Kite.

7.4.2 ASSUMPTIONS AND LIMITATIONS

Initial exploratory assessments for bird collision risk were undertaken by Nature Advisory on behalf of GHD. The methodology for undertaking BUS during these times differs to what has been applied during additional surveys undertaken by ERM. As the associated RSA of the chosen WTG was not known during the March and November 2020 surveys, bird observations were described as either below the RSA (less than 20m high) or within the RSA (20m to 300m high) with no detailed flight heights available. To overcome this limitation, for those species also recorded within the BUS undertaken by ERM, the average flight height of that species across all records was calculated and applied to observations made by Nature Advisory. For those species only observed by Nature Advisory, individuals were assumed to be flying at the documented average flight heights within scientific literature.

Due to changes in legislation throughout the life of the project, requirements for bird utilization surveys have changed. Prior to the implementation of the updated BBAMP guidelines in mid-2023, BUS were completed in 15 (March 2020 and November 2020) and 20 minute (February 2022 and August 2022) intervals in line with current recommendations. As a conservative approach, a 30-minute survey time was modelled across all survey periods to account for variation in required survey methodology. In doing so, relative time an individual is assumed to spend within the RSA is increased to reflect the total time surveyed at each point.

The chord width of the proposed WTG model (Nordex-n163-5.x) is variable depending on the prevailing wind speed, being near 0 degrees during low wind and up to 90 degrees when freewheeling during paused or stopped operation. However, the Band model (2007) that has been used to model collision risk in this draft BBAMP, requires a single stationary pitch angle value to calculate the probability of collision. To overcome the limitations of the model, a surrogate pitch angle (7.5 degrees) has been taken from a WTG model with a similar blade length.

TABLE 7-12 COLLISION RISK MODEL INCLUSION CRITERIA

Risk Category	Category Criteria and Detail	Included in CRM
Negligible	• Species unlikely, or with the potential to occur within the Subject Land; • No records in the Subject Land and locality for 10 years; • No to low records in the broader locality for 10 years (up to 150 km from Subject Land); • Flight height outside of RSA; and • No to low amounts of potential habitat in the Subject Land / no impact to site utilisation.	NO
Low	• Species with the potential to occur within the Subject Land; • No records in the Subject Land and locality for 10 years; • Low to moderate records in the broader locality for 10 years (up to 150 km from Subject Land); • Flight height inside of RSA; and • Limited potential habitat in the Subject Land/ no to low impact to site utilisation.	YES (only with sightings in RSA)
High	• Species known, likely or with the potential to occur within the Subject Land; • No to low amounts of records in the Subject Land and locality for 10 years; • Moderate to high records in the broader locality for 10 years (up to 150 km from Subject Land); • Flight height inside of RSA; and • Limited to moderate known and potential habitat in the Subject Land / likely impact to site utilisation.	YES (only with sightings in RSA)
Very High	• Species known, likely or with the potential to occur within the Subject Land; • No to low amounts of records in the Subject Land and locality for 10 years; • high records in the broader locality for 10 years (up to 150 km from Subject Land); • Flight height inside of RSA; and • moderate to high known and potential habitat in the Subject Land / likely impact to site utilisation	YES (only with sightings in RSA)

7.4.3 COLLISION RISK MODELLING RESULTS

A summary of model output for preliminary collision risk model is presented in Table 7-14 . Three different avoidance scenarios (95%, 98%, and 99%) have been included.

For the twelve species included in the model, collision risk has been calculated as the number of collisions per species per annum (Table 7-14). It is expected that birds in practice show a high level of avoidance of WTGs (Band, Madders, & Whitfield, 2007). However, avoidance rates have not been calculated for all species and research is necessary to determine each species-specific avoidance rates. For this CRM, 95% 98% and 99% avoidance rates have been used to calculate collision numbers per annum for the given species. These avoidance rates are what is typically used in CRM exercises (Smales & Muir, 2005).

TABLE 7-13 MODEL CRM ESTIMATED COLLISION RISK NUMBERS PER ANNUM

Estimated annual number of collisions (based on a rotor swept range of 100-300m)			
Species Name	**95%**	**98%**	**99%**
Nankeen Kestrel	0.03	0.01	0.01
Wedge-tailed Eagle	0.29	0.11	0.06
Straw-necked Ibis	14.01	5.61	2.8
Fork-tailed Swift	0.40	0.16	0.08
Australian Raven	0.05	0.02	0.01
Great Cormorant	0.06	0.02	0.01
Australian Magpie	0.03	0.01	0.01
Black Kite	0.05	0.02	0.01
Brown Falcon	0.01	0.01	0.01
Little Black Cormorant	0.21	0.08	0.04
Black Falcon	0.005	0.002	0.001
Spotted Harrier	0.007	0.003	0.001
Total	15.162	6.065	3.032

In total, this CRM Model indicates that between three and fifteen birds are expected to collide with the WTGs per year. This is the worst-case scenario, based on the modelling approach as described. Based on the field investigations that have been undertaken as well as the literature providing the maximum parameters for the species, the total annual collision numbers in the above table are considered the 'worst-case' scenario for the project.

7.4.4 MONITORING PROGRAM

Design for the bird and bat monitoring program has been based on the desktop and field investigations conducted for the proposed development to date. The design of the monitoring program will be finalized in the BBAMP and will include potential habitat that has been mapped for 'low' risk of impact species. This will also apply to other potentially occurring species with negligible risk of impact, where habitat (or potential habitat) occurs in the Subject Land. The following Sections detail the methods for the bird and bat monitoring program.

7.4.4.1 CONSTRUCTION PHASE

During the construction phase, a BUS in each of the remaining seasons will be undertaken in addition to the six baseline surveys that have already been undertaken and informed the development of this report. Bird and bat survey techniques undertaken during the construction phase of the proposed development will be consistent with the techniques and locations undertaken in Winter and Spring 2023.

7.4.4.2 OPERATION PHASE

Bird and bat surveys during the commencement of operation will target the species listed as 'known' or 'likely' to occur within the Subject Land, as well as those listed species with potential to occur in the Subject Land. Bird surveys will occur during the first two years of commencement of operation with surveys being undertaken across each season in those years. The monitoring methods used in the initial two years of operation of the proposed development will be consistent with techniques used during the Winter and Spring 2023 survey events.

The monitoring during operation will be based on two main approaches. The first is to monitor bird and bat activity and ongoing mortality searches that aim to determine impacts (collisions) occurring during the first two years of operation. The second is to inform specific response to impact triggers that may result to bird and bat species, which will include increased monitoring surveys and carcass searches, investigation of risk behaviours and subsequent risk mitigation. This adaptive management approach is further detailed below.

7.4.4.3 CARCASS SEARCH METHODOLOGY

As part of the monitoring program, carcass searches will be performed to determine the actual impact of the proposed development on birds and bats. The results of the monitoring will be used to review the risk assessment if necessary and to identify and determine if any further monitoring of bird and bat species is required and to update mitigation measures or adaptive management approaches.

The proposed development is to comprise of up to 155 WTGs. At the commencement of operation, it is proposed that a subsample of turbines across all risk categories will be selected for monitoring over a two-year period at monthly intervals. Following the assessment of turbine specific risk rating, searches will be undertaken to detect the presence of raptor nests and other habitat features that may raise the risk rating of individual turbines across the lifetime of the Project. The number of turbines chosen for carcass searches will be updated accordingly to reflect the evolving risk.

The selected turbines will be revisited over the course of the first two years of operation. These visits will ensure that carcass searches are able to gain high accuracy on data regarding the mortality associated with WTG strike. The order of selected WTGs searched will be random during each monitoring event. The final number and location of individual WTGs that will be constructed is not yet known, and so this will be reflected in an updated map of selected WTGs for monitoring.

All carcass searches will be undertaken by suitably qualified personnel with appropriate skills in both bird and bat identification as well as in the handing of deceased species. Searches within areas and near selected WTGs will target birds and bats of medium to large size as per the Hull and Muir Model (2010), which uses the Monte Carlo simulation. The model suggests that 95% of bat carcasses should be present within 74 m of a WTG, and the carcasses for birds of medium to large sizes would be distributed to distances up to 122 m. Some species (larger birds) may be found further out from this model; however, 95% are expected to occur within an approximate 122 m search area from each selected turbine (Hull & Muir, 2010). This model was based upon parameters of a 72 m rotor radius and 120 m hub height.

Based on the principles adopted in Hull and Muir (2010), the following search areas have been designed for birds and bats for the Project, with its approximate maximum rotor tip height of up to 291.5 m and turbine rotor size of up to 91.5 m:

- Bats and small to medium sized birds, including some large sized birds: 100 m radius around the turbine. Transects will be spaced every 6 m from the WTG; and
- Medium to large sized birds (and some larger bats): 100-150 m radius around the WTG. Transects in this search area will be 12 m apart, undertaken from the inner (100 m) to outer (150 m) sections of the search area.

7.4.4.4 RECORDING INFORMATION AND CARCASS HANDLING PROCEDURES

The following information is to be recorded if a carcass is detected during the carcass searches:

- Position of the carcass in relation to the WTG.
- Comments on the vegetation type and area where the carcass was located, including if the species was found on an access path or on the WTG hard-stand area.
- Details on the individual found such as species, age, sex, number of individuals, the injury description as well as the estimate time of death if found deceased. If the carcass is unable to identified, this will be taken to appropriate facilities for DNA testing to be undertaken;
- Photos must be taken of the area and of the individual found. Such photos will need to be sent to an appropriately qualified ecologist within two business days so they can adequately undertake identification; and
- Whether details on the find date, as well as details taken of the weather conditions in the time preceding the find date of the carcass, including wind speeds, temperate and rainfall amounts.

7.4.4.5 SCAVENGER RATES AND TRIALS

The scavenger trial is adopted to ascertain at what rate naturally occurring scavengers remove carcasses from the Subject Land. These trials will be developed such that they are adopted twice within the first year following operation commencement, with each trial undertaken across 30 days. This will ensure that the difference in seasonal vegetation condition is accounted for. Such periods are also going to be associated with different stocking levels across seasons.

Scavenger trials will be undertaken in the inner search area of the turbines selected for carcass search trials (100 m radius from the turbine). Carcasses will be distributed sufficiently with lower than ten carcasses per trial to avoid biasing the results through scavenger swamping. (Smallwood, 2010).

Two different categories of carcasses will be used for the scavenger trials. Such carcasses will be those that are found during mortality trials. Additionally, small mice can be used in place of micro-bats if these carcasses are not able to be found. The two different categories will help to ascertain the different scavenger rates in the search area.

The two categories and the number of replicates that will be used for each trial are:

- Micro-bats and small birds: seven replicates/trial; and
- Medium sized birds: six replicates/trial.

At each of the randomly selected turbines used for the carcass searches, carcasses will be randomly placed under the turbines. The carcasses will be checked as follows:

- Each day for the first five days.
- Every two days from day six to 10.
- Every three days from day 11 to 19; and
- Every four days from day 20 until they disappear or until the end of the 30-day trial period.

The proposed development operation staff will be trained over a five-day period to undertake the scavenger trials following trial establishment by a suitably qualified ecologist.

In the event that a trigger point criteria is approached or met through general monitoring, additional targeted species monitoring may be required in response where additional information is needed.

Additional procedures to follow for scavenger trials is detailed below:

- Timing of searches has been based on the detailed experience and regulatory approval of other windfarms where scavenger trials have been undertaken that show almost all carcasses have been scavenged within a period of 5-10 days. Additionally, GPS coordinates will be taken for all carcasses placed during the scavenger trials, so as not to confuse these with any naturally occurring carcasses in the search areas.
- A mix of carcass sizes of bird and bats (small, medium to very large) will be obtained to use in scavenger trials from prior searches of the Subject Land. If a carcass of species at risk or of concern cannot be located for the trial, a substitute of the same colour and size will be used in its place.
- Thick latex gloves must be worn at all times when handling the bird and bat carcasses. This will ensure that both the safety of the personnel but also that human scent will not replace the scent of the carcass which will alter scavenger behaviour and find rates.
- One carcass at minimum will be placed randomly within the 100 m search area at each trial site. This carcass will be thrown in the air in order to recreate the natural landing of a carcass from impact with a wind turbine, such that feathers or fur may become dislodged or ruffled from the impact of the simulated fall; and
- Detailed observations will be taken at the search areas where carcasses have been scavenged, including the composition of the carcass and weather any types of scavenging behaviour have been present (feathers, bones dispersed, pecking, tearing, partial removal of carcasses, as well as scats and tracks of potential predators).
- The final state of the carcass will be recorded at the end of the survey period

The outcome focused objectives for the scavenger trials are detailed below:

- Ascertain at what rate naturally occurring scavengers remove carcasses from the Subject Land to determine removal rate of carcasses that cannot be found due to scavenger removal; and
- Use removal rates to enable more accurate estimations of fatality rates of turbine strikes, to determine if mortality rates reach or exceeds an ecologically significant proportion of a population.

Scavenger trials will be conducted across seasons to account for different rates of scavenging that has been observed across seasons (Catling 1988; Molsher et al., 2000). Dependant on results of the scavenger trials, reassessment of requirements and procedures (including replicate numbers) will be reassessed to determine if changes to the above procedures are needed.

An alternative to the method used above is to use motion sensor cameras that monitor scavenger activity. In this case a star picket (approximately 1 m high) will be placed in the ground approximately 4 m away from the carcass, with a camera attached. This camera will record any scavenging activity over the course of 30 days from placement. This method gathers the exact time and method of scavenging and thus eliminates any uncertainties in the results analysis.

7.4.4.6 DETECTABILITY TRIAL

Detectability trials will be conducted at the same time as scavenger trials, conducted during the first day of placing carcasses. These detectability trials will be conducted to test the efficiency of searchers in finding the carcasses for the Subject Land. The detectability trials will be conducted four times in the first year of operation, sampling across all four seasons (Summer, Autumn, Winter, Spring). This sampling will represent the greatest change in vegetation cover. Such detectability trials will also be conducted for handlers and dogs, if they are to be used for the proposed development. The detectability trials will be conducted by personnel who have been involved in the monthly carcass searches.

The detection efficiency that is determined from the detectability trials will be incorporated into mortality rates and analyses to account for the error associated with human detection of carcasses. This detectability analysis will be documented in the report at the end of the first two-year monitoring period in accordance with the BBAMP.

Carcasses will be randomly placed in the inner search area of a turbine (100 m zone) and their location noted by the suitably qualified ecologist. The efficiency will be recorded as the number of successful finds by a searcher against the actual carcasses placed by the suitably qualified ecologist.

The categories, number of carcasses and replicates to be used in the detectability trials across the wet and dry season is presented in Table 7-14.

TABLE 7-14 NUMBER OF REPLICATES OF BIRD AND BAT CARCASSES FOR DETECTABILITY TRIALS

Season	Micro-bat - Small birds	Medium sized birds	Large raptor sized birds
Summer	7	7	3
Autumn	7	7	2
Winter	7	7	2
Spring	7	7	3

7.4.4.7 RESULTS ANALYSIS AND PRESENTATION

It is proposed that a 12-month monitoring report and a final monitoring report (end of two-year monitoring period) will be prepared. Annual compliance reports will include an assessment of the monitoring programs and whether any trigger limits have been met. Ongoing monitoring will be assessed following risk assessments as a component of the described adaptive management framework.

Data that will be analysed and documented in the reports will include information on carcass identification and timing, the results of the trials (scavenger and detectability) so that factors influencing mortality can be determined. Mortality rates should be expressed as the number of carcasses discovered per turbine per year and any spatiotemporal variation across the Subject Land and seasons should be presented and discussed.

Data analysis will estimate mortality rates of birds and bats within the Subject Land, considering standard error and variation. Appropriate software packages will be used to inform variables needed to be determined during the carcass, detectability and scavenger trials which will subsequently inform the survey design.

At this stage, prior to construction and knowledge of precise turbines to be constructed, the following software packages and statistical principles are proposed for the proposed development, with specific variables to be measured and data input requirements (and associated assumptions) considered in the final monitoring design:

- Logistical regression (general liner modelling) to be used to determine searcher efficiency. This will account for significance.
- The proportion of the area searched to be estimated using the Monte-Carlo Simulation method as described in Hull and Muir (2010), as mentioned in Section 5.3.
- Mortality will be estimated using the Hortvitz-Thompson style estimator from Huso (2011); and
- Survival analysis (survival regression to account for interval censoring) to be calculated using Generalised Estimator (GenEst) (or similar).

GenEst is used to estimate the total number of individuals that are present within an area in a given time period, when their detection probability may not be known. This program is used as counts of carcasses alone is not an accurate way to measure the true number of fatalities in an area due to those that may be missed in the process. This method also allows for comparisons across locations and years considering the rate of detection:

- GenEst includes tools for estimating searcher efficiency, carcass persistence, and other detection probability parameters from experimental field trials. GenEst is not an evidence of absence-type estimator and is not going to be used in circumstances where few carcasses are found. This is where the EoA program will be adopted; and
- Evidence of Absence (EoA). This program can be used in order to help determine potential fatalities which may have occurred, with respect to the survey effort, even in the absence of a carcass being located.

Statistical analyses will assist in determining potential significant differences across size categories of species, vegetation composition or across seasons.

Documented results will inform adaptive management on whether additional mitigation measures are necessary and whether specific turbines in the Subject Land pose higher risks to birds and bats than others. Such adaptive management will occur in consultation with BCD.

7.4.4.8 BBAMP PERSONNEL AND ASSOCIATED TRAINING REQUIREMENTS

All personnel involved in the implementation of the BBAMP will be familiar with the approved BBAMP, relevant proposed development policies and procedures, and other important administrative matters such as health and safety documents. The Proponent will be responsible for ensuring that suitably qualified and trained people are engaged to supervise and implement the formal monitoring program as defined in the BBAMP. Beyond the formal period of monitoring, the Proponent will be additionally responsible for ensuring ongoing reporting of incidental finds and the engagement of relevant specialists were triggered by the BBAMP.

Training will be provided to all personnel that will be undertaking carcass searches, species identification and handling. Such training will be delivered by suitably qualified ecologists who are specialists in the field of bird and bat carcass retrievals. The training will include trial establishment, transect search techniques, selection of specific turbines for monitoring, species identification, carcass handling practices and PPE management.

The qualified ecologist will be involved in the initial search program of the turbines to oversee and assist with the carcass search, handling and identification. So that the BBAMP is being implemented and monitoring routinely performed to standard, the suitably qualified ecologist will undertake an audit after the first 6 months of the commencement of the implementation of the BBAMP.

The suitably qualified ecologist will be available to identify any carcasses that proposed development personnel are unable to identify, either from frozen specimens or from photographs taken at the search area.

Training will be provided to assigned operational personnel which on how to properly prepare and handle carcasses and how to randomise the placement of carcasses in trial areas.

Scavenger trials will be developed by the suitably qualified ecologist, who will supervise the searches undertaken by trained operational personnel.

The suitably qualified ecologist will undertake data analysis and prepare the 12-month interim and two-year final monitoring reports.

Training will be provided by the suitably qualified ecologist to operational personnel involved in the monitoring program and trials, with refresher training available if requested or deemed necessary during the two-year implementation period of the BBAMP.

7.4.5 TRIGGER ACTION RESPONSE PLAN

This section outlines the impact triggers and the process for assessing if an impact exceeds a significant residual impact to that species associated with interactions with turbines, including the decision-making framework and adaptive management where a response is required.

Impact triggers and response requirements will be different for both listed and non-listed species. For listed threatened and migratory species, two levels of assessment are to be considered in the BBAMP:

1. An impact trigger, defined as a single mortality event to a listed species that triggers an ecological investigation into the cause and significance of the event, with recommendations for adaptive management to avoid, minimise and manage the impact; and
2. Assessment of the significance of the impact, with a method for estimating if the impact exceeds a significant residual impact, as defined by Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DEWHA, 2013) to identify if offsets are required to compensate for the significant residual impact.

The Applicant will be responsible for ensuring implementation of the developed BBAMP and the adaptive management approach. A suitably qualified ecologist will be required to support decision-making elements and provide advice in relation to the impact significance and where Regulator consultation (State and Commonwealth) is required.

7.4.5.2 THREATENED AND MIGRATORY SPECIES IMPACT TRIGGER REQUIREMENTS

Where a single listed threatened and/or migratory bird or bat species are found dead within the search area of a turbine (proximity that can be attributed to turbine collision) during implementation of the BBAMP, or via an incidental find, then the impact trigger methodology as described below applies. Additionally, if a breeding area for these species is located within 200 m of a turbine, then an impact trigger will occur. There are currently no known breeding places for the likely or known species within the Subject Land.

Where a single carcass of a listed threatened and/or migratory species is detected within the Subject Land, a decision-making framework will be implemented. This includes additional surveys being undertaken within two weeks of the carcass find by a suitably qualified ecologist, and where data is available, a population viability analysis (PVA) will be undertaken. A report will be prepared by a suitably qualified ecologist and presented to DCCEEW and/or BCD outlining the next steps of mitigation and management. Additionally, the developed collision risk model will be updated following any suspected turbine collision. It is noted that documents that will be assessed in determining impact triggers will include:

- Significant Impact Guidelines 1.1 - Matters of National Environmental Significance per the EPBC Act (DEWHA, 2013)
- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment, 2015)
- Species-specific management plans and Conservation Advice from SPRAT profiles

Additionally, if any threatened species are identified throughout the monitoring program would trigger additional mitigation actions, including:

- Species specific monitoring
- Flight path mapping
- Additional targeted surveys

7.4.5.3 DECISION MAKING FRAMEWORK

If the impact trigger requirements are met for the proposed development the following decision-making framework will be followed:

1. The bird or bat carcass must be immediately reported to the proposed development's Responsible Officer, including information such as the species type, the area where the species was found and any other contributing factors that appear appropriate. Photos must be taken of the carcass or injured species so that correct identification can be carried out.
2. A suitably qualified ecologist, engaged by the Proponent (and managed by the Responsible Officer), will undertake an analysis to determine the presence of the impact trigger either in person or through analysis of the carcass and/or photographic evidence. The ecologist will assess whether the death/injury can be directly attributed to a WTG strike. Where there is conclusive evidence the death/ injury is not related to WTG strike, no further action is required.
3. If the impact trigger has been confirmed by the ecologist, the proposed development's Responsible Officer will report the trigger to DPE and/or DCCEEW within two business days.
4. The suitably qualified ecologist will undertake a detailed investigation to determine the events that caused the death or injury of the listed species. This investigation will include a PVA where data is available for the species. Once this investigation is concluded and if it is deemed that WTG collision or interference with the WTG has caused the death/injury, other factors like species behaviour will also be considered:
    a. If the evaluation undertaken by the suitably qualified ecologist (including a PVA) reveals the impact trigger has the potential to contribute a significant impact to the species, species-specific monitoring will likely be recommended and implemented. This monitoring will be informed by the ecologist, with a minimum six-week period of fortnightly monitoring. These monitoring exercises will need to be supervised and reported by the suitably qualified ecologist, who will include in the report any recommendations for additional mitigation measures to manage or reduce the impact to the species, in accordance with the adaptive management measures. BCD and/or DCCEEW will be consulted on the course of action to best close-out the response.
    b. If the evaluation undertaken by the suitably qualified ecologist can demonstrate that a significant impact is unlikely and no further action will be required. This significant impact will be determined through following the relevant guidelines including but not limited to the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance per the EPBC Act (DEWHA, 2013), and the process provided in Section 6.4 of this BBAMP. Species-specific guidelines will be applied as well as current knowledge of the species populations and ranges.

c. If the evaluation undertaken by the suitably qualified ecologist cannot determine the cause of the impact trigger beyond reasonable doubt, further monitoring (fortnightly for six-weeks) may be proposed to determine re-occurrences/extent of the impact. As with the previous steps, if the additional monitoring confirms a one-off occurrence to the species, then no further action except advising the relevant authority is required. If more than a one-off occurrence is observed, then step 4b) above applies.

5. If the impact trigger is assessed as having the potential to contribute to a significant residual impact, adaptive management will be designed to reduce and mitigate impact to the species. Further monitoring of the effect of these additional mitigation measures and their impact would be undertaken by suitably qualified ecologist to determine and report on their effectiveness. The BBAMP will be updated to include any additional or adjusted mitigation measures. As part of the adaptive management strategy, several mitigation measures may be considered, such as:
    - Acoustics to discourage foraging birds at particular locations
    - Encourage species into alternative low-risk areas using social attraction techniques (decoys and audio playback systems)
    - Removal of foraging habitat where appropriate
    - Investigate alternative stocking arrangements
6. All evaluations and decisions regarding mitigation measures for the impacted species will be reported to BCD and/or DCCEEW, with consultations to ensure the best course of action is applied for the proposed development and species affected. Outcomes will also be reported in the monitoring reports that are prepared by the ecologist to the Proponent; and
7. Offsets may be required where the significant residual impact to the species cannot be effectively mitigated by other measures. Offsets may be in the form of financial offsets under the BOS or research-based offsets where an appropriate institution can undertake species specific research. Offsets will need to be considered and developed in accordance with the BOS. Any offset consultations will need to be undertaken with BCD. Additionally, if a trigger is assessed to have occurred, surveys will be undertaken to review the area, and discussions with BCD will occur, which may include turbine curtailing if assessed as appropriate for species management.

7.4.5.4 NON-THREATENED (PROTECTED AND LOCALLY ABUNDANT SPECIES) IMPACT TRIGGER REQUIREMENTS

The impact trigger for the non-listed threatened species in the BBAMP will be a total of five or more bat or bird carcasses of the same species that are recorded at the same WTG during a 12-month period.

The definition of a significant impact to a non-listed threatened species is an impact that is likely to reduce the viability of the population of the species within that bioregion. Sometimes the population numbers for a species are not known or reported. In the case where such information is not publicly available, a suitably qualified ecologist will undertake an assessment of the potential impact to a species in the bioregion to determine whether the impact will exceed indicative significant impact thresholds.

7.4.5.5 DECISION MAKING FRAMEWORK

If the impact trigger requirements are met for the proposed development, the following decision-making framework will be followed:

1. BCD will be notified of the trigger (including species, time and area) within seven days of the trigger event;
2. A suitably qualified ecologist will undertake an analysis to determine if the impact trigger will exceed the indicative significant impact threshold. This assessment will consider factors like the distribution of the species, known population size and habitat requirements, as well as any literature on specific threats to the species within the bioregion;
3. A report on the findings of the analysis will be prepared by the suitably qualified ecologist and presented to the proposed development's Responsible Officer and subsequently then presented to BCD within three weeks of the impact triggering event (this date may be subject to change upon consultation with BCD):
    a. If the evaluation undertaken by the suitably qualified ecologist reveals the impact trigger to be a one-off event and unlikely to occur again, no further action will be required;
    b. If the evaluation undertaken by the suitably qualified ecologist reveals the impact trigger may lead to the indicative significant impact thresholds being exceeded, species-specific monitoring will likely be recommended and implemented. These monitoring exercises (fortnightly for six-weeks) will need to be observed and reported on by the suitably qualified ecologist, who will then determine if any additional mitigation measures are necessary to manage or reduce the significant impact upon the species. Such measures will be decided upon through adaptive management approach; and
4. The investigations and mitigation measures recommended in the case of a significant impact will need to be included in the monitoring reports, in accordance with the BBAMP.

7.4.5.6 ADAPTIVE MANAGEMENT

In the event of an impact trigger to a listed threatened bird or bat species, adaptive management principles will be applied. Application of adaptive management will be upon written recommendation (from the reporting requirement of the impact trigger response) by a suitably qualified ecologist, in accordance with the BBAMP.

Adaptive management will take into consideration the species impacted, the area of impact and other factors such as population dynamics, to determine the most appropriate solution.

Additional mitigation and monitoring measures, should they be required, and potential effects will be monitored and documented within the monitoring reports, in accordance with the BBAMP, and presented to the BCD for consultation on the next steps for management and mitigation to be implemented.

7.4.6 MITIGATION MEASURES

The BBAMP will define environmental objectives for the proposed development that will enable the implementation of a long-term approach to the mitigation and management of potential impacts on listed threatened and migratory species. Monitoring will also identify any potential changes to the species' utilisation of the project site and the surrounding landscape.

Mitigation measures will be implemented for potential significant impacts to listed threatened species arising out of the operation of the proposed development. Impact triggers act as a measure to determine when additional mitigation measures should be implemented. Mitigation measures will be reviewed throughout the monitoring period, and at the end of every two-year monitoring period, a suitably qualified ecologist will oversee and determine whether any adjustments should be made. The required monitoring frequency over the lifetime of the Project will be reviewed by a suitably qualified ecologist in consultation with DCCEEW to establish an appropriate frequency based on results and changes in collision risk following monitoring completed to date.

The adaptive management approach proposed to monitor impacts, detect impact triggers and apply corrective actions is outlined in Section 7.3 . The measures in Table 4-6 have been designed so that species (locally abundant, least concern and listed species) are not significantly impacted by the proposed development. If changes to the mitigation measures are likely to result in a new or increased impact to any EPBC Act listed species (i.e. beyond minor variations or updates to the BBAMP), impacts may need to be referred to the Minister in accordance with Section 143A of the EPBC Act, following a self-assessment.

The main causes of impact to listed species for the proposed development are considered as:

- Collision of birds and bats with blades of operating WTGs is likely to occur, with non-listed species most at risk;
- Injury and mortality of birds and bats caused by exposure to rapid air pressure reduction due to close proximity to turbine blades, causing barotrauma; and
- Removal or reduction of critical foraging, dispersal and breeding habitat is likely to occur following construction of WTGs and associated infrastructure.

Factors that can increase the potential of impacts to listed species for the proposed development are considered as:

- Promotion of water and foraging resources that result in attracting birds and bats into the vicinity of the WTGs. This could result in higher rates of collision and injury/death. Nesting may occur close to WTGs; and
- Lighting on WTGs and buildings causing an increase in bird and bat prey. This may result in increased bird and bat abundance in the vicinity of the WTGs and increase collision risk.

An adaptive management process has been established by this BBAMP, which includes the following broad elements:

- Baseline monitoring surveys – prior to the commencement of operation of the proposed development (six of which have already occurred from 2020 - 2023, and two of which are proposed to occur in Autumn and Winter 2024) in addition to deploying Anabat devices recording at various heights attached to Met Masts throughout 2024.
- Operational monitoring surveys – to be undertaken at selected WTGs throughout the operation of the proposed development, to estimate mortality of bird and bat species as well as record species within the Subject Land;
- Reporting – to be undertaken in the first and second year of operation and agreed upon timeframes thereafter with DCCEEW and BCD. Such reports will include mortality estimates, incident findings, mitigation measure effectiveness or inefficiencies; and
- Development of mitigation measures based on monitoring surveys and reporting results to manage risks such as minimising mortality.

The management actions will aim to minimise the impact of mortality associated with collisions with WTGs. The success of management actions will be measured through performance indicators related to impact triggers, monitoring and assessment outputs. Despite these measures, a residual risk will likely remain. The success of the proposed management actions will be measured through monitoring documentation and reporting.

7.4.7 TURBINE STRIKE NOTIFICATION

7.4.7.1 ASSESSMENT OF SIGNIFICANT RESIDUAL IMPACTS

As part of the ecological investigation completed when an impact trigger is detected, the significance of impact will be assessed by a suitably qualified ecologist with reference to the EPBC Act Significant Impact Guidelines 1.1 - Matters of National Environmental Significance.

It is proposed that the method for assessment for identifying if an impact will exceed an indicative significant impact threshold will quantify the number of mortalities of each species based on the carcass search results (see Section 7.4.4.3) that reaches or exceeds an ecologically significant proportion of a population over a defined time period (referred to as a "significant impact threshold"). As described in the referral guideline for 14 birds listed as migratory species under the EPBC Act (2015), an ecologically significant proportion of a population is defined as being 0.1% of the estimated national population size for a species. Where this is exceeded, offsets may be required for the significant residual impact.

A high-level review of species population ecology has been used to establish an indicative significant impact estimate, that considers the number of mortality events and time frame considered as potentially significant to the species identified at low risk in this BBAMP. Generational time, defined as the average interval between the birth of an individual and the birth of its offspring, is approximately ten years for most species identified as having a potential future risk in this BBAMP. These generational times can be used as an indication of the time required for a population to replace individuals lost to turbine collisions.

The species ranges and population sizes have also been considered for these estimates presented in this BBAMP, with those having larger populations. Table 7-15 provides an indicative significant impact threshold associated with four at risk listed threatened and migratory bird species, and twelve species identified as vagrants (Section 7.4.5.2). Due to unknown population estimates for some species, a conservative approach has been taken to proposed impact thresholds that are likely to be a greater proportion of the population than is applied to the remaining species. If population estimates for a species become available, the significant impact thresholds proposed by this BBAMP will be updated accordingly. Where a species is listed as threatened under the BC Act but not listed as threatened under the EPBC Act, known population estimates specific to NSW have been used to calculate mortality thresholds.

TABLE 7-15 SPECIES INDICATIVE SIGNIFICANT IMPACT THRESHOLD

Species	Australian Population Estimate	Indicative Significant Impact Threshold (0.1% of population)
White-throated Needletail	41,000	41 mortalities over a five-year period
Fork-tailed Swift	50,000	50 mortalities over a five-year period
Little Eagle	Unknown	1 mortality within a one-year period
Australian Painted Snipe	340	1 mortality within a one-year period
Black Falcon	4,000	4 mortalities within a one-year period
Spotted Harrier	Unknown	3 mortalities within a one-year period
Pink Cockatoo	15,000	15 mortalities within a five-year period
Grey Falcon	1,000	1 individual within a one-year period
White-bellied Sea-eagle	1600 (NSW)	1 individual within a one-year period
Square-tailed Kite	Unknown	3 mortalities within a one-year period
Magpie Goose	1,000,000	3 mortalities within a one year period
Dusky Woodswallow	200,000	200 mortalities within a five-year period
Australasian Bittern	1,300	1 mortality within a one-year period
Varied Sitella	Unknown	3 mortalities within a one-year period
Blue-billed Duck	15,000	15 mortalities within a five-year period
Freckled Duck	18,000	18 mortalities within a five-year period
Brolga	1,000 (Southern Australia)	1 mortality within a one-year period
Blue-winged parrot	10,000	100 mortalities within a five-year period
Little Pied Bat	Unknown	3 mortalities within a one-year period
Yellow-bellied Sheath-tail Bat	Unknown	3 mortalities within a one-year period

These significant impact thresholds are indicative only, and the actual significant impact assessment and associated advice will be provided by a qualified ecologist aligned with the investigation process. These indicative thresholds may exhibit fluctuations through time as updated species population estimates become available and it is expected that contemporary information be used during an investigation, as required throughout the life of this BBMP.

Global population estimates of fork-tailed swifts have not been quantified at the time of this draft BBAMP. It is thought that when present in Australia during annual migration that the entire global population is present in the region. Indicative population estimates included in this draft BBAMP have been based on the largest flock sizes ever recorded in Australia. While flocks ranged from 50,000 to 90,000 individuals a conservative approach has been taken with 50,000 being substituted for a population estimate.

7.4.7.2 SPECIFIC MANAGEMENT OBJECTIVES, ACTIVITIES, TIMING AND PERFORMANCE CRITERIA

Table 7-16 summarises management objectives, activities, timing and responsible parties for the implementation of this BBAMP. This table should be referred to for reporting and monitoring purposes throughout the two-year monitoring period. It is noted that adaptive management may require an adjustment to the requirements in Table 7-16 under the direction of a suitably qualified ecologist.

TABLE 7-16 MANAGEMENT ACTIONS

Stage	Management Action
Pre-Development	The two-stage impact and disturbance mitigation process will be implemented. Areas of remnant and regrowth vegetation will be avoided at the design and micro-siting phases
	Design of a turbine with a blade sweep area >60 m above ground level to provide a collision-free foraging zone within the canopy and 20 m above the canopy
	Locating turbines away from key bird and bat habitats (waterways and drainage lines)
	Initial field surveys for bird and bats will be undertaken. Impacts areas to be selected as part of the BACI designed bird surveys. A further iteration of the CRM to be undertaken, utilising updated BUS data, and incorporating any additional listed threatened or migratory species detected.
Pre-construction	Pre-clearing surveys shall be undertaken prior to clearing efforts within the marked boundaries. These pre-clearance surveys will form part of the micro-siting process, which will closely analyse potential infrastructure locations. If potential habitat for bats, such as riparian areas and dense woodlands, occur in such locations, development layout will be adjusted. Control areas to be selected as part of BACI designed bird surveys. Surveys will then be undertaken in the control and impact areas prior to construction beginning. These surveys will include BUS such as point, waterbody and bird of prey surveys, to determine species presence in the RSA and bat surveys will be conducted via the use of echolocation call detectors and harp trapping
	Targeted surveys to identify important habitat features of value to birds and bats in the Subject Land and, in particular, identify raptor nesting sites so that turbine location can be adjusted as part of micro-siting requirements to minimise collision risk
Construction	All clearing shall be within clearly marked boundaries and in accordance with the Development Permit
	Where trenching and excavations are created which may entrap fauna, suitable escape measures are put in place, and excavation are checked for fauna before backfilling
	Include toolbox talks for site specific bird and bat information during the proposed development
	Ensure appropriate waste management (lidded bins), including food scraps, to reduce potential for feral species to become established on-site
	BACI surveys conducted at impact and control areas during construction to determine bird and bat composition, abundance and density at control and development areas. This includes BUS and use of bat survey techniques

Stage	Management Action
Monitoring	Daily inspections by spotter / catcher during clearing, specifically hollow trees, roosting sites, and rocky outcrops and caves for birds and bats
	Weekly site inspections to review flora and fauna control measures during clearing and construction
	Annual auditing of Construction Environmental Management Plan (CEMP) during construction
	BACI surveys to be conducted in the operation phase at control and impacts areas, to determine the 'after' development effect on bird and bat composition, abundance and density.
	Mortality monitoring: at approximately 30% of turbines (approximately 8 WTGs) monthly for two years. Any extension to monitoring is considered under Section 6.3 of this document
	Scavenger and detectability trials: two of each, undertaken within the first year of monitoring, approximately 6 months apart.
	Adaptive management and inclusion of additional mitigation measures as a result of impact triggers as a result of recommendations from a suitably qualified ecologist
	Low wind speed curtailment required when wind speeds are below the manufacturer's cut in speed of 3 m/s (i.e., feathered to prevent turning or other mechanism)
Reporting	Sightings and incidents reported in daily Pre-starts
	Fauna spotter-catcher will keep an inventory of any bird and bat species encountered with details of species, capture and release condition and capture and release GPS co-ordinates during construction. This also includes carcass reporting and notification
	Injured native fauna to be reported to Health, Safety, Environment Quality (HSEQ) Manager
	Preparation of monitoring BBAMP reports: one within three months of the first year of monitoring, and one within three months of the second year of monitoring
	Monitoring report after two years: estimates of mortality for bird and bat species across the monitoring period. Taking into account detectability and scavenger trial results
Corrective Action	All near misses and incidents will be investigated to establish root cause. Where necessary corrective actions will be developed to improve existing processes

7.5 SUMMARY OF MEASURES TO AVOID AND MINIMISE IMPACTS

Table 7-17 summarises the avoidance and minimization measures to be implemented for direct, indirect and prescribed impacts.

TABLE 7-17 AVOIDANCE AND MINIMISATION MEASURES FOR DIRECT, INDIRECT AND PRESCRIBED IMPACTS

Action	Justification	Outcome	Timing	Responsibility
Implementation of a suite of mitigation measures	To minimise the impacts on biodiversity a suite of mitigation measures will be implemented such as the delineation of clearing areas, erosion sedimentation and pollution control, timing of construction works, mammalian predator management, pre-clearance surveys, clearance supervision, weed management, a BBAMP and a Vegetation Management Plan (VMP).	Minimise impacts on biodiversity	Pre and post construction and during operation phase	Applicant and consultant team
Design amendments to various elements of the Project design	Several design amendments have been implemented for the Project to avoid and minimise impacts on biodiversity.	Avoid and minimise direct and indirect impacts on TECs and fauna habitat	During design and approval	Applicant and consultant team
Consideration of alternative sites and layouts for the development within the Subject Land	The potential sites reviewed for development were considered on the basis of a variety of developmental factors, including environmental limitations, wind resource and planning considerations. The Subject Land contains valuable characteristics that satisfied initial feasibility for wind farm development.	Appropriate site selection to avoid environmental constraints while optimising location for the Project.	Preconstruction	Applicant

8. IMPACT ASSESSMENT

8.1 DIRECT IMPACTS

The construction and operational phase of the development will result in direct impacts to biodiversity values (change in vegetation integrity score and habitat suitability) within the Subject Land which cannot be avoided. Direct impacts include habitat clearance, noise and disturbance associated with clearing and construction, and presence of infrastructure which may create barriers to movement.

The direct impacts of the development are on:

- Native vegetation (outlined in Table 8-1); and
- Threatened species and threatened species habitat (outlined in Table 8-2).

TABLE 8-1 SUMMARY OF IMPACTS TO NATIVE VEGETATION

Entity Directly Impacted	BC Act	EPBC Act	SAII entity	Project phase/timing of impact	Extent (ha)
HZ 1 (PCT 164 – Moderate)	Not Listed	Not Listed	No	Construction	855.73
HZ 2 (PCT 163 – Moderate)	Not Listed	Not Listed	No	Construction	268.58
HZ 3 (PCT 44 - Moderate)	Not Listed	Not Listed	No	Construction	4.78
HZ 4 (PCT 160 – Moderate)	Not Listed	Not Listed	No	Construction	1.84

TABLE 8-2 SUMMARY OF RESIDUAL IMPACTS TO THREATENED SPECIES AND THREATENED SPECIES HABITAT

Candidate Species Credit Species	BC Act	EPBC Act	SAII entity	Project phase/timing of impact	Extent (ha)
Slender Darling Pea *Swainsona murrayana*	Vulnerable	Vulnerable	No	Construction	789.20*
Mossgiel Daisy *Brachyscome papillosa*	Vulnerable	Vulnerable	No	Construction	1,021.82*
Chariot Wheels *Maireana cheelii*	Vulnerable	Vulnerable	No	Construction	769.52*
Little Eagle *Hieraaetus morphnoides*	Vulnerable	-	No	Construction and Operation	16.33

* Note: Area includes unsurveyed assumed presence. Impact area to be reduced by completion of targeted survey during correct season.

8.1.1 CHANGE IN VEGETATION INTEGRITY SCORE

Table 8-3 details the change in vegetation integrity score for each vegetation zone. The direct impacts of the Project involve all four vegetation zones, resulting in the total clearing of vegetation within the Disturbance Footprint.

TABLE 8-3 IMPACTS TO VEGETATION INTEGRITY

Vegetation zone	PCT ID	Management zone	Area (ha)	Before development			
				Composition	Structure	Function	Change in VI score
Zone 1	164	Complete clearance	855.73	98.5	96.7	-	-97.6
Zone 2	163	Complete clearance	268.58	97.8	86.8	-	-92.2
Zone 3	44	Complete clearance	4.78	98	18.7	-	-42.8
Zone 4	160	Complete clearance	1.84	86	65.5	-	-75.1

8.2 INDIRECT IMPACTS

The BAM (Section 8.2.2) identifies 16 potential indirect impacts that, as a minimum, must be considered as a part of a BDAR. Residual indirect impacts of the Project on native vegetation, threatened entities and their habitat beyond the Disturbance Footprint have been considered in accordance with the BAM in Table 8-4 .

Despite the propensity for indirect impacts, it is considered that the mitigation measures proposed are reliable and capable of remedying the effects of these impacts without causing harm to the adjoining environment. No residual indirect impacts are expected. See Section 8.5 for recommended mitigation measures.

TABLE 8-4 SUMMARY OF RESIDUAL INDIRECT IMPACTS

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
Impacts of the proposal on TECs/PCTs and/or threatened species and their habitat beyond the construction area, including but not limited to:			
(a) Inadvertent impacts on adjacent habitat or vegetation	Retained vegetation and adjacent vegetation.	Construction	There are potential impacts to retained and adjacent vegetation through edge effects resulting from increased dust and runoff from construction activities, potential impact from trampling by site vehicles, and overstepping clearing and disturbance boundaries. These risks will be mitigated through environmental management measures and controls via the preparation and implementation of a Construction Environmental Management Plan (CEMP). There is unlikely to be residual inadvertent impacts to adjacent vegetation.
(b) Reduced viability of adjacent habitat due to edge effects	Retained vegetation and adjacent vegetation.	Operation	Impacts to viability of adjacent habitat due to edge effects is considered very low due to current land use and condition (livestock grazing and weed incursions) of the Subject Land. However, to minimise edge effects as a result of the Project, the CEMP will include measures to minimise soil disturbance, artificial light, runoff, noise and dust incursions on adjoining vegetation. The CEMP will also be implemented to manage weed incursions.
(c) Reduced viability of adjacent habitat due to noise, dust or light spill	The Project is not expected to result in reduced viability of adjacent habitat due to noise, dust or light spill.	N/A	N/A
(d) Transportation of weeds and pathogens from the subject site to adjacent vegetation	Retained vegetation and adjacent vegetation.	Construction, operation and rehabilitation	There is a potential risk of transportation of introduced weeds and pathogens during construction and operation to adjacent vegetation as weed species have been recorded across the Subject Land. The risk of weed and pathogen spread is considered manageable and will be management as part of the CEMP.

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
Impacts of the proposal on TECs/PCTs and/or threatened species and their habitat beyond the construction area, including but not limited to:			
(e) Increased risk of starvation, exposure and loss of shade or shelter	The Project is not expected to result in any indirect impacts resulting in an increased risk of starvation, exposure and loss of shade or shelter for further species.	N/A	N/A
(f) Loss of breeding habitat due to vegetation clearance	The Project is not expected to result in any indirect impacts to breeding habitat due to vegetation clearing.	N/A	N/A
(g) Trampling of threatened flora species	Identified and assumed present threatened flora species.	Construction, operation and rehabilitation	Chariot Wheels, Mossgiel Daisy and Slender Darling Pea are confirmed to occur within the Subject Land. The Project has potential to result in trampling of these threatened flora where they occur beyond the construction area. These risks will be mitigated through environmental management measures and controls via the preparation and implementation of the CEMP. There is unlikely to be residual inadvertent impacts to threatened flora.
(h) Inhibition of nitrogen fixation and increased soil salinity	The Project is not expected to result in the inhibition of nitrogen or increased soil salinity.	N/A	N/A
(i) Fertiliser drift	The Project is not expected to result in any fertiliser drift.	N/A	N/A
(j) Rubbish dumping due to improper management of waste	The Project is not expected to result in rubbish dumping.	N/A	N/A
(k) Wood collection	The Project is not expected to result in increased wood collection.	N/A	N/A

Indirect impact	Impacted entities	Project phase/ timing of impact	Likelihood and consequences
Impacts of the proposal on TECs/PCTs and/or threatened species and their habitat beyond the construction area, including but not limited to:			
(l) Removal and disturbance of rocks, including bush rocks	The Project is not expected to result in any indirect impacts resulting in Removal and disturbance of rocks, including bush rocks.	N/A	N/A
(m) Increase in predators	The Project will result in larger access routes with potential to be utilised by predatory species.	N/A	The Plains-wanderer is at risk of predation from Feral cats and European Foxes known to occur in the locality. Mitigation measures will be implemented to minimise residual impact to the Plains-wanderer. Additionally, the Applicant will consider funding local control actions for the European Fox to further support conservation efforts for the species. This is further discussed in Section 8.2.1.
(n) Increase in pest animal populations	The Project is unlikely to increase pest animal populations.	N/A	The Plains-wanderer is at risk of predation from Feral cats and European Foxes known to occur in the locality. Mitigation measures will be implemented to minimise residual impact to the Plains-wanderer. Additionally, the Applicant will consider funding local control actions for the European Fox to further support conservation efforts for the species. This is further discussed in Section 8.2.1.
(o) Change in fire regimes	The Project is not expected to result in any change in fire regimes.	N/A	N/A
(p) Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds	The Project is not expected to result in any disturbance to specialist breeding habitat	N/A	N/A

8.2.1 INCREASED RISK OF PREDATORS

European Foxes (*Vulpes vulpes*), Feral Cats (*Felis catus*) and native birds of prey, such as the Spotted Harrier (*Circus assimilis*) and Black Falcon (*Falco subniger*), are all potential predators of the Plains-wanderer. Predation by European Foxes is considered a major threat to the species in New South Wales and is listed as a Key Threatening Process in Schedule 4 of the BC Act. European Foxes and remaining Plains-wanderer predatory species have been recorded within the broader Project Area and are considered likely to traverse and forage across the Subject Land.

The Project includes the construction of internal roads and tracks, that will lead to a larger road network across the site. The European Fox and Feral Cat commonly make use of cleared areas with easy access such as tracks and roads, with greater hunting success for Foxes observed along linear habitats such as roadsides when compared to remnant vegetation and open paddocks.

The Project has been designed to maximise use of existing access tracks across the Subject Land where possible, reducing the potential for an increase to predatory access and activity. The potential risks will be mitigated further via the preparation and implementation of feral pest management programs to be developed in accordance with guidelines and relevant code of practice, including but not limited to the following:

- *NSW Threat Abatement Plan: Predation by the Red Fox (Vulpes vulpes)* (NSW OEH, 2010);
- *Regional Pest Management Strategy 2012-2017: Western Rivers Region* (NSW OEH, 2013); and
- *NSW Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Cats* (NSW DPI, 2022).

The Applicant will consider funding control actions for the European Fox in the local area to further support conservation efforts for the species.

8.3 PRESCRIBED IMPACTS

8.3.1 WATERBODIES, WATER QUALITY AND HYDROLOGICAL PROCESSES

Changes to drainage can affect the integrity, structure and composition of habitat and thus, have secondary impacts on the species that rely on them. Several minor waterways occur throughout the Subject Land, with these being modified historically from the construction of farm dams. The potential increased risk of impacts to hydrological processes as a result of the Project are identified in Section 7.2.1.

The Project is likely to slightly modify the current hydrological regimes of the Subject Land. However, given that the vegetation communities occurring near the subject site are not reliant on specific hydrological regimes, and that they exist in a modified environment with engineered drainage, it is unlikely that any alteration as a result of the proposal will significantly impact these communities.

8.3.2 WIND TURBINE STRIKES

The potential risk of wind turbine strikes as a result of the Project will be mitigated through measures presented in the BBAMP, as identified in Section 7.2.2.

8.3.3 VEHICLE STRIKES

The potential increased risk of vehicle strikes as a result of the Project are identified in Section 7.2.3. With the implementation of mitigation measures the risk of vehicle collision will be substantially reduced and considered low. These measures will be addressed in the CEMP, and include examples such as on-site education, identifying and reporting hazards as they occur during construction, and setting appropriate working hours and vehicle speed limits.

8.4 CUMULATIVE IMPACTS

The Project will contribute to the overall development of the South West REZ. REZ combine wind, solar, hydroelectric and energy storage, and high-voltage transmission lines, to generate and deliver clean, renewable energy. Relevant clean energy proposed, approved, under construction and operational SSDs known at the time of finalisation of this BDAR and within and in the vicinity of the South West REZ have been considered.

Potential biodiversity direct, indirect and prescribed impacts as a result of the Project have been assessed, additionally it is acknowledged the Project will contribute to cumulative impacts during construction and operation within the existing environment. Cumulative impacts occur when impacts from a project interact or overlap with impacts from other projects and can potentially result in a larger overall effect on the environment.

A review of relevant clean energy proposals known at the time of finalisation of this BDAR and within and in the vicinity of the South West REZ has been undertaken, with potential cumulative biodiversity impacts provided in Table 8-6 . A large portion of these projects are in the planning phase, and as such the level of direct impacts to native vegetation, TECs, and threatened and migratory listed species is unknown. It is considered likely that cumulative impacts will increase the loss of similar native vegetation and threatened species habitat in the region.

Of the projects detailed, seven (7) have received consent. Of these, the EnergyConnect (Eastern) project (EnergyConnect) and Yanco Wind Farm occur across similar vegetation communities and have direct impacts to similar listed species as the Project. The expected loss as a result of all considered projects is presented in Table 8-6.

Yanco Wind Farm (Yanco WF) is situated within the Riverina IBRA region and Murrumbidgee IBRA Bioregion, as is the Project. The direct impact on native vegetation for Yanco WF is calculated at 173.39 ha, with PCTs similar to the direct impact as a result of this Project (PCTs 44, 160 and 164). EnergyConnect covers an area of the Murrumbidgee IBRA subregion, direct impacts to this region as a result of the development have been considered. Direct impacts for EnergyConnect (Murrumbidgee subregion) are associated with the removal of native vegetation, with PCTs matching all those impacted by this Project (PCTs 44, 163 and 164).

Cumulative impacts to threatened species across Yanco WF, EnergyConnect (Murrumbidgee subregion) and this Project will include those provided in Table 8-5 .

The removal of habitat across the landscape for this Project will contribute to the cumulative loss of native vegetation.

TABLE 8-5 CUMULATIVE IMPACTS ACROSS YANCO WIND FARM, ENERGYCONNECT AND THE PROJECT

Threatened Species	**Impact area (ha)**			
	Yanco WF	**EnergyConnect (Murrumbidgee Subregion)**	**The Project**	**Total**
Swainsona murrayana Slender-darling Pea	32.12	241.98	789.20*	1,063.3
Brachyscome papillosa Mossgiel Daisy	23.60	132.19	1,021.82*	1,177.61
Maireana cheelii Chariot Wheels	12.92	144.71	769.52*	927.15
Hieraaetus morphnoides Little Eagle	-	5.67	16.33	22.00

* Note: includes large area of 'assumed presence', which can be reduced following completion of seasonal surveys demonstrating absence from habitat

TABLE 8-6 POTENTIAL CUMULATIVE IMPACTS

Project	Description	Distance (km) [1]	Construction Period / Timeline
Wind Energy Developments			
Argoon Wind Farm (Prepare EIS)	• Estimated generating capacity of up to 901 MW. • Up to 106 WTGs with maximum height of 249 m to blade tip. • BESS (460 MW/2300 MWh) and ancillary infrastructure. • Peak construction workforce 340 FTE. • Operational workforce between 6 and 12 FTE. • Temporary workforce accommodation will be included if required.	158 km east	• Construction estimated to commence within one year of project approval. • Construction period about 24-36 months.
Baldon Wind Farm (Prepare EIS)	• Nominal generating capacity 1,000 MW. • Up to 162 WTGs with a maximum height of 300 m to blade tp. • BESS (200 MW/800MWh) and ancillary infrastructure. • Peak construction workforce 350 FTE. • Operational workforce 25 FTE. • Temporary workers accommodation will be established within Project Area.	13 km south-east	• Construction expected to commence 2024. • Construction period of 2-3 years. • Commissioning expected 2026-2027.
Bullawah Wind Farm (Prepare EIS)	• Nominal generating capacity of 1,000 MW. • 170 WTGs with maximum height of 300 m to blade tip. • BESS (storage of 500 MW/2000 MWh) and ancillary infrastructure. • Peak construction workforce 400 FTE. • Operational workforce 40 FTE. • Temporary workers accommodation may be located within the Project Area (as required).	115 km east	• Construction estimated to commence mid to late 2025. • Construction period about 24-months. • Commissioning expected 2027 (full scale operations).

[1] *Indicative direct-line distances from the approximate centre points of the Project sites*

Project	Description	Distance (km) [1]	Construction Period / Timeline
Dinawan Wind Farm (Prepare EIS)	• Nominal generating capacity of 1,500 MW. • Up to 250 WTGs with maximum height of 280 m to blade tip. • BESS (300 MW/1200 MWh) and ancillary infrastructure. • Peak construction workforce 800 FTE. • Operational workforce up to 50 FTE . • Workforce accommodation is expected to rely on available rental, motel and other accommodation in surrounding townships and regional centres.	153 km south-east	• Construction expected to commence 2025. • Construction period up to 36 months. • Commissioning expected 2028.
Junction Rivers Wind Farm (formerly Burrawong Wind Farm) (Prepare EIS)	• Nominal generating capacity 750 MW. • Up to 96 WTGs with a maximum height of 300 m to blade tip. • BESS (250 MW/500 MWh) and ancillary infrastructure. • Peak construction workforce 250 FTE. • Operational workforce 10-15 FTE. • Existing facilities in Balranald and other options in Kyalite and surrounding region will be utilised for construction staff accommodation.	33 km south-west	• No current information available regarding construction.
Pottinger Wind Farm (Prepare EIS)	• Nominal generating capacity of 750 MW. • Up to 108 WTGs with maximum height of 280 m to blade tip. • BESS (500 MW/2000 MWh) and ancillary infrastructure. • Peak construction workforce 450 FTE. • Operational workforce 40 FTE. • Temporary workers accommodation located within the Project Area or located offsite.	99 km east	• Construction estimated to commence 2025 or 2026. • Construction period expected to commence 2026. • Commissioning expected 2027.
Tchelery Wind Farm (Prepare EIS)	• Nominal generating capacity of 800 MW. • Up to 120 WTGs with maximum height of 285 m to blade tip. • Ancillary infrastructure and potential for BESS (not confirmed). • Peak construction workforce 500 FTE. • Operational workforce of up to 20 FTE. • Temporary workforce accommodation to be investigated.	25 km south-east	• Construction expected to commence 2026. • Construction period about 30-months. • Commissioning expected late 2028 early 2029.

Project	Description	Distance (km) [1]	Construction Period / Timeline
The Plains Wind Farm	• Nominal generating capacity of up to 1,800 MW. • Up to 226 WTGs with maximum height of 280 m to blade tip plus ancillary infrastructure. • Peak construction workforce 850 FTE. • Operational workforce 56 FTE.	56 km north-east	• Construction expected to commence early 2026. • Construction period expected to take place for 2-3 years. • Commissioning expected 2028-2029.
Wilan Wind Farm (Prepare EIS)	• Nominal generating capacity of up to 800 MW. • Up to 138 WTGs with maximum height of 300 m to blade tip. • BESS (200 MW/800 MWh) and ancillary infrastructure. • Peak construction workforce 400 FTE. • Operational workforce 10-15 FTE. • Temporary workers accommodation will be established, with the location subject to Project design and community consultation.	13 km north	• Construction expected to commence early 2025. • Construction period expected to take place for 24 to 30 months. • Commissioning expected 2027-2028.
Yanco Delta Wind Farm (Approved)	• Nominal generating capacity of 1,500 MW. • Up to 225 WTGs with maximum height of 270 m to blade tip. • BESS (500 MW/500 MWh) and ancillary infrastructure • Peak construction workforce 300 FTE. • Operational workforce of 20-30 FTE. • Workforce accommodation is expected to rely on available rental, motel and other accommodation in surrounding townships and regional centres.	151 km east	• Construction expected to commence late 2024. • Construction period about 36 months. • Commissioning expected late 2027.
Solar Energy Developments			
Currawarra Solar Farm (Approved)	• Generating capacity 195 MW with 654,000 solar panels with associated infrastructure. • Workforce of approximately 200 FTE during construction and 4 FTE during operations.	140 km south-east	• Construction period expected to last for 18 months.
Hay Solar Farm (Approved)	• Generating capacity 110 MW with 430,000 solar panels. • 150 FTE during peak construction and between 2 and 5 FTE during operation. • Currently under construction.	93 km north-west	• Construction period expected to last 12-months.

Project	Description	Distance (km) [1]	Construction Period / Timeline
Limondale Solar Farm (Operational)	• Generating capacity 250 MW with 868,00 solar panels. • BESS and ancillary infrastructure. • Peak construction workforce of 200 FTE and operational workforce of 4-7 FTE.	40 km west	• Currently operational.
Pottinger Solar Farm (Prepare EIS)	• Generating capacity 300 MW with 750,000 solar panels. • BESS (500 MW/2000 MWh) and ancillary infrastructure. • Peak construction workforce of 220 FTE and operational workforce of 4 FTE. • Temporary workforce accommodation to be investigated.	102 km east	• Construction expected to commence in 2026. • Construction period is estimated to take 24 months including commissioning.
Romani Solar Farm (SEARs)	• Generating capacity of 870.5 MW. • BESS (150 MW/300 MWh) and ancillary infrastructure. • Peak construction workforce of 150-200 FTE. • Temporary workforce accommodation to be investigated.	70 km west	• Construction expected to commence in 2025. • Construction period of 12-18 months, including commissioning.
Southdown Solar Farm (Prepare EIS)	• Generating capacity 130 MW with 335,000 solar panels and other associated infrastructure. • Workforce of up to 200 FTE during construction.	130 km south-east	• Construction was expected to commence in 2022 but has not yet begun. • Construction period about 15 months.
Sunraysia Solar Farm (Operational)	• Generating capacity 200 MW. With 750,000 solar panels and ancillary infrastructure. • Peak construction workforce of 250 FTE and operational workforce of at least 2 FTE.	42 km west	• Currently operational.
The Plains Solar Farm (Prepare EIS)	• Nominal generating capacity of 400 MW with 900,000 solar panels. • BESS with a capacity of up to 400 MW/1.6 GWh. • Peak construction workforce of up to 278 FTE employees	72 km east	• Construction estimated to commence in 2026. • Construction period approximately 18 months. • Commissioning expected 2028.
Other Developments			
Project EnergyConnect (NSW – Eastern Section) (Approved)	• 330kV transmission line • 375 km of new transmission lines and associated infrastructure • Up to 500 construction jobs and 5 operational jobs		• Construction and remediation work expected to be completed in 2025.

8.5 MITIGATING RESIDUAL IMPACTS – MANAGEMENT MEASURES AND IMPLEMENTATION

A range of mitigation measures have been developed for the Project to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the Project. Each mitigation measure is discussed in detail below, and a summary is provided in Table 8-7.

TABLE 8-7 SUMMARY OF PROPOSED MITIGATION AND MANAGEMENT MEASURES FOR RESIDUAL IMPACTS (DIRECT, INDIRECT AND PRESCRIBED)

Mitigation measure	Method	Timing	Frequency	Responsibility
Removal of native and threatened species habitat and habitat features				
Offsets	Residual impacts on habitat will be offset through the Biodiversity Offset Scheme.	Detailed design	Planning phase	Applicant
Vegetation clearing protocol	There is limited treed habitat present within the Subject Land, however where vegetation is to be removed it will be undertaken in accordance with specifications provided in a vegetation clearing protocol, detailed within the CEMP.	Pre-construction and construction phase	Throughout planning and construction phase	Construction contractor
Plain wire instead of barbed used on perimeter fence and stock fencing	Plain wire perimeter fencing (opposed to barbed-wire fencing) will be used to avoid potential entrapment of fauna on fences.	Construction phase	Ongoing	Construction contractors
Chemical Protocols	Protocols for the use of spraying exclusion zones around Plains-wanderers and their habitat to be implemented	Construction phase	Ongoing	Construction contractors
Impact to native vegetation				
Delineation of clearing areas	To avoid unnecessary removal or damage to retained vegetation, the limit of clearing will be clearly demarcated with temporary fencing and signed as 'Environmental Sensitive No-Go Zones' prior to the commencement of clearing. This will be detailed within the CEMP, including measures: • Vehicles or machinery will not be permitted to park within or drive through areas of retained vegetation. • Construction materials will not be stockpiled or stored within areas of retained vegetation. • Ancillary facilities, such as site compounds and construction zones, will not be located beyond the limits of clearing. • Temporary fencing and signage will be maintained throughout construction. • Site inductions will be given by the civil contractor to all personnel and visitors to ensure all site workers and visitors are aware of any No-Go Zones.	Pre-construction and construction phase	Throughout planning and construction phase	Construction contractor

Mitigation measure	Method	Timing	Frequency	Responsibility
Light/noise/dust				
Daily/seasonal timing of construction activities to reduce impact of noise and light spill	The CEMP will include measures to avoid light encroachment on adjacent habitats such as restricting construction works to daylight hours and incorporating sensitive lighting arrays that shield the adjoining native vegetation and habitat from stray light, with low-level lighting installed for all required external lighting.	Pre-construction and construction phase	Throughout planning and construction phase	Construction contractor
Adaptive dust monitoring programs to control air quality	The Applicant will implement daily monitoring programs to monitor the generation of dust during construction activities. All activities relating to the Project would be undertaken with the objective of preventing visible dust emissions from the Disturbance Footprint.	Construction phase	Clearing phase	Construction contractor
Invasive flora/pathogens				
Weed management	To minimise the spread of weeds throughout the Subject Land and surrounding patches, appropriate weed control activities will be undertaken in accordance with all state and regional weed management plans. The Subject Land is subject to the *Riverina Regional Strategic Weed Management Plan 2017 – 2022* (LLS, 2017) and management of Weeds of National Significance. The NSW Biosecurity Act 2015 and regulations provide specific legal requirements for state level priority weeds and high-risk activities. To comply with the objectives of the Riverina Regional Strategic Weed Management Plan 2017 – 2022 (LLS, 2017), the following measures be implemented as part of the CEMP for the Subject Land: • Initial weed treatment - Including eliminating woody species and targeting infestations of exotic herbs. In particular, High Threat Exotic weed species occurring within the subject land will be managed in order to prevent further spread. Prior to any vegetation clearance, High Threat Exotic weeds should be demarcated for these to be disposed of separately from native material. • Containment – Follow-up monitoring and maintenance should be undertaken in areas of the development site	Construction and operations phase	Ongoing	Construction and operations contractor

Mitigation measure	Method	Timing	Frequency	Responsibility
	that have received past primary weeding treatments in the following months, to contain any re-emergence of weed species. • Minimisation – Minimisation of weed species that cannot be effectively controlled on the site, such as exotic grasses, will be prevented from further spread through construction and operational phase site hygiene procedures. The CEMP will include provisions for elevated non-native vegetation (i.e Lycium ferocissimum) with potential to provide perches for known predators of the the Plains-wanderer, this non-native vegetation is to be removed within 300 m of suitable habitat for the species.			
Pathogen management	A pathogen management protocol will be implemented. Infection of native plants by *Phytophthora cinnamomic* is listed as a key threatening process under the BC Act and EPBC Act. *P. cinnamomic* is known to occur within the Riverina IBRA Bioregion can lead to death of trees and shrubs, resulting in devastation of native ecosystems. The risk of spreading pathogens and the mitigation measures required on site will be regularly communicated to staff and contractors e.g. during inductions and toolbox talks.	Construction and operations	Ongoing	Construction and operations contractors
Increased pest species presence				
Pest management programs	Feral pest management programs will be developed and implemented for the Project, with focus on Feral Cats and European Foxes. All control methods will be completed in accordance with relevant legislation / standard operating procedures, including but not limited to the following: • *Regional Pest Management Strategy 2012-2017: Western Rivers Region* (NSW OEH, 2013); • *NSW Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Cats* (NSW DPI, 2022); and • *NSW Threat Abatement Plan: Predation by the Red Fox (Vulpes vulpes)* (NSW OEH, 2010).	Construction and operations	Ongoing	Construction and operations contractors

Mitigation measure	Method	Timing	Frequency	Responsibility
Erosion and sediment				
Erosion and sediment control plan	A site-specific Erosion and Sediment Control Plan will be developed and implemented to minimise erosion and sediment control risks. The Plan will include arrangements for managing wet weather events, and working with high surface water levels, including monitoring of potential high-risk events and specific controls and follow-up measures to be applied in the event of wet weather to avoid adverse impacts to hydrological processes, wetlands and ephemeral creek line Abercrombie Creek.	Construction phase	Ongoing	Construction contractors
Turbine Strike				
BBAMP	A Bird and Bat Adaptive Management Plan will be developed in accordance with the Draft Wind Farm Assessment Guidance for the SW REZ, released by DPE in July 2023.	Pre-construction, construction and operations	ongoing	Environmental consultant contractors

9. ASSESSING AND OFFSETTING IMPACTS

9.1 SERIOUS AND IRRIVERSIBLE IMPACTS

A SAII is listed under the BC Act as an impact that is likely to contribute significantly to the risk of extinction of a threatened entity.

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- It will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
- It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
- It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution; or
- The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

Potential SAII has been addressed in the following sections in accordance with Section 9.1 of the BAM (2020).

9.1.1 ASSESSMENT FOR SERIOUS AND IRREVERSIBLE IMPACTS ON BIODIVERSITY VALUES

Based on candidate ecosystem credit species, species credit species, and result of field surveys, no species are at risk of an SAII because of the Project.

9.1.2 ADDITIONAL IMPACT ASSESSMENT PROVISIONS FOR TECS AT RISK OF AN SAII

No TECs are at risk of an SAII because of the Project.

9.2 IMPACT SUMMARY

9.2.1 IMPACTS THAT REQUIRE AN OFFSET

Impacts requiring an offset are shown in Figure 9-1. In accordance with Section 9.2.1 of the BAM, these areas comprise native vegetation with vegetation integrity score of at least:

- ≥15, where the PCT is representative of an EEC or a CEEC.
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community; or
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

All PCTs mapped within the Subject Land that are to experience a permanent direct impact require offsetting as they meet the vegetation integrity score threshold above.

9.2.2 IMPACTS THAT DO NOT REQUIRE FURTHER ASSESSMENT

The Subject Land contains 32.8 ha of non-native vegetation that does not require assessment for ecosystem credits. These areas are lacking vegetation because of clearing for access tracks or for infrastructure such as dams, troughs, and water tanks. This land does not constitute habitat for threatened species. There are no prescribed impacts requiring offsets in areas of non-native vegetation. Non-native vegetation not requiring offset is shown in Figure 9-2.

LOORICA ROAD

STURT HIGHWAY

KERI KERI

KERI KERI ROAD

KERI EAST ROAD

Legend

- Project Area
- Impacts Requiring Offset
- Disturbance Footprint
- Subject Land
- Main Roads
- Minor Roads
- Path/Track

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 01/03/2024

Created By: VN

Drawing Size: A3

0 0.5 1 1.5km

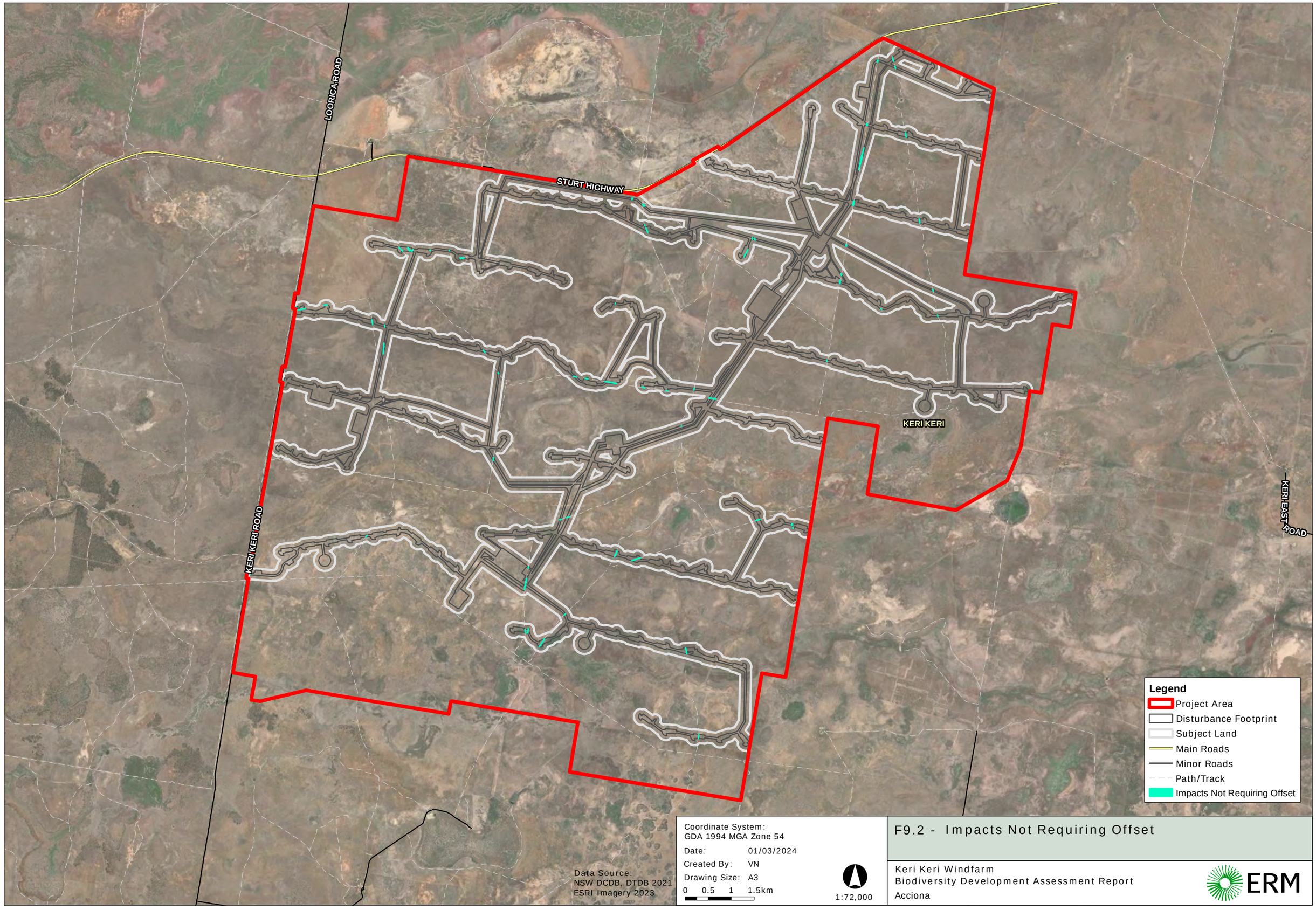
1:72,000

F9.1 - Impacts Requiring Offset

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

0617753_KKWF_BDAR_G016_R1.mxd



F9.2 - Impacts Not Requiring Offset

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

ERM

0617753_KKWF_BDAR_G017_R1.mxd

10. APPLYING THE NO NET LOSS STANDARD

The offset liability for the Project is calculated in the following sections. The Biodiversity Credit Report is provided in Appendix C.

10.1 OFFSET REQUIREMENTS FOR DIRECT IMPACTS

10.1.1 ECOSYSTEM CREDITS

Table 10-1 identifies the ecosystem credits required to offset the Project as per BAM Subsection 9.2.1(1.). There are no vegetation zones, TECs or ECs that are assessed as not requiring offsets as per BAM Subsection 9.2.1(3.).

Like for like trading options apply to the Ecosystem credit classes as outlined in Table 10-2 .

TABLE 10-1 IMPACTS THAT REQUIRE AN OFFSET – ECOSYSTEM CREDITS

Vegetation zone	PCT ID/Condition	Impact area (ha)	Change in VI score	Number of ecosystem credits required
1	164_Moderate	855.73	-97.6	31,315
2	163_Moderate	268.58	-92.2	9,282
3	44_Moderate	4.78	-42.8	102
4	160_Moderate	1.84	-75.1	52

TABLE 10-2 ECOSYSTEM CREDIT CLASS AND MATCHING CREDIT PROFILE

PCT name	PCT vegetation class	Associated TEC or EC	Offset trading group	Hollow bearing trees present?	Credits
44 - Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Riverine Plain Grasslands This includes PCT's: 44	-	Riverine Plain Grasslands - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status).	No	102
160 - Nitre Goosefoot shrubland wetland on clays on the inland floodplains	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 195, 196, 211, 377	-	Riverine Chenopod Shrublands - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	No	52
163 - Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	-	Riverine Chenopod Shrublands - < 50% cleared group (including Tier 4 or higher threat status).	No	9,282
164 - Cotton Bush open shrubland of the semi-arid (warm) zone	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	-	Riverine Chenopod Shrublands - < 50% cleared group (including Tier 4 or higher threat status).	No	31,315

10.1.2 SPECIES CREDITS

Candidate species requiring an offset are presented in Table 10-3 .

TABLE 10-3 IMPACTS THAT REQUIRE AN OFFSET – SPECIES CREDITS

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha)	Biodiversity risk weighting	Number of species credits required
Chariot Wheels	*Maireana cheelii*	V	V	769.52*	2	37,542
Slender Darling Pea	*Swainsona murrayana*	V	V	789.20*	2	38,493
Mossgiel Daisy	*Brachyscome papillosa*	V	V	1,021.82*	2	49,199
Little Eagle	*Hieraaetus morphnoides*	V	-	16.33	1.5	580

* Note: This area calculation includes a large proportion of 'assumed presence'. The actual true impact on the species habitat would be reduced following completion of appropriate timed targeted surveys within the Development Footprint (i.e., September).

The area from which the Species credits can be obtained is limited to the State of NSW.

10.2 OFFSET STRATEGY

The No Net Loss standard involves the retirement of ecosystem and species credits for Project related direct impacts in accordance with the BOS. The BOS requires all biodiversity impacts to be calculated using the BAM-C, which provides an output determining the final Species credit and Ecosystem credit obligations for the Project. Typically, the final credit obligations are to be 'retired' prior to construction or in accordance with an approved staged approach.

The Applicant is developing a biodiversity offset strategy in parallel with the Biodiversity Assessment Report. This strategy will detail the offset approach to be undertaken to retire credit obligations and will be achieved by:

- Retiring 'like for like' credits as specified in Sections 7.1 and 7.2 to the amount and from the regions indicated;
- Funding a biodiversity conservation action instead of, or in combination with, the retirement of species credits; or
- Payment into the Biodiversity Conservation Trust (BCT) in lieu of satisfying the offset liability specified in Section 7.1 and 7.2.

The fee associated with the latter option is to be determined through formal consultation with the BCT.

10.2.1 PROPOSED CONDITION OF CONSENT

Due to insufficient targeted survey during the correct season this BDAR has assumed presence for the following species:

- Chariot Wheels (*Maireana cheelii*);
- Slender Darling Pea (*Swainsona murrayana*); and
- Mossgiel Daisy (*Brachyscome papillosa*).

The offset credit summary report is based on 'assumed presence' and represents the maximum theoretical credit liability for the development. However, it is possible/likely that the offset liability for each of the species is substantially less than indicated. If this is proven to be the case through the completion of seasonally appropriate targeted survey, then the offset credit liability should be reduced accordingly such that it is commensurate with the final impacts of the development.

Prior to vegetation clearing commencing on site, the proponent will undertake additional targeted surveys (as required by whatever guidelines) and submit a revised biodiversity offset plan to the Planning Secretary for approval including an updated offset credit summary report based on additional surveys and the final development footprint.

10.2.2 FUNDING A BIODIVERSITY CONSERVATION ACTION

Ancillary rules are available to SSD projects in making contribution to the offset liability for eligible species. Eligible species identified in this assessment that qualify for this are listed in Table 10-4 .

TABLE 10-4 APPLICATION OF ANCILLARY RULES – PRESCRIBED BIODIVERISTY CONSERVATION ACTIONS

Common name	Scientific name	PRESCRIBED BIODIVERISTY CONSERVATION ACTIONS
Chariot Wheels	*Maireana cheelii*	Target survey at known locations in scalded country in salt bush plains area to identify extent of populations. Undertake a threat assessment at sites where populations are located in Moulamein, Deniliquin and Hay areas.
Mossgiel Daisy	*Brachyscome papillosa*	Targeted survey in areas of suitable habitat between Mungo National Park and Balranald; areas surrounding Willandra National Park; Lachlan Valley National Park south of Corrong; Murrumbidgee National Park (Yanga); Kalyarr and surrounding areas on travelling stock reserves, to confirm distribution, population sizes and undertake threat assessment. Investigate life history dynamics including seed viability, germination, dormancy and longevity (in the natural environment and in storage). Conduct experimental research into the relative impacts of different disturbance regimes such as grazing and fire on the species survival and recruitment

The extent to which these ancillary rules are applied and how they form part of the offset strategy is to be determined through consultation with BCS and DPHI. A written agreement is required from BCS to define the terms of this outcome.

11. CONCLUSION

11.1 BIODIVERSITY MATTERS REQUIRING ASSESSMENT

Five PCTs are identified within the Subject Land, with four of these situated within the Disturbance Footprint making up four vegetation zones as provided below:

- VZ1: PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone
- VZ2: PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zone
- VZ3: PCT 44 Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion
- VZ4: PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains

While in the Subject Land, PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion, is situated wholly outside of the operational and construction footprint (Disturbance Footprint).

Seven ecosystem credit species has been recorded within the Subject Land:

- Spotted Harrier (*Circus assimilis*)
- White-fronted Chat (*Epthianura albifrons*)
- Black Falcon (*Falco subniger*)
- Little Eagle (*Hieraaetus morphnoides*)
- Pink Cockatoo (*Lophochroa leadbeateri*)
- Plains-wanderer (*Pedionomus torquatus*)
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)

A species polygon was developed for four species credit species:

- Mossgiel Daisy (*Brachyscome papillosa*)
- Chariot Wheels (*Maireana cheelii*)
- Slender Darling Pea (*Swainsona murrayana*)
- Little Eagle (*Hieraaetus morphnoides*)

The presence of one PCT has been confirmed across the Haul Route:

- PCT 164 is present in areas of Pinch Point 10, 11 and 12, which are associated with the site access points.

Further assessment in accordance with the BAM will be required to determine biodiversity offset obligation under the BOS. This includes effort to determine vegetation integrity and to confirm Candidate Species presence or absence, required to be undertaken in the timing recommended in the TBDC.

11.2 AVOID, MINIMISE AND MITIGATE

The Project design has been revised and refined for the EIS based on detailed assessments and in response to the identification and assessment of environmental limitations, constructability requirements, and consideration of the outcomes of agency, landowner, and community consultations. The project design has aimed to avoid areas of biodiversity values as follows:

- Remnant woodland habitat and ephemeral wetlands were identified as having high biodiversity value for resident and nomadic fauna, and in areas woodland constituted threatened ecological communities. The mapped extent and condition of this habitat was used to affect an avoidance during Project design;
- Resident raptor nesting sites were identified during survey events and largely avoided; and
- The Project has been designed to maximise use of existing public and internal access tracks across the Subject Land where possible, minimising vegetation clearance required and where possible preventing an increase to predatory access routes and activity.

A suite of mitigation measures to avoid and further minimise direct, indirect and prescribed impacts will be implemented, such as the development of a BBAMP, and the delineation of clearing areas, erosion sedimentation and pollution control, timing of construction works, light spill mitigation measures, mammalian predator management, pre-clearance surveys, clearance supervision, weed management, and a Vegetation Management Plan.

11.3 DIRECT IMPACTS ON ASSESSABLE BIODIVERSITY MATTERS

The Project will have a direct impact on native vegetation and the habitat of known and assumed candidate threatened species. Direct impacts on PCTs are provided below:

- PCT 44 Forb-rich Speargrass – Windmill Grass – White Top grassland of the Riverina Bioregion – 4.78 ha
- PCT 160 Nitre Goosefoot shrubland wetland on clays on the inland floodplains – 1.84 ha
- PCT 163 Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones – 268.58 ha
- PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone – 855.73 ha

Species polygon area for the four candidate threatened species impacted, or assumed to be impacted, by the Project are:

- Mossgiel Daisy (*Brachyscome papillosa*) – 1,021.82 ha
- Chariot Wheels (*Maireana cheelii*) – 769.52 ha
- Slender Darling Pea (*Swainsona murrayana*) – 789.20 ha
- Little Eagle (*Hieraaetus morphnoides*) – 16.33 ha

11.4 INDIRECT IMPACTS ON ASSESSABLE BIODIVERSITY MATTERS

Indirect and prescribed impacts are expected as a result of the Project and are associated with the following:

- Impacts to hydrological processes
- Increase risk of mammal predatory species access
- Increase risk of vehicle strike
- Risk of turbine strike.

Mitigation measures will be implemented to mitigate against these indirect impacts and are inclusive of the implementation of a Construction Environmental Management Plan (CEMP), Bird and Bat Adaptive Management Plan (BBAMP) and feral pest management plan.

12. REFERENCES

Armstrong, K. & Aplin, K. 2017. *Rhinolophus megaphyllus*. The IUCN Red List of Threatened Species 2017: e.T19553A21993377. https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T19553A21993377.en. Downloaded on 15 December 2019.

Armstrong, K. & Lumsden, L. 2017. *Saccolaimus flaviventris*. The IUCN Red List of Threatened Species 2017: e.T19799A22006694. https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T19799A22006694.en. Downloaded on 15 December 2019.

Band, W., Madders, M. and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at windfarms. In De Lucas, M., Janss, G. and Ferrer, M. (eds) 'Birds and Wind Power'. www.quercus.pt.

Band, W. (2000). Windfarms and Birds: calculating a theoretical collision risk assuming no avoiding action. Scottish Natural Heritage Guidance Note. http://www.snh.gov.uk/planningand-development/renewable-energy/onshore-wind/assessing-bird-collision-risks/

BirdLife, 2019. Woodland Birds for Biodiversity. Birdlife Australia. Accessed 16 December 2019, <http://www.birdlife.org.au/projects/woodland-birds-for-biodiversity>.

BirdLife, 2021a. Satin Flycatcher *Myiagra cyanoleuca*. BirdLife Australia. Accessed 15 March 2021, < https://www.birdlife.org.au/bird-profile/satin-flycatcher>.

Bureau of Meteorology (2023). *Groundwater Dependent Ecosystems Atlas*. Retrieved from Bureau of Meteorology (BoM) web site: http://www.bom.gov.au/water/groundwater/gde/

Campbell S., 2009: So long as it's near water: variable roosting behaviour of the large-footed myotis (Myotis macropus). Australian Journal of Zoology, 2009, 57, 89–98.

Catling, P.C. 1988. Similarities and constracts in the diets of foxes, *Vulpes vulpes*, and cats, Felis catus, relative to fluctuating prey populations and drought. *Australian Wildlife Research*, 15:307-317.

Churchill, S. 2008. *Australian Bats*. 2nd edn, Allen & Unwin, Sydney.

Commonwealth of Australia (2016). *National Recovery Plan for the Plains-wanderer (Pedionomus torquatus)*. Retrieved from Australian Government https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.dcceew.gov.au%2Fsites%2Fdefault%2Ffiles%2Fdocuments%2Fnational-recovery-plan-plains-wanderer.docx&wdOrigin=BROWSELINK

Debus, S. and G. M. Kirwan (2020). "Australian Kestrel (Falco cenchroides), version 1.0." In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. doi:10.2173/bow.auskes1.01.

DCCEEW (2023). *Directory of Important Wetlands in Australia*. Retrieved from Australian Government https://www.dcceew.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands

DCCEEW (2023). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)*. Retrieved from NSW Government https://datasets.seed.nsw.gov.au/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7-subregions

DCCEEW (2023). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions)*. Retrieved from NSW Government https://datasets.seed.nsw.gov.au/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7-regions

DCCEEW (2023). *Protected Matters Search Tool*. Retrieved from Australian Government https://pmst.awe.gov.au/#/map?lng=131.52832031250003&lat=-28.671310915880834&zoom=5&baseLayers=Imagery,ImageryLabels

DCCEEW (2023). *Species Profile and Threats Database.* Retrieved from Australian Government https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DCCEEW (2010). *Survey guidelines for Australia's threatened birds*. Retrieved from https://www.dcceew.gov.au/sites/default/files/documents/survey-guidelines-birds-april-2017.pdf

Department of Environment and Conservation (DEC) (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*

DECC (2002). *Descriptions for NSW (Mitchell) Landscapes, Version 2.* Retrieved from DECC https://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf

DECCW (2009). *Calotis moorei Recovery Plan*. Retrieved from DCCEEW https://www.dcceew.gov.au/sites/default/files/documents/calotis-moorei.pdf

Department of the Environment and Science (DES), 2018. Terrestrial Vertebrate Fauna Survey Guidelines for Queensland. Accessed 7 July 2021, < https://www.qld.gov.au/__data/assets/pdf_file/0022/68224/fauna-survey-guidelines.pdf >.

Department of the Environment, Water, Heritage and the Arts (DEWHA), 2013. Significant Impact Guidelines 1.1 - Matters of National Environmental Significance. Accessed 18 March 2021, <https://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance>.

Department of the Environment (DoE) (2015). *Arrive Clean, Leave Clean*. Retrieved from Australian Government https://www.agriculture.gov.au/sites/default/files/documents/arrive-clean-leave-clean.pdf

Department of Environment, Land, Water and Planning (DEWLP), Victoria (2021). *Threatened Species and Communities Risk Assessment – Little Eagle Risk Assessment.* https://www.environment.vic.gov.au/__data/assets/pdf_file/0029/595037/Little-Eagle-Risk-Assessment-Report.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010a. Survey guidelines for Australia's threatened birds. Accessed 7 July 2021, < https://www.environment.gov.au/sys tem/files/resources/107052eb-2041-45b9-9296-b5f514493ae0/files/survey-guidelines-birds-april-2017.pdf>.

DEWHA 2010b. Survey guidelines for Australia's threatened bats. Accessed 7 July 2021, < http://www.environment.gov.au/system/fil es/resources/2f420bf1-d9e4-44ec-a69c-07316cb81086/files/survey-guidelines-bats.pdf>.

Department of the Environment (DoE), 2015. Draft referral guideline for 14 birds listed as migratory species under the EPBC Act. Accessed 7 July 2021.

DPE (2024). *Bionet Atlas https://atlaseditor.bionet.nsw.gov.au/UI_Modules/TSM_/Default.aspx*

DPE (2024). *NSW Biodiversity Values Map* https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

DPE (2024). *Biodiversity Assessment Calculator*. Retrieved from NSW Government https://www.lmbc.nsw.gov.au/bamcalc

DPE (2024). *BioNet Vegetation Classification*. Retrieved from NSW Government https://www.environment.nsw.gov.au/nswvca20prapp/loginpr.aspx

DPE (2024). *State Vegetation Type Mapping Version C1.1.M1.1* (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map)

DPE (2022). *Guidance for the Biodiversity Development Assessment Report Template*. State of NSW and Department of Planning and Environment.

DPE (2022). *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide*.

DPE (2016). *Wind Energy Guidelines, For State significant wind energy development*. Retrieved from NSW Government https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/wind-energy-guideline-for-state-significant-wind-energy-development-2016-12.pdf

Department of Primary Industries (DPI) (2024). *Key Fish Habitat Maps*. https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/key-fish-habitat-maps#:~:text=KFH%20was%20defined%20to%20include,the%20top%20of%20the%20bank.

DPI (2024). *Fisheries Spatial Data Portal*.

DPI (2022). *NSW Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Cats.* State of NSW.

DPI (2013). *Policy and Guidelines for Fish Habitat Conservation and Management* (Update 2013)

DPI (2007). *Lower Murray River aquatic ecological community*. https://www.dpi.nsw.gov.au/fishing/threatened-species/legislation-and-approvals/habitat/publications/pubs/lower-murray-aquatic-ecological-community

DPI (2003). *Fish Passage Requirements for Waterway Crossings*.

DPIE (2024) *Threatened Species Database Collection* http://www.environment.nsw.gov.au/threatenedspeciesapp/

DPIE (2020). *Surveying Threatened Plants and their Habitats*, *NSW survey guide for the Biodiversity Assessment Method.* Retrieved from NSW Government https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf

DPIE (2020). *NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method*.

DPIE (2020). *The Biodiversity Assessment Method 2020.* Retrieved from NSW Department of Planning and Environment https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/accredited-assessors/biodiversity-assessment-method-2020

DPIE (2019). *Guidance to assist a decision-maker to determine a serious and irreversible impact.* State of NSW.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), 2012. EPBC Act environmental offsets policy. Accessed 18 March 2021, <https://www.environment.gov.au/epb c/publications/epbc-act-environmental-offsets-policy>.

Department of the Environment (DoE) (2020). Plegadis falcinellus in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of Sustainability, Environment, Water, Population & Communities (DSWP&C) (2012). *Approved Conservation Advice for Natural Grasslands of the Murray Valley Plains ecological community*. Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/117-conservation-advice.pdf.

DSWP&C (2011). *Survey Guidelines for Australia's Threatened Mammals.*

ERM (2022). *Keri Keri Wind Farm Scoping Report*.

Flower, P., Hamley, T., Smith, G.C., Corben, C., Hobcroft, D. and Kehl, J. 1995. Black-breasted Button-quail *Turnix melanogaster* (Gould) in Queensland. DPI Forest Service, Internal Report, Fauna Conservation and Ecology Section, Queensland Forest Research Institute, Indooroopilly.

Hall, L, Lumsden, L, Parnaby, H. (2008). "Large Forest Bat Vespadelus darlingtoni". IUCN Red List of Threatened Species. IUCN. 2008: e.T15006A4486408. doi:10.2305/IUCN.UK.2008. RLTS.T7920A12870313.en

Heath, Julie A.; Frederick, Peter C.; Kushlan, James A.; Bildstein, Keith L. (10 February 2009). "White Ibis: Behavior". Birds of North America Online. Cornell University. Retrieved 15 January 2012.

Higgins, P.J. (ed.) (1999). Handbook of Australian, New Zealand and Antarctic Birds. Volume Four - Parrots to Dollarbird. Melbourne: Oxford University Press.

Hull, C.L & Muir, S. 2010. Search areas for monitoring bird and bat carcasses at wind farms using a Monte-Carlo method. *Australian Journal of Environmental Management* 17:77-87.

Huso, M.M.P. 2011. An estimator of wildlife fatality from observed carcasses. Environmetrics, 22: 318-329.

Local Land Services (2017). *Murray Regional Strategic Weed Management Plan 2017 – 2022.* Retrieved from NSW Government https://www.lls.nsw.gov.au/__data/assets/pdf_file/0004/722632/20170626-Murray-Regional-Weed-Mgmt-Plan_for-web.pdf

Lucas, A (2010). *National Recovery Plan for the Mueller Daisy Brachyscome muelleroides*. Retrieved from DCCEEW https://www.dcceew.gov.au/sites/default/files/documents/brachyscome-muelleroides.pdf

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

Matheu, Eloïsa, del Hoyo, Josep; Garcia, Ernest; Boesman, Peter F. D. (2020-03-04). "Straw-necked Ibis (Threskiornis spinicollis)". In Shawn M. Billerman; Brooke K. Keeney; Paul G. Rodewald; Thomas S. Schulenberg (eds.). Birds of the World. Cornell Lab of Ornithology. Retrieved 2020-11-27.

Menkhorst, P.W, Knight, F. (2011). A field guide to the mammals of Australia (3rd ed.). Melbourne: Oxford University Press. p. 176. ISBN 9780195573954.

Molsher, R.L, Gifford, E.J, & McIIroy, J.C. 2000. "Temporal, spatial and individual variation in the diet of red foxes (*Vulpes vulpes*) in central New South Wales" Wildlife Research 27, 593-601.

Nature Advisory, 2020. Dulacca Renewable Energy Project: Bird and Bat Management Plan. Prepared for RES Australia Pty Ltd. Accessed 18 March 2021, < http://www.dulacca-renewableenergy.com.au/media/2638763/20200529_dulacca_bbmp_final.pdf >.

NGH (2020). *NGH Preliminary Constraints Assessment – Keri Keri Wind Farm*

NGH (2020). *Preliminary Biodiversity Assessment – Spring Survey Report 2020*

National Parks and Wildlife Service (NPWS) NSW (2003). *The Bioregions of New South Wales: their biodiversity, conservation and history*. Retrieved from NSW Government https://www.environment.nsw.gov.au/resources/nature/bioregionscontentsintro.pdf

NPWS (2003). *NSW Mitchell Landscapes map and descriptions*.

NSW Government (2023). *Soils Near Me NSW.* Retrieved from NSW Government https://soilsnearme.app/info/1001

NSW Scientific Committee (2021). *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions - endangered ecological community listing.* https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/myall-woodland-endangered-ecological-community-listing

NSW Scientific Committee (2009). *Plains-wanderer Pedionomus torquatus Review of Current Information in NSW*. Retrieved from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/sc-plains-wanderer-pedionomus-torquatus-review-report.pdf?la=en&hash=9BD9A3592227D7D7241AE60286066DE9D4C209C4

Office of Environment and Heritage NSW (OEH) (2015). *NSW Threat Abatement Plan: Predation by the Red Fox (Vulpes vulpes)*.

OEH (2024). *BAM Calculator (BAM-C)* https://www.lmbc.nsw.gov.au/bamcalc

OEH 2021, Threatened species profile search, NSW Office of Environment and Heritage, viewed 15th March 2021, http://www.environment.nsw.gov.au

OEH (2018). *'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method.*

OEH (2013). *Regional Pest Management Strategy 2012-2017: Western Rivers Region*

Olsen, P. (1995), Australian Birds of Prey, University of New South Wales Press, Sydney.

Queensland Government, 2020. Bats and human health. Accessed 17 March 2021, < http://conditions.health.qld.gov.au/HealthCondition/condition/14/217/14/Bats-human-health >.

Scottish Natural Heritage (SNH), (2000). Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action. SNH Guidance Note. Available at http://www.snh.gov.uk/docs/C205425.pdf

Schulz, M. 1999. Relative abundance and other aspects of the natural history of the rare golden-tipped bat, *Kerivoula papuensis* (Chiroptera:Vespertilionidae). Acta Chiropterologica 1: 165–178.

Simpson, K. and Day, N., (2010), Field guide to the birds of Australia, (8th ed), Penguin Books, Australia.

Smales, I (2015). *Fauna collisions with wind turbines: effects and impacts, individuals and population. What are we trying to assess?* Wild and Wildlife: Proceedings from the Conference on Wind Energy and Wildlife Impacts, Melbourne Australia (pp. 23-40). Springer Netherlands

Smales, I and Muir, S. 2005. Modelled Cumulative Impacts on the Tasmanian Wedge-tailed Eagle of Wind Farms Across the Species' Range. Biosis Research Pty. Ltd. Project no. 4857. Retrieved from: https://www.researchgate.net/publication/237246526_Modelled_Cumulative_Impacts_on_the_Tasmanian_Wedge-tailed_Eagle_of_Wind_Farms_Across_the_Species'_Range.

SMALLWOOD, K. S., BELL, D. A., SNYDER, S. A., & DIDONATO, J. E. (2010). Novel Scavenger Removal Trials Increase Wind Turbine–Caused Avian Fatality Estimates. The Journal of Wildlife Management, 74(5), 1089–1097. https://doi.org/10.2193/2009-266

Stewart-Oaten A, Murdoch WW, and Parker KR. 1986. Environmental impact assessment: "Pseudoreplication" in time? Ecology, 67: 929–940.

Threatened Species Scientific Community (TSSC), NSW. 2020. Grey Falcon (Falco hypoleucos) - endangered species listing. Available at https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/grey-falcon-falco-hypoleucos-endangered-species-listing

TSSC (2012). *Commonwealth Listing Advice on Natural Grasslands of the Murray Valley Plains. Department of Sustainability, Environment, Water, Population and Communities.* Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Retrieved from http://www.environment.gov.au/biodiversity/threatened/communities/pubs/117-listing-advice.pdf

TSSC (2009). *Commonwealth Listing Advice on Weeping Myall Woodlands*. http://www.environment.gov.au/biodiversity/threatened/communities/pubs/98-listing-advice.pdf.

TSSC (2002). *Convolvulus tedmoorei (a perennial plant) - endangered species listing*. https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2000-2003/Convolvulus-tedmoorei-a-perennial-plant-endangered-species-listing

Urban Bird Foundation (2022). *Reducing Bird Strike Mortality*. Retrieved from https://urbanbird.org/reducing-bird-strike-mortality/

APPENDIX A HAUL ROUTE ASSESSMENT

Keri Keri Wind Farm – NSW Haul Route Assessment

Biodiversity Due Diligence

PREPARED FOR

acciona energía

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REFERENCE
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Biodiversity Due Diligence

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
NSW	New South Wales
PREP	The Plains Renewable Energy Park
GW	gigawatt
MW	megawatt
AC	Alternating current
DC	Direct current
BESS	Battery energy storage system
hr	hour
km	kilometre
REZ	Renewable Energy Zone
kV	Kilovolt
ERM	Environmental Resources Management Australia Pty Ltd
SA	South Australia
BC Act	Biodiversity Conservation Act 2016
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EIS	Environmental Impact Statement
ha	hectares
WTG	Wind turbine generators
PV	Photovoltaic
GWhr	gigawatt hours

Acronyms	Description
m	metres
IBRA	Interim Biogeographic Regionalisation for Australia
OSOM	Over-size over-mass
MNES	Matters of National Environmental Significance
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
TEC	Threatened ecological community
BOS	Biodiversity Offsets Scheme
BAM	Biodiversity Assessment Method 2020
SSD	State significant development
SSI	State significant infrastructure
DPIE	Department of Planning, Industry and Environment
BDAR	Biodiversity Development Assessment Report
LLS Act	Local Land Services Act 2013
LGA	Local government area
FM Act	Fisheries Management Act 1994
DPI	Department of Primary Industries
ALA	Atlas of Living Australia
MSES	Matters of State Environmental Significance
DPE	Department of Planning and Environment
PCT	Plant community type
TBDC	The BioNet threatened biodiversity profiles data collection
BAM-C	The Office of Environment and Heritage BAM calculator

1. INTRODUCTION

The Project is situated about 30 kilometres (km) southeast of Balranald, and 75 km southwest of Hay in the Murray River Local Government Area (LGA). The Project is located within the South West Renewable Energy Zone (REZ) and is directly south of the Sturt Highway on land that is predominately used for sheep grazing and cropping. The Project extends over an area of approximately 18,012 hectares (ha) across 66 freehold land parcels (Project Area).

The under-construction Project EnergyConnect intersects the Project Area. Project EnergyConnect is a new 900 km TL (interconnector) that will connect power grids across three (3) Australian states between Wagga Wagga in NSW and Robertstown in SA, with a connection to Red Cliffs in VIC. The Applicant intends to bid for Access Rights to this interconnector. An internal 330 kV overhead TL is proposed to connect the Project to Project EnergyConnect should the Applicant be successful with Access Rights.

The Project involves the construction, operation, maintenance and decommissioning of:

- Up to 155 Wind Turbine Generators (WTG) with a hub height of 200 metres (m) and maximum height tip height of 291.5 m (vertical tip);
- Battery energy storage system (BESS) with capacity of approximately 200 megawatt (MW) / 800 MW hours (MWh);
- Electrical reticulation, on-site substations and switchyard; and
- Other ancillary infrastructure including (but not limited to) internal access tracks, road upgrades, meteorological masts, and operation and maintenance (O&M) buildings.

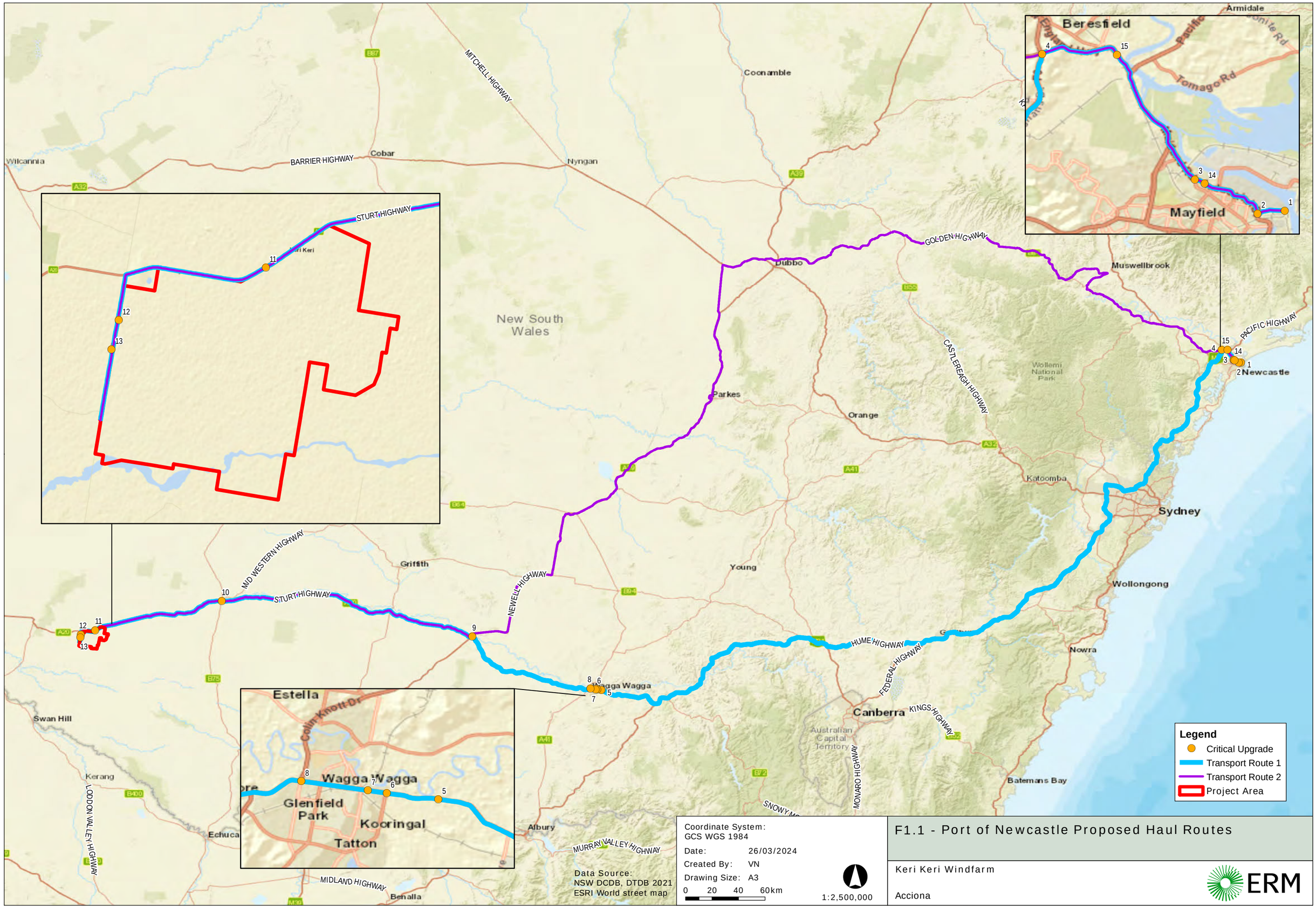
Following the desktop due diligence assessment, Environmental Resources Management Australia Pty Ltd (ERM) undertook an assessment of biodiversity values of the haul route from the Port of Newcastle (NSW) to the Project.

The purpose of this assessment is to characterise the biodiversity values within the indicated areas of each Pinch Point (PP) and an alternate route (combined as the Study Area), that may be subject to native vegetation removal, and to identify the occurrence of (or habitat for) any species, populations or ecological communities that are listed as threatened under the NSW State *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

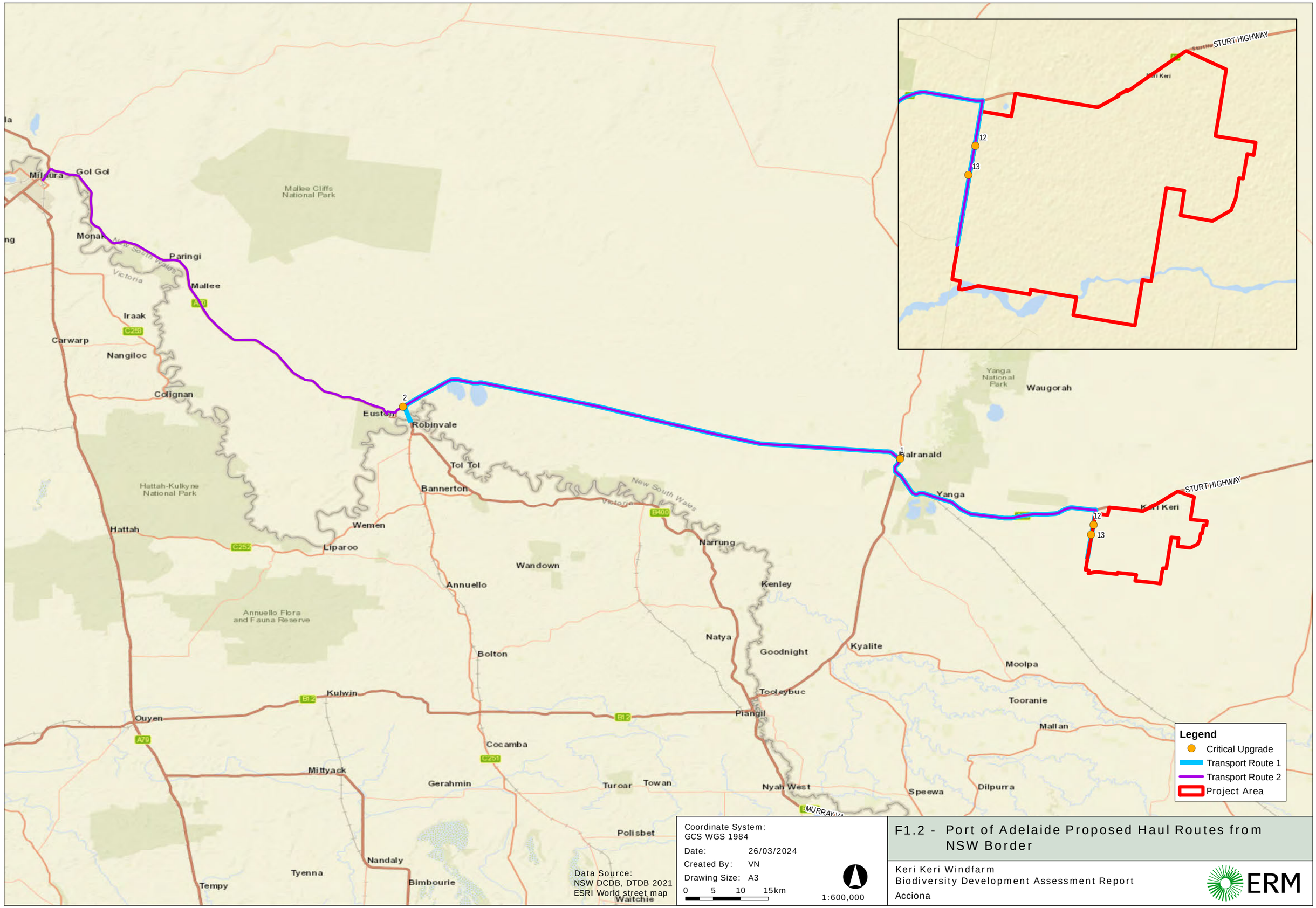
This assessment has been prepared to support the Environmental Impact Statement (EIS) associated with the Project. The assessment was informed by a combination of desktop reviews, database searches and fieldwork completed on 10 November 2023.

1.1 BACKGROUND

The Project, spanning across a total area of 18,012 ha (Project Boundary) will feature some of the largest wind turbines and towers currently available with a proposed height (to tip of vertical blade) of 291.5 metres (m) (hub height 200 m, blade length 91.5 m). Tower components will be up to 5.0 x 5.9 m in width/height. As part of the construction of the Project the transportation of the blades and tower components from either the Port of Newcastle or Port of Adelaide to the Project will play an important role in the site feasibility. Due to the large and specific equipment required to transport these loads, PP were identified along the transport route where modifications are required to either private or government owned land, including removal of signage and/or light poles, tree trimming and removal, and road and intersection amendments. The haul routes between the Port of Newcastle and the Project are shown in Figure 1-1 and the haul routes between the Port of Adelaide from the New South Wales border to the Project are shown in Figure 1-2 .



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F1.2 - Port of Adelaide Proposed Haul Routes from NSW Border

Keri Keri Windfarm
Biodiversity Development Assessment Report
Acciona

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1.2 HAULAGE ROUTE LOCATION AND JUSTIFICATION

Route Study assessments were conducted by Rex J Andrews (RJA) (Appendix A). Both ports assessed are currently being used by several wind farm projects and have the capacity and laydown area required for the Project.

Two routes are proposed from the Port of Newcastle to the Project site:

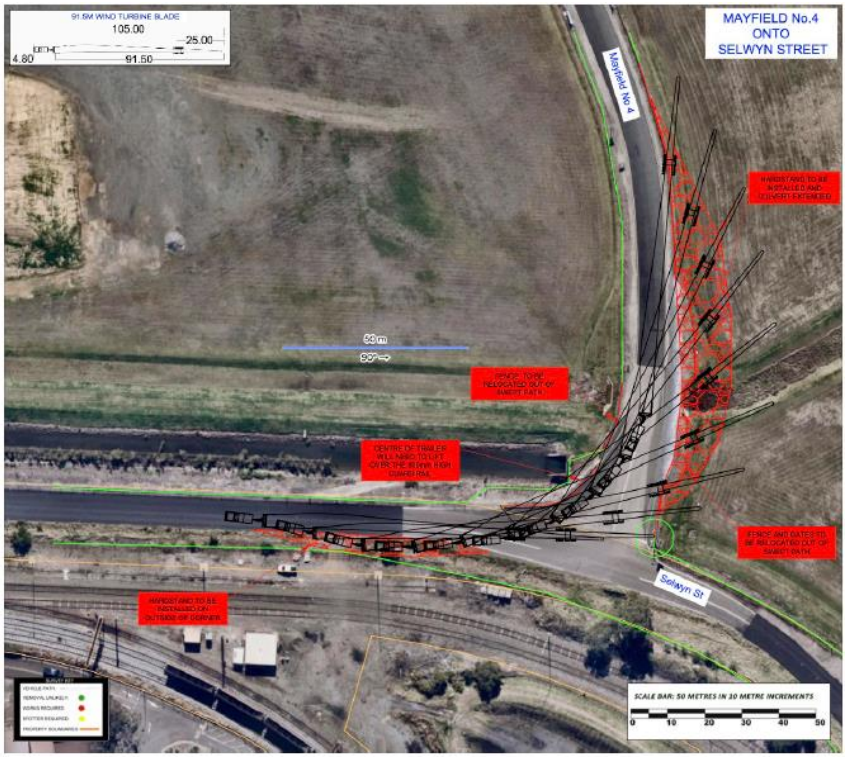
- Route 1 allows for 5.25 m loaded height, requires modification and has 13 pinch points identified and Route 2 allows for 5.9 m loaded height, requires modification and has six pinch points identified Figure 1-1 . Respective works required to facilitate blade transport for the route from the Port of Newcastle are summarised below in Table 1-1 ; and
- Route 2 has no additional pinch points requiring ecological assessment, four of the pinch points along this route correspond with pinch points 10 through 13 of Route 1 and the additional two pinch points are referred to as Pinch Point 14 and 15. A full description of the required works is provided within Appendix A.

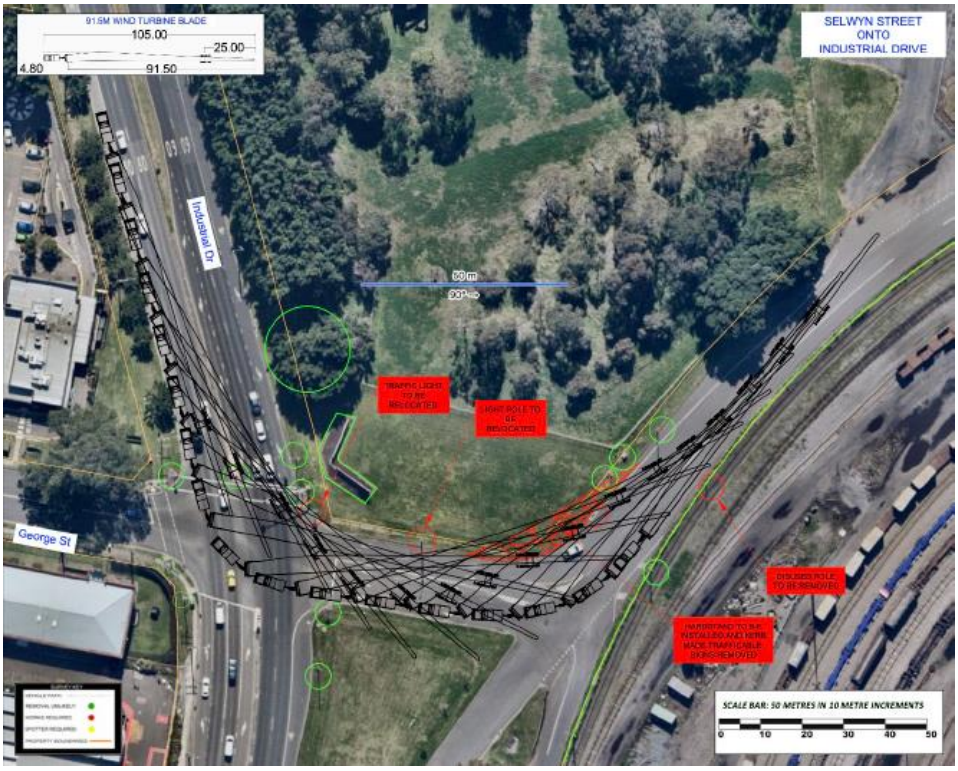
Two routes are also proposed from the Port of Adelaide from the NSW to the Project site:

- Route 1 is designed for transportation of the blades and commences in Robinvale, NSW and requires modification to five pinch points, three of which are associated with site entry and are consistent with those identified for the Port of Newcastle route; and
- Route 2 from the Port of Adelaide is designed for loads under 40 m in overall length and 5.9 m loaded height, commencing from Mildura. Route 1 has two pinch points not previously assessed in the Port of Newcastle route, referred to as Pinch Points 16 and 17 and Route 2 has no additional pinch points requiring assessment.

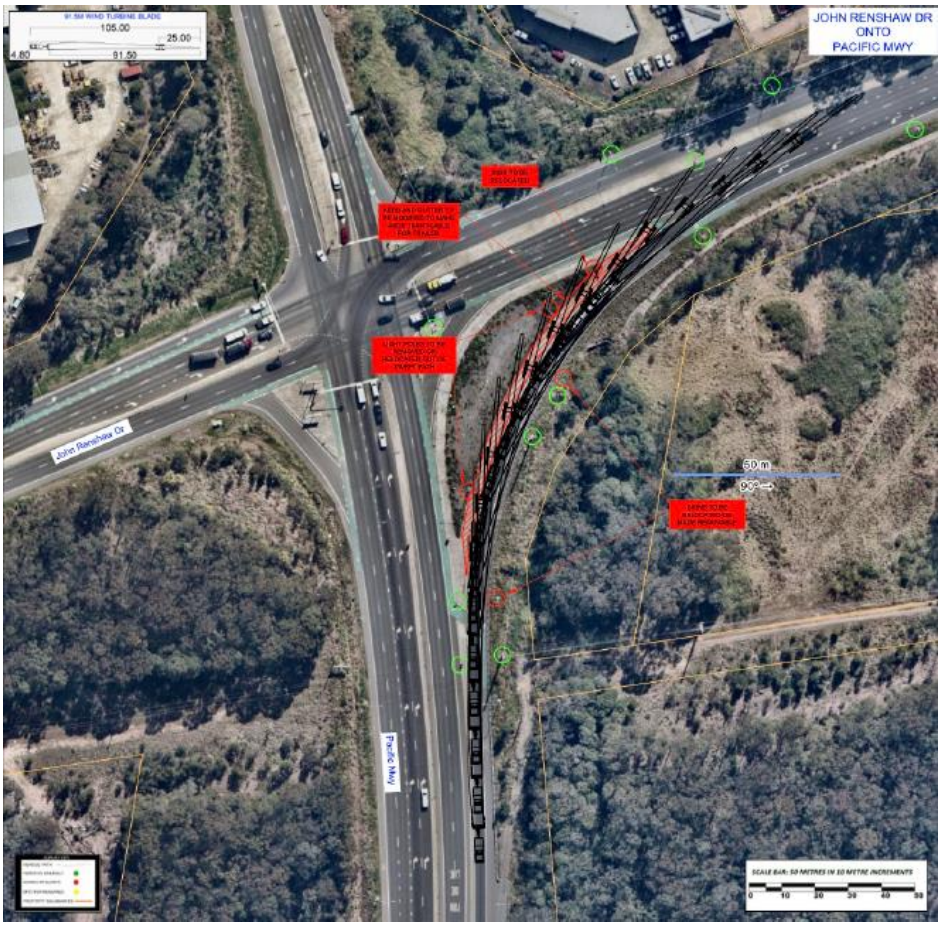
Respective modifications required for the route from the Port of Adelaide from the NSW border are summarised in Table 1-2 and the full description of required works is provided within Appendix B.

TABLE 1-1 PINCH POINTS AND SCOPE OF WORKS FOR PORT OF NEWCASTLE ROUTE

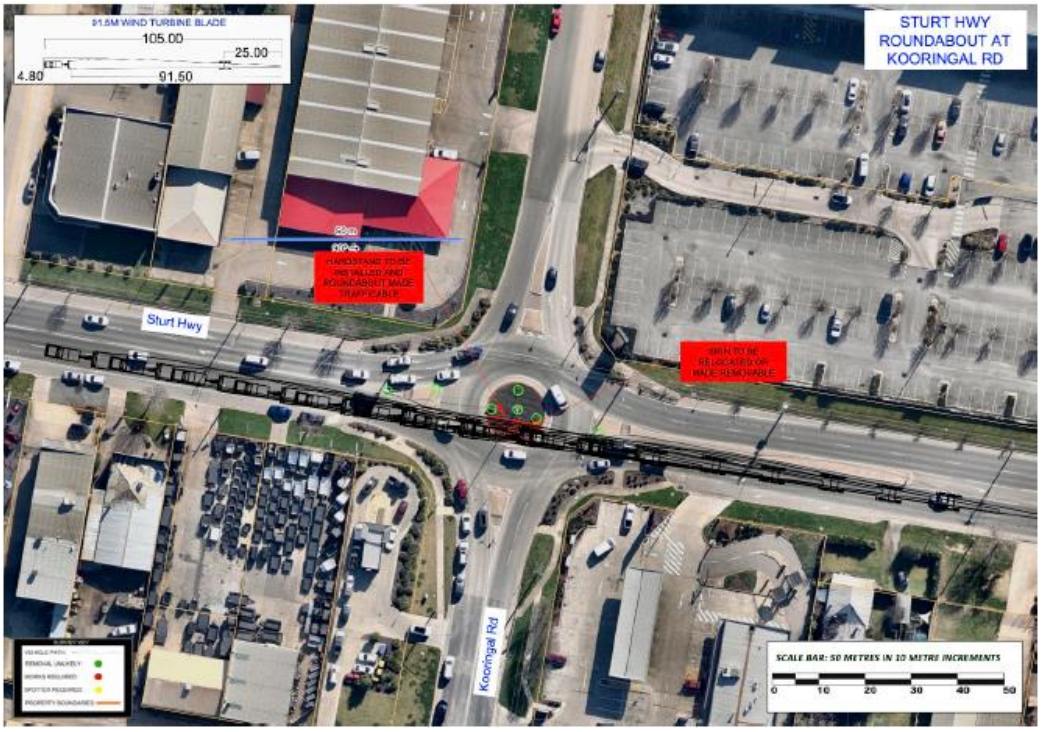
Pinch Point 1 - Mayfield	
Location	Moderate right hand turn from Mayfield #4 Berth onto Selwyn Street
Description of Works (RJA 2024)	Hardstand will need to be added to the left entry and exit of the corner. The existing culvert will need to be extended. Some signs will need to be relocated and or made removable and some fence and gate will need to be relocated.
Image from Route Study (RJA 2024)	
Image from ERM Site Inspection (2023)	
Biodiversity Values Observed	The area of impact is heavily dominated by invasive species representing little to no ecological value to the area. No trees were within the impact area, with the exception of a large *Acacia saligna*, which is a shrub that is not native to the area and won't require clearing.

Pinch Point 2 - Mayfield	
Location	Right hand turn from Selwyn Street onto Industrial Drive via George Street
Description of Works (RJA 2024)	The first right hand turn through George Street will need a sign made removable and a disused pole on the overhang removed. On the inside of the corner hardstand will need to be added, a sign made removable, and a light pole relocated. On the outside tailswing the disused pole next to the railway line will need to be removed.
Image from Route Study (RJA 2024)	
Image from ERM Site Inspection (2023)	
Biodiversity Values Observed	The area of impact is comprised of invasive species representing little to no ecological value to the area. No trees or shrubs were within the impact area, the groundcover is dominated by exotic herbaceous and grass species.

Pinch Point 3 – Mayfield West	
Location	Right hand turn from Industrial Drive onto Maitland Road
Description of Works (RJA 2024)	A light pole on the inside of the corner will need to be relocated outside swept path, and two signs will need to be made removable or relocated. Traffic islands to be replaced with painted lines to be trafficable.
Image from Route Study (RJA 2024)	
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

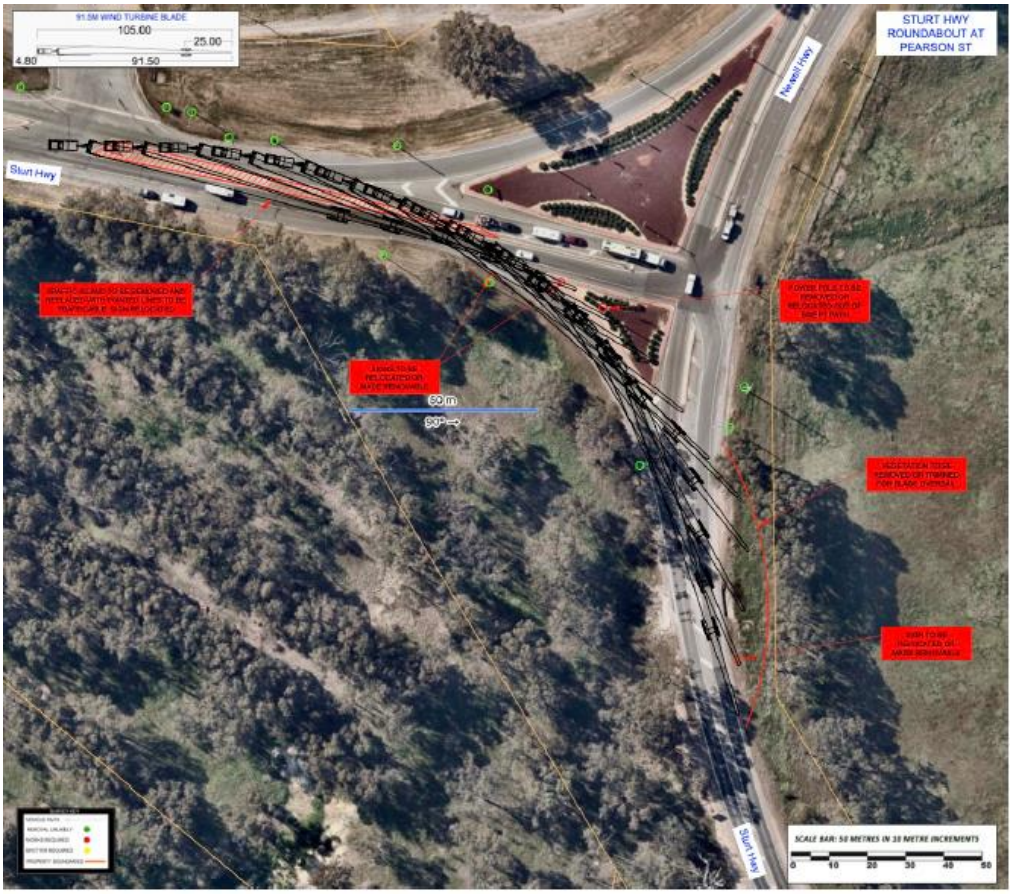
Pinch Point 4 – Beresfield	
Location	Left hand bend from John Renshaw Drive onto the M1
Description of Works (RJA 2024)	2x light poles need to be removed or relocated on the outside of corner for tail swing. Signs to be relocated/removed. Kerb and gutter to be modified to be trafficable for trailer.
Image from Route Study (RJA 2024)	
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

Pinch Point 5 – Wagga Wagga	
Location	Second Exit on Round-about, Sturt Highway
Description of Works (RJA 2024)	Sign to be removed in the middle of the roundabout. Roundabout made trafficable.
Image from Route Study (RJA 2024)	
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

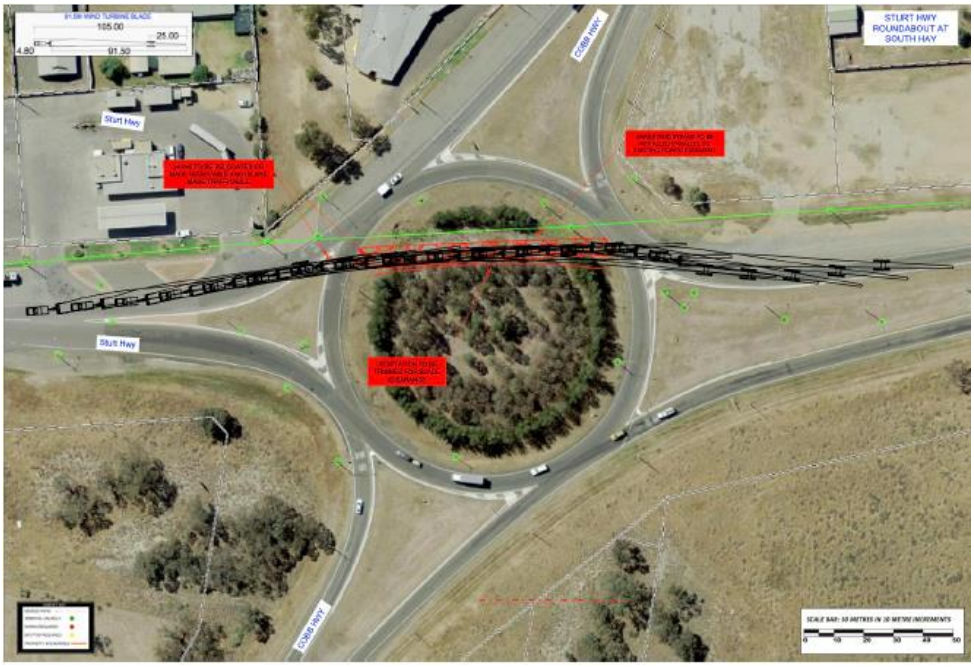
Pinch Point 6 – Wagga Wagga	
Location	Second Exit on Round-about, Sturt Highway
Description of Works (RJA 2024)	Sign to be removed in the middle of the roundabout. Hardstand to be installed on roundabout and roundabout made trafficable.
Image from Route Study (RJA 2024)	
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

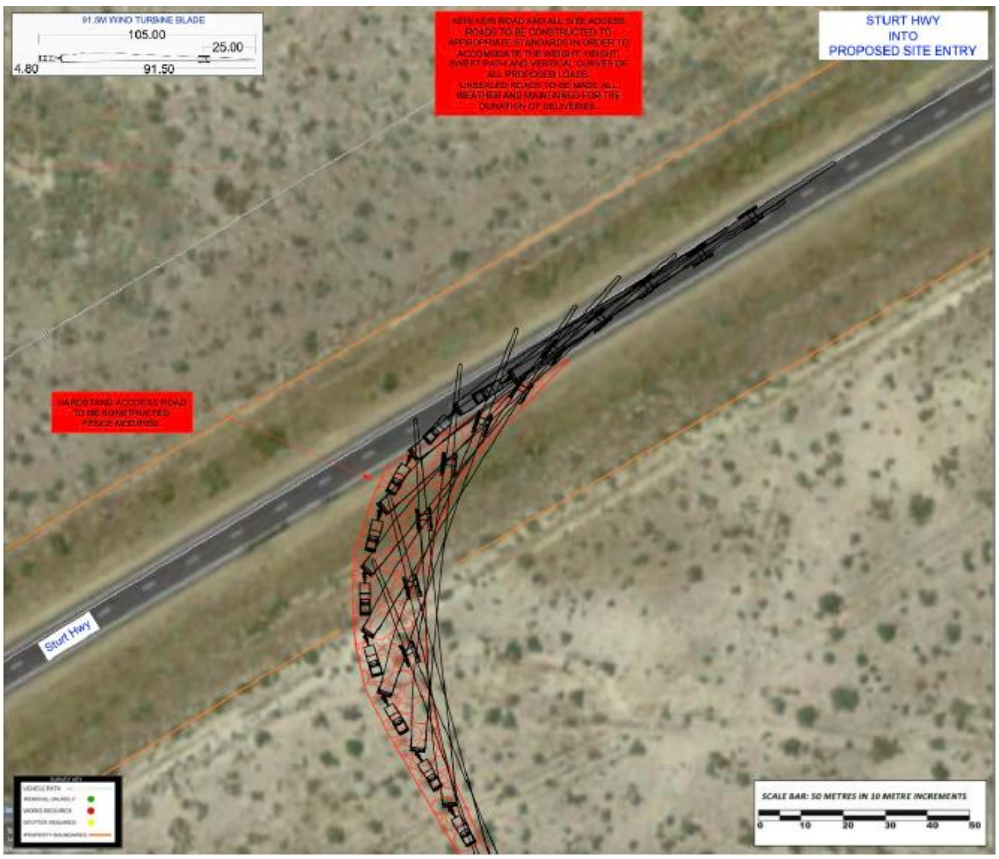
Pinch Point 7 – Wagga Wagga	
Location	Second Exit on Round-about, Sturt Highway
Description of Works (RJA 2024)	The truck will need to cut across the centre of the roundabout. The existing pavement is ok to drive on without any extra work. 2x signs to be removed in the middle of the roundabout.
Image from Route Study (RJA 2024)	
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

Pinch Point 8 – Wagga Wagga	
Location	Second Exit on Round-about, Sturt Highway
Description of Works (RJA 2024)	Signs to be removed in the middle of the roundabout. Roundabout made trafficable.
Image from Route Study (RJA 2024)	
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

Pinch Point 9 – Gillenbah	
Location	Left hand turn, Sturt Highway
Description of Works (RJA 2024)	Several signs to be relocated or made removable. Power pole to be relocated out of swept path. Vegetation to be removed or trimmed for blade oversail. Traffic island to be removed and replaced with paint to make trafficable.
Image from Route Study (RJA 2024)	

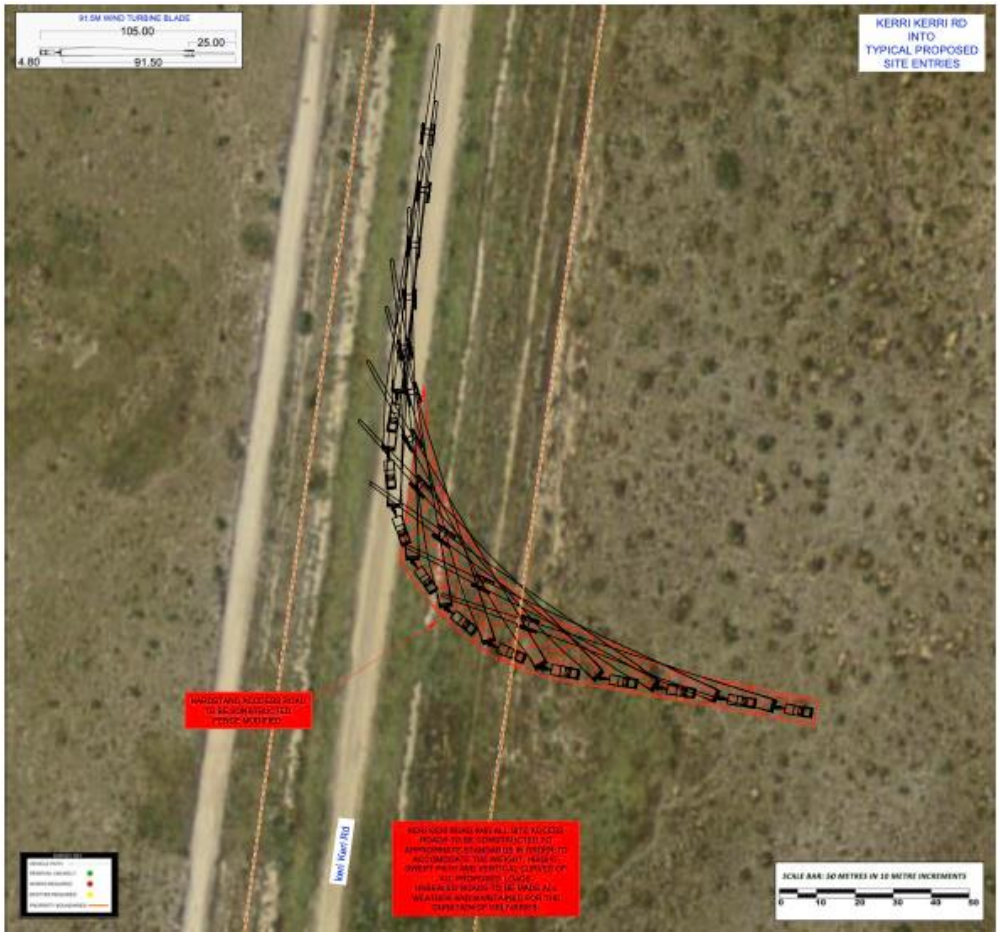
Pinch Point 9 – Gillenbah	
Image from ERM Site Inspection (2023)	
Biodiversity Values Observed	Remnant woodland vegetation mapped as PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion is present. No clearing or trimming of vegetation has been identified as required. If clearing/trimming of vegetation is necessary to facilitate transport, a permit will be required. Biodiversity value in this area is considered as high.

Pinch Point 10 – Hay South	
Location	Load to cross to incorrect side of road and use bypass through roundabout, Sturt Highway Roundabout at Cobb Highway
Description of Works (RJA 2024)	Existing shoulder on entry to be made trafficable. Hardstand bypass installed through roundabout parallel with existing easements. Vegetation to be removed or trimmed. Several signs relocated or made removable.
Image from Route Study (RJA 2024)	
Image from ERM Site Inspection (2023)	
Biodiversity Values Observed	This patch is mapped as PCT 0 – non-native on the SVTM. The roundabout contains a homogenous stand of Mugga Ironbark (*Eucalyptus sideroxylon*) which is evidently planted. No stick nests or evidence of fauna use were present and microhabitat features that support threatened species such as hollows, fallen timber and rocks were absent. The vegetation has been assessed against requirements to remove native planted vegetation and has been deemed that an assessment is not required under the Biodiversity Assessment Method 2020 (BAM).

Pinch Point 11 – Keri Keri	
Location	Sturt Highway into Sturt Highway site entrance
Description of Works (RJA 2024)	A site entrance is proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards to accommodate the weight, height, swept patch and vertical curved of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
Image from Route Study (RJA 2024)	
Image from ERM Site Inspection (2023)	The exact point of access from the Sturt Highway had not been provided at the time of the ERM Site Inspection.
Biodiversity Values Observed	The most common occurrence of native vegetation along the Sturt Highway adjoining to the Project is PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone. Clearing of native vegetation will be required; however, a swept path analysis for the blades to enter the site is required to calculate the area and complete assessment requirements. These areas are of moderate ecological value. The extent of clearing required is to be determined during the detailed design.

Pinch Point 12 – Keri Keri	
Location	Left hand turn from Sturt Highway onto Keri Keri Road
Description of Works (RJA 2024)	Hardstand to be installed and signs and all obstacle relocated or removed. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic. Keri Keri Rd and all site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept patch and vertical curved of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
Image from Route Study (RJA 2024)	

Pinch Point 12 – Keri Keri	
Image from ERM Site Inspection (2023)	
Biodiversity Values Observed	This area is mapped under the State Vegetation Type Map (SVTM) as PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone. Ground-truthing has confirmed vegetation present conforms to PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone. The area of clearing required has been incorporated into the BDAR of the Project. This area is of moderate ecological value.

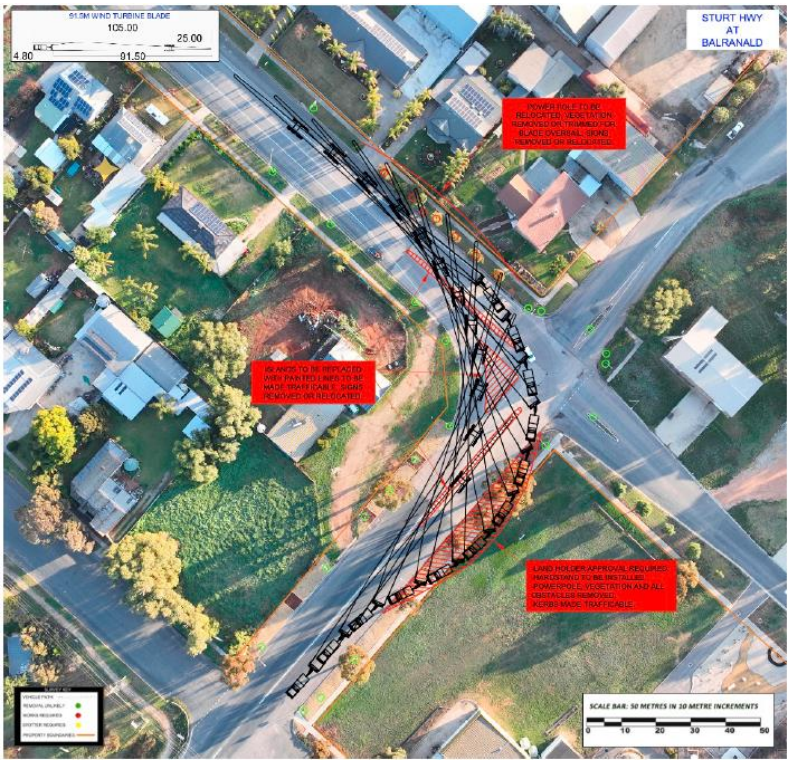
Pinch Point 13 – Keri Keri	
Location	Keri Keri Road into Keri Keri site entrances
Description of Works (RJA 2024)	3x site entrances are proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards to accommodate the weight, height, swept patch and vertical curved of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
Image from Route Study (RJA 2024)	
Image from ERM Site Inspection (2023)	The exact points of access from Keri Keri Road had not been provided at the time of the ERM Site Inspection.
Biodiversity Values Observed	The most common occurrence of native vegetation along Keri Keri Road adjoining to the Project is PCT 164 - Cotton Bush open shrubland of the semi-arid (warm) zone. Clearing of native vegetation will be required; however, a swept path analysis for the blades to enter the site is required to calculate area and complete assessment requirements. These areas are of moderate ecological value. The extent of clearing required is to be determined during detailed design.

Pinch Point 14 – Mayfield (Route 2)	
Location	Travel directly ahead in the far right lane along Industrial Drive under the traffic signals.
Description of Works (RJA 2024)	The lowest traffic signal on route is at the intersection of Steel River Blvd. Trucks that exceed 5.3 metres will need to travel in the right-hand lane. Clearance in the right end lane is 6.0 metres. Base towers (6.1m) will need to be lowered for travel through this intersection.
Image from Route Study (RJA 2024)	Not provided.
Biodiversity Values Observed	Desktop study informed no ecological assessment required.
Pinch Point 15 – Hexham (Route 2)	
Location	Travel directly ahead along New England Highway under gantry.
Description of Works (RJA 2024)	This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.9 metres should not be exceeded. Base towers (6.1m) will need to be lowered before travelling under this structure.
Image from Route Study (RJA 2024)	Not provided.
Biodiversity Values Observed	Desktop study informed no ecological assessment required.

TABLE 1-2 PINCH POINTS AND SCOPE OF WORKS FOR PORT OF ADELAIDE ROUTE

Pinch Point 16 – Euston	
Location	Right hand turn from Murray Valley Highway onto Sturt Highway
Description of Works (RJA 2024)	This is a very tight corner that cuts back on itself. A very large amount of hardstand is required. The new alignment will need a lot of fill to bring it level with the highway. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.
Image from Route Study (RJA 2024)	
Image from ERM Site Inspection (2023)	

Pinch Point 16 – Euston	
Biodiversity Values Observed	This patch is mapped as PCT 0 – non-native on the SVTM. Species observed contained a mix of native and introduced grasses including Austrostipa, Avena, Hordeum, Lolium, Chloris and Walwhalleya species. Introduced forbs were observed including Echium plantagineum, Carrichtera annua and Sonchus sp. and scattered native Maireana and other chenopod shrubs were observed. Overall, the area is mostly comprised of non-native species, is subject to high levels of disturbance and offers little to no ecological value. One native fauna species, a Singing Honeyeater (Lichenostomus virescens) was observed in the area.

Pinch Point 17 - Balranald	
Location	Right hand turn from Sturt Highway (Market Street) onto Sturt Highway
Description of Works (RJA 2024)	This section is very tight and will require the truck to continue into the park on the outside of the corner. A large area of hardstand will be required along with the removal of 5x trees, 2x light poles and 11x signs. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.
Image from Route Study (RJA 2024)	

Pinch Point 17 - Balranald	
Image from ERM Site Inspection (2023)	
Biodiversity Values Observed	This patch is mapped as PCT 0 – non-native on the SVTM. Vegetation consists of 5x planted Sugar Gum (Eucalyptus cladocalyx) that are not native to the area and therefore do not comprise of a PCT. A small number of seedlings occur in the understorey growing through the gravel that has been laid in the planting boxes, including Atriplex, Erodium and Sclerolaena species and non-natives. Stick nests were observed within the Sugar Gums and likely to belong to native species such as the Australian Magpie (Gymnorhina tibicen). One native fauna species, Noisy Miners (Manorina melanocephala) were observed in the area. The vegetation has been assessed against requirements to remove native planted vegetation and has been deemed that an assessment is not required under the Biodiversity Assessment Method 2020 (BAM).

2. LEGISLATION

Table 2-1 below provides a description of the relevant legislative context for the Project, and subsequently the proposed haul route. This report addresses the objectives and requirements of the legislation as it relates to the identification of biodiversity and ecological values for the route only.

TABLE 2-1 LEGISLATIVE CONTEXT

Commonwealth Legislation
Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
The EPBC Act requires approval of the Commonwealth Minister for the Environment for actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES) as assessed in accordance with the EPBC Significant Impact Guidelines 1.1. The EPBC Act is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and lists threatened species, ecological communities and other MNES. Any proposed action that is expected to have an impact on MNES must be referred to the Minister for assessment under the EPBC Act, or assessed under the existing bilateral agreement, or accredited process between the Commonwealth and the State of New South Wales.
NSW Statutory Legislation
Biodiversity Conservation Act 2016
With reference to the Project, the BC Act establishes the following: • A list of threatened species of native flora and fauna (excluding fish and marine vegetation) and threatened ecological communities (TECs); • The declaration of Areas of Outstanding Biodiversity Values; and • The Biodiversity Offsets Scheme (BOS) including the 'no net loss' standard. This institutes a biodiversity offset requirement for development that is deemed to have a significant impact on biodiversity values (i.e., retirement of biodiversity credits). The type and number of biodiversity credits is determined by applying the Biodiversity Assessment Method 2020 (BAM). The BOS applies to SSD and state significant infrastructure (SSI) projects, unless the Secretary of the Department of Planning, Industry and Environment determines that the Project is not likely to have a significant impact on biodiversity values. The Applicant has engaged an accredited assessor to apply the BAM to assess the impacts of the proposal on biodiversity values through the preparation of a Biodiversity Development Assessment Report (BDAR). The assessment undertaken throughout this report will be appended to the BDAR.
Local Land Services Act 2013
The NSW Local Land Services Act 2013 (LLS Act) regulates the management of vegetation on rural land. The amendments to the LLS Act have resulted in a change to the criteria for native vegetation clearing. There are now three land categories which determine clearing on rural land: • Category 1 – 'Exempt land' which is not subject to clearing approval under the LLS Act; • Category 2 – 'Regulated Land' on which clearing of native vegetation may be carried out with or without formal approval in accordance with an 'allowable activity' or 'code' under the LLS Act. Includes the categories of Category 2 - Vulnerable Regulated Land and Category 2 - Sensitive Regulated Land on which vegetation clearing is restricted; and • 'Excluded Land' – Land not categorised on the Transitional Native Vegetation Regulatory (NVR) Map and to which the LLS Act does not apply. A review of the Draft NVR Map confirms that areas of Category 2 – Regulated Land are present, associated with the Alternate Route. No Category 1 – Exempt Land is mapped in areas impacted by the Alternate Route, or Pinch Points.

Biosecurity Act 2015

The NSW Biosecurity Act 2015 came into effect on 1 July 2017, effectively replacing the NSW Noxious Weeds Act 1993. Under the NSW Biosecurity Act 2015, landholders have a responsibility to control weeds on their property under the provisions of the General Biosecurity Duty.
The General Biosecurity Duty states "Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised." The general biosecurity duty applies to all weeds listed in Schedule 3 of the NSW Biosecurity Act 2015. Primary weeds have been identified in different LGAs based on the level of threat infestation they represent and, if the species presents a significant threat, they may be subject to a Biosecurity Control Order under which stricter provisions apply.
Weeds identified within the Study Area may be subject to the General Biosecurity Duty or a Biosecurity Control Order and will need to be managed accordingly. A strategic plan for each WoNS identified in the Project Area will be required to define responsibilities and identify strategies and actions to control the weed species (Centre for Invasive Species Solutions, 2021).

Fisheries Management Act 1994

The NSW Fisheries Management Act 1994 (FM Act) provides for the conservation, protection and management of fisheries, aquatic systems and habitats in NSW. Like the BC Act, the NSW Fisheries Management Act 1994 lists threatened species, populations and ecological communities of fish and marine vegetation.
The Study Area does not consist of aquatic systems and based on a review of the Department of Primary Industries (DPI) Fisheries NSW Spatial Data Portal does not contain any Key Fish Habitat, habitat for freshwater threatened species or mapped marine vegetation. The FM Act is not further discussed.

3. METHODOLOGY

3.1 DESKTOP REVIEW

The Desktop Review included analysis of the following online resources:

- Interim Biogeographical Regionalisation for Australia (IBRA) and IBRA sub-regions v7 (http://www.environment.gov.au/land/nrs/science/ibra).
- NSW Mitchell Landscapes map v3.1 (SEED) and descriptions (NPWS 2003).
- DPE State Vegetation Type Mapping Version C1.1.M1.1 (SEED) (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map Accessed 02 July 2023)

3.2 FIELD SURVEYS

A one-day preliminary vegetation and habitat survey was undertaken on 9 October 2023 by four ecologists to assess the haul route from the Port of Adelaide from the NSW/Victorian border and another one-day survey conducted on 10 November 2023 by two ecologists to assess the haul route from the Port of Adelaide. The purpose of the field survey was to identify the presence of important biodiversity values within the Study Area, including:

- The likely presence of threatened fauna and flora species;
- Threatened ecological communities; and
- Habitat and resources considered important for threatened species or ecological communities.

Surveys were undertaken via a meander of the Study Area. Survey methodologies were designed to rapidly assess biodiversity values and to record native and non-native vegetation and features of ecological value present. Opportunistic sightings of fauna were also recorded throughout the survey period.

Comprehensive and targeted fauna surveys were not undertaken as part of the current survey.

3.3 ASSUMPTIONS AND LIMITATIONS

The field and desktop assessments undertaken provide an overview of the biodiversity values that exist within the Study Area. The field survey was undertaken across the Study Area to gain a general understanding of the types of species and habitat features that occur.

The absence of a species from a database list or observational studies does not confirm its absence from the Study Area. The lack of existing records from databases may indicate a low historic sampling effort in the region, as opposed to an absence of species. Similarly, the timing of the November 2023 survey precludes the detection of several species that are typically absent from the area at that time of the year.

4. SITE CONTEXT

4.1 LANDSCAPE FEATURES

Site context features have been identified from an inspection of the haul route pinch point sites and alternate route along with GIS assessment of available relevant digital mapping layers and aerial imagery. Five Pinch Points have been identified as containing ecological value, the features identified are provided in Table 4-1.

TABLE 4-1 LANDSCAPE FEATURES

Landscape feature	Description for each pinch point		
	Pinch Point 09	**Pinch Point 10**	**Pinch Point 11, 12 and 13**
IBRA Bioregions and Subregions	PP09 occurs within the Lower Slopes IBRA Subregion of the NSW South Western Slopes IBRA Bioregion.	PP10 occurs within the Murrumbidgee IBRA Subregion, of the Riverina IBRA Bioregion	PP11, 12 and 13 occur within the Murrumbidgee IBRA subregion, of the Riverina IBRA Bioregion.
NSW Landscape Regions (Mitchell)	PP09 occurs within the Murrumbidgee-Tarcutta Channels and Floodplains Mitchell Landscape	PP10 is situated across two Mitchell Landscapes: • Murrumbidgee Scalded Plains • Murrumbidgee Channels and Floodplains	PP 11 and 12 are situated across the Murrumbidgee Scalded Plains Mitchell Landscape. PP 13 is likely to be situated within the Murrumbidgee Channels and Floodplains Mitchell Landscape
Rivers, streams, estuaries and wetlands	The Murrumbidgee River is situated in close proximity (approximately 260 m) to PP09	The Murrumbidgee River is situated in close proximity (approximately 470m) to PP10	PP 11, 12 and 13 are situated approximately 10 km north of the Abercrombie Creek and 10 km south of Uara Creek.
Habitat connectivity	The vegetation near PP09 forms part of a stand of roadside remnant vegetation	PP10 contains vegetation that is isolated to within the roundabout and has no connectivity to nearby native vegetation without being separated by a road.	PP 11, 12 and 13 contain patches of chenopod shrubland that is contiguous with the surrounding vegetation however, these areas are more disturbed due to proximity to roads.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	No Karst, caves, crevices, cliffs, rocks or other geological features of significance are present	No Karst, caves, crevices, cliffs, rocks or other geological features of significance are present	No karst, caves, crevices, cliffs, rocks or other geological features of significance are present.
Soil hazard features	PP09 is on Dermosols soil type. Dermosols are non texture contrast soils that can vary from stony hard setting soils to friable deeper profiles.	PP10 is on Vertosol soil type. Vertosols are categorised as clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular peds.	PP11, 12 and 13 are on Vertosol soil type. Vertosols are categorised as clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular peds.
Areas of outstanding biodiversity value	Not applicable	Not applicable	Not applicable

5. NATIVE VEGETATION AND THREATENED ENTITIES

5.1 OVERVIEW

Ground-verified vegetation mapping was conducted across the Pinch Point locations, with some minor changes made to the SVTM (DPE, 2022a).

5.2 PLANT COMMUNITY TYPES

The haul route was assessed for the presence of native vegetation that aligns with NSW PCTs via rapid vegetation assessments. Noting no vegetation integrity surveys were undertaken in accordance with the BAM (2020).

Based on a review of the SVTM three PCTs are mapped across the Pinch Points:

- PP09 – PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion;
- PP11 and 13 - PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone; and
- PP12 – PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.

As a result of the field verification surveys, PCT 28 has been discounted due to a lack of characteristic canopy species and the vegetation has been confirmed to comply with PCT 164. The impact to these PCTs is discussed in Table 5-1.

TABLE 5-1 PINCH POINT PCTS

PCT ID	PCT Name	Impact Area (ha)
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Not subject to impact
164	Cotton Bush open shrubland of the semi-arid (warm) zone	PP12 – 0.07 ha PP 11 and 13 - TBC

5.3 THREATENED ECOLOGICAL COMMUNITIES

No Threatened Ecological Communities are considered to occur within the Pinch Point sites.

5.4 THREATENED SPECIES

The BAM defines two types of threatened species credits that are used to measure impacts on development sites. The two types of credits are:

- Ecosystem credit species – threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys; and
- Species credit species – threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence. These species are identified in the TBDC. A targeted survey or an expert report is required to confirm the presence or absence of these species.

The candidate species and ecosystem species lists are auto-generated lists produced by the Office of Environment and Heritage BAM calculator (BAM-C) based largely on BAM Plot data collected for PCTs identified within the Study Area. There are no mapped PCTs associated with the Pinch Points, and subsequently no ecosystem or species credit species for these areas.

There were no threatened species recorded during the survey events. Habitat present across the Pinch Points has potential to provide supplementary habitat for a range of mammalian, reptilian, amphibian and avian species only.

5.4.1 APPLICATION OF THE BAM

A potential list of ecosystem credit species and candidate credit species for any areas of PCT 164 to be impacted, as advised by the BAM-C, are listed in Table 5-2 and Table 5-3 respectively. These lists are based on the inputs into the BAM-C of mapped PCTs provided in Table 5-1, each assigned a single vegetation zone, and provided a vegetation integrity (VI) score of 100 based on a precautionary approach. This list has potential to change as a result of further survey effort. Where a species has been determined not likely to be retained for further assessment, this is based on values known of the corresponding Pinch Point as it is adjacent to the Project.

TABLE 5-2 ECOSYSTEM CREDIT SPECIES

Common name	Scientific name	Listing status		Species likely to be retained for further assessment	Associated PCTs	Sensitivity to gain class
		BC Act	EPBC Act			
Black Falcon	*Falco subniger*	V	-	Yes	164	Moderate
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	Yes	164	Moderate
Grey Falcon	*Falco hypoleucos*	V	-	Yes	164	Moderate
Little Eagle	*Hieraaetus morphnoides*	V	-	Yes	164	Moderate
Little Pied Bat	*Chalinolobus picatus*	V	-	Yes	164	High

Common name	Scientific name	Listing status		Species likely to be retained for further assessment	Associated PCTs	Sensitivity to gain class
		BC Act	EPBC Act			
Spotted Harrier	*Circus assimilis*	V	-	Yes	164	Moderate
White-bellied Sea-eagle	*Haliaeetus leucogaster*	V	-	Yes	164	High
White-fronted Chat	*Epthianura albifrons*	V	-	Yes	164	Moderate

TABLE 5-3 SPECIES CREDIT SPECIES

Common name	Scientific name	Listing status		Species retained for further assessment	Associated PCTs	Sensitivity to gain class
		BC Act	EPBC Act			
Bindweed	*Convolvulus tedmoorei*	E	-	No	164	High
Chariot Wheels	*Maireana cheelii*	V	V	Yes	164	High
Mossgiel Daisy	*Brachyscome papillosa*	V	V	Yes	164	High
Slender Darling Pea	*Swainsona murrayana*	V	V	Yes	164	High
Little Eagle	*Hieraaetus morphnoides*	V	-	Yes	164	Moderate
Square-tailed Kite	*Lophoictinia isura*	V	-	No	164	Moderate
White-bellied Sea-eagle	*Haliaeetus leucogaster*	V	-	No	164	High

6. CONCLUSION

The biodiversity investigations and analysis undertaken for the Haul Route have confirmed the presence of PCTs and absence of TECs within the identified Pinch Points that will impact native vegetation and is to be assessed under the BAM.

Pinch Points requiring further assessment under the BOS and BAM are:

- Pinch Point 11;
- Pinch Point 12; and
- Pinch Point 13.

Pinch Points requiring no further assessment under the BOS nor under the BAM:

- Pinch Point 1;
- Pinch Point 2;
- Pinch Point 3;
- Pinch Point 4;
- Pinch Point 5;
- Pinch Point 6;
- Pinch Point 7;
- Pinch Point 8; and
- Pinch Point 10.

It is recommended that Pinch Point 9 is further assessed to ensure no vegetation will require trimming or removal, as this vegetation may grow to the point of requiring this.

The presence of one PCT has been confirmed across the Haul Route:

- PCT 164 is present in areas of Pinch Point 10, 11 and 12, associated with the site access points.

Further assessment in accordance with the BAM will be required to determine biodiversity offset obligation under the BOS. This includes effort to determine vegetation integrity and to confirm Candidate Species presence or absence, required to be undertaken in the timing recommended in the TBDC. Recommended survey timing for the potential Candidate Species list is presented in Table 6-1.

TABLE 6-1 RECOMMENDED SURVEY TIMING FOR CANDIDATE SPECIES

Common name	Scientific name	Recommended survey period
Chariot Wheels	*Maireana cheelii*	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec
Mossgiel Daisy	*Brachyscome papillosa*	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec
Slender Darling Pea	*Swainsona murrayana*	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec
Little Eagle	*Hieraaetus morphnoides*	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec

7. REFERENCES

DCCEEW (2024). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)*. Retrieved from NSW Government https://datasets.seed.nsw.gov.au/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7-subregions

DCCEEW (2024). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions)*. Retrieved from NSW Government https://datasets.seed.nsw.gov.au/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7-regions

DECC (2002). *Descriptions for NSW (Mitchell) Landscapes, Version 2.* Retrieved from DECC https://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf

DPE (2023). *Biodiversity Assessment Calculator*. Retrieved from NSW Government https://www.lmbc.nsw.gov.au/bamcalc

DPE (2023). *BioNet Vegetation Classification*. Retrieved from NSW Government https://www.environment.nsw.gov.au/nswvca20prapp/loginpr.aspx

DPIE (2020). *The Biodiversity Assessment Method 2020.* Retrieved from NSW Department of Planning and Environment Web site: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/accredited-assessors/biodiversity-assessment-method-2020

Rex J Andrews (2022). *Route Study Port of Newcastle to Keri Keri Windfarm*.

APPENDIX A ROUTE STUDY PORT OF NEWCASTLE TO KERI KERI WINDFARM – REX J ANDREWS 2024

REX J ANDREWS
ENGINEERED TRANSPORTATION

ROUTE STUDY: ACCIONA

PROJECT: KERI KERI WINDFARM

EX PORT OF NEWCASTLE

07/03/2024 REV 01

Rev	Date	Change	Responsible	Checked
00	04/08/22	Route Assessed	C Ewin	✓
00	27/09/22	Report Compiled	S Kasteel	✓
00	14/10/22	Report Completed	W Andrews	✓
01	07/03/24	Report Updated 91.5m Blade	E Novak	✓
01	07/03/24	Report Completed	W Andrews	✓

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1.0 Introduction

This Route Study has been prepared for the Keri Keri Wind Farm (the Project) for Acciona Energy Australia Global Pty Ltd (the Applicant).

The study is to understand the transport route constraints for the components listed in this report and assist in planning of the windfarm layout.

This document describes observations and previous experience on route and explains the transport of wind turbine equipment from Newcastle to Keri Keri Windfarm.

The route survey was conducted on 04/08/2022

2.0 Evaluation

1	No Work
2	Some Work
3	Moderate Amount of Work
4	Extreme Amount of Work

(Mark below boxes with an X)

		1	2	3	4
A	Harbour		**X**		
B	Road Modification			**X**	
C	Road Furnishings			**X**	
D	Trees			**X**	
E	Site Entrance				**X**
F	Bridge Calculations			**X**	
G	Traffic Control			**X**	

3.0 Project Data

Date of latest Route Assessment: 04/08/2022
Survey undertaken by: (Rex J Andrews P/L)
Project name: Keri Keri Windfarm
Location: Port of Newcastle (NSW) to Keri Keri Wind Farm (NSW)
The project consists of the following key components:

- Up to 155 Wind Turbine Generators (WTG) with a hub height of 200 metres (m) and maximum height tip height of 291.5 m (vertical tip)

4.0 Transport Combinations Examples

465 x Blades (91.5l x 4.8w x 3.9h x 35.0T)
Transport configuration. Prime mover with 3x8-3x8 Blade trailer.
Overall dimensions: 105.0l x 4.8w x 4.9h x 108.5T.

125 x Hubs (4.8l x 4.8w x 4.0h x 60.0T)
Transport configuration. Prime mover with 2x8 dolly 3x8 low loader.
Overall Dimensions: 28.0l x 4.8w x 5.0h x 96.5T.

176 x Nacelle (12.0l x 4.5w x 4.2h x 75.0T)
Transport configuration. Prime mover with 2x8 dolly 5x8 low loader.
Overall Dimensions: 30.0l x 4.5w x 5.0h x 117.5T.

176 x Drive Train (7.0l x 3.5w x 3.5h x 95.0T)
Transport configuration. Prime mover with 2x8 8x8 dolly platform trailer.
Overall Dimensions: 32.0l x 4.2w x 4.5h x 157.5T.

176 x T1 tower sections (13.4 x 5.5 x 5.0 x 99T)
Transport configuration. Prime mover with 10x8 Low Platform trailer.
Overall Dimensions: 30.0l x 5.0w x 5.9h x 161.5T.

176 x T2 tower sections (19.3 x 5.0 x 5.0 x 98T)
Transport configuration. Prime mover with 10x8 Low Platform trailer.
Overall Dimensions: 30.0l x 5.0w x 5.9h x 160.5T.

176 x T3 tower sections (23.4 x 5.0 x 5.0 x 97T)
Transport configuration. Prime mover with 10x8 Low Platform trailer.
Overall Dimensions: 37.0l x 5.0w x 5.9h x 159.5T.

176 x T4 tower sections (29.5 x 5.0 x 5.0 x 98T)
Transport configuration. Prime mover with 5x8 5x8 Extending Platform trailer.
Overall Dimensions: 45.0l x 5.0w x 5.9h x 169.5T.

176 x T5 tower sections (29.9 x 5.0 x 4.1 x 86T)
Transport configuration. Prime mover with 5x8 5x8 Extending Platform trailer.
Overall Dimensions: 45.0l x 5.0w x 5.9h x 157.5T.

176 x T6 tower sections (29.3 x 4.1 x 3.3 x 50.5T)
Transport configuration. Prime mover with 4x4-2x8 Dolly and Jinker.
Overall Dimensions: 45.0l x 5.0w x 5.9h x 86.5T.

Modular tower option:

1056 x Standard loads (12l x 2.4w x 2.4h x 10.0T)
Transport configuration. Prime mover with 3x4 semi-trailer.
Overall Dimensions: 19.0l x 2.5w x 4.3h x 38.5T.

1936 x Generic special loads (18l x 3.5w x 3.5h x 20.0T)
Transport configuration. Prime mover with 3x4 semi-trailer.
Overall Dimensions: 26.0l x 3.5w x 5.0h x 42.5T.

126 x Transition segments (17.3l x 4.3w x 4.3h x 66.0T)
Transport configuration. Prime mover with 8x8 Platform trailer.
Overall Dimensions: 30.0l x 4.3w x 5.3h x 124.5T.

126 x Monotubular segment 3 (21.5l x 4.3w x 4.3h x 72.0T)
Transport configuration. Prime mover with 10x8 Platform trailer.
Overall Dimensions: 35.0l x 4.3w x 5.3h x 134.5T.

126 x Monotubular segment 2 (28.8l x 4.3w x 4.3h x 67.0T)
Transport configuration. Prime mover with 4x8-4x8 Extending platform trailer.
Overall Dimensions: 42.0l x 4.3w x 5.3h x 131.5T.

126 x Monotubular segment 1 (28.9l x 4.3w x 3.3h x 44.0T)
Transport configuration. Prime mover with 4x4-2x8 Dolly jinker.
Overall Dimensions: 40.0l x 4.3w x 5.3h x 86.5T.

5.0 Transport Drawings

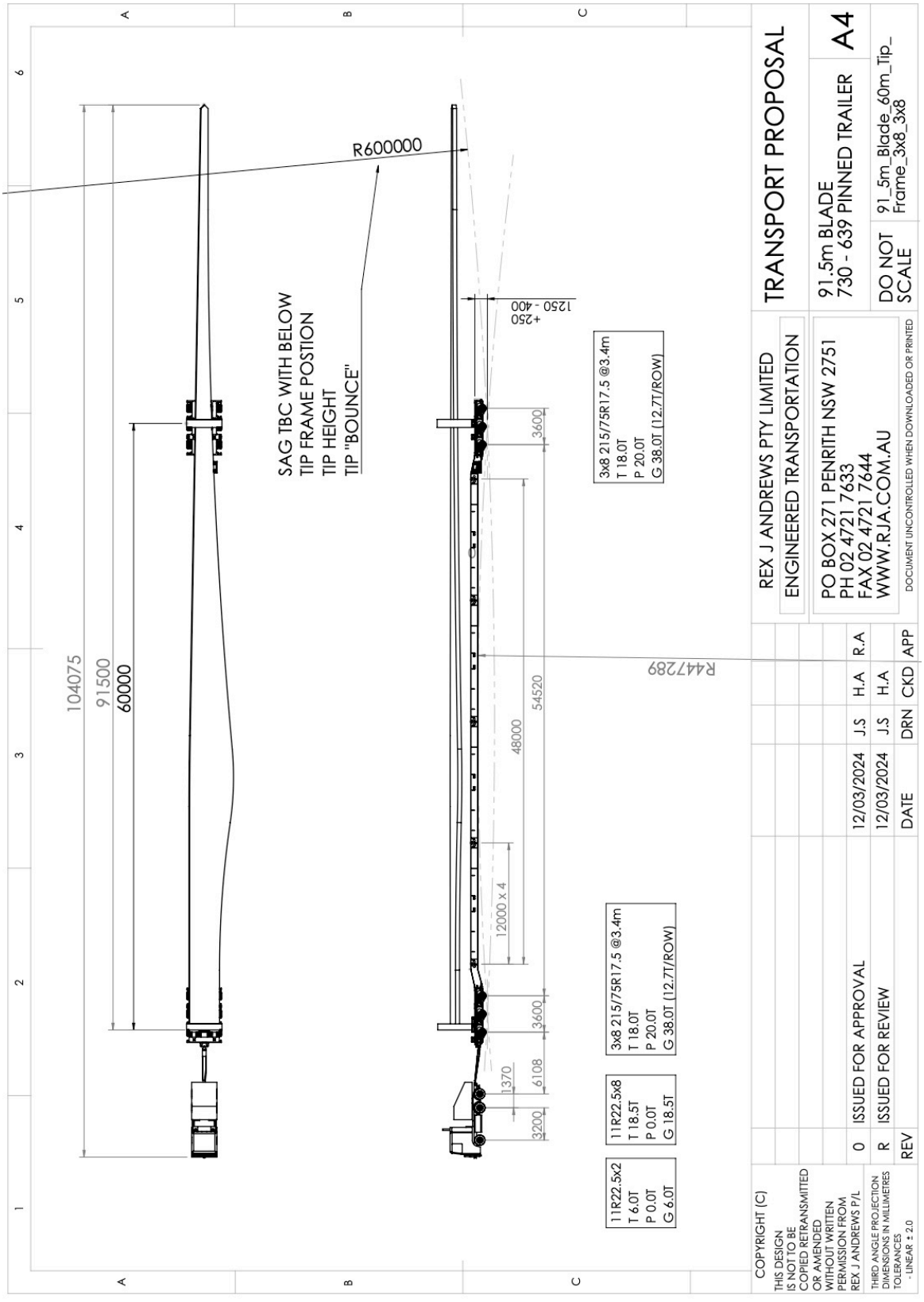


Figure 1 - Blade diagram

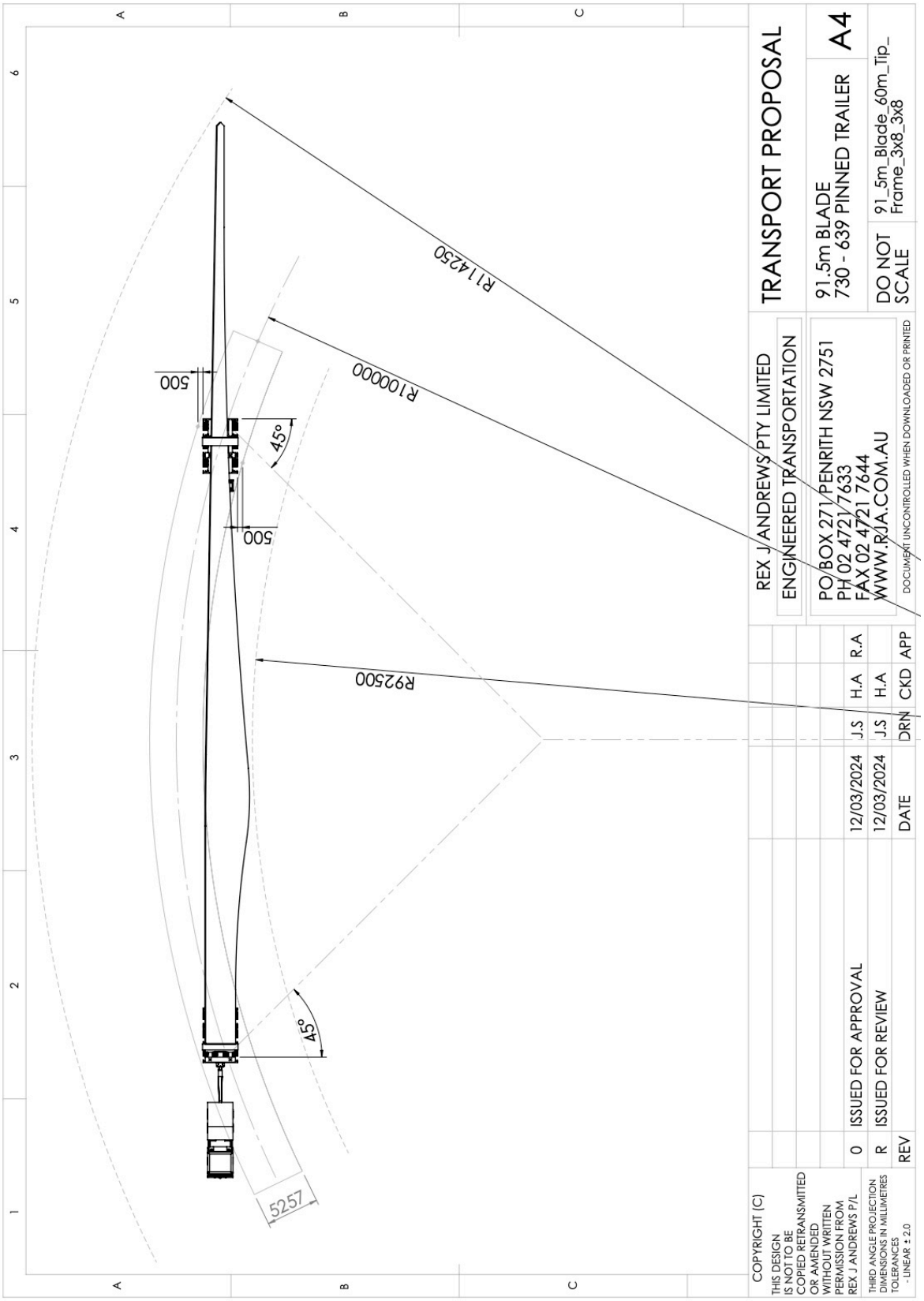


Figure 2 - Blade diagram: Swept path

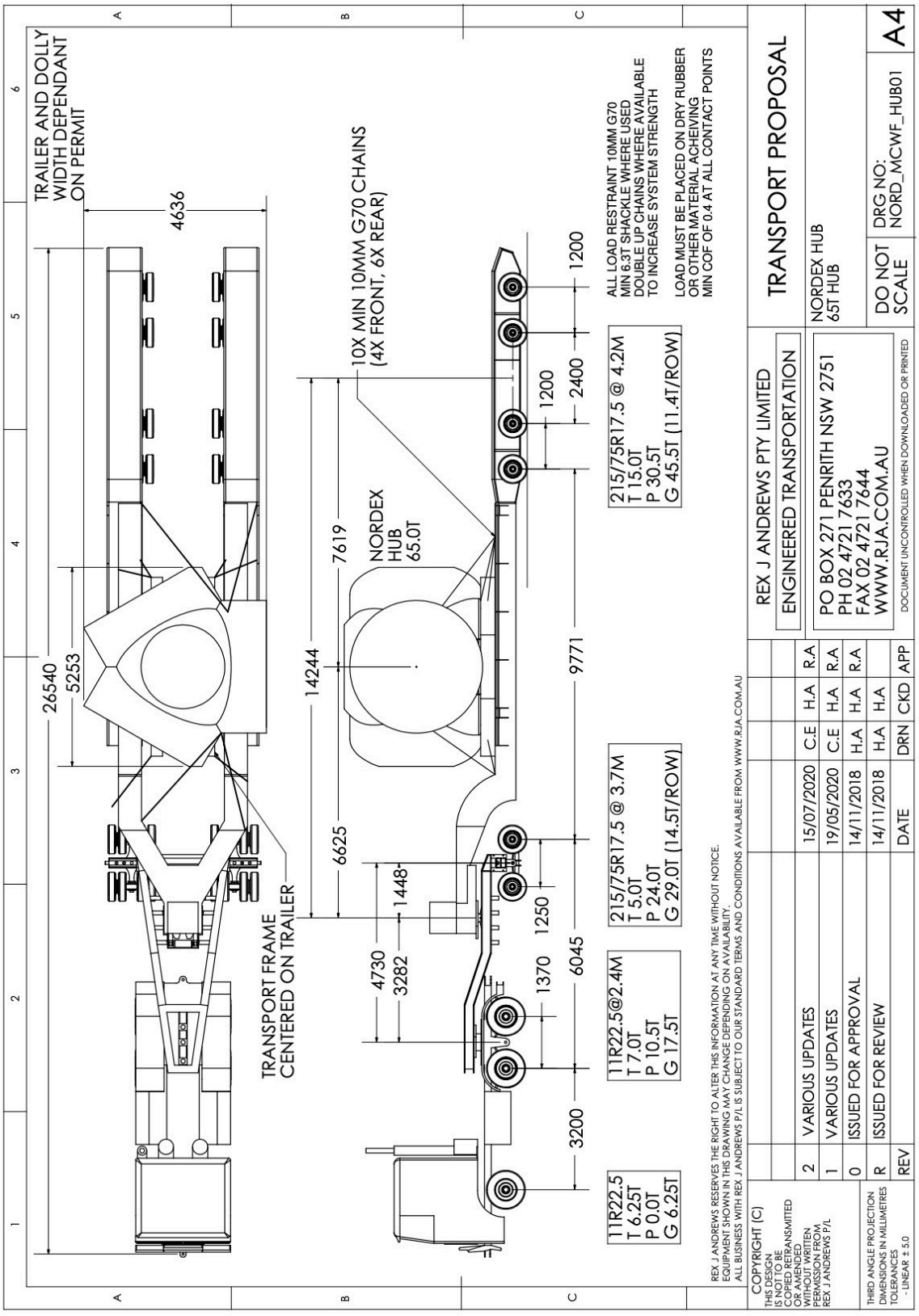


Figure 3 - Hub combination example

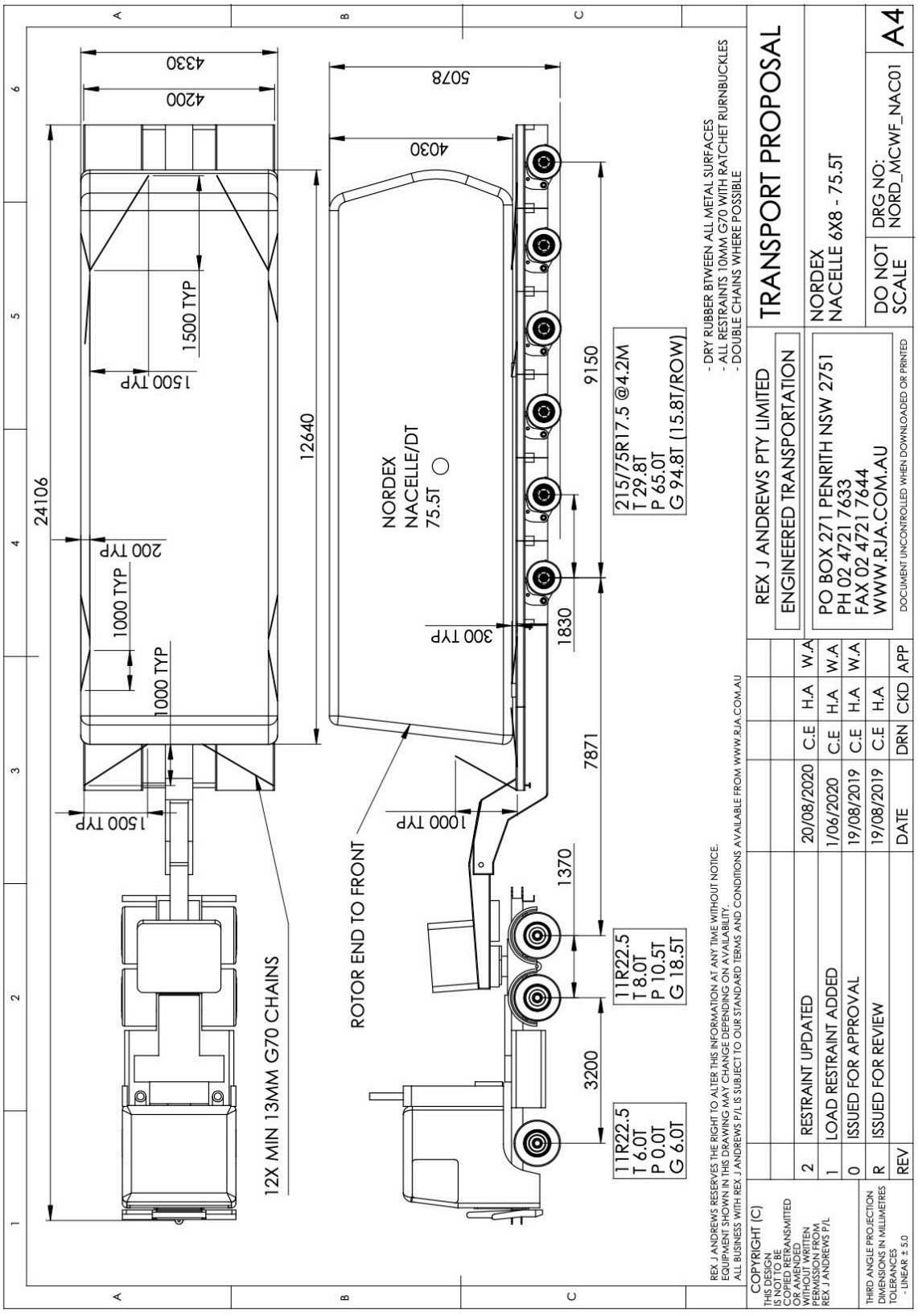


Figure 4 - Nacelle combination example

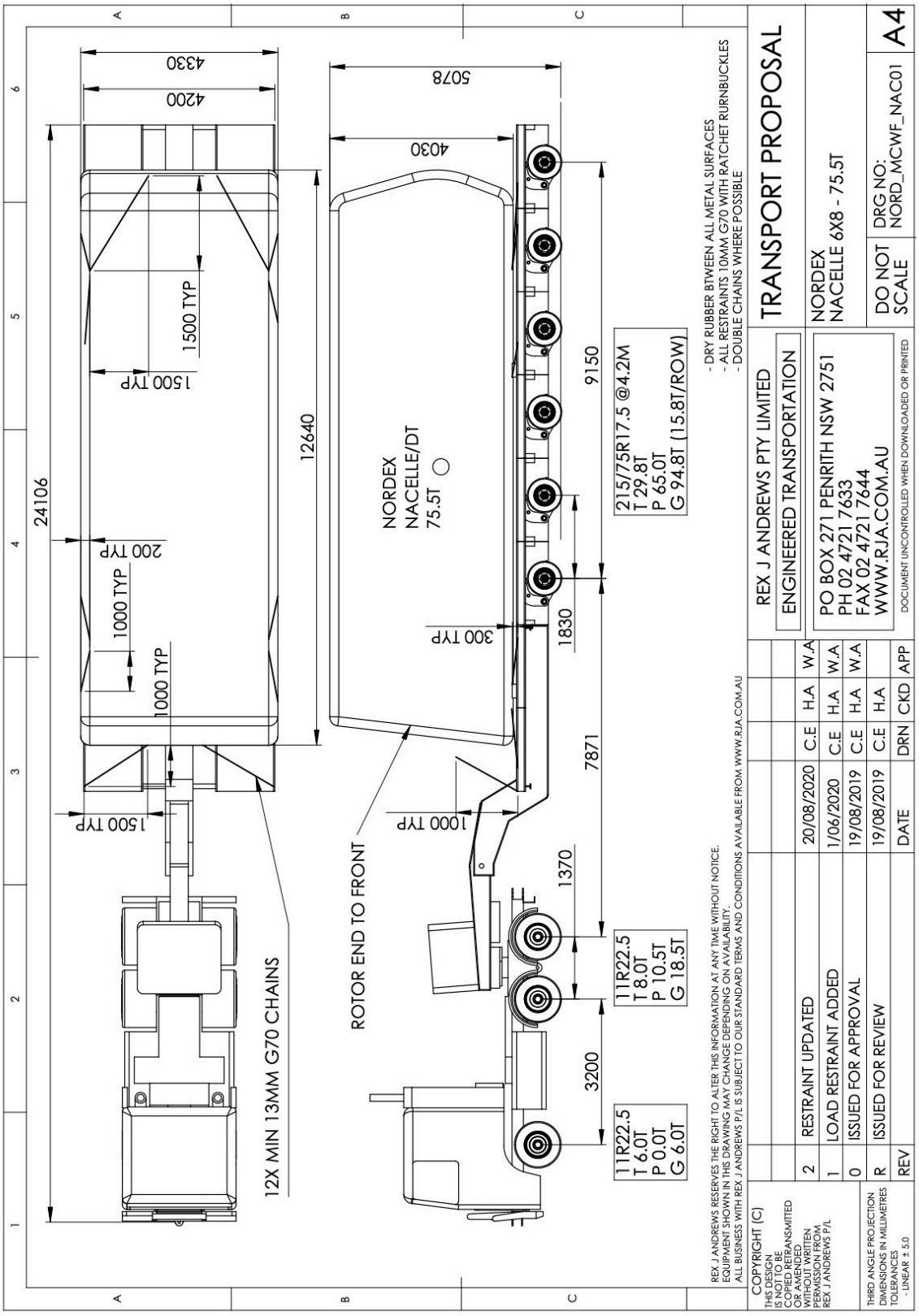


Figure 5 - Nacelle combination example

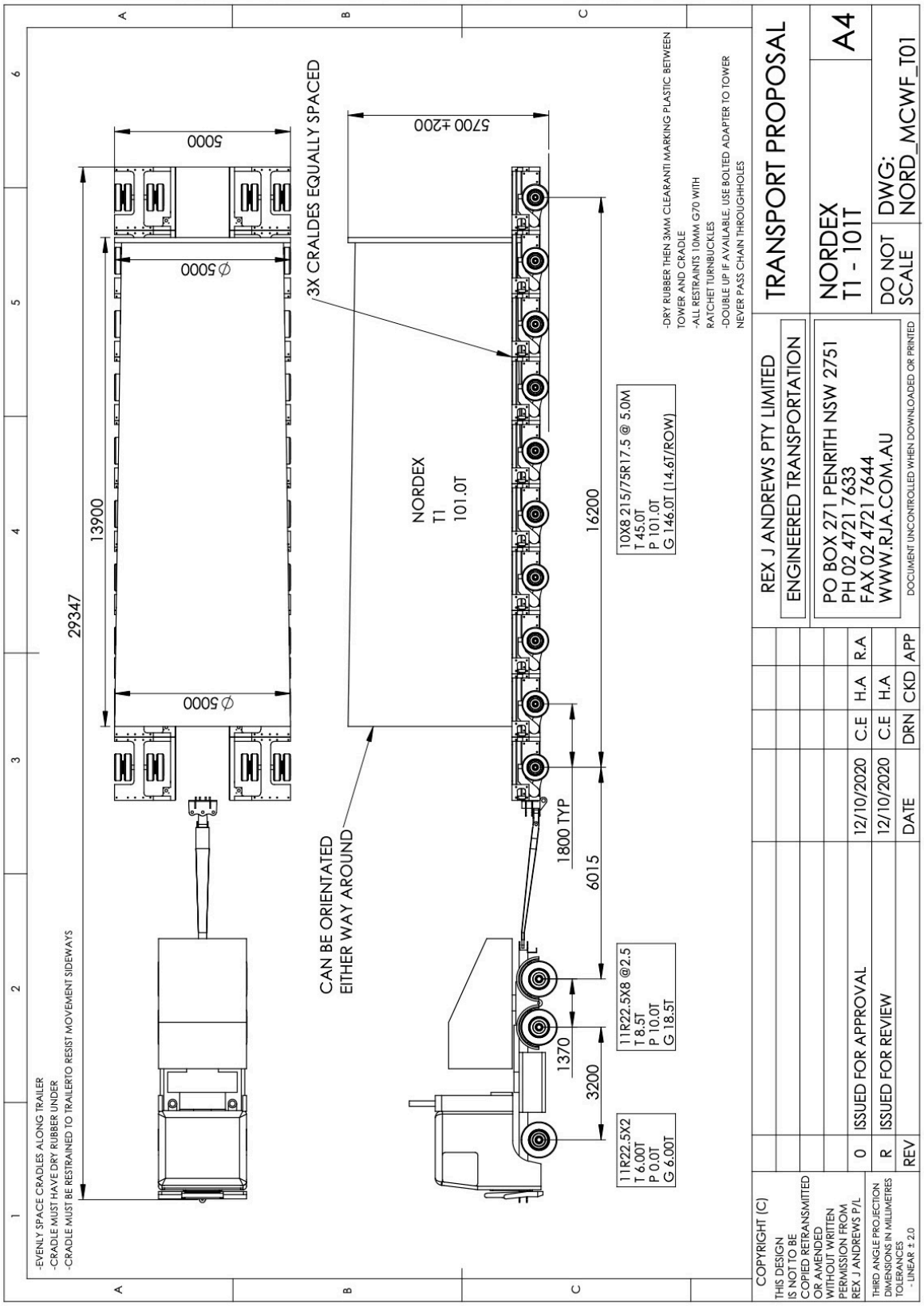


Figure 6 - Tower Trailer 10x8 Low platform example

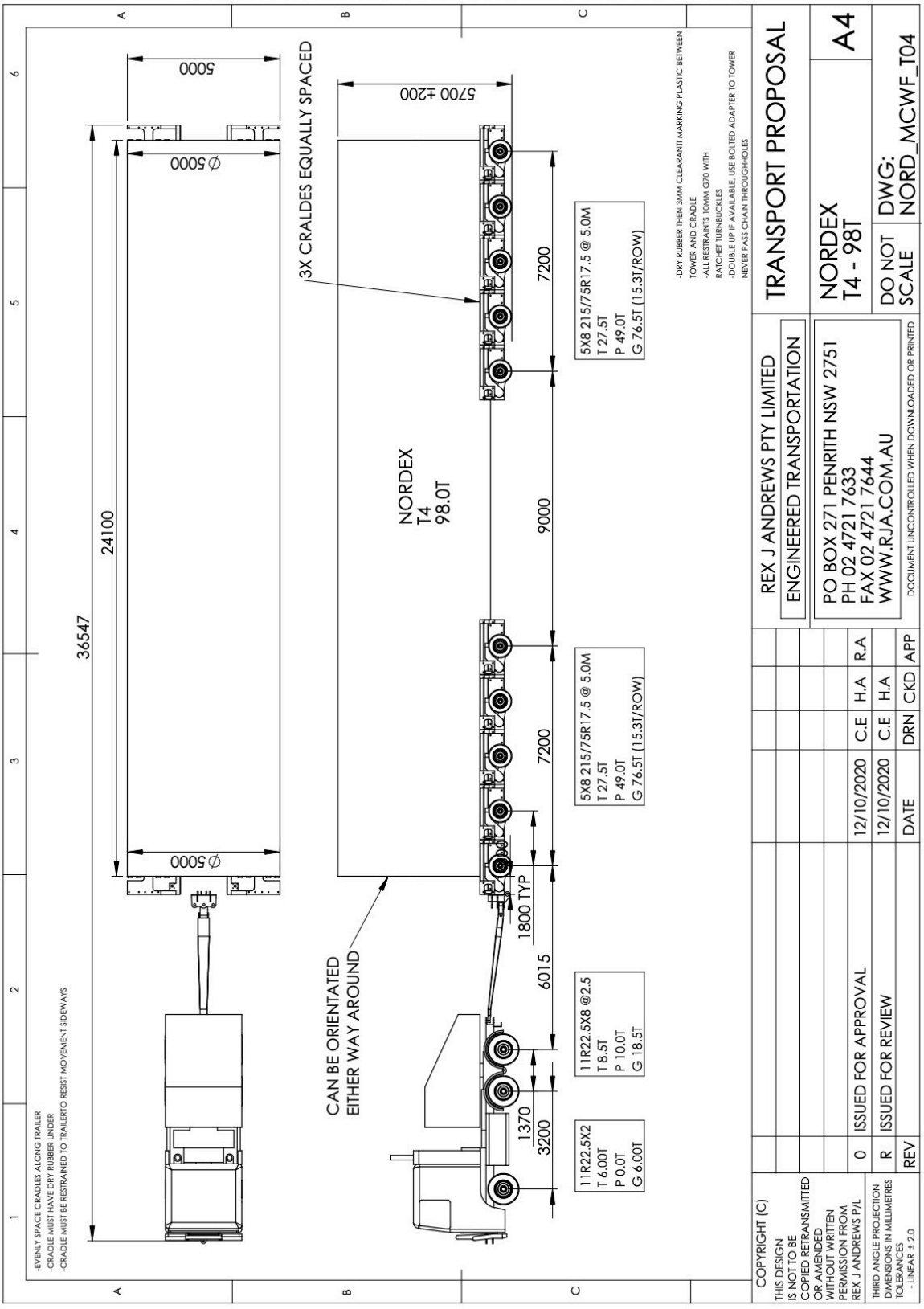


Figure 7 - Tower trailer 5x8-5x8 Low extending platform example

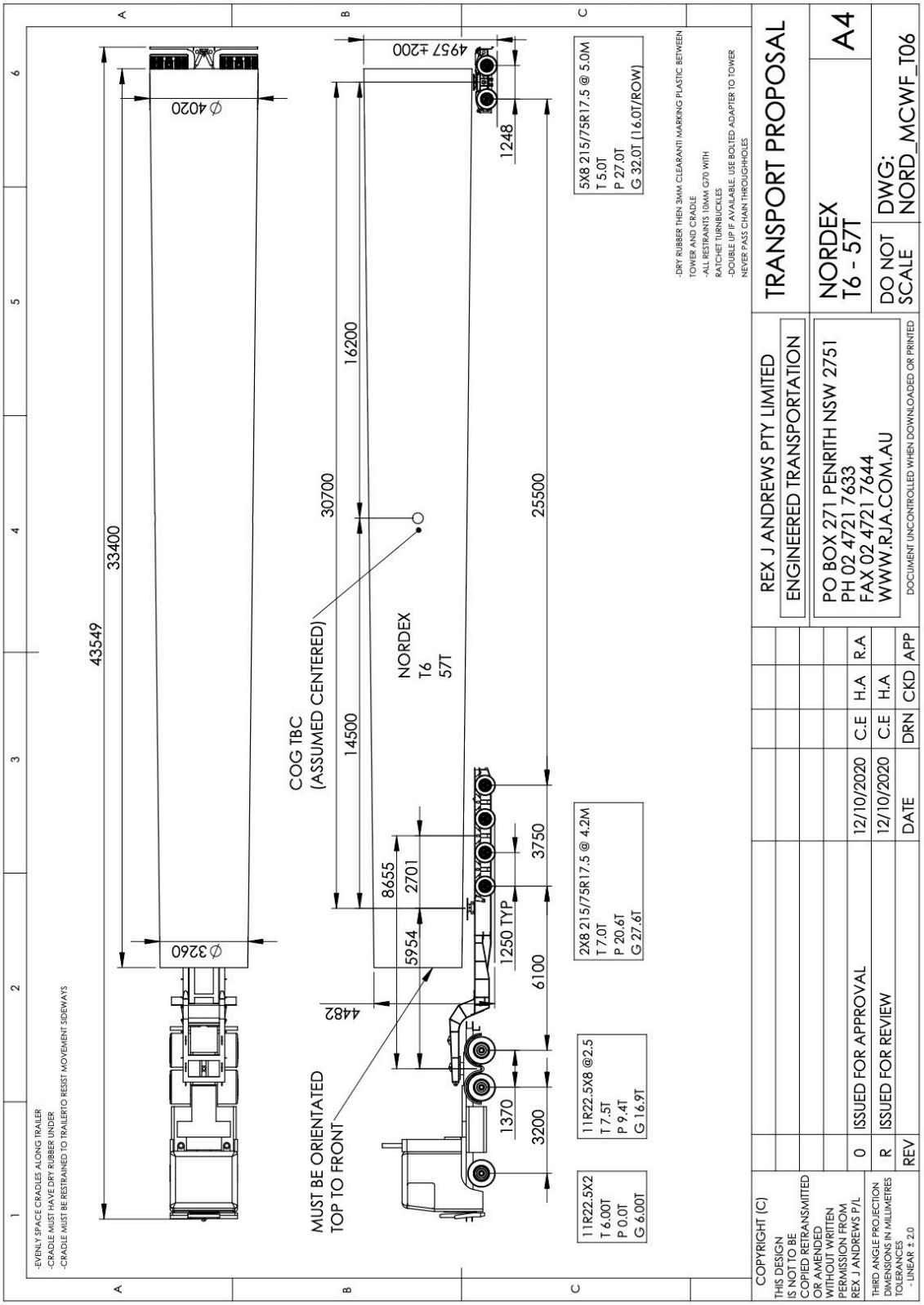


Figure 8 - Tower trailer Dolly and Jinker example

6.0 Keri Keri Wind Farm Site Location

The proposed Keri Keri Wind Farm is located approximately 30 kilometres (km) southeast of Balranald, and 75 km southwest of Hay in the Murray River Local Government Area (LGA).

The project is located within the Southwest Renewable Energy Zone (REZ) and is directly south of the Sturt Highway.

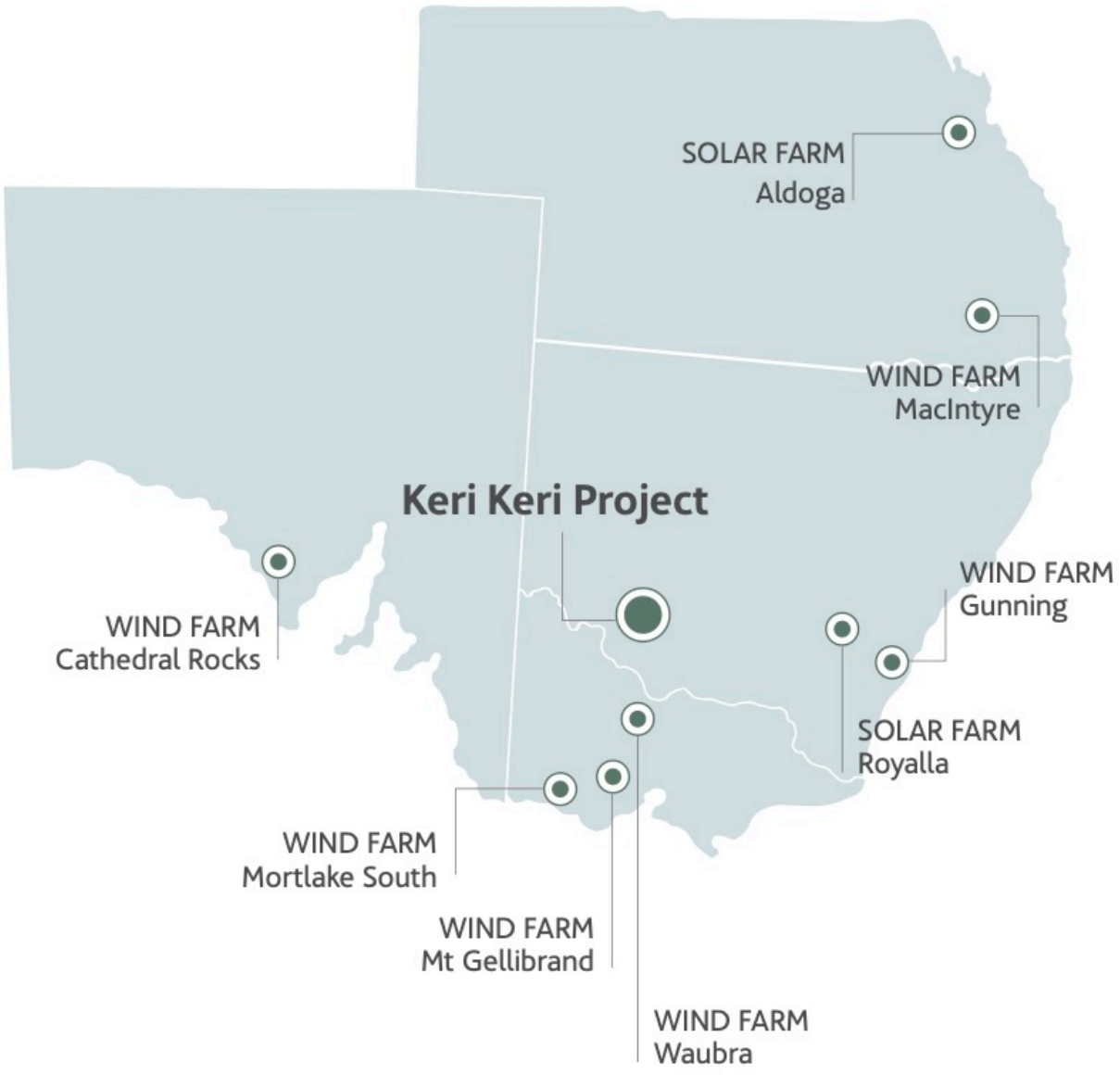


Figure 9 - Keri Keri Wind Farm Site Location

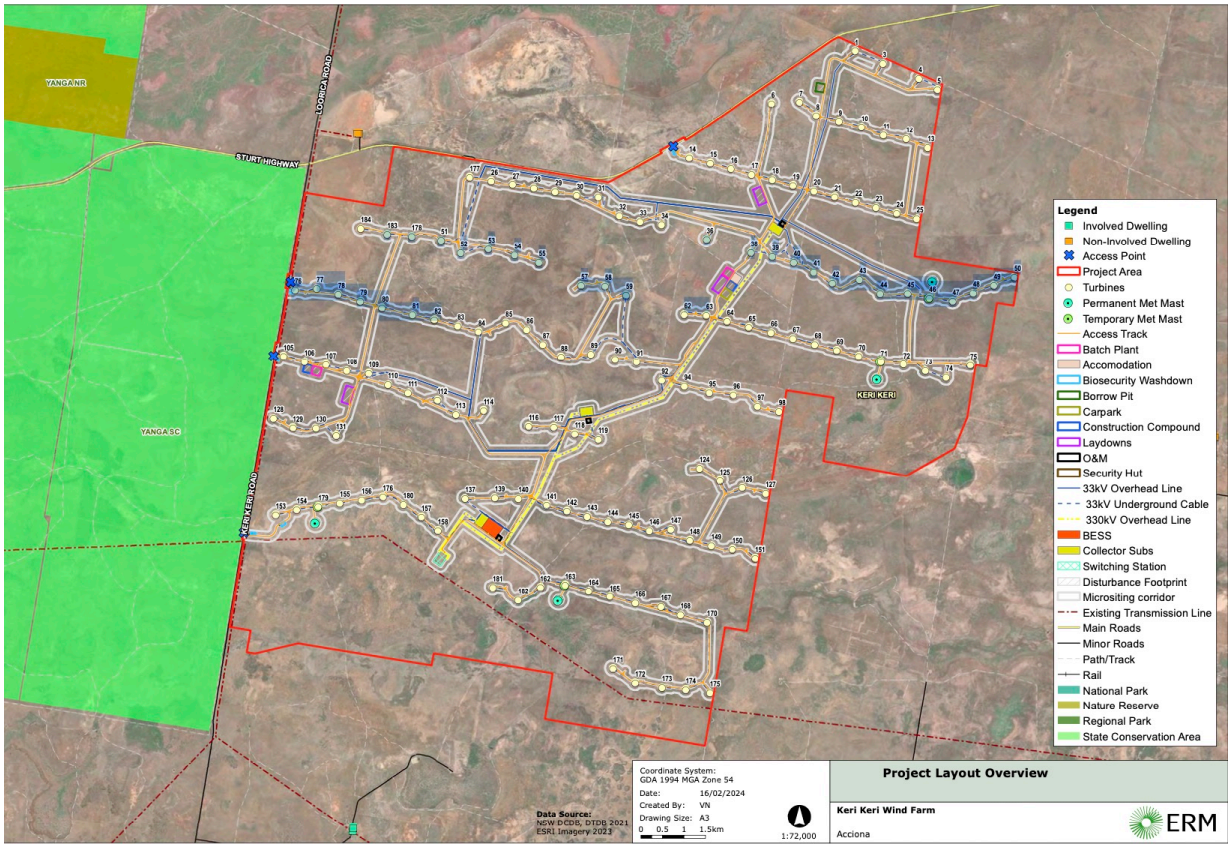


Figure 10 - Keri Keri Wind Farm Site Layout

7.0 Port of Import

The wind turbine equipment will be imported from various countries and will arrive on ships into the Port of Newcastle. The ideal berth for these shipments is the Mayfield No.4 Berth. This facility has a hardstand storage area of roughly 100,000 s/q meters, adjacent to the berth.

Access from the storage to the public roads, is via a port operated road onto Selwyn Street. There will need to be a small amount of road modifications within the port.



Figure 11 - Mayfield No.4 berth overview



Figure 12 - Mayfield No.4 Port storage area

8.0 Transport Summary

The study is based on the turbine components entering Australia via the Port of Newcastle. The study will show the likely route for these components, and the constraints that they may encounter on the route.
Route 1 would be used as the option for the blades and components under 5.25m loaded height.
Route 2 is the option for all loads over 5.25m with a **maximum loaded height of 5.9m**

ROUTE 1: Blades and components **under 5.25m** loaded height

DISTANCE: 984 kilometres

GPS LINK: https://maps.app.goo.gl/vBHUqDDoFLSuFELCA

ROUTE: Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, M1, NorthConnex tunnel, (Pennant Hills Road for all items other than blades), M2, M7, M5, Hume Highway, Sturt Hwy, Keri Keri Road.

ROUTE 2: High load route. **Maximum loaded height 5.9m**

DISTANCE: 1106 kilometres

GPS LINK: https://maps.app.goo.gl/wEudEHokGnwBWK7M7

ROUTE: Selwyn street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Bengalla Road, Wybong Road, Golden Highway, Boothenba Road, Troy Bridge Road, Bunglegumbie Road, Mitchell Highway, Manildra Street, Derribing Avenue, Algalah Street, Tomingley Road, Newell Highway, Thomas Street, Moulden Street, Henry Parkes Way, Westlime Road, Hartigan Avenue, Newell Highway, Compton Road, Showground Road, Newell Highway, Sturt Highway, Keri Keri Road.

9.0 Route 1: Blades and components under 5.25m loaded height

DISTANCE: 984 kilometres
COMPONENTS: Blades and components under 5.25m loaded height
GPS LINK: https://goo.gl/maps/rrHV7cAEwTqzcX5EA
ROUTE: Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, M1, NorthConnex tunnel, (Pennant Hills Road for all items other than blades), M2, M7, M5, Hume Highway, Sturt Hwy, Keri Keri Road.

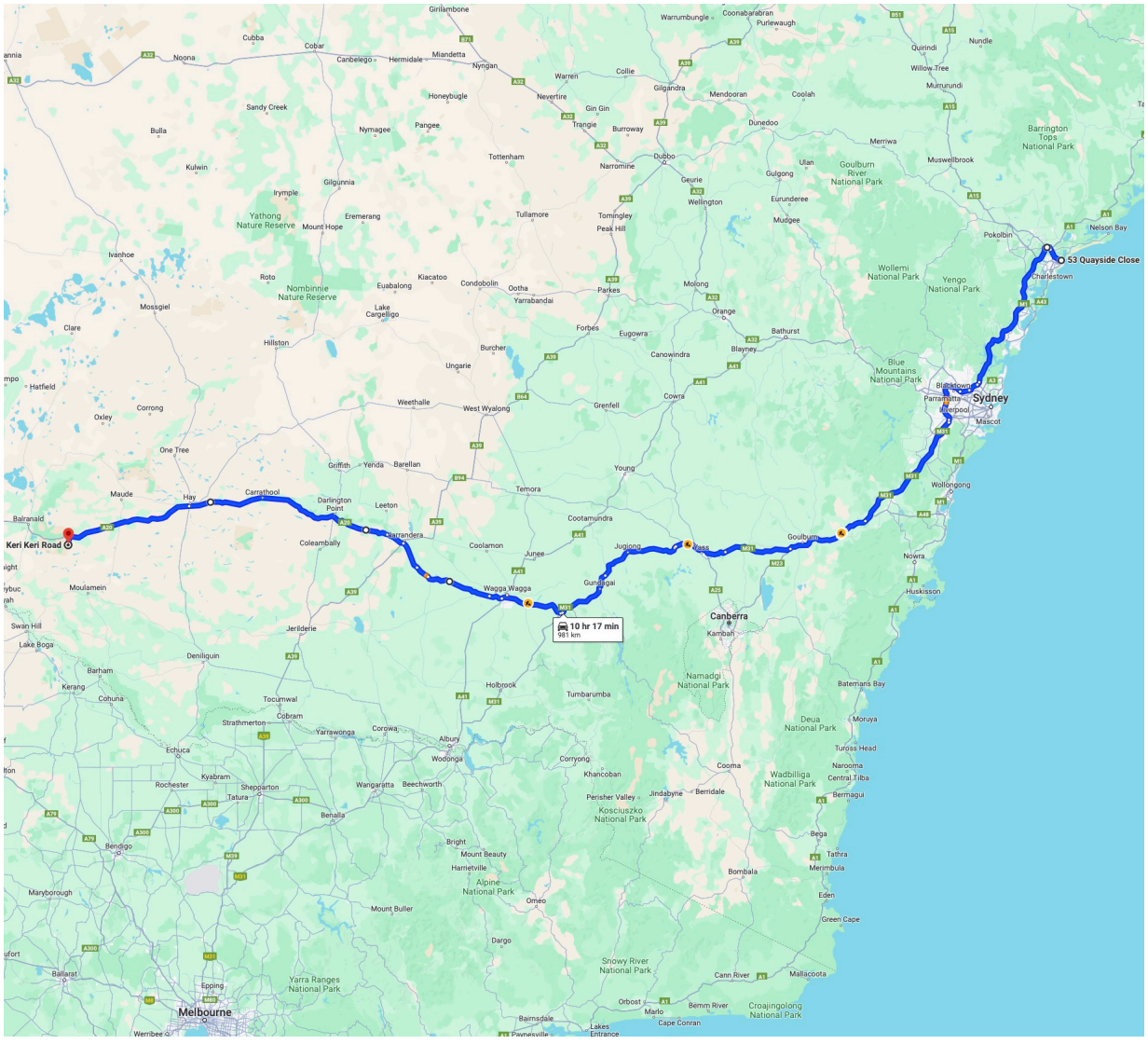


Figure 13 - Route 1

KEY	
MODIFICATIONS REQUIRED	
MINOR WORKS OR CAUTION	
PARKING	

KM index	Location	Section of road	Current clearance	Procedure	Comments
0.0	Mayfield	Mayfield #4 berth onto Selwyn Street https://goo.gl/maps/afLwPYKuNdm	Length: 70.0m Width: 8.0m	Moderate right hand turn	Hardstand will need to be added to the left entry and exit of the corner. The existing culvert will need to be extended. Some signs will need to be relocated and or made removable and some fence and gate will need to be relocated.
0.4	Mayfield	Selwyn Street rail crossing https://goo.gl/maps/864FhMSaF9P2	Width: 9.0m	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
1.3	Mayfield	Selwyn Street onto Industrial Drive via George Street https://goo.gl/maps/brPRAckLr572	Length: 70.0m Width: 8.0m	Right hand turn	The first right hand turn through George Street will need a sign made removable and a disused pole on the overhang removed. On the inside of the corner hardstand will need to be added, a sign made removable, and a light pole and traffic signal relocated. On the outside tailswing the disused pole next to the railway line will need to be removed.
4.9	Mayfield	Industrial Drive under traffic signals https://goo.gl/maps/5DpD3b7KnT72	Clearance: Height: 5.4m	Travel directly ahead	The blades will need to cross to the incorrect side of the intersection 200 metres prior, before crossing back over to the correct side 120 metres to the north of the intersection. A light pole on the inside of the corner will need to be made removable, and two signs will need to be made removable or relocated.
5.5	Mayfield West	Industrial Drive onto Maitland Road https://goo.gl/maps/Kn49dhWG2qG2	Length: 70.0m Width: 8.0m	Right hand turn	A light pole on the inside of the corner will need to be relocated outside swept path, and two signs will need to be made removable or relocated. Traffic islands to be replaced with painted lines to be trafficable.
14.8	Tarro	New England Highway/Maitland Rd https://goo.gl/maps/hkKqsZMfdVJncRdu6	Length: 100.0m Width: 12.0m	Left hand bend	Spotter to guide load through this section of road.
17.4	Tarro	New England Highway onto John Renshaw Drive https://goo.gl/maps/SRDr5JigkBp	Length: 100.0m Width: 12.0m	Left hand merge	No problems with this section of road.

KM index	Location	Section of road	Current clearance	Procedure	Comments
18.4	Beresfield	John Renshaw Drive onto the M1 https://goo.gl/maps/A34jhxCjM5wfRDdo6	Length: 80.0m Width: 8.0m	Left hand bend	2x light poles to be removed or relocated on the outside of corner for tail swing. Signs to be relocated/removed. Kerb and gutter to be modified to be trafficable for trailer.
113.0	Mt White	M1 Motorway under Mt White overpass https://goo.gl/maps/K3fPPe4fNx63xB3j7	Height clearances: Left Lane: 5.2m Centre Lane: 5.3m Right Lane: 5.4ms	Travel directly ahead	Loads that exceed 5.3 metres high are not to travel under this structure. Loads over 5.2 metres high are to travel under the bridge in the far-right lane, and at a speed of no more than 5 km's per hour. Spotter to guide load through this section of road.
122.0	Hawkesbury River	M1 Motorway https://goo.gl/maps/yDzjirEKLAbREE8B6	100.0 long x 6.0 wide	Merge to left	Large parking area
146.4	Wahroonga	M1 onto North Connex GPS link: https://goo.gl/maps/7TMrKXHJzJDzimqZ7	Height: 5.0m 120 metres	Right Hand Merge	Merge into right hand lane ready to enter North Connex Tunnel. BLADES ONLY.
146.4 to 155.9	Wahroonga to West Pennant Hills	M1 onto Pennant Hills Road GPS link: https://maps.app.goo.gl/ZEBwkDNnC7DtmPoA8	Height: 5.0m 120 metres	Left hand turn onto PHR, travel along PHR before turning right onto the M2.	Merge into right hand lane ready to enter North Connex Tunnel. REMAINING LOADS UNDER 5.25 METRES IN HEIGHT.
155.9	West Pennant Hills	North Connex onto M2 GPS Link: https://goo.gl/maps/C6aAHGR54c4KbkeJ7	Height: 5.25m 120 metres	Right Hand Merge	Merge onto the M2 Motorway
167.0	Kings Park	M7 Motorway https://goo.gl/maps/T8WcbR9T84Zs7WpF7	100.0 long x 6.0 wide	Merge to left	Large parking area
201.0	Prestons	M7 Motorway onto M5 Motorway https://goo.gl/maps/FA2mF7PxZkxrRDTR9	Width: 10.0 metres	Travel directly ahead	No problems with this section of road.
229.0	Menangle	Hume Highway https://goo.gl/maps/KPMdLS1XuRWHrcyb6	200.0 long x 8.0 wide	Merge to left	Large parking area for towers and motors, no blades to enter this parking bay.
238.0	Wilton	Hume Highway under Farm access overpass https://goo.gl/maps/2ZsVqYJ9j9qPTGqa9	Height clearances: Left Lane: 5.5m Centre Lane: 5.4m Right Lane: 5.3m	Travel directly ahead	Loads that exceed 5.3 metres high are not to travel under this structure. Loads over 5.2 metres high are to travel under the bridge in the left lane, and at a speed of no more than 5 km's per hour. Spotter to guide load through this section of road.
303.0	Sutton Forest	Hume Highway https://goo.gl/maps/uT1ubtSuawS2	150.0 long x 10.0 wide	Merge to left	Large parking area
352.0	Goulburn	Hume Highway https://goo.gl/maps/7HywRcjZiJy	180.0 long x 15.0 wide	Merge to left	Large parking area
353.0	Goulburn	Windellama/Bungonia Road Overpass GPS Link: Windellama Rd OP	5.44 Metres clearance	Travel directly ahead	No problems with this section of road
380.0	Breadalbane	Hume Highway https://goo.gl/maps/UWjx3XndLejWG1UD9	140.0 long x 14.0 wide	Merge to left	Large parking area
453.0	Bowning	Hume Highway https://goo.gl/maps/vRMmSbJCke5d65PJ9	200 long x 8.0 wide	Merge to left	Large Parking area
456.0	Bowning	Hume Highway https://goo.gl/maps/XENMvuFeHCevVo8J6	80 long x 25 wide	Merge to left	Large parking area

KM index	Location	Section of road	Current clearance	Procedure	Comments
510.0	Jugiong	Hume Highway https://goo.gl/maps/QzzfyAAnixQn3nwx8	140.0 long x 14.0 wide	Merge to left	Large parking area
573.70	Tarcutta	Hume Hwy onto Sturt Hwy GPS Link: https://goo.gl/maps/ruqNDSw5vanJDd4x5	200m long	Left Hand Merge	Merge left to left lane to exit Hume Hwy, follow road right onto overpass onto Sturt Hwy. No problems with this section of road.
614.6	Wagga Wagga	Sturt Hwy GPS Link: https://goo.gl/maps/7VDWUvW8KnUhCEdd7	80m long	Second Exit on Round-about	Sign to be removed in the middle of the roundabout. Roundabout made trafficable.
617.3	Wagga Wagga	Sturt Hwy GPS Link: https://goo.gl/maps/VeavHs6e4AiLaqqDA	80m long	Second Exit on Round-about	Sign to be removed in the middle of the roundabout. Handstand to be installed on roundabout and roundabout made trafficable.
618.4	Wagga Wagga	Sturt Hwy GPS Link: https://goo.gl/maps/dBrte59BvHvvcGSr5	80m long	Second Exit on Round-about	The truck will need to cut across the centre of the roundabout. The existing pavement is ok to drive on without any extra work. 2x signs to be removed in the middle of the roundabout.
618.75	Wagga Wagga	Sturt Hwy under rail overpass GPS Link: https://goo.gl/maps/JPkJBAyzJuMAiHUz8	Height clearances: 5.40m	Travel under rail overpass	Detailed vertical curve assessment required to determine whether blade loads can travel under the rail bridge and maintain clearance, as well as maintaining tip clearance to the ground on entry and the bridge on exit while travelling through the dip.
621.5	Wagga Wagga	Sturt Hwy GPS Link: https://goo.gl/maps/fx388vcUAibykivPA	80m long	Second Exit on Round-about	Signs to be removed in the middle of the roundabout. Roundabout made trafficable.
711.0	Gillenbah	Sturt Hwy GPS Link: https://goo.gl/maps/C7qJ8ouDVdpcH5Rz7	80m long	Left Hand Turn	Several signs to be relocated or made removable. Power pole to be relocated out of swept path. Vegetation to be removed or trimmed for blade oversail. Traffic island to be removed and replaced with paint to make trafficable.
711.5	Gillenbah	Sturt Hwy GPS Link: https://goo.gl/maps/w4bRo2oaCsWADQcA7	100.0 metres long 5.0 metres wide	Merge to	Emergency parking
882.0	Hay South	Sturt Hwy Roundabout at Cobb Hwy GPS Link: https://maps.app.goo.gl/Sln5kWiKvUXBYK5e9	50 metres	Load to cross to incorrect side of road and use bypass through roundabout.	Existing shoulder on entry to be made trafficable. Hardstand bypass installed through roundabout parallel with existing easement. Vegetation to be removed or trimmed. Several signs relocated or made removable.
967	Keri Keri	Stuart Highway into site entrances GPS Link: https://goo.gl/maps/C2aaH9WJcqcRE9MD8		Site Entrance	A site entrance is proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

KM index	Location	Section of road	Current clearance	Procedure	Comments
976	Keri Keri	Sturt Highway onto Keri Keri Road GPS Link: https://goo.gl/maps/uH5pmWwzWvz3TJ4K6		Left hand turn	Hardstand to be installed and signs and all obstacle relocated or removed. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic. Keri keri Rd and All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
979-984	Keri Keri	Keri Keri Road into site entrances GPS Link: https://maps.app.goo.gl/nGXFh9Snwd52CoR69		3 x Site Entrance	3 x site entrances are proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

0.0 Km's: Mayfield No.4 onto Selwyn Street at Mayfield

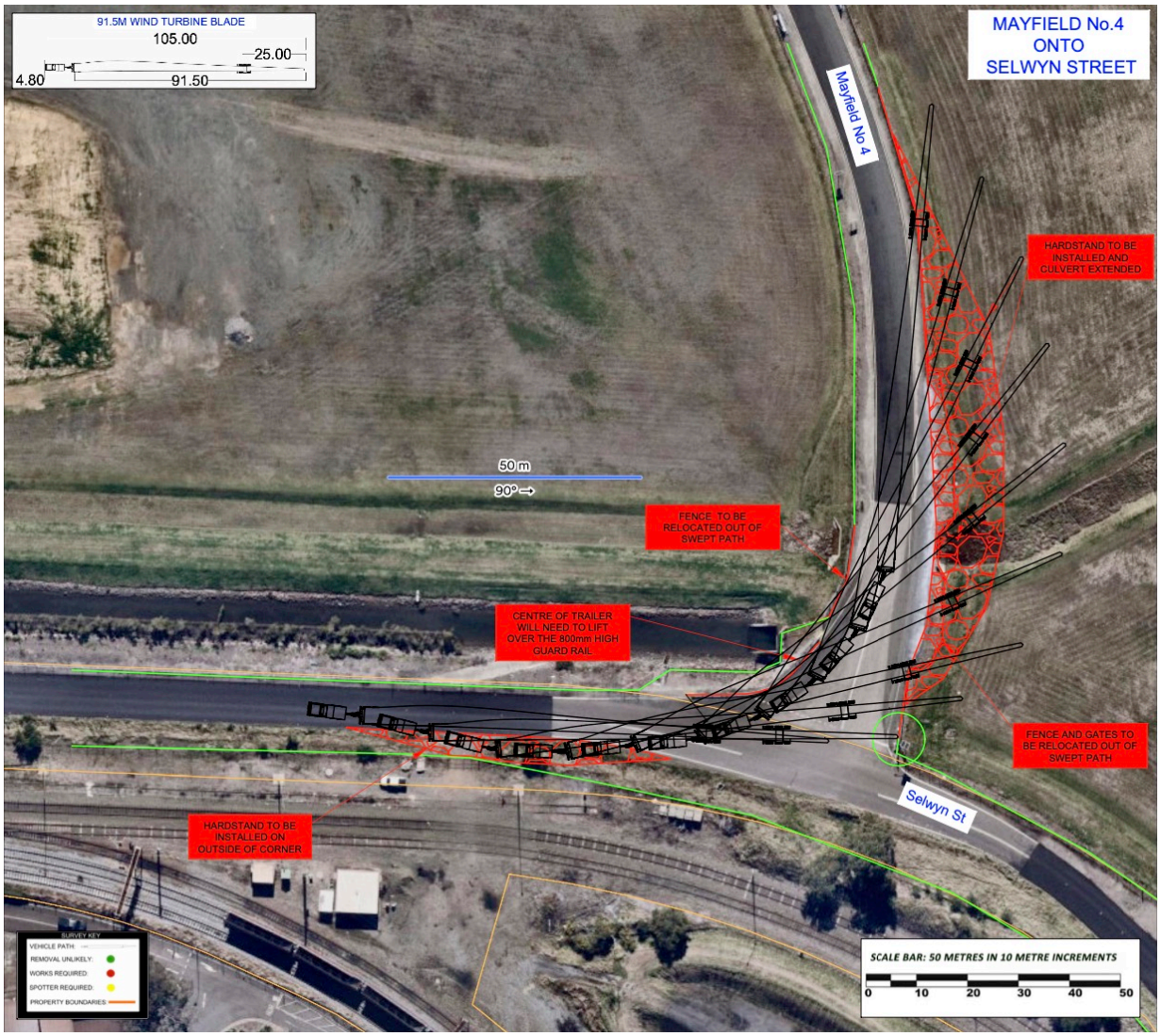


Figure 14 - Mayfield No.4 onto Selwyn Street

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/afLwPYKuNdm

PROCEDURE: Right hand turn.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Hardstand will need to be added to the left entry and exit of the corner. The existing culvert will need to be extended. Some signs will need to be relocated and or made removable and some fence and gate will need to be relocated.

0.4 Km's: Rail crossing over Selwyn Street at Mayfield



Figure 15 - Rail crossing over Selwyn Street

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/864FhMSaF9P2

PROCEDURE: Travel directly ahead over the crossing.

COMMENTS: Large width clearance and good ground clearance over this crossing. Police and escorts to control local traffic either side of the crossing. ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

ROAD MODIFICATIONS: No works are required.

1.3 Km's: Selwyn Street onto Industrial Drive, via George Street at Mayfield

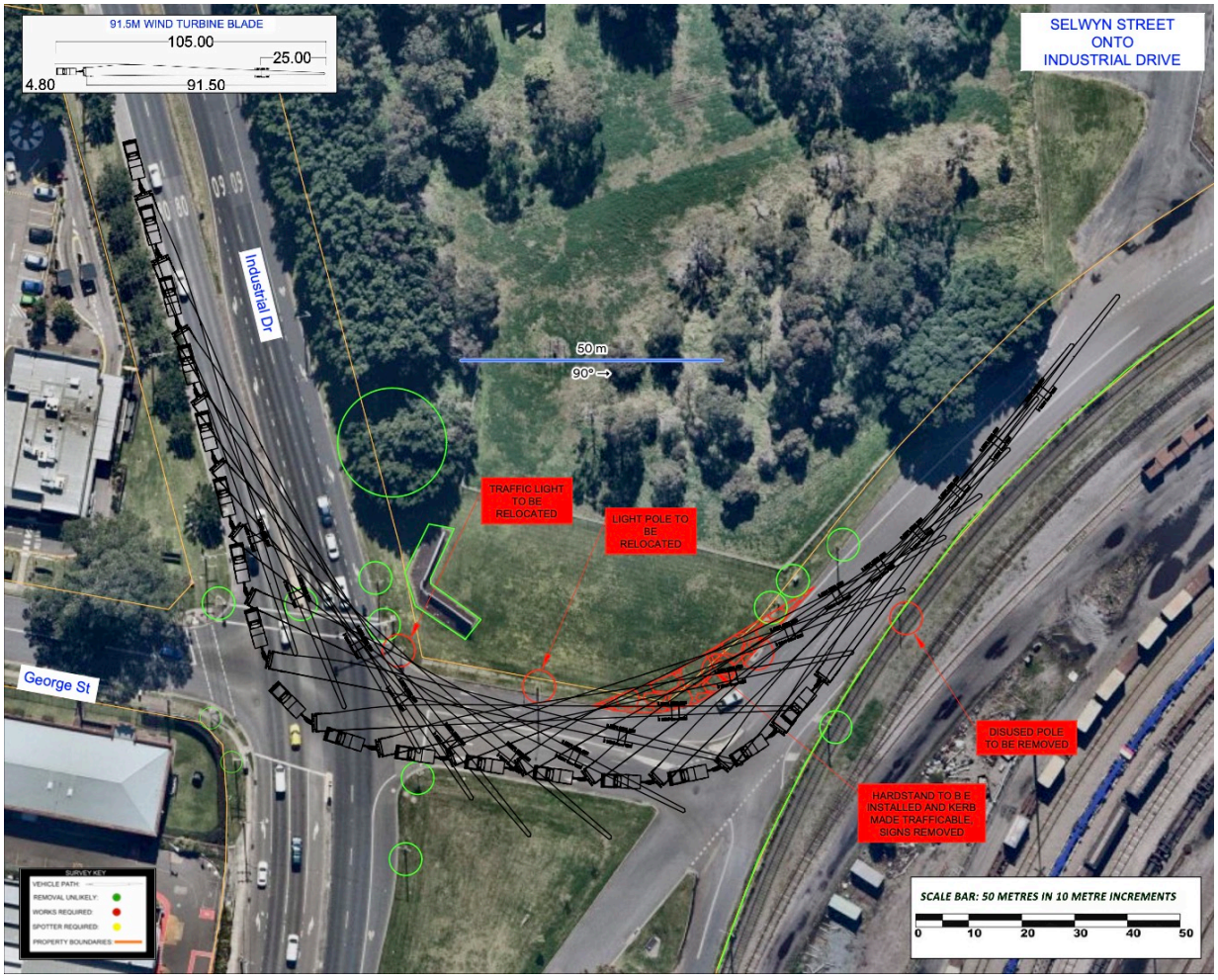


Figure 16 - Selwyn Street onto Industrial Drive

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/brPRAckLr572

PROCEDURE: Right hand turn from Selwyn Street through George Street and onto Industrial Drive. Entering Industrial Drive, the prime mover will cross from the correct side to the correct side with the trailer cutting the corner and travelling over the centre median strip.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: The first right hand turn through George Street will need a sign made removable and a disused pole on the overhang removed. On the inside of the corner hardstand will need to be added, a sign made removable, and a light pole and traffic signals relocated. On the outside tail swing the disused pole next to the railway line will need to be removed.

4.9 Km's: Standard overhanging Traffic signals Mayfield to Hunter Expressway



Figure 17 - Standard overhanging Traffic signals Mayfield to Hunter Expressway

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/5DpD3b7KnT72

PROCEDURE: Overhanging signals while travelling through the intersection.

COMMENTS: The lowest traffic signal on route has 5.4 metres clearance. This signal is on the corner of Steel River Blvd at Mayfield West. Loads with an overall height of 5.3 or higher, can avoid this signal by travelling in the centre lane. Loads to slow down while doing this manoeuvre. All other signals exceed 5.6 metres high on this section of road.

ROAD MODIFICATIONS: No works are required.

5.5 Km's: Industrial Drive onto Maitland Road at Mayfield West



Figure 18 - Industrial Drive onto Maitland Road

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/Kn49dhWG2qG2

PROCEDURE: Right hand turn from Industrial Drive onto Maitland Road. The blades will need to cross to the incorrect side of the intersection 200 metres prior, before crossing back over to the correct side 120 metres to the north of the intersection.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: A light pole on the inside of the corner will need to be relocated outside swept path, and two signs will need to be made removable or relocated. Traffic islands to be replaced with painted lines to be trafficable.

14.8 Km's: New England Highway/Maitland Rd at Tarro



Figure 19 - New England Highway/Maitland Rd at Tarro

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/hkKgsZMfdVJncRdu6
PROCEDURE: Left hand bend.
COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.
ROAD MODIFICATIONS: No works required. The blades will stay on the correct side of the road for the entirety.
Spotter to keep the driver informed throughout the procedure.

18.4 Km's: Intersection of John Renshaw Drive and M1 at Beresfield

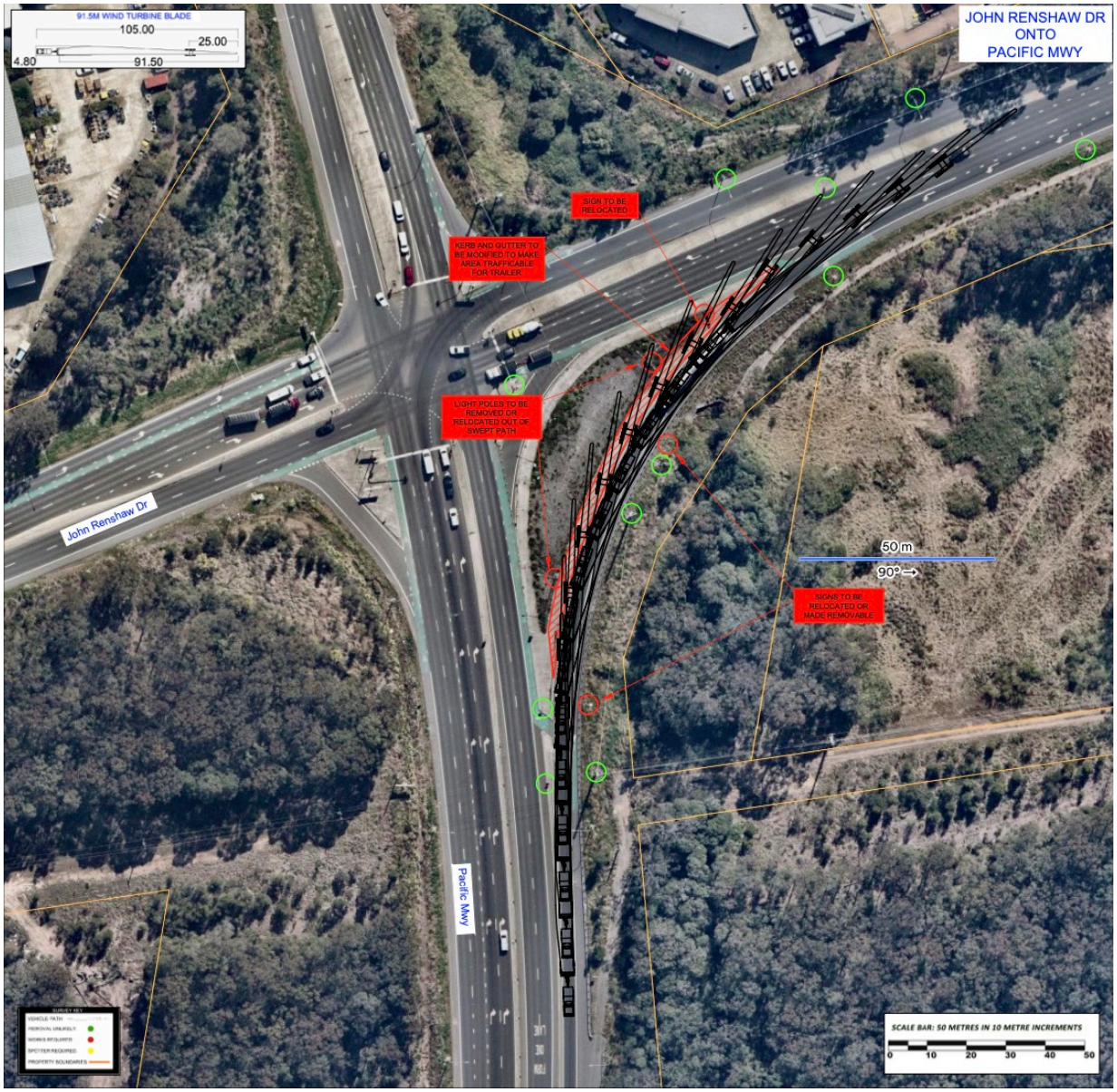


Figure 20 - Intersection of John Renshaw Drive and M1

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/A34ihxCjM5wfRDdq6

PROCEDURE: Left hand turn via slip lane.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: 2x light poles to be removed or relocated on the outside of corner for tail swing. Signs to be relocated/removed. Kerb and gutter to be modified to be trafficable for trailer.

146.1 – 155.9 Km's: M1 Motorway onto M2 Motorway through the Northconnex tunnel.

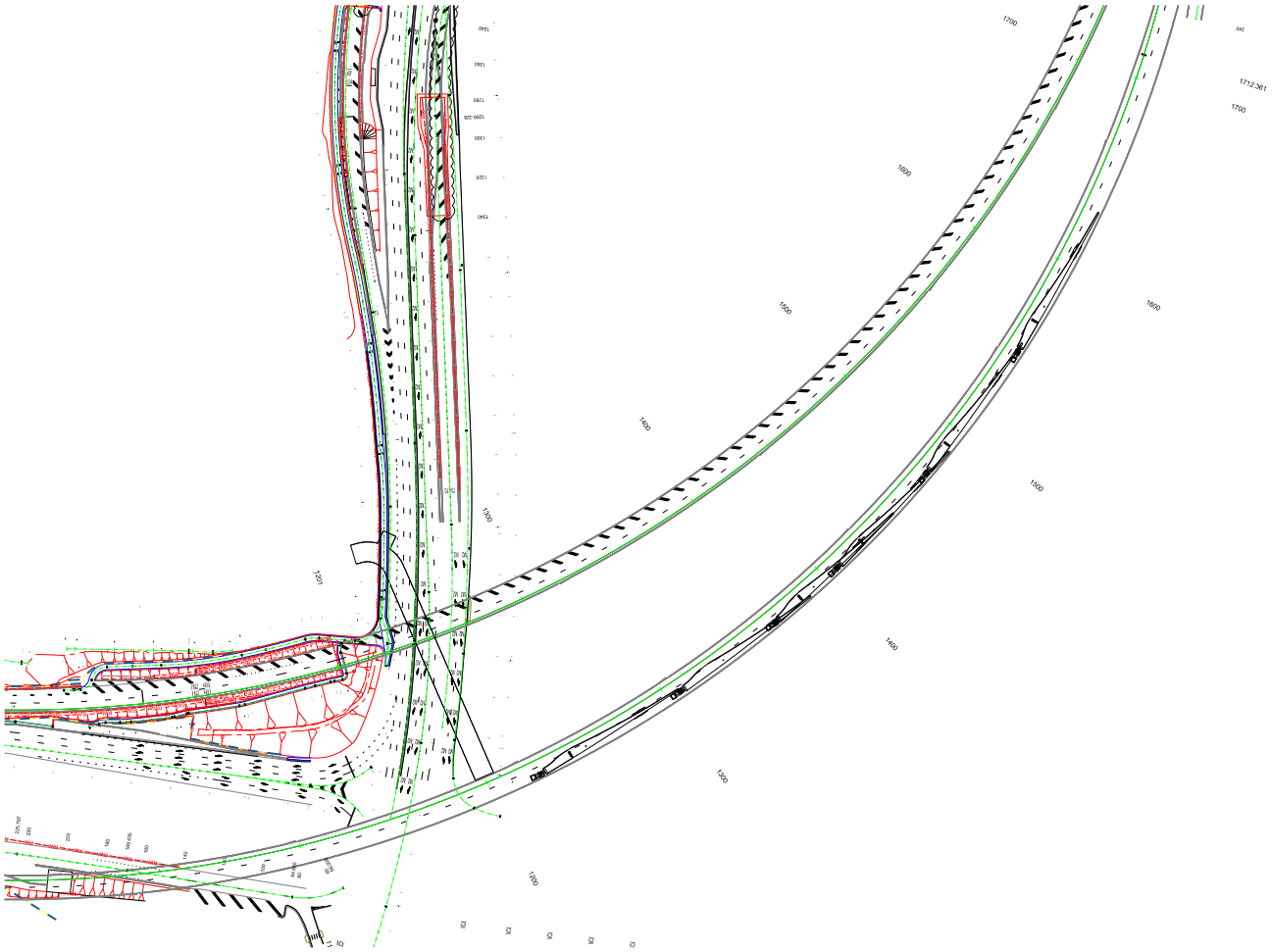


Figure 21 - Intersection of John Renshaw Drive and M1

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/BZaXJ5V6CmT2Pt8v8

PROCEDURE: Travel through the Northconnex tunnel.

COMMENTS: The tunnel has very large radius corners that will be no issues for the blades. The tightest section is shown above.
Approval will be required from TfNSW and the Northconne to travel through the tunnel.

Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic. Maximum height of 5.0 metres.

ROAD MODIFICATIONS: No works are required.

614.6 Km's: 1st Roundabout on the Sturt Highway at Wagga Wagga

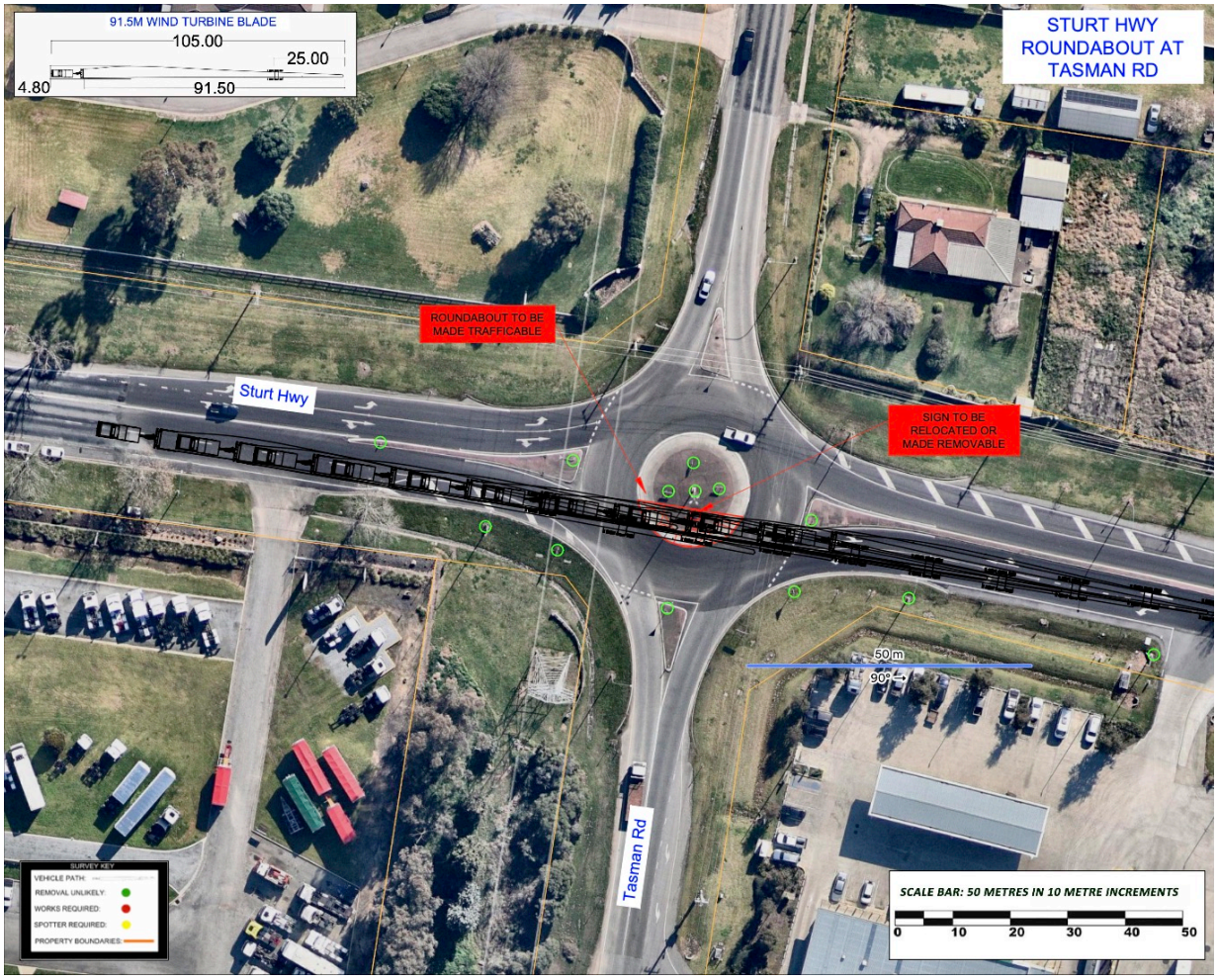


Figure 22 - 1st Roundabout on the Sturt Highway at Wagga Wagga

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/7VDWUyW8KnUhCEdd7

PROCEDURE: Continue straight ahead. The truck will need to cut across the centre of the roundabout.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Sign to be removed in the middle of the roundabout. Roundabout made trafficable.

617.3 Km's: 2nd Roundabout on the Sturt Highway at Wagga Wagga

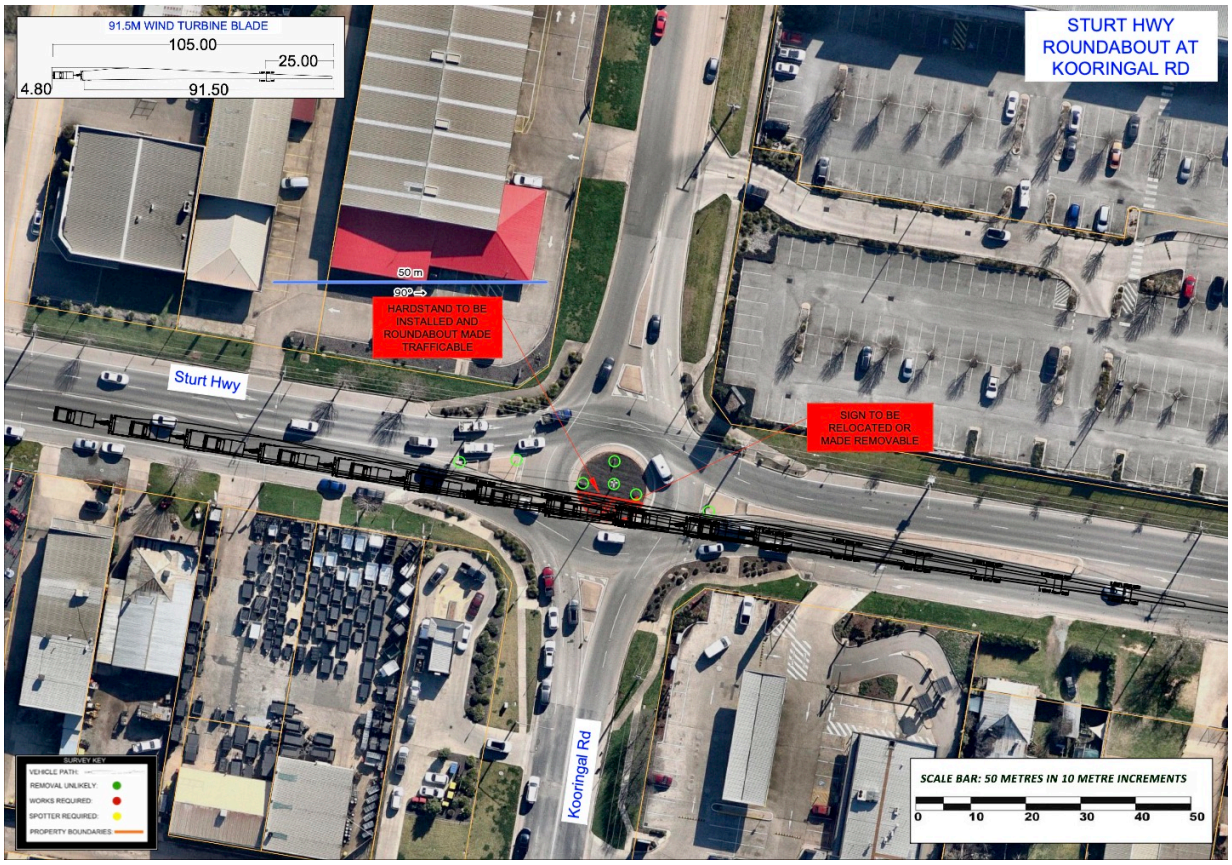


Figure 23 - 2nd Roundabout on the Sturt Highway at Wagga Wagga

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/VeavHs6e4AjLaggDA

PROCEDURE: Continue straight ahead. The truck will need to cut across the centre of the roundabout.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Sign to be removed in the middle of the roundabout. Handstand to be installed on roundabout and roundabout made trafficable.

618.4 Km's: 3rd Roundabout on the Sturt Highway at Wagga Wagga



Figure 24 - 3rd Roundabout on the Sturt Highway at Wagga Wagga

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/dBrte59BvHyvcGSr5

PROCEDURE: Continue straight ahead. The truck will need to cut across the centre of the roundabout.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Sign to be removed in the middle of the roundabout. Roundabout made trafficable.

618.75 Km's: Sturt Hwy under Edward St Rail Bridge

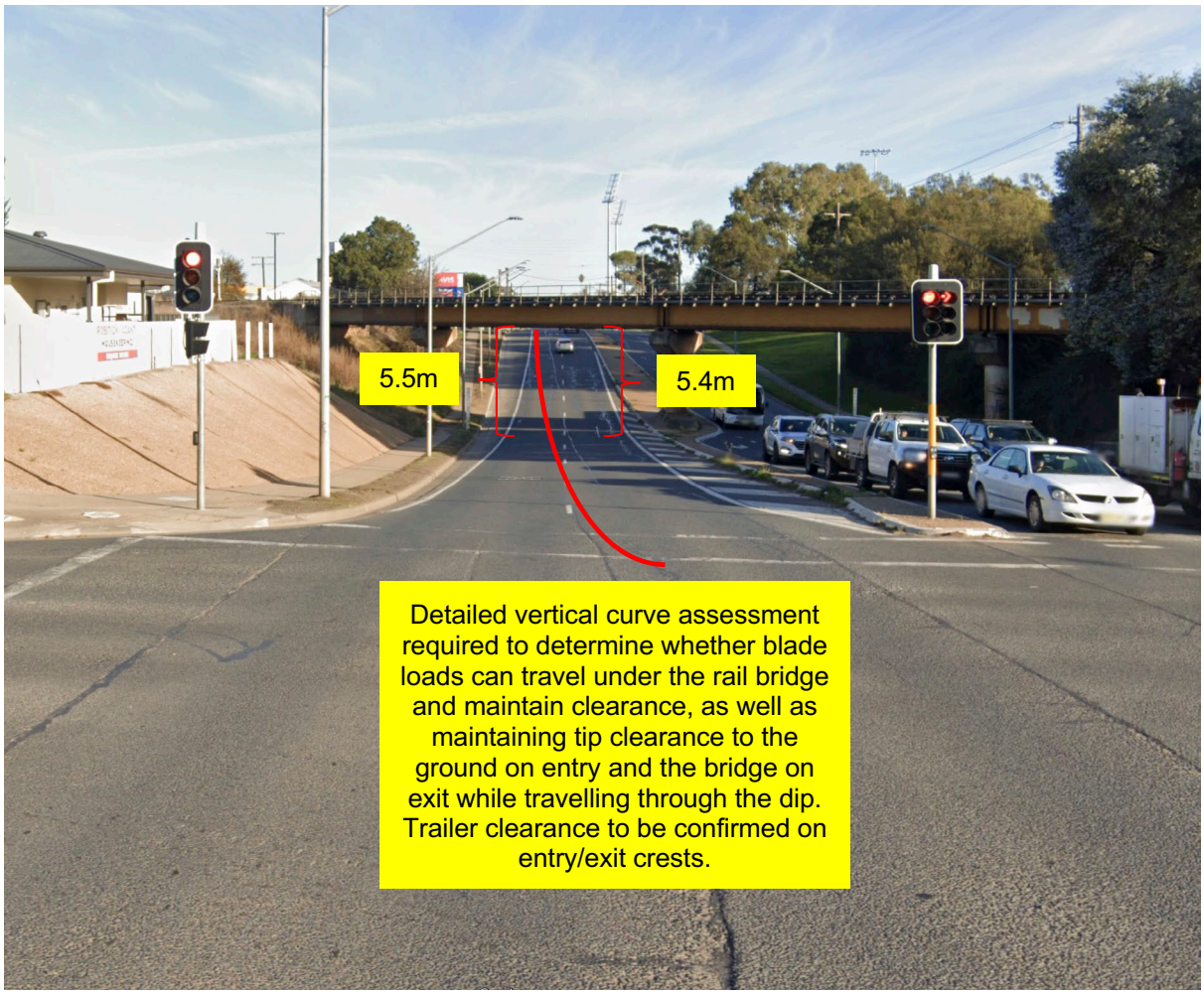


Figure 25 - Sturt Hwy under Edward St Rail Bridge

621.5 Km's: 4th Roundabout on the Sturt Highway at Wagga Wagga



Figure 26 - 4th Roundabout on the Sturt Highway at Wagga Wagga

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/fx388veUAjbykiyPA

PROCEDURE: Continue straight ahead. The truck will need to cut across the centre of the roundabout.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Signs to be removed in the middle of the roundabout. Roundabout made trafficable.

716.2 Km's: Left hand bend to stay on the Sturt Highway at Gillenbah

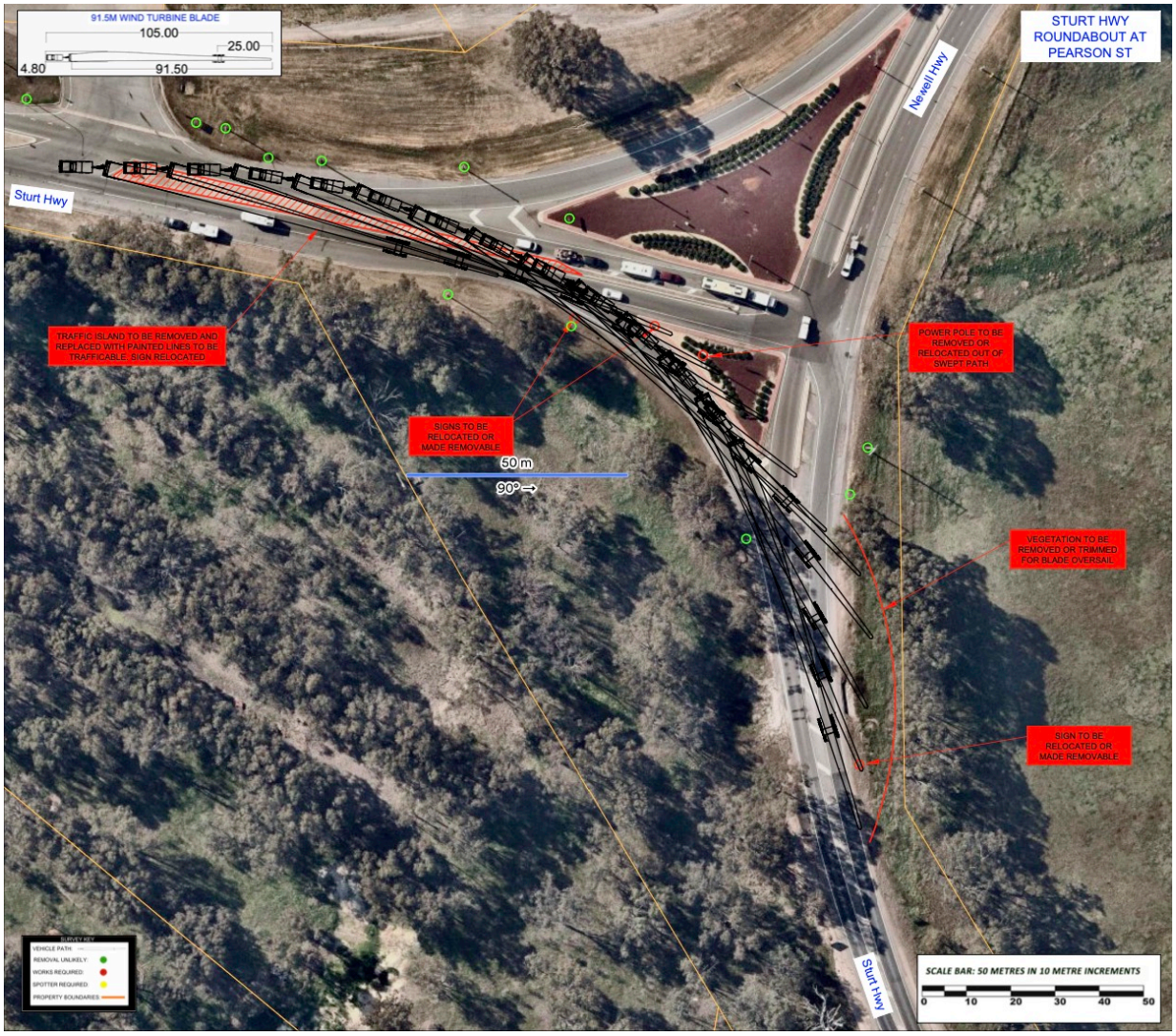


Figure 27 - Left hand bend to stay on the Sturt Highway at Gillenbah

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/C7gJ8ouDVdpcH5Rz7

PROCEDURE: Left hand Turn. The truck will need to cross onto the wrong side of the road for about 100m by cutting across the medium strip.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Several signs to be relocated or made removable. Power pole to be relocated out of swept path. Vegetation to be removed or trimmed for blade oversail. Traffic island to be removed and replaced with paint to make trafficable.

880.9 Km's: Roundabout on the Sturt Highway at Hay South

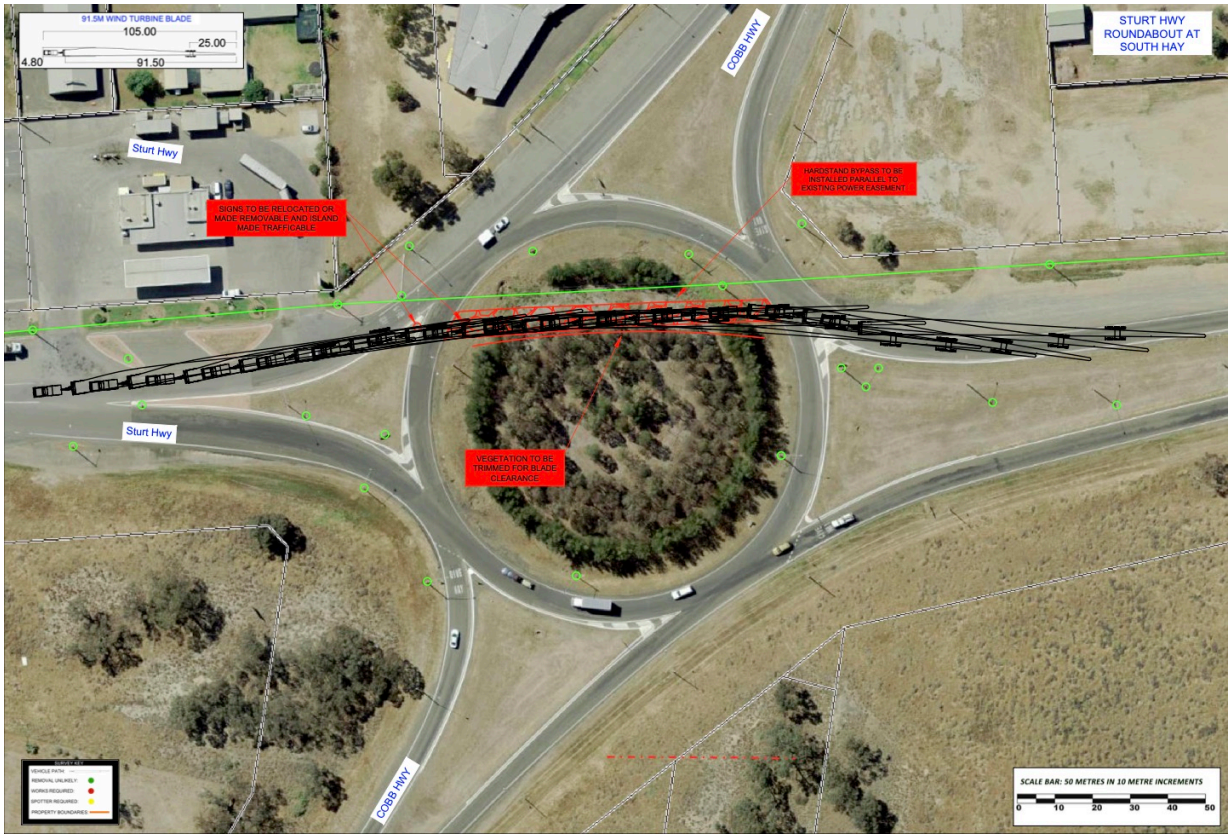


Figure 28 - Roundabout on the Sturt Highway at Hay South

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/NBFhAv8wqei8gws66

PROCEDURE: Load to cross to incorrect side of road and use bypass through roundabout adjacent to existing power easement.

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Existing shoulder on entry and traffic island on exit to be made trafficable. Hardstand bypass to be installed through roundabout parallel with existing easement. Vegetation to be removed or trimmed. Several signs relocated or made removable.

967 Km's: Sturt Highway into Site Entrance

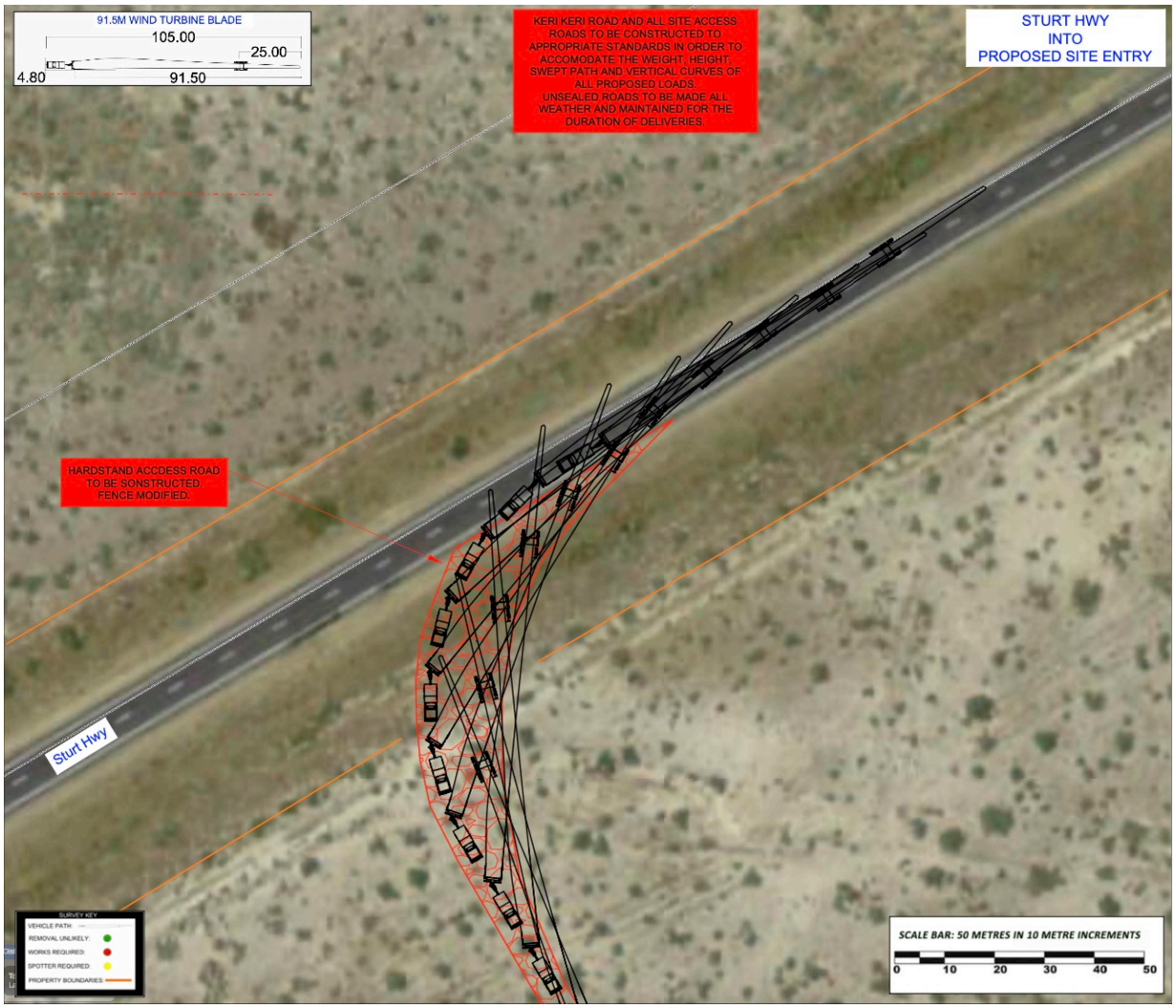


Figure 29 - Sturt Highway into site entrance

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/uUhj8HobAbyn9rcy8

PROCEDURE: Left hand turn

COMMENTS: The site entrances are proposed along this location. The land is very flat with limited vegetation. Client to provide adequate swept path for the blade to enter site.

ROAD MODIFICATIONS: All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

976 Km's: Sturt Highway onto Keri Keri Road

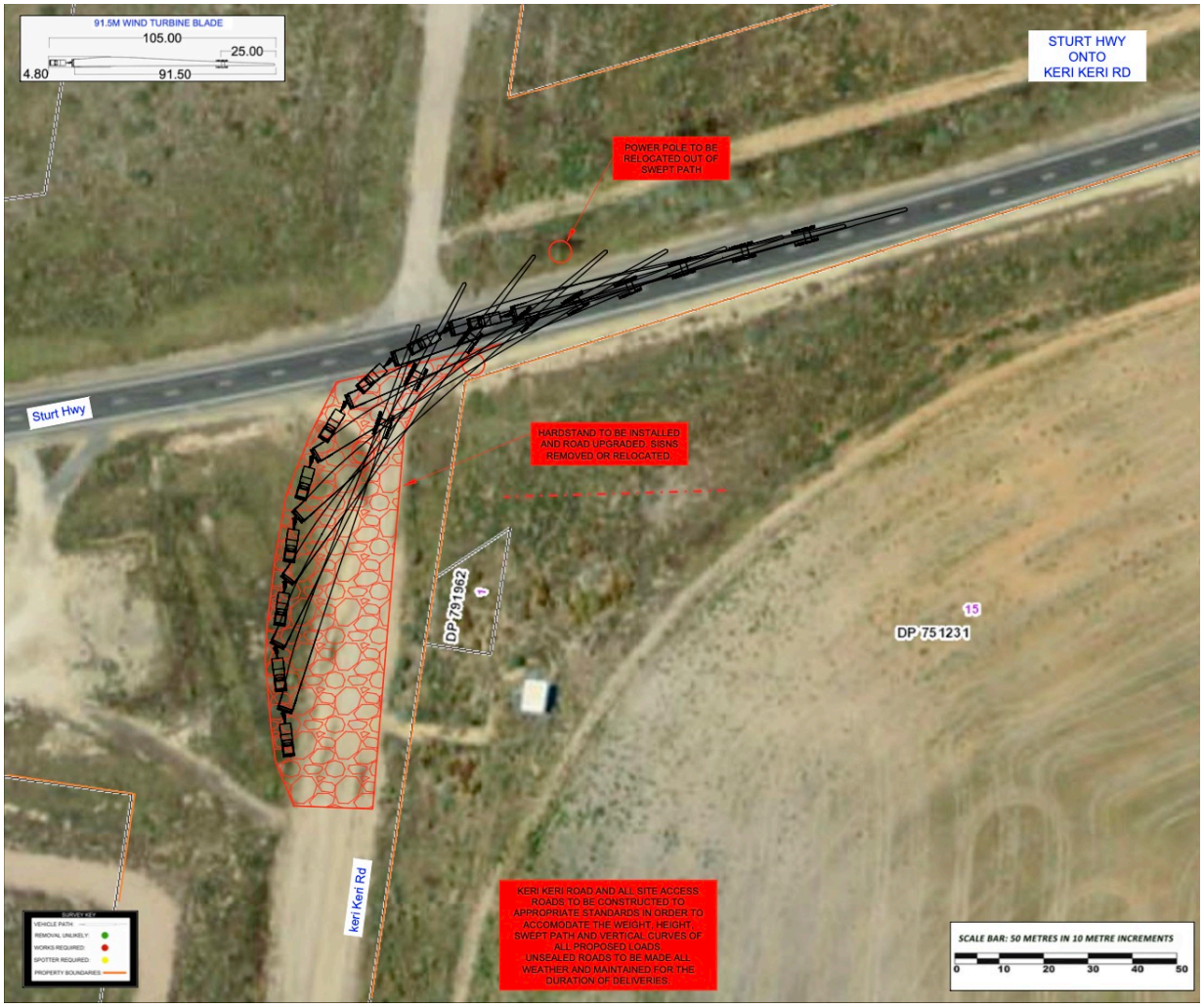


Figure 30 - Sturt Highway onto Keri Keri Road

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/uUhj8HobAbyn9rcy8

PROCEDURE: Left hand turn

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: Hardstand to be installed and signs and all obstacle relocated or removed. Power pole to be relocated out of swept path.
Keri Keri Rd and all site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

979-984 Km's: Keri Keri Rd into 3 x Proposed Site Entries

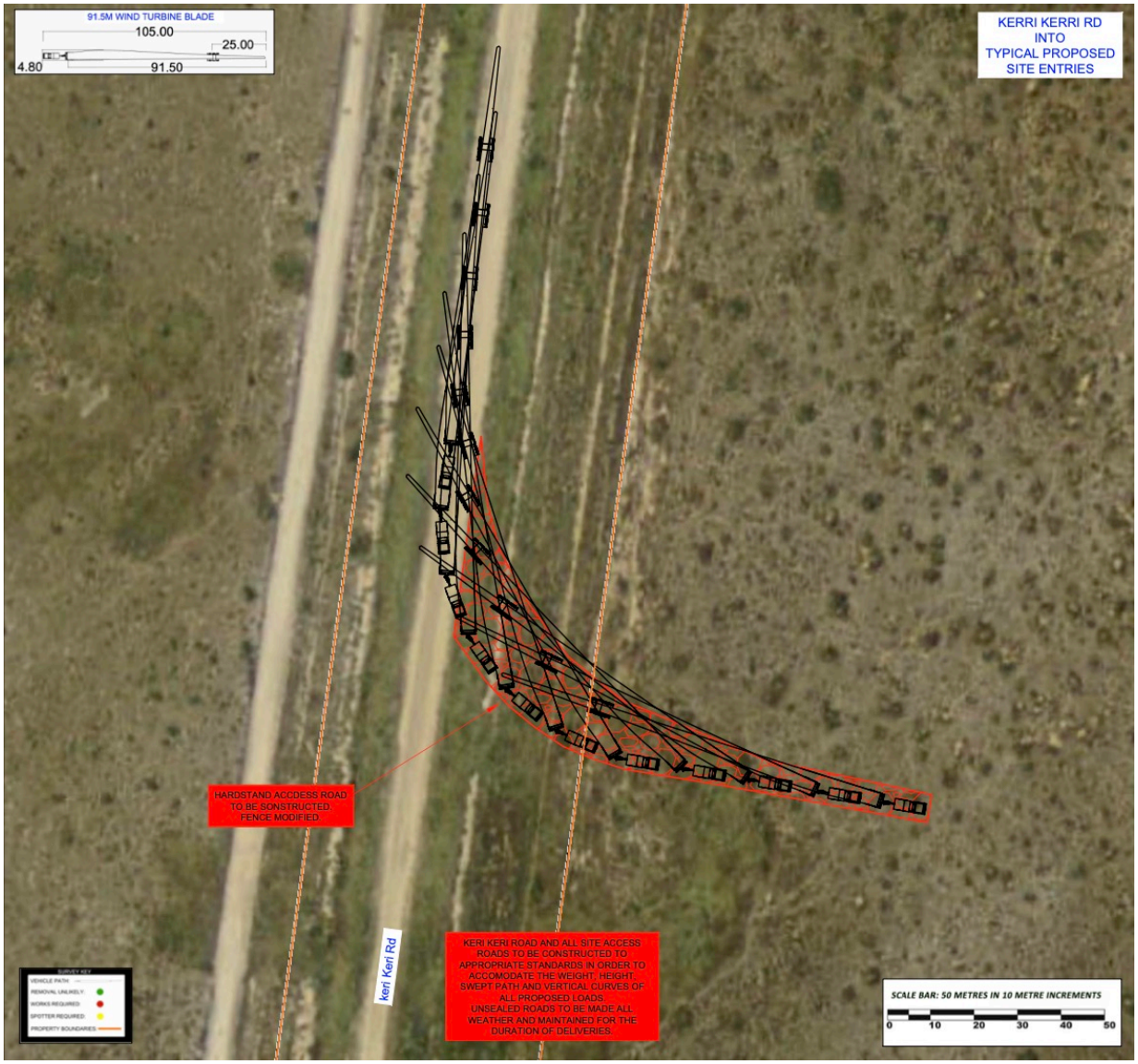


Figure 31 - Keri Keri Rd into 3 x Proposed Site Entries

GPS LINK FOR THIS LOCATION:

PROCEDURE: Left hand turn

COMMENTS: Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic.

ROAD MODIFICATIONS: All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

10.0 Conclusion Route 1

After studying all options and undertaking a route survey, this route in its current condition will require a moderate to major amount of upgrades before it could be deemed suitable for transporting the proposed components.

The following are the key points that need to be taken into consideration if the project moves forward with this route.

SWEPT PATH:

- There are numerous sections along the route that need moderate to major work to allow a blade of this size through.
- All the work detailed above looks achievable.
- Numerous site entrances are proposed that will need to be designed to suit the largest components.

OVERHEAD STRUCTURES: (5.0m maximum loaded height)

- The maximum loaded height through the Northconnex tunnel should not exceed 5.0m. NOTE: No oversize loads are currently allowed to use the Northconnex tunnel. Negotiations are required with Northconnex to use the tunnel for the blades. All loads are to use Pennant Hills Road unless approval to use Northconnex is otherwise granted.
- If blades are approved to travel through the Northconnex tunnel, NO other components on this route can use the tunnel, they must use Pennant Hills Road to bypass the tunnel.
- The rail overpass at Wagga Wagga needs further investigation to determine the impact the change in vertical curve under this overpass may have on the blades.
- Loads higher than 5.25m cannot use this route and will need to travel along route 2 (high load route)

OVERHEAD UTILITIES:

- This route will need to be checked by an authorised scoping company. It is likely that a route of at least 5.25m is required for this project.

BRIDGES:

- Majority of the bridges have been used previously for similar loads so it is expected they will be ok. A bridge assessment will still be required.

RAIL ASSETS:

- There are a number of rail overbridges and crossings on route that will require approval from authorities before loads can access the routes.

VEGETATION:

- A moderate amount of vegetation may require trimming.

PAVEMENT:

- All roads have adequate highway pavement until Keri Keri Road.
- Keri Keri Road may need regular maintenance during deliveries.

ROADWORKS:

- The project will need to start discussions with government authorities at least 18 months prior to turbine transport to understand if the project would conflict with any upcoming roadworks. Once a Transport Management Plan “TMP” has been approved for the transport of the turbines, then the exact movement dates need to be communicated with all relevant authorities to make all road stakeholders are aware of the scheduled movements for each day.
- The project will need to regularly check on any new upgrades not listed in the report. If upgrades have taken place on a section of route after this report has been completed, then a swept path study would need to be undertaken on that section of road to confirm that it can still be used.

ROADWORKS:

- All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads.
- Unsealed roads to be made all weather and maintained for the duration of deliveries.

11.0 Route 2: High load route. Maximum loaded height 5.9m

DISTANCE: 1106 kilometres

COMPONENTS: Components over 5.25m up to 5.9m Maximum loaded height

GPS LINK: https://goo.gl/maps/pAPp2X19Q1DoQDdW9

Route: Selwyn street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Bengalla Road, Wybong Road, Golden Highway, Boothenba Road, Troy Bridge Road, Bunglegumbie Road, Mitchell Highway, Manildra Street, Derribing Avenue, Algalah Street, Tomingley Road, Newell Highway, Thomas Street, Moulden Street, Henry Parkes Way, Westlime Road, Hartigan Avenue, Newell Highway, Compton Road, Showground Road, Newell Highway, Sturt Highway, Keri Keri Road.

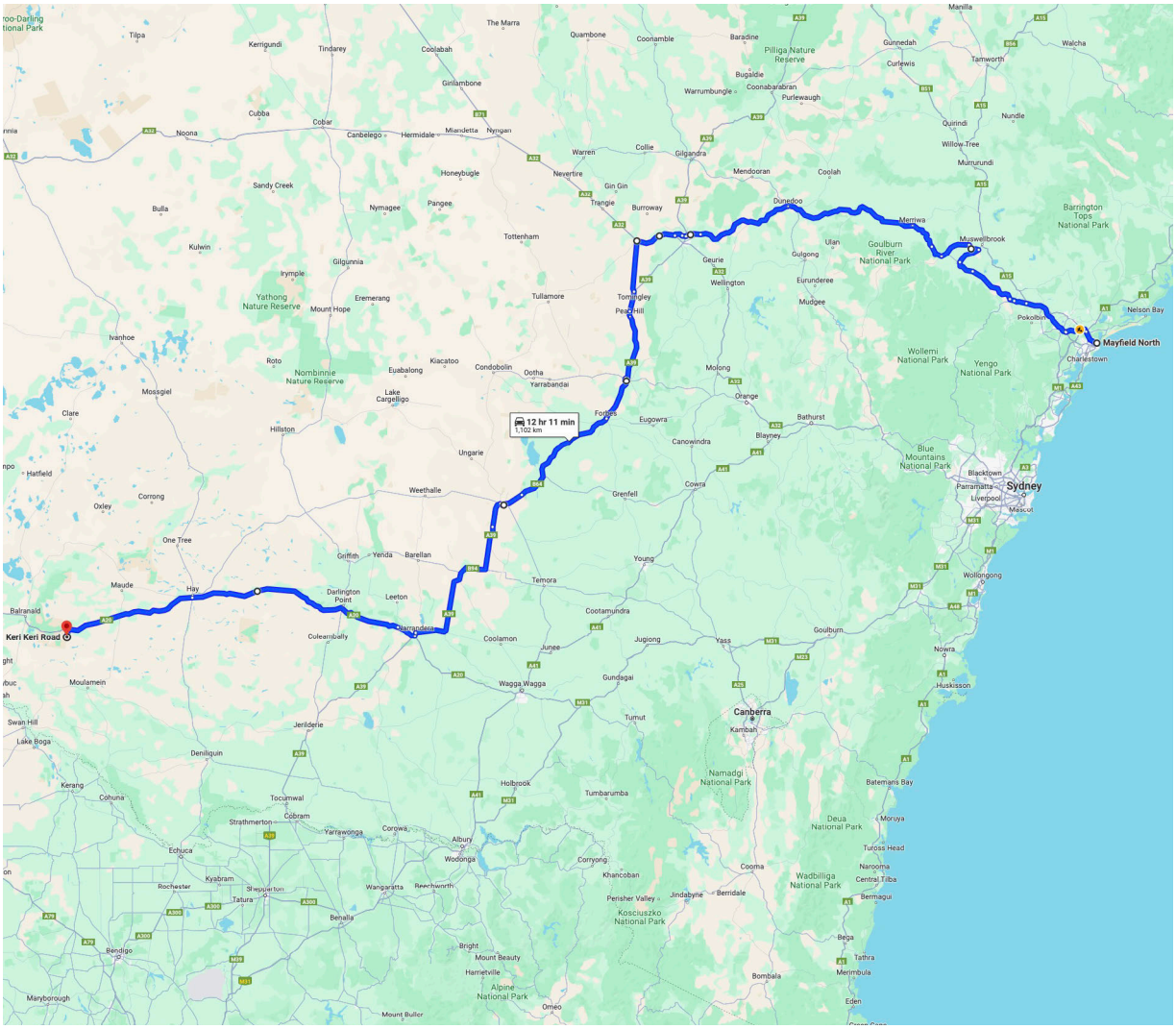


Figure 32 - 11.0 Route 2

KEY	
CRITICAL	
CAUTION	
EMERGENCY PARKING	

KM index	Location	Section of road	Current clearance	Procedure	Notes
0.0	Mayfield	Mayfield #4 berth onto Selwyn Street https://goo.gl/maps/afLwPYKuNdm	Length: 70.0 Mtrs Width: 8.0 Mtrs	Moderate right hand turn	No problems with the towers on this section of road.
0.4	Mayfield	Selwyn Street over rail crossing https://goo.gl/maps/AmohE54hKSz	Length: 90 metres Width: 9.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
1.3	Mayfield	Selwyn Street onto George Street https://goo.gl/maps/gXeHvBtCp4D2	Length: 40.0 Mtrs Width: 8.0 Mtrs	Right hand turn	No problems with the towers on this section of road.
1.4	Mayfield	George Street onto Industrial Drive https://goo.gl/maps/s4ayrsuoAsD2	Length: 40.0 Mtrs Width: 8.0 Mtrs	Right hand turn	No problems with the towers on this section of road.
4.9	Mayfield	Industrial Drive under traffic signals https://goo.gl/maps/YmqhiS2iR582	Height: 5.4 metres	Travel directly ahead in the far right lane.	The lowest traffic signal on route is at the intersection of Steel River Blvd. Trucks that exceed 5.3 metres will need to travel in the right-hand lane. Clearance in the right end lane is 6.0 metres. Base towers (6.1m) will need to be lowered for travel through this intersection
5.5	Mayfield West	Industrial Drive onto Maitland Road https://goo.gl/maps/Kn49dhWG2qG2	Length: 40.0 Mtrs Width: 7.0 Mtrs	Right hand turn	No problems with the towers on this section of road.
6.4	Sandgate	Maitland Road over rail bridge https://goo.gl/maps/W2JWWjhfqv5UMviB7	Length: 90 metres Width: 9.0 Metres	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
13.9	Hexham	New England Highway under gantry https://goo.gl/maps/YTMoFe7Aick	Height: 5.9 metres	Travel directly ahead	This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.9 metres should not be exceeded. Base towers (6.1m) will need to be lowered before travelling under this structure.
15.1	Tarro	New England Highway over rail bridge https://goo.gl/maps/tTnWLwQC2hzSPhAp6	Length: 90 metres Width: 7.0 Metres	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
17.4	Tarro	New England Highway onto John Renshaw Drive https://goo.gl/maps/SRDr5JigkBp	Length: 100.0 Mtrs Width: 12.0 Mtrs	Left hand merge	No problems with the towers on this section of road.
18.4	Beresfield	John Renshaw Drive https://goo.gl/maps/N19vJih1Fgr	Length: 100.0 Mtrs Width: 10.0 Mtrs	Travel directly ahead	The roundabout has been removed. A set of dual lanes now takes traffic directly across the intersection.
28.7	Buchanan	John Renshaw Drive onto the Hunter Expressway https://goo.gl/maps/1STJ1PfQt9E2	Length: 65.0 Mtrs Width: 7.0 Mtrs	Right hand turn	No problems with the towers on this section of road.
58.9	Branxton	The Hunter Expressway onto The New England Highway https://goo.gl/maps/7rauNuxzqjq	Length: 100.0 Mtrs Width: 12.0 Mtrs	Travel directly ahead	No problems with this section of road.

KM index	Location	Section of road	Current clearance	Procedure	Notes
67.3	Whittingham	The New England Highway onto the Golden Highway https://goo.gl/maps/nAnfkYfeUn42	Length: 70.0 Mtrs Width: 8.0 Mtrs	Left Hand turn	The NSW Government is currently upgrading this intersection. At this stage the data that is available for the upgrades shows that the section of road that we would need to access does not change considerably. However, it is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
67.4	Whittingham	Golden Highway https://goo.gl/maps/R86RFuPnmFU2	115.0 x 9.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
68.0	Whittingham	Golden Highway over rail bridge https://goo.gl/maps/5NwDQofandvvMKfY9	Length: 90 metres Width: 9.0 Metres	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
77.3	Mount Thorley	Golden Highway over rail bridge https://goo.gl/maps/qTxSbkxPu87L5hx4A	Length: 90 metres Width: 9.0 Metres	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
77.4	Whittingham	Golden Highway intersection with the Putty Road https://goo.gl/maps/7hQdEmK1EgE2	Length: 65 metres Width: 6.0 Metres	Left hand turn	No problems with this section of road.
77.5	Mount Thorley	Golden Highway https://goo.gl/maps/zGvdupDuixx	100.0 x 10.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
80.6	Mount Thorley	Golden Highway over rail bridge https://goo.gl/maps/ipGU4USXmWZ8GkJs6	Length: 90 metres Width: 9.0 Metres	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
80.8	Mount Thorley	Putty Road under Mt Thorley Road https://goo.gl/maps/SMzSLP1kvQYDMqa86	Heights: Left: 6.6 metres Centre: 6.3 Metres Right: 6.3 metres	Travel under the bridge in the left lane	Mt Thorley underpass is 6.3 metres in the centre of the road. Towers to pass under this structure on the correct side.
80.8	Mount Thorley	Golden Highway intersection with the Putty Road https://goo.gl/maps/QS9quvSyHYWaFHoX9	Length: 45 metres Width: 6.0 Metres	Right hand turn	No problems with this section of road.
98.0	Warkworth	Golden Highway https://goo.gl/maps/Y6V6EXaCwxq	100.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
107.0	Jerrys Plains	Golden Highway through Jerrys Plains village https://goo.gl/maps/WgSCRsJ9ZGt	Length: 60 metres Width: 6.0 Metres	Left hand than right hand turn	No problems with this section of road.
126.0	Ogilvy	Golden Highway https://goo.gl/maps/58Tj9ojs7CC2	6% gradient	Travel directly ahead	This section of road has a steep mountain range that will require additional pull trucks to assists loads that exceed 80T gross weight. Additionally, the NSW Government is currently upgrading this section of road. It is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
131.9	Denman	Golden Highway onto Denman Road https://goo.gl/maps/sf4PNnycxB32	Length: 55 metres Width: 6.0 Metres	Right hand turn	No problems with this section of road.
137.9	Muswellbrook	Denman Road onto Bengalla Road https://goo.gl/maps/3sK4m6YSHNHqkqn68	Length: 60 metres Width: 8.0 Metres	Left hand turn	No problems with this section of road.
149.0	Bengalla	Bengalla Road onto Wybong Road https://goo.gl/maps/zfDyG4GQq6G37imB9	Length: 90 metres Width: 8.0 Metres	Left hand bend	No problems with this section of road.
158.0 to 183.0	Bengalla	Wybong Road https://goo.gl/maps/ekGZA5wFFK55Mvmc7	Length: 60 metres Width: 8.0 Metres	Travel directly ahead	This road is maintained by Muswellbrook Council. Approval will be required to travel on this section of Road.

KM index	Location	Section of road	Current clearance	Procedure	Notes
183.0	Sandy Hollow	Wybong Road onto Golden Highway https://goo.gl/maps/5ft3VnWpnPhpeN4u7	Length: 60 metres Width: 8.0 Metres	Right hand turn	No problems with this section of road.
190.1	Sandy Hollow	Golden highway https://goo.gl/maps/2THBuV165xx	50.0 x 4.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
193.0	Sandy Hollow	Golden Highway under safety Cam https://goo.gl/maps/b7t9zH2ankJcvWpT6	Height: Left: 6.3 metres	Travel directly ahead on the correct side	No problems with this section of road.
201.0	Gungal	Golden highway https://goo.gl/maps/WDoL2LfeCoP2	70.0 x 6.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
221.0	Merriwa	Golden Highway under safety Cam https://goo.gl/maps/D92rzQ8vnUcYsqj56	Height: Right: 6.4 metres	Travel directly ahead on the correct side	No problems with this section of road.
224.0	Merriwa	Golden highway https://goo.gl/maps/NqrWzTsRmnt	100.0 x 5.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
274.0	Cassilis	Golden highway https://goo.gl/maps/vs6YMT6TxCA2	200.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
305.0	Leadville	Golden highway https://goo.gl/maps/ujxMGukhopeFWRhb8	200.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
331.0	Dunedoo	Golden Highway over rail crossing https://goo.gl/maps/wsyNKfcoAij3SosY9	Length: 90 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
331.1	Dunedoo	Golden Highway intersection with Wargundy Street https://goo.gl/maps/WzACUHey3jYadj1K7	Length: 60 metres Width: 6.0 Metres	Right hand bend	No problems with this section of road.
384.0	Ballimore	Golden Highway https://goo.gl/maps/RuKKrfHarw1Mjy5E9	150.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
392.0	Ballimore	Golden Highway over rail crossing https://goo.gl/maps/yb15Kz6R2r3E69fj6	Length: 90 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
400.0	Dubbo	Golden Highway onto Boothenba Road https://goo.gl/maps/TJLi5W4ir11ejgtb6	Length: 50 metres Width: 6.5 Metres	Right hand turn	No problems with this section of road.
411.0	Dubbo	Boothenba Road over rail crossing https://goo.gl/maps/72aqeimPLqPWYY7M9	Length: 90 metres Width: 6.5 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
411.1	Dubbo	Boothenba Road onto Troy Bridge Road https://goo.gl/maps/2u5uRf2BvKxseoFm9	Length: 90 metres Width: 6.5 Metres	Travel directly ahead	No problems with this section of road.
414.0	Dubbo	Troy Bridge Road onto Bunglegumbie road https://goo.gl/maps/6Uke9jwPypNYVPux5	Length: 90 metres Width: 6.5 Metres	Travel directly ahead	No problems with this section of road.
420.0	Dubbo	Bunglegumbie road onto the Mitchell Highway https://goo.gl/maps/jCWqmaQsd3fChp837	Length: 50 metres Width: 6.5 Metres	Right hand turn	No problems with this section of road.
450.0	Narromine	Mitchell Highway onto Manildra Street https://goo.gl/maps/hFG648tcSMUHxJ8h6	Length: 40 metres Width: 6.5 Metres	Left hand turn	No problems with this section of road.
450.1	Narromine	Manildra Street over rail crossing https://goo.gl/maps/4s2HYJJfJQ5pGbKq7	Length: 60 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
450.2	Narromine	Manildra Street onto Derribong Avenue https://goo.gl/maps/776aPaxgsFTWi6qL6	Length: 40 metres Width: 6.5 Metres	Left hand turn	No problems with this section of road.
450.5	Narromine	Derribong Avenue onto Algalah Street https://goo.gl/maps/9s8cb8G4T2c75t1V8	Length: 40 metres Width: 6.5 Metres	Left hand turn	No problems with this section of road.
452.0	Narromine	Algalah Street onto Tomingley Road https://goo.gl/maps/EWfZYo3Xos6T3J8A8	Length: 60 metres Width: 7.0 Metres	Travel directly ahead	No problems with this section of road.
487.5	Tomingley	Tomingley Road onto the Newell Highway https://goo.gl/maps/NJtXmHCFHxaiMaq39	Length: 60 metres Width: 7.0 Metres	Travel directly ahead	No problems with this section of road.
488.0	Tomingley	Newell Highway https://goo.gl/maps/ADMke5At2A1Uy1z4A	200.0 x 15.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
489.0	Tomingley	Newell Highway under safety Cam https://goo.gl/maps/9Vqu9xXxRwhHt4Uk6	Height: Right: 6.8 metres	Travel directly ahead on the correct side	No problems with this section of road.
490.0	South Tomingley	Newell Highway https://goo.gl/maps/1q8f6HJ2zsZSxup66	150.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
502.0	Peak Hill	Newell Highway https://goo.gl/maps/orKTBB8wobK6exsc6	90.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.

KM index	Location	Section of road	Current clearance	Procedure	Notes
503.0	Peak Hill	Newell Highway under safety Cam https://goo.gl/maps/sAbh8zwZzZVMriD2A	Height: Right: 6.3 metres	Travel directly ahead on the correct side	No problems with this section of road.
526.0	Alectown	Newell Highway https://goo.gl/maps/GMGbEJHAEkeWuRyz5	90.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
552.0	Parkes	Newell Highway onto Thomas Street https://goo.gl/maps/fSnFVWPr78RePSTz9	Length: 55 metres Width: 6.5 Metres	Right hand turn	No problems with this section of road.
554.0	Parkes	Thomas Street onto Moulden Street https://goo.gl/maps/HpYrcwcx8BHrUmfc8	Length: 55 metres Width: 6.5 Metres	Left hand turn	No problems with this section of road.
554.8	Parkes	Moulden Street onto Henry Parkes Way https://goo.gl/maps/atnNtdtyi21wK4PF9	Length: 55 metres Width: 6.5 Metres	Left hand turn	No problems with this section of road.
555.0	Parkes	Henry Parkes Way onto Westlime Road https://goo.gl/maps/Uk2nuLS7xvfnv5dt6	Length: 55 metres Width: 6.5 Metres	Right hand turn	No problems with this section of road.
556.0	Parkes	Westlime Road onto Hartigan Ave https://goo.gl/maps/XtKgPrWcZHY3im65A	Length: 55 metres Width: 6.5 Metres	Travel directly ahead	No problems with this section of road.
557.0	Parkes	Hartigan Avenue under traffic signal https://goo.gl/maps/sQxVxzZivbDX7E3j6	Height: Left: 5.5 metres	Travel around the traffic signal on the incorrect side of the road.	Traffic signal is too low. Pass on right hand side.
558.0	Parkes	Hartigan Ave onto the Newell Highway https://goo.gl/maps/y3rabftt4HGreX9e6	Length: 55 metres Width: 6.5 Metres	Travel directly ahead	No problems with this section of road.
558.1	Parkes	Newell Highway over rail crossing https://goo.gl/maps/7tSoLfFManXyKV3T9	Length: 60 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
562.0	Parkes	Newell Highway over rail crossing https://goo.gl/maps/Kxa3shUCMiuKe2sX7	Length: 60 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
569.0	Tichborne	Newell Highway over rail crossing https://goo.gl/maps/gxYUZLLe3jsCEJqD7	Length: 60 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
576.0	Daroobalgie rest area	Newell Highway https://goo.gl/maps/swec16PWh1N8ZbUR7	200.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
590.0	Forbes	Newell Highway intersection with Dowling Street https://goo.gl/maps/DqkvxH4qtWnXvLJ26	Length: 45 metres Width: 6.0 Metres	Left hand turn	No problems with this section of road.
590.2	Forbes	Newell Highway https://goo.gl/maps/Hsmjs9pqvZ5UYFAH7	100.0 x 6.5 metres	Parking Bay	Suitable parking for Fatigue breaks.
595.5	Forbes	Newell Highway under safety Cam https://goo.gl/maps/hUdv6YJunC9yfoxF7	Height: Right: 6.4 metres	Travel directly ahead on the correct side	No problems with this section of road.
658.0	Marsden	Newell Highway under safety Cam https://goo.gl/maps/fRpjbRoXfup29Swx6	Height: Right: 6.9 metres	Travel directly ahead on the correct side	No problems with this section of road.
659.0	Marsden rest area	Newell Highway https://goo.gl/maps/AfAfr2wuNTjQMdKT8	200.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
689.0	Wyalong	Newell Highway under safety Cam https://goo.gl/maps/sudP4qYXPWbDB6sL6	Height: Centre: 6.2 metres	Travel directly ahead on the correct side	No problems with this section of road.
698.0	West Wyalong	Newell Highway onto Compton Road https://goo.gl/maps/PeM4uWq5hLiyZiPd8	Length: 55 metres Width: 6.5 Metres	Left hand turn	Spotter to assist at this pinchpoint. Escorts to control traffic as per plan below for this section of road.
700.5	West Wyalong	Compton Road onto Showground Road https://goo.gl/maps/hts5qARMMWZcvW7R7	Length: 50 metres Width: 6.5 Metres	left hand turn	No problems with this section of road.
701.0	West Wyalong	Compton Road over rail crossing https://goo.gl/maps/KQwsqDkEDASMpB9r8	Length: 50 metres Width: 6.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
702.5	West Wyalong	Showground Road https://goo.gl/maps/C8GevkguVtpkHikFA	150.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.

KM index	Location	Section of road	Current clearance	Procedure	Notes
703.0	West Wyalong	Showground Road onto the Newell Highway https://goo.gl/maps/yAyBdrZcocEeTBnz6	Length: 50 metres Width: 6.5 Metres	Left hand turn	Spotter to assist at this pinchpoint. Escorts to control traffic as per plan below for this section of road.
721.0	Allena	Newell Highway over rail crossing https://goo.gl/maps/GMHsd5ynEFwzjmnXA	Length: 50 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
749.0	Mirrool	Newell Highway over rail crossing https://goo.gl/maps/kFkwMBL9nfKgL954A	Length: 50 metres Width: 6.5 Metres	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
784.0	Ardlethan rest area	Newell Highway https://goo.gl/maps/Na3rzBt25sMnsBya6	200.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
810.0	Grong Grong rest area	Newell Highway https://goo.gl/maps/vBTyD3zJVMcbn6wy9	200.0 x 7.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
823.0	Narrandera	Newell Highway over rail bridge https://goo.gl/maps/YBWuYYyVoZfSUTJ37	Length: 50 metres Width: 7.0 Metres	Travel directly ahead	Loads to travel over the bridge in the center of the road. Approval required crossing this line, likely cross with caution.
824.0	Narrandera	Newell Highway at Whitton Street https://goo.gl/maps/EXcuuBeMsXdhVDtm8	Length: 50 metres Width: 7.5 Metres	Left hand turn	Spotter to assist at this pinchpoint. Escorts to control traffic as per plan below for this section of road.
824 to 827	Narrandera	Newell Highway (Cadell St) https://goo.gl/maps/Z3ptasM9sGGtaB5A8	Length: 50 metres Width: 7.5 Metres	Travel directly ahead	Trees to be trimmed
827	Narrandera	Newell Highway onto Sturt Highway https://goo.gl/maps/uFiCyhp9uF147Wie8	Length: 80 metres Width: 7.5 Metres	Right hand turn. use wrong side of road.	Use slip lane on incorrect side of road.
999	Hay South	Sturt Hwy Roundabout at Cobb Hwy GPS Link: https://maps.app.goo.gl/Sfn5kWiKvUXBYK5e9	50 metres	Travel directly ahead	Use correct side of road
1083	Keri Keri	Stuart Highway into site entrances GPS Link: https://goo.gl/maps/C2aaH9WJcqcRE9MD8		Site Entrance	A site entrance is proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
1096.3	Keri Keri	Sturt Highway onto Keri Keri Road GPS Link: https://goo.gl/maps/uH5pmWwzWvz3TJ4K6		Left hand turn	Use hardstand installed for blades as required. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warn all traffic. All site access roads to be constructed to appropriate standards in order to accomodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

KM index	Location	Section of road	Current clearance	Procedure	Notes
1105	Keri Keri	Keri Keri Road into site entrances GPS Link: https://maps.app.goo.gl/nGXFh9Snwd52CoR69		3 x Site Entrance	3 x site entrances are proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

12.0 Conclusion Route 2

After studying all options and undertaking a route survey, this route is suitable in its current condition for transporting the proposed components.

The following are the key points that need to be taken into consideration, if the project moves forward with this route.

LENGTH:

- The longest combination that can travel along this route without upgrades is **55m overall length**
- Numerous site entrances are proposed that will need to be designed to suit the largest components.

OVERHEAD STRUCTURES: (Maximum loaded height 5.9m)

- The lowest unavoidable structures are the gantries along the New England Highway. The lowest of these has a clearance of 6.0m. A maximum loaded height of 6.0m should not be exceeded on this route.
- Base towers will need to be lowered at a number of points along the route.
- The lowest bridge structure is the Tarro interchange at 6.1 metres in height.
- There are several traffic signals that will need to be lifted on route.

OVERHEAD UTILITIES:

- This route will need to be checked by an authorised scoping company. It is likely that a route of at least 5.9m is required for this project.

BRIDGES:

- Majority of the bridges have been used previously for similar loads so it is expected they will be ok. A bridge assessment will still be required.

RAIL ASSETS:

- There are a number of rail overbridges and crossings on route that will require approval from authorities before loads can access the routes.

PAVEMENT:

- All roads have adequate highway pavement up until Keri Keri Road.

ROADWORKS:

- All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads.
- Unsealed roads to be made all weather and maintained for the duration of deliveries.

13.0 References

Rex J Andrews P/L Route survey # 362 REV01
Google Earth/Maps
Nearmaps
ERM
Acciona
NHVR (OSOM)
Australian Load Restraint Guide

Disclaimer: This route study is provided on the basis of information only purposes and is to be used strictly as a guide only; Government approvals would be required before these routes could be deemed suitable for transporting the components over the listed routes.

Any, and all parties using information contained this submission do so at own risk.

RJA accept no responsibility for the use of all information contained within this report.

Actual approved routes may differ from those surveyed.

Proposed routes may change subject to approvals from authorities.

This study was undertaken using data supplied by Rex J Andrews P/L. Equipment and swept paths might vary if using transport methodology other than the data supplied by Rex J Andrews.

APPENDIX B ROUTE STUDY NSW/VIC BORDER TO KERI KERI WINDFARM – REX J ANDREWS 2024

REX J ANDREWS
ENGINEERED TRANSPORTATION

ROUTE STUDY: ACCIONA

PROJECT: KERI KERI WINDFARM

EX NSW/VIC BORDER

07/03/2024 REV 01

Rev	Date	Change	Responsible	Checked
00	04/08/22	Route Assessed	C Ewin	✓
00	27/09/22	Report Compiled	S Kasteel	✓
00	14/10/22	Report Completed	W Andrews	✓
01	07/03/24	Report Updated 91.5m Blade	E Novak	✓
01	07/03/24	Report Completed	W Andrews	✓

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1.0 Introduction

This Route Study has been prepared for the Keri Keri Wind Farm (the Project) for Acciona Energy Australia Global Pty Ltd (the Applicant).

The study is to understand the transport route constraints for the components listed in this report and assist in planning of the windfarm layout.

This document describes observations and previous experience on route and explains the transport of wind turbine equipment from the NSW/VIC border through to the Keri Keri Windfarm.

The route survey was conducted on 04/08/2022

2.0 Evaluation

1	No Work
2	Some Work
3	Moderate Amount of Work
4	Extreme Amount of Work

(Mark below boxes with an X)

		1	2	3	4
A	Harbour		**X**		
B	Road Modification				**X**
C	Road Furnishings				**X**
D	Trees				**X**
E	Site Entrance				**X**
F	Bridge Calculations			**X**	
G	Traffic Control			**X**	

3.0 Project Data

Date of latest Route Assessment: 04/08/2022
Survey undertaken by: (Rex J Andrews P/L)
Project name: Keri Keri Windfarm
Location: (NSW/VIC border) to Keri Keri Wind Farm (NSW)
The project consists of the following key components:

- Up to 155 Wind Turbine Generators (WTG) with a hub height of 200 metres (m) and maximum height tip height of 291.5 m (vertical tip)

4.0 Transport Combinations Examples

465 x Blades (91.5l x 4.8w x 3.9h x 35.0T)
Transport configuration. Prime mover with 3x8-3x8 Blade trailer.
Overall dimensions: 105.0l x 4.8w x 4.9h x 108.5T.

125 x Hubs (4.8l x 4.8w x 4.0h x 60.0T)
Transport configuration. Prime mover with 2x8 dolly 3x8 low loader.
Overall Dimensions: 28.0l x 4.8w x 5.0h x 96.5T.

176 x Nacelle (12.0l x 4.5w x 4.2h x 75.0T)
Transport configuration. Prime mover with 2x8 dolly 5x8 low loader.
Overall Dimensions: 30.0l x 4.5w x 5.0h x 117.5T.

176 x Drive Train (7.0l x 3.5w x 3.5h x 95.0T)
Transport configuration. Prime mover with 2x8 8x8 dolly platform trailer.
Overall Dimensions: 32.0l x 4.2w x 4.5h x 157.5T.

176 x T1 tower sections (13.4 x 5.5 x 5.0 x 99T)
Transport configuration. Prime mover with 10x8 Low Platform trailer.
Overall Dimensions: 30.0l x 5.0w x 5.9h x 161.5T.

176 x T2 tower sections (19.3 x 5.0 x 5.0 x 98T)
Transport configuration. Prime mover with 10x8 Low Platform trailer.
Overall Dimensions: 30.0l x 5.0w x 5.9h x 160.5T.

176 x T3 tower sections (23.4 x 5.0 x 5.0 x 97T)
Transport configuration. Prime mover with 10x8 Low Platform trailer.
Overall Dimensions: 37.0l x 5.0w x 5.9h x 159.5T.

176 x T4 tower sections (29.5 x 5.0 x 5.0 x 98T)
Transport configuration. Prime mover with 5x8 5x8 Extending Platform trailer.
Overall Dimensions: 45.0l x 5.0w x 5.9h x 169.5T.

176 x T5 tower sections (29.9 x 5.0 x 4.1 x 86T)
Transport configuration. Prime mover with 5x8 5x8 Extending Platform trailer.
Overall Dimensions: 45.0l x 5.0w x 5.9h x 157.5T.

176 x T6 tower sections (29.3 x 4.1 x 3.3 x 50.5T)
Transport configuration. Prime mover with 4x4-2x8 Dolly and Jinker.
Overall Dimensions: 45.0l x 5.0w x 5.9h x 86.5T.

Modular tower option:

1056 x Standard loads (12l x 2.4w x 2.4h x 10.0T)
Transport configuration. Prime mover with 3x4 semi-trailer.
Overall Dimensions: 19.0l x 2.5w x 4.3h x 38.5T.

1936 x Generic special loads (18l x 3.5w x 3.5h x 20.0T)
Transport configuration. Prime mover with 3x4 semi-trailer.
Overall Dimensions: 26.0l x 3.5w x 5.0h x 42.5T.

126 x Transition segments (17.3l x 4.3w x 4.3h x 66.0T)
Transport configuration. Prime mover with 8x8 Platform trailer.
Overall Dimensions: 30.0l x 4.3w x 5.3h x 124.5T.

126 x Monotubular segment 3 (21.5l x 4.3w x 4.3h x 72.0T)
Transport configuration. Prime mover with 10x8 Platform trailer.
Overall Dimensions: 35.0l x 4.3w x 5.3h x 134.5T.

126 x Monotubular segment 2 (28.8l x 4.3w x 4.3h x 67.0T)
Transport configuration. Prime mover with 4x8-4x8 Extending platform trailer.
Overall Dimensions: 42.0l x 4.3w x 5.3h x 131.5T.

126 x Monotubular segment 1 (28.9l x 4.3w x 3.3h x 44.0T)
Transport configuration. Prime mover with 4x4-2x8 Dolly jinker.
Overall Dimensions: 40.0l x 4.3w x 5.3h x 86.5T.

5.0 Transport Drawings

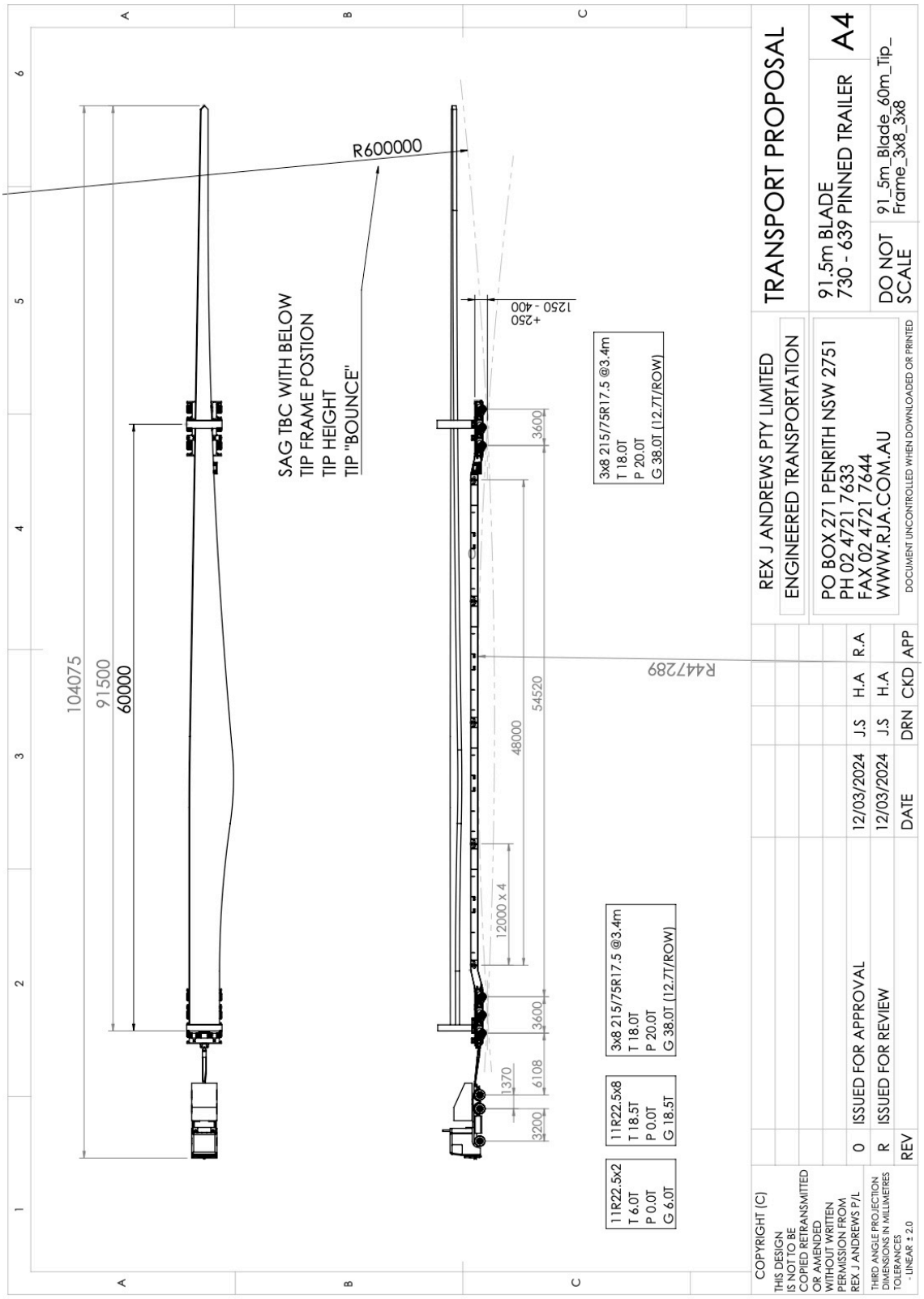


Figure 1 - Blade diagram

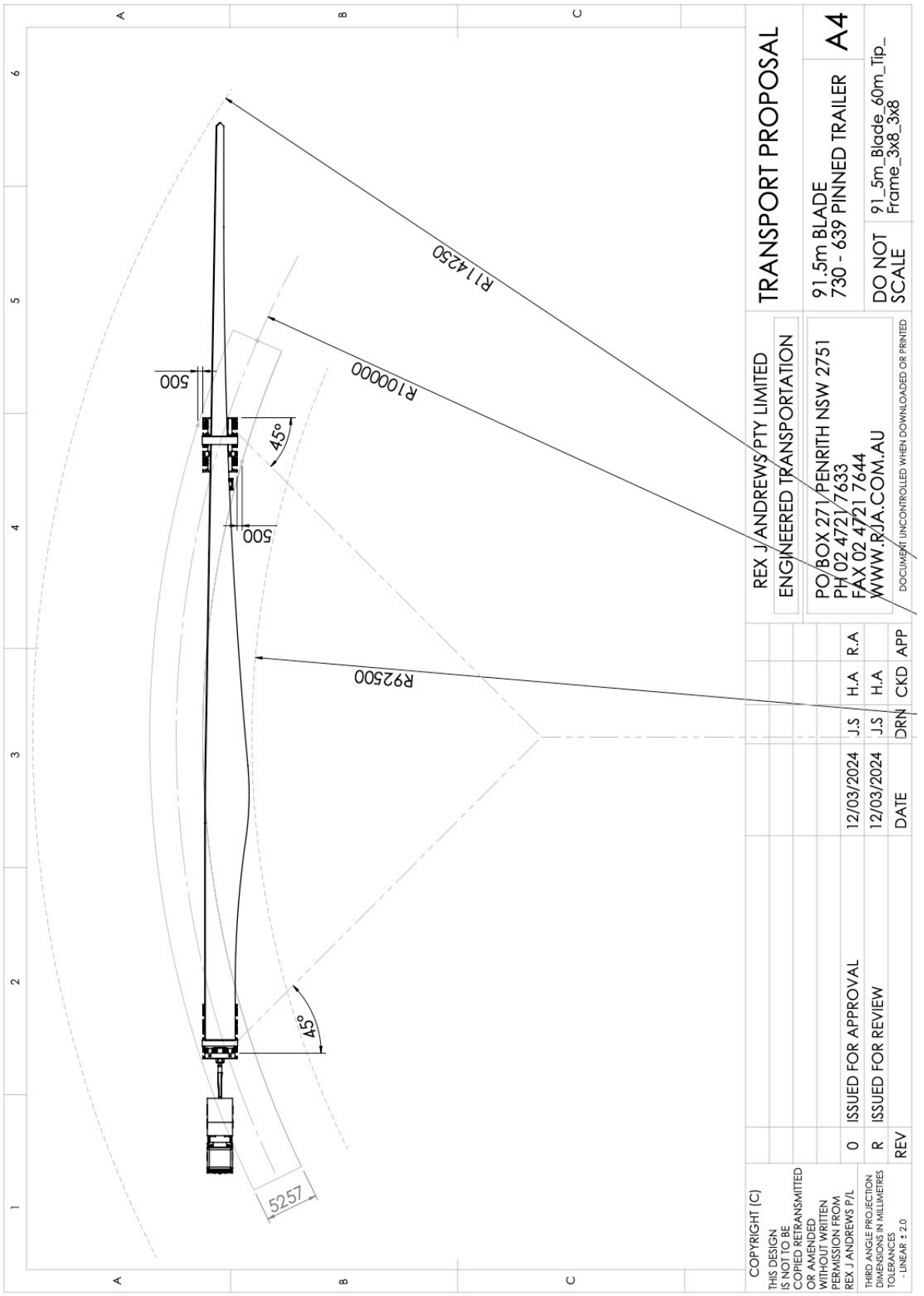


Figure 2 - Blade diagram: Swept path

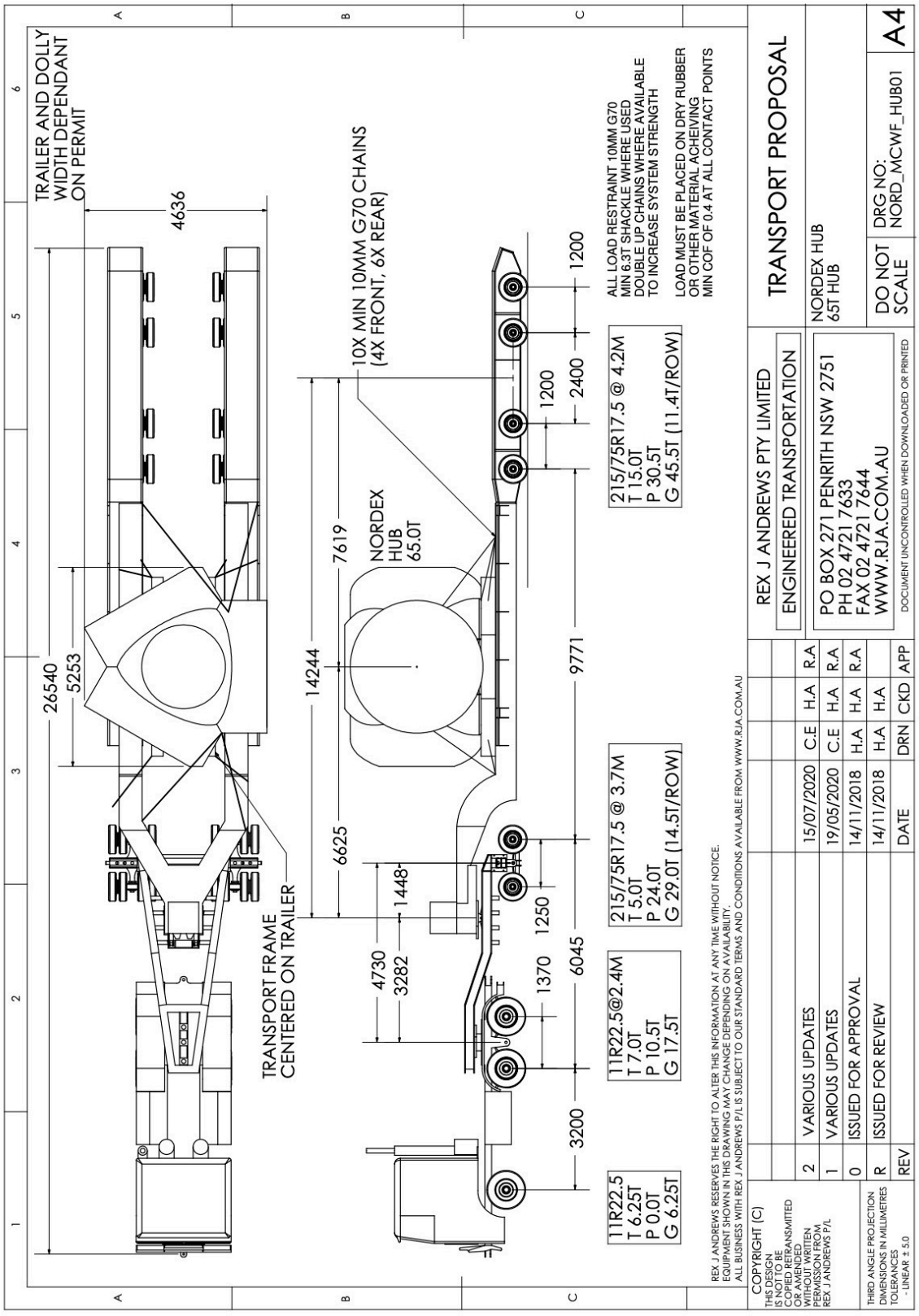


Figure 3 - Hub combination example

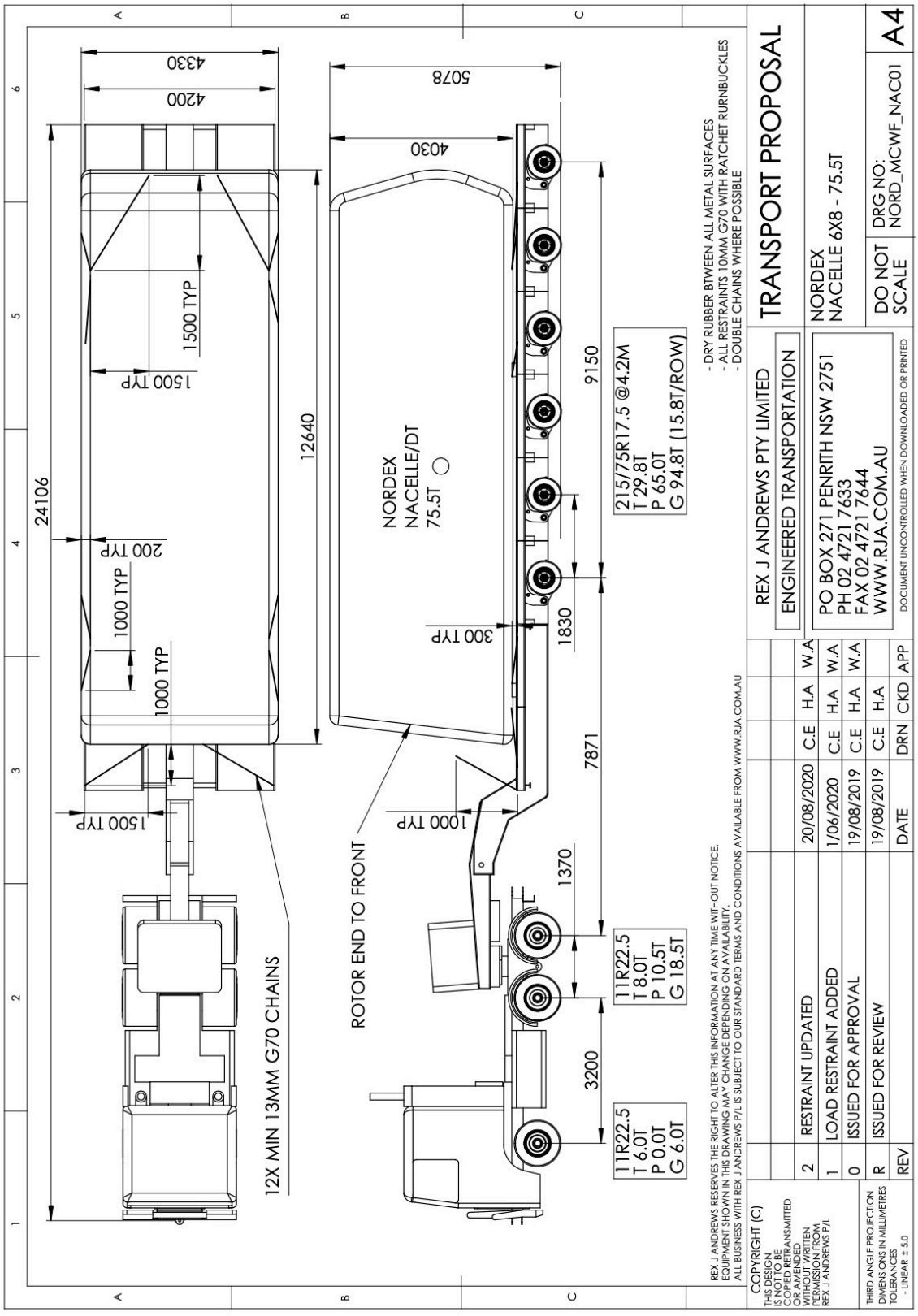


Figure 4 - Nacelle combination example

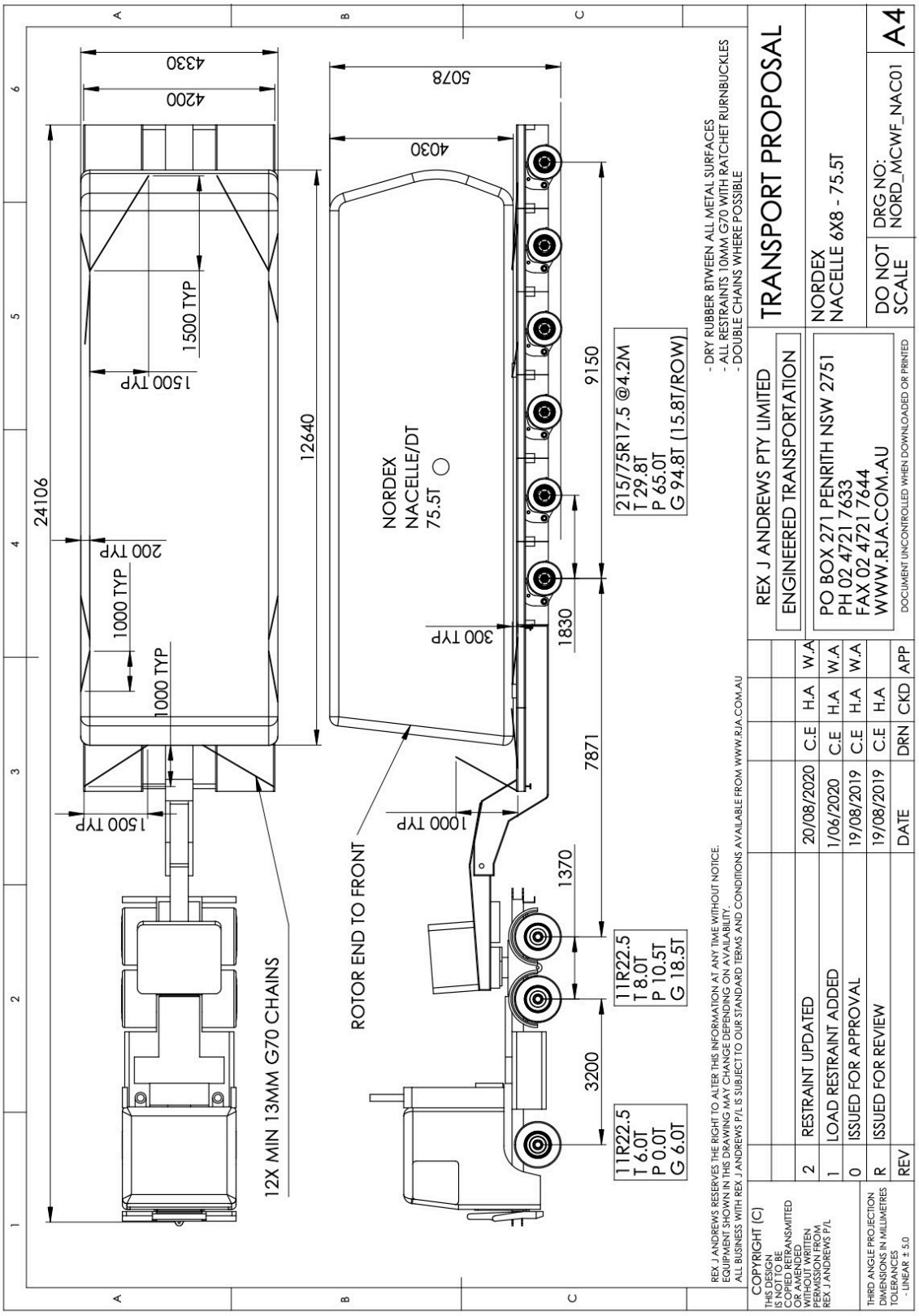


Figure 5 - Nacelle combination example

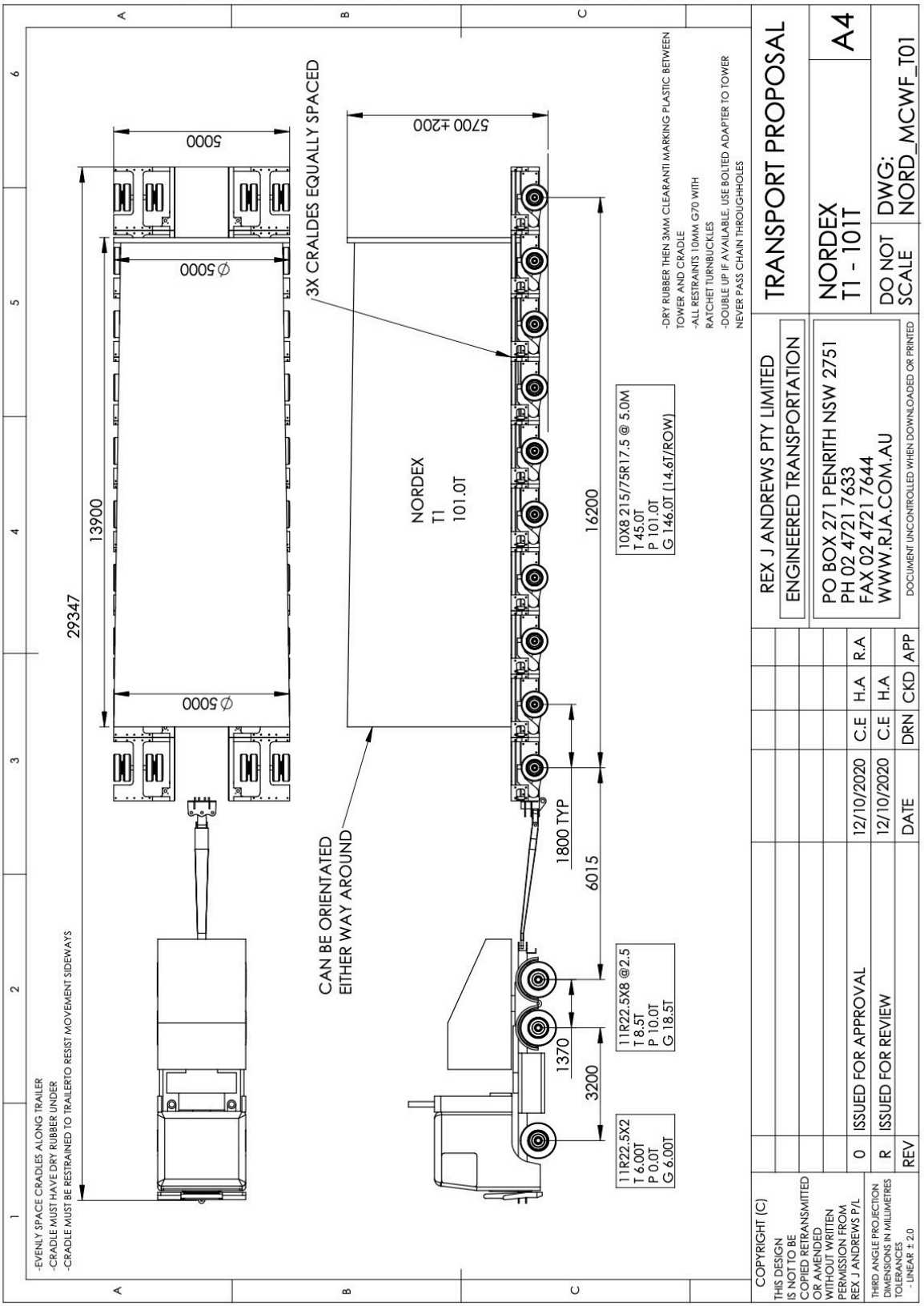


Figure 6 - Tower Trailer 10x8 Low platform example

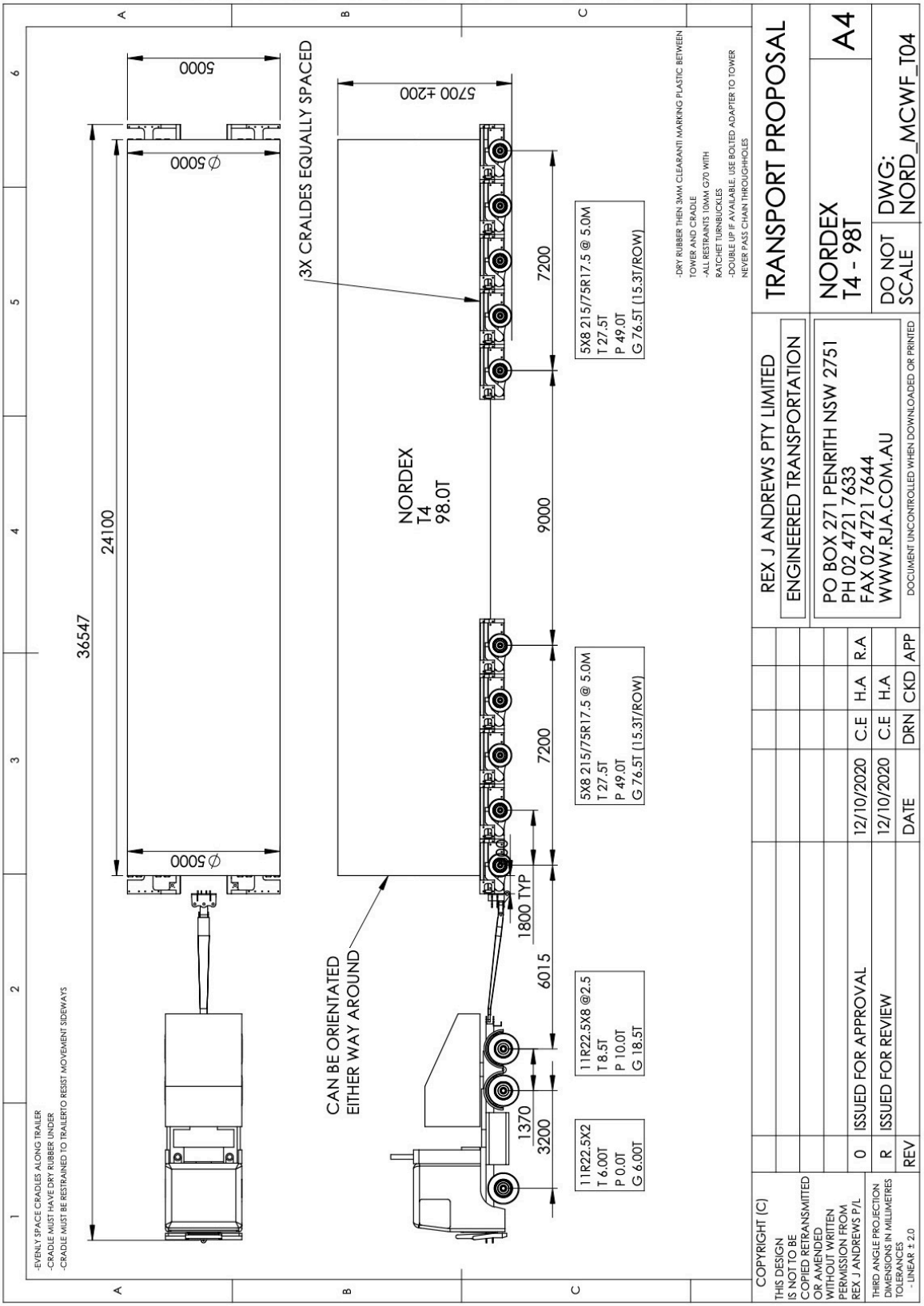


Figure 7 - Tower trailer 5x8-5x8 Low extending platform example

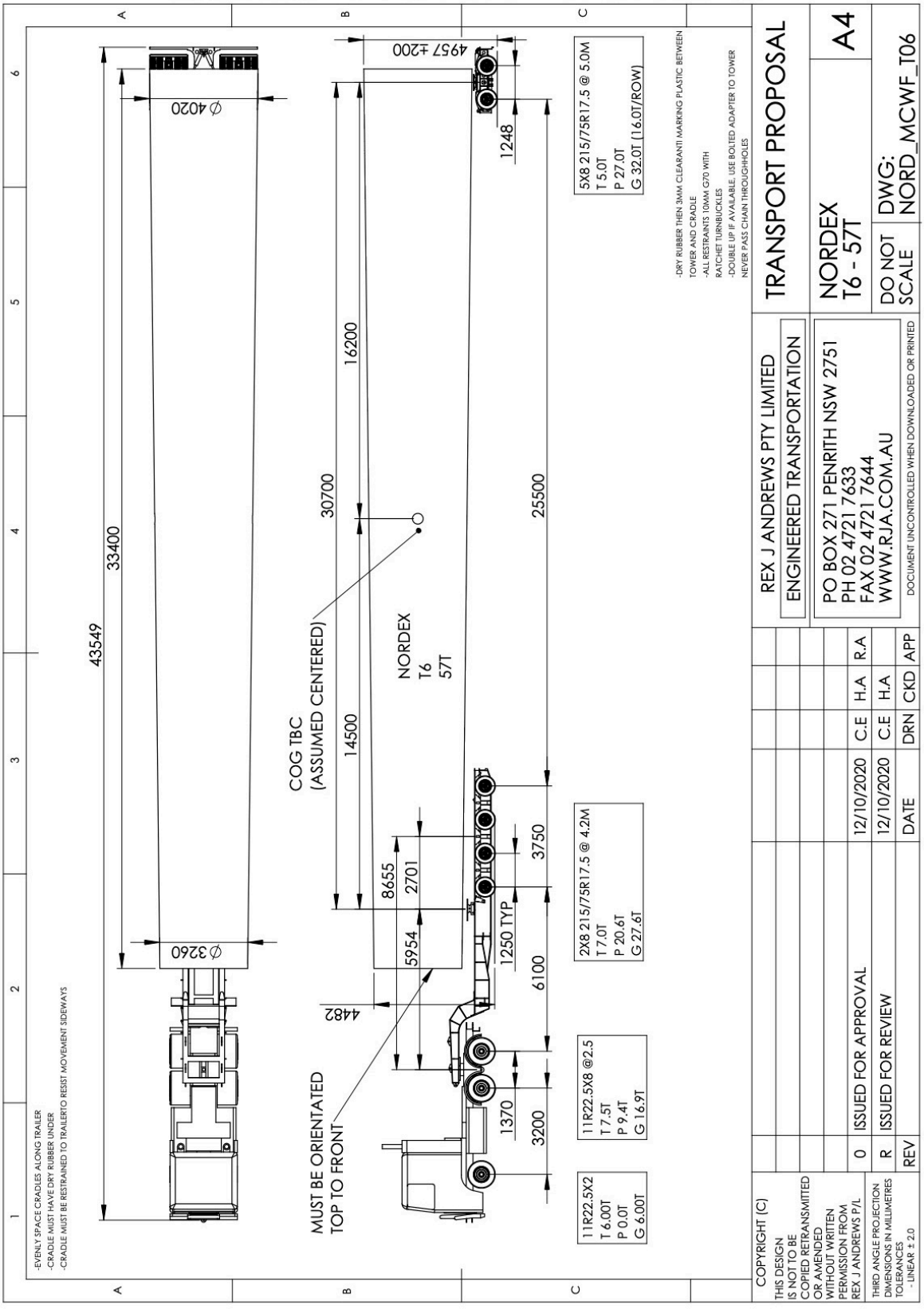


Figure 8 - Tower trailer Dolly and Jinker example

6.0 Keri Keri Wind Farm Site Location

The proposed Keri Keri Wind Farm is located approximately 30 kilometres (km) southeast of Balranald, and 75 km southwest of Hay in the Murray River Local Government Area (LGA).

The project is located within the Southwest Renewable Energy Zone (REZ) and is directly south of the Sturt Highway.

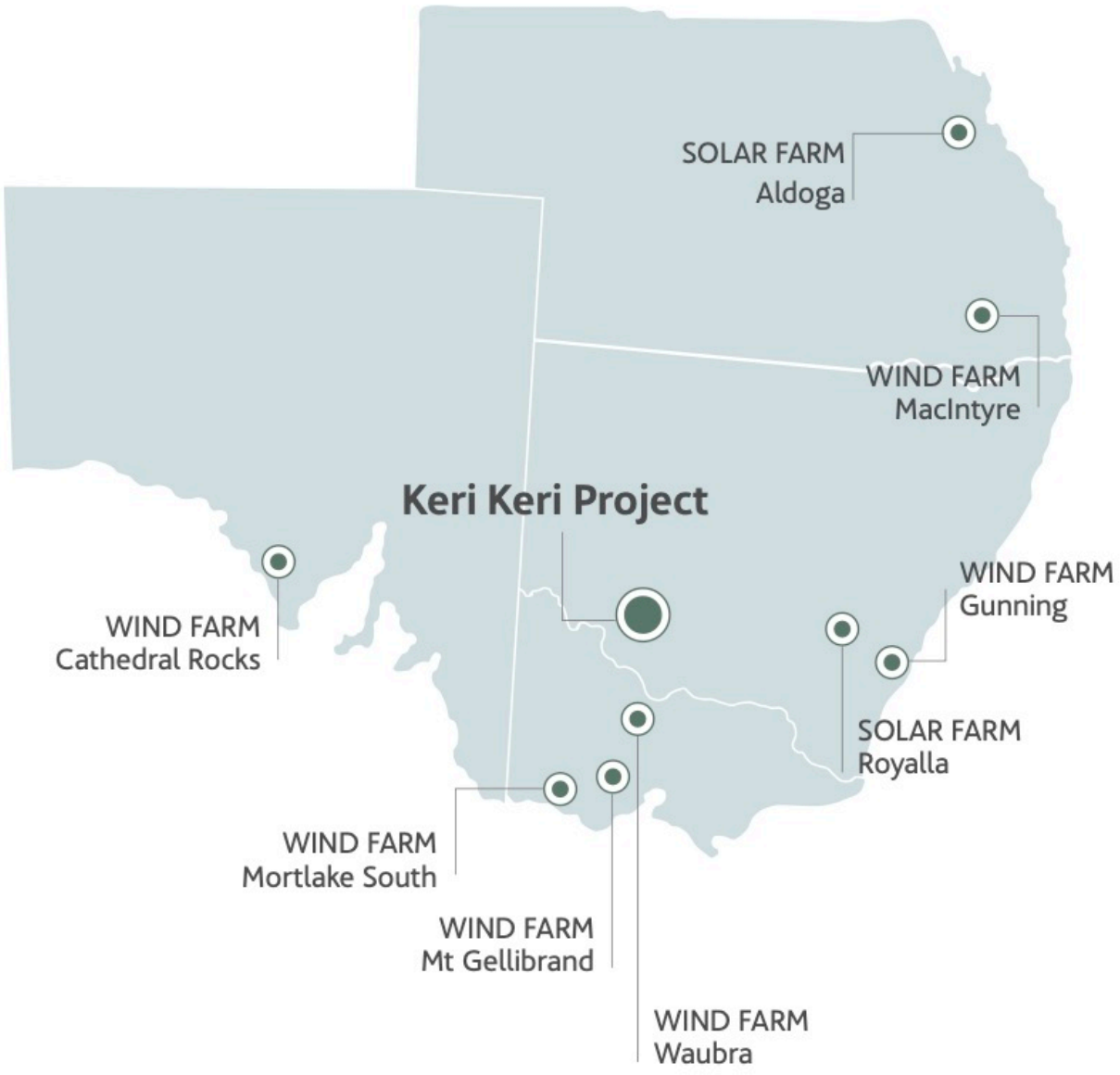


Figure 9 - Keri Keri Wind Farm Site Location

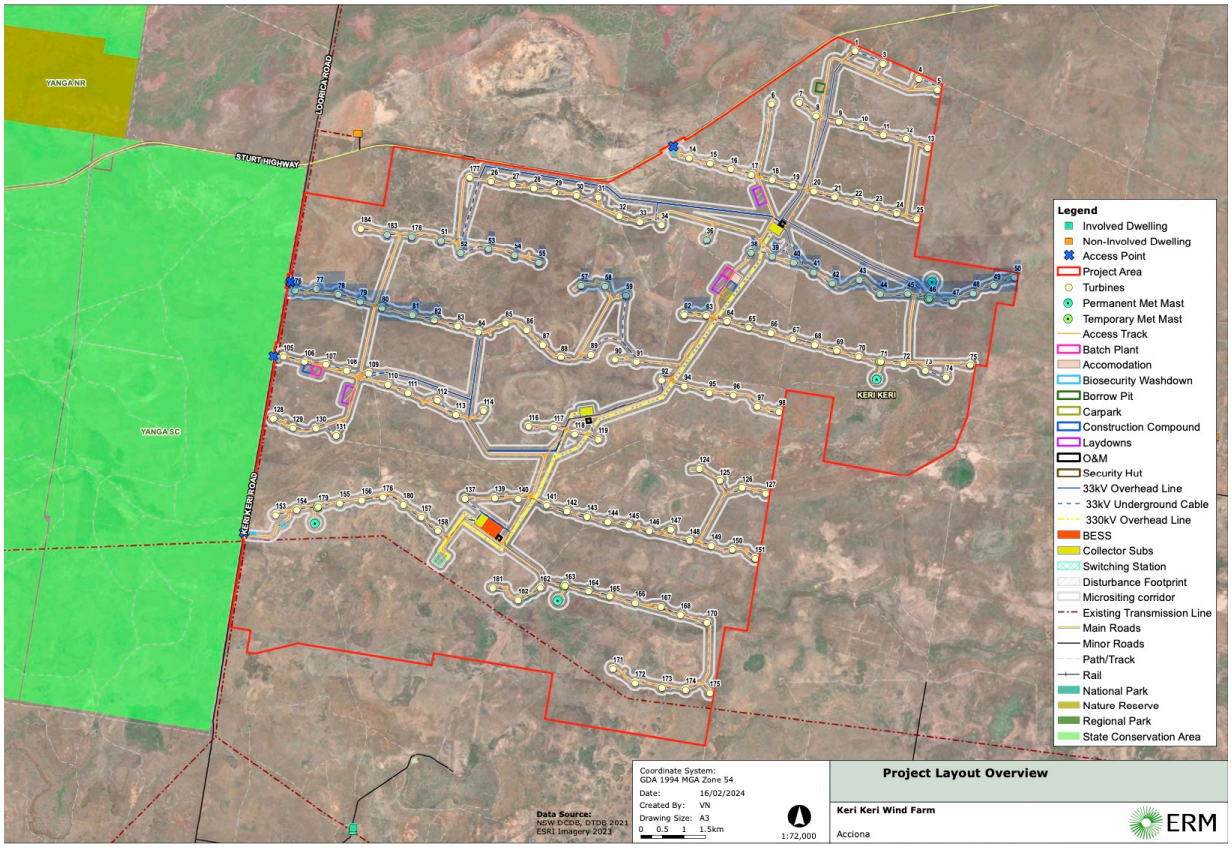


Figure 10 - Keri Keri Wind Farm Site Layout

7.0 Transport Summary

The study shows the proposed route for the wind turbine components, and the constraints they may encounter on the route to the Keri Keri Wind Farm from the Victorian border.

Route 1 would be used as the option for the blades.

Route 2 is the option for all other loads.

ROUTE 1: NSW/Victorian border (Robinvale) to Keri Keri Wind Farm
COMPONENTS: Blades.
DISTANCE: 125.0 kilometres
GPS LINK: https://goo.gl/maps/k465JQgDL8Tkp9Ez8
ROUTE: Robinvale-Sea Lake Rd, Murray Valley Hwy, Sturt Hwy, Keri Keri Road.

ROUTE 2: NSW/Victorian border (Mildura) to Keri Keri Wind Farm.
COMPONENTS: Loads under 40m overall length. **Max loaded height 5.9m**
DISTANCE: 199.0 kilometres
GPS LINK: https://goo.gl/maps/Q2aKRTh5KELca7Xv8
ROUTE: Seventh St, Sturt Hwy, Keri Keri Road.

8.0 Route 1: NSW/Victorian Border (Robinvale) to Keri Keri Windfarm

COMPONENTS: Blades.
DISTANCE: 125.0 kilometres
GPS LINK: https://goo.gl/maps/k465JQgDL8Tkp9Ez8
ROUTE: Robinvale-Sea Lake Rd, Murray Valley Hwy, Sturt Hwy, Keri Keri Road.

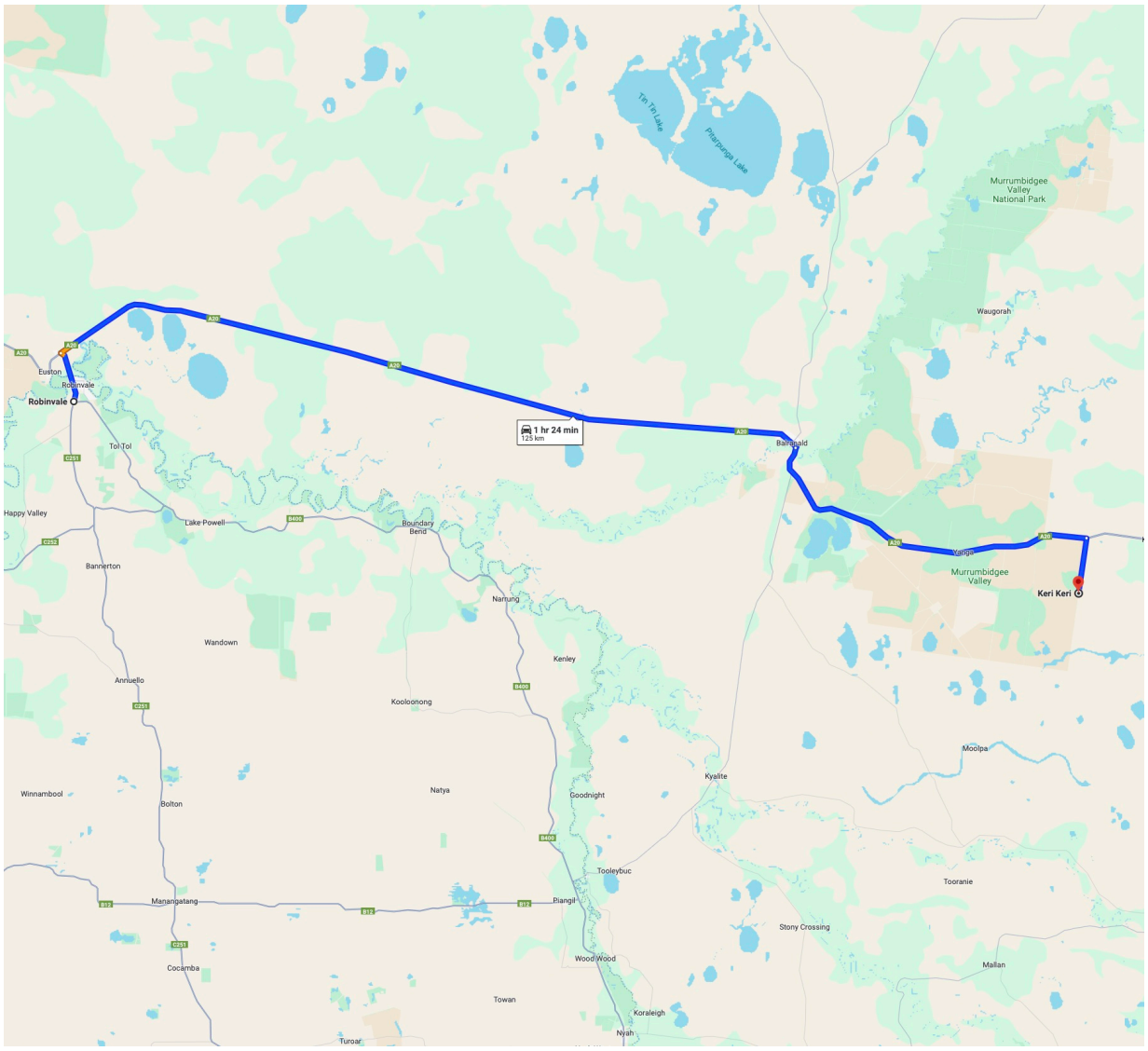


Figure 11 - Route 1

KEY	
MODIFICATIONS REQUIRED	
MINOR WORKS OR CAUTION	
PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
540.9	Robinvale	Robinvale-Sea Lake Rd turns into Murray Valley Hwy GPS Link: https://goo.gl/maps/55pknuwKNHsoA1ydA	120 metres	Continue Straight	No issues with this section
2.7	Robinvale	Murray Valley Highway over the Euston-Robinvale Bridge https://goo.gl/maps/uKnaiBJZG5yVVWJQ9	NA	Continue straight	A sign was noted saying the bridge has a load limit of 21.0t for a tri-axle group. A bridge assessment will be required to check suitability.
5.1	Euston	Murray Valley Hwy onto Sturt Hwy GPS Link: https://goo.gl/maps/rnhvninN6VkAWX3eA	50 metres	Right Hand Turn	This is a very tight corner that cuts back on itself. A very large amount of hardstand is required. The new alignment will need a lot of fil to bring it level with the highway. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.
82.8	Balranald	Sturt Hwy (Market S t) onto Sturt Hwy GPS Link: https://goo.gl/maps/xve4ZgbuRkqqPvVr7	50 metres	Right Hand Turn	This section is very tight and will require the truck to continue into the park on the outside of the corner. A large area of hardstand will be required along with the removal of 5x trees, 2x light poles and 11x signs. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.
119.6	Keri Keri	Sturt Highway onto Keri Keri Road GPS Link: https://goo.gl/maps/uH5pmWwzWvz3TJ4K6	`	Right hand turn	A large area of hardstand is required on the inside of the corner. Keri keri Rd and All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
125	Keri Keri	Keri Keri Road into site entrances https://maps.app.goo.gl/ytL5UYQ4rNfQq7SB8		3 x Site Entrance	3 x site entrances are proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.
129.1	Keri Keri	Stuart Highway into site entrances GPS Link: https://goo.gl/maps/RkFMB8h4vJBVnHGw5		Site Entrance	A site entrance is proposed for this location. The land is very flat with limited vegetation. All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

5.1 Km's: Murray Valley Highway onto Sturt Highway at Euston

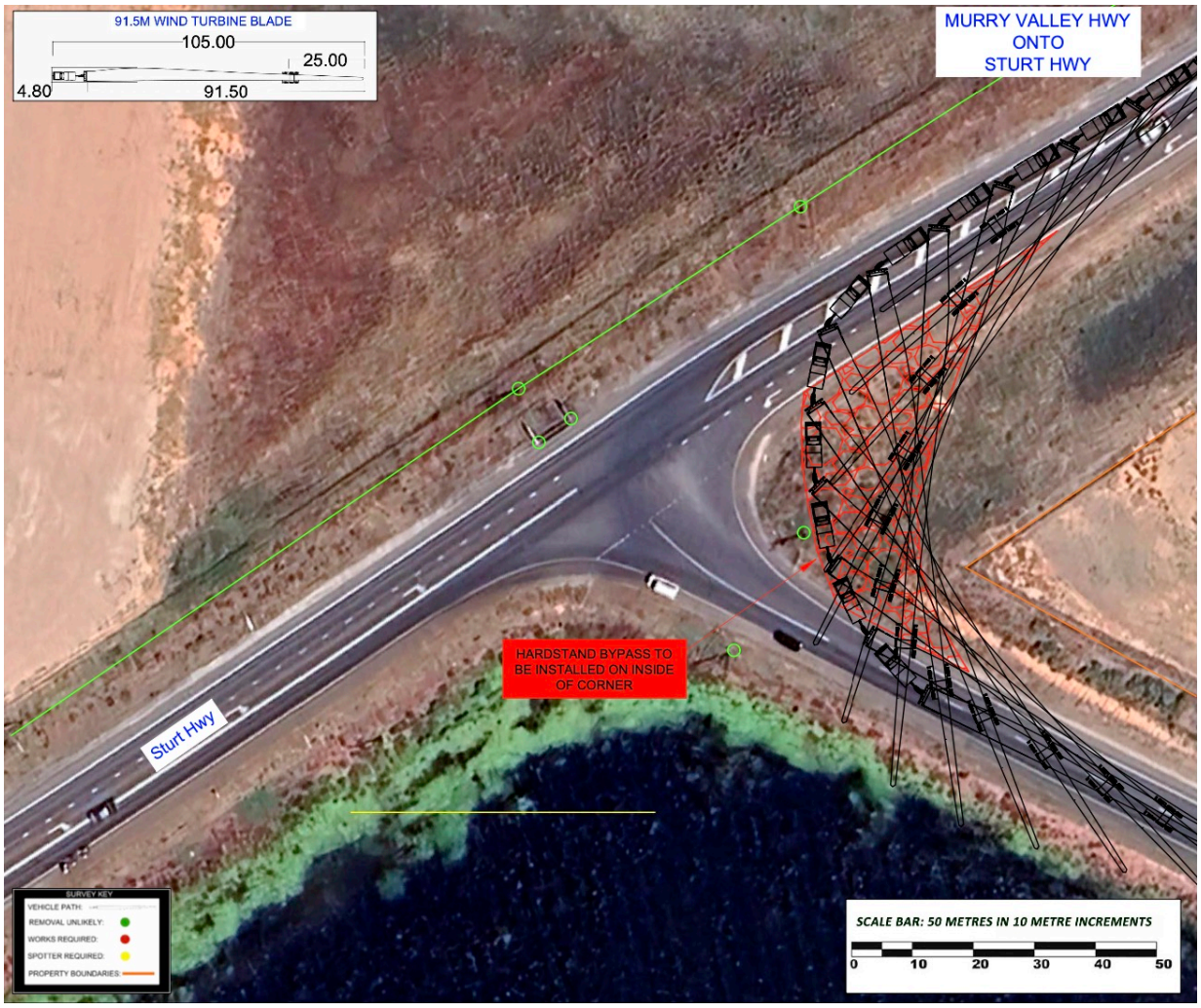


Figure 12 - Murray Valley Highway onto Sturt Highway



Figure 13 - Low angle shot

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/rnhvnjnN6VkAWX3eA

PROCEDURE: Right hand turn

COMMENTS: This is a very tight corner that cuts back on itself.

Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.

ROAD MODIFICATIONS: A very large amount of hardstand is required. The new alignment will need a lot of fil to bring it level with the highway. See image 2, there is a large drop off at the edges of the highway.

82.8 Km's: Right hand bend on Sturt Highway at Balranald

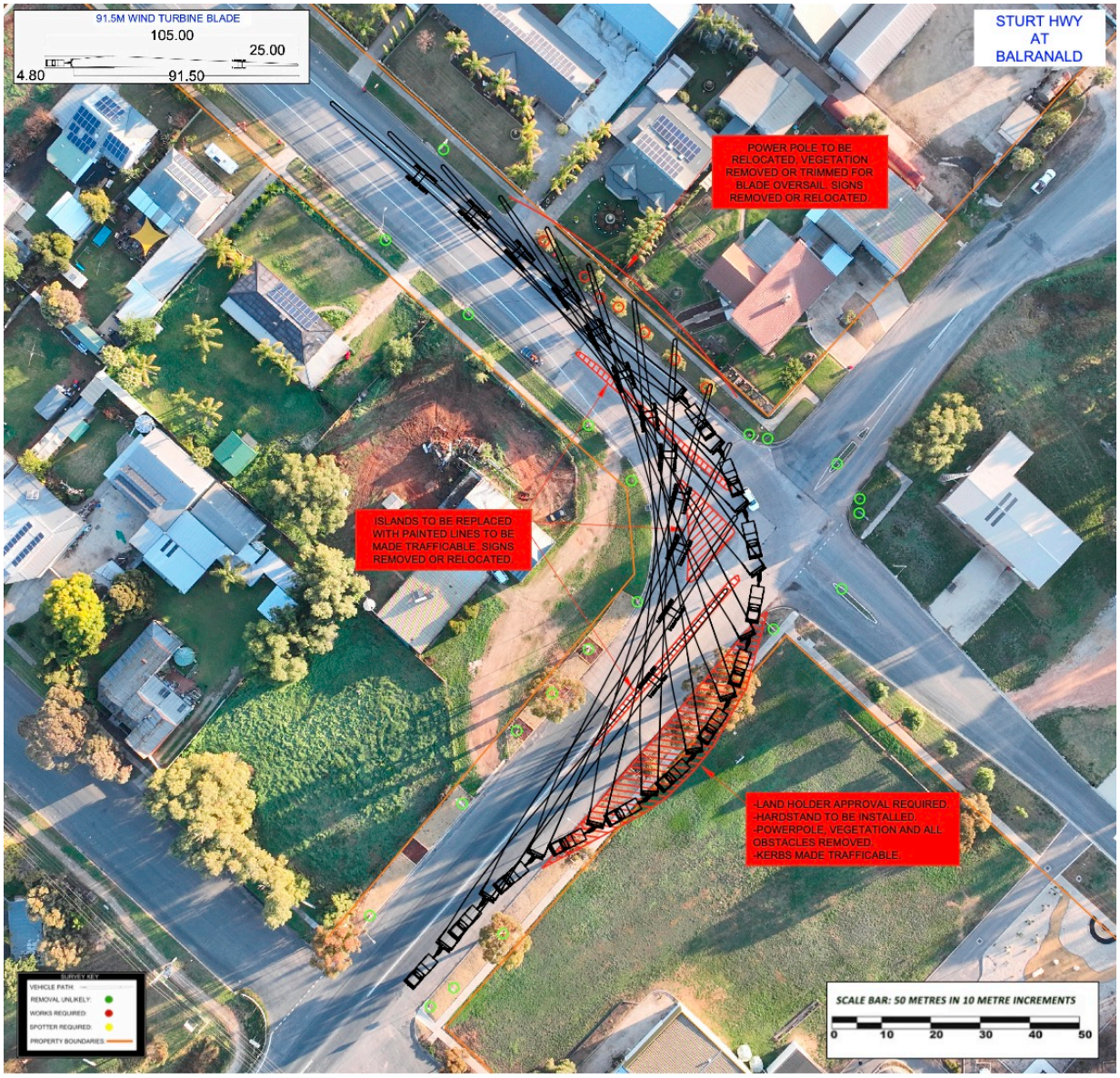


Figure 14 - Right hand bend on Sturt Highway



Figure 15 - Low angle shot

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/xve4ZgbuRkqqPvVr7

PROCEDURE: Right hand turn

COMMENTS: This section is very tight and will require the truck to continue into the park on the outside of the corner.

Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.

ROAD MODIFICATIONS: A large area of hardstand will be required on the exit of the corner, along with the removal of several trees, light poles, and signs. Kerb to be made trafficable. Landholder permission will be required.

A power pole and several trees and signs to be removed or trimmed on entry to corner. Traffic islands to be replaced with painted lines and made trafficable.

119.6 Km's: Sturt Highway onto Keri Keri Road

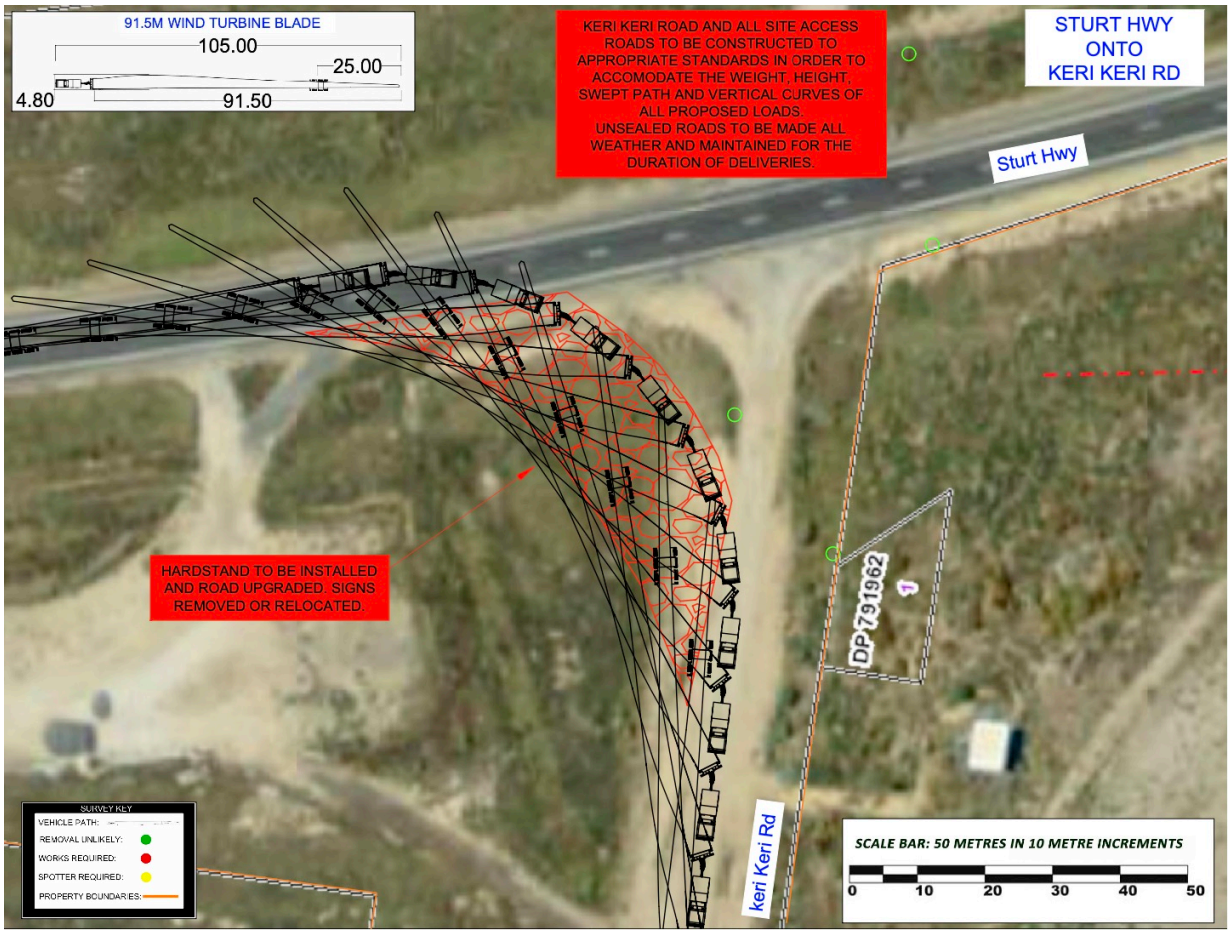


Figure 16 - Sturt Highway onto Keri Keri Road

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/uUhj8HobAbyn9rcy8

PROCEDURE: Right hand turn

COMMENTS: A large area of hardstand is required on the inside of the corner.

Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.

ROAD MODIFICATIONS: Keri keri Rd and All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

129.1 Km's: Sturt Highway into Site Entrance

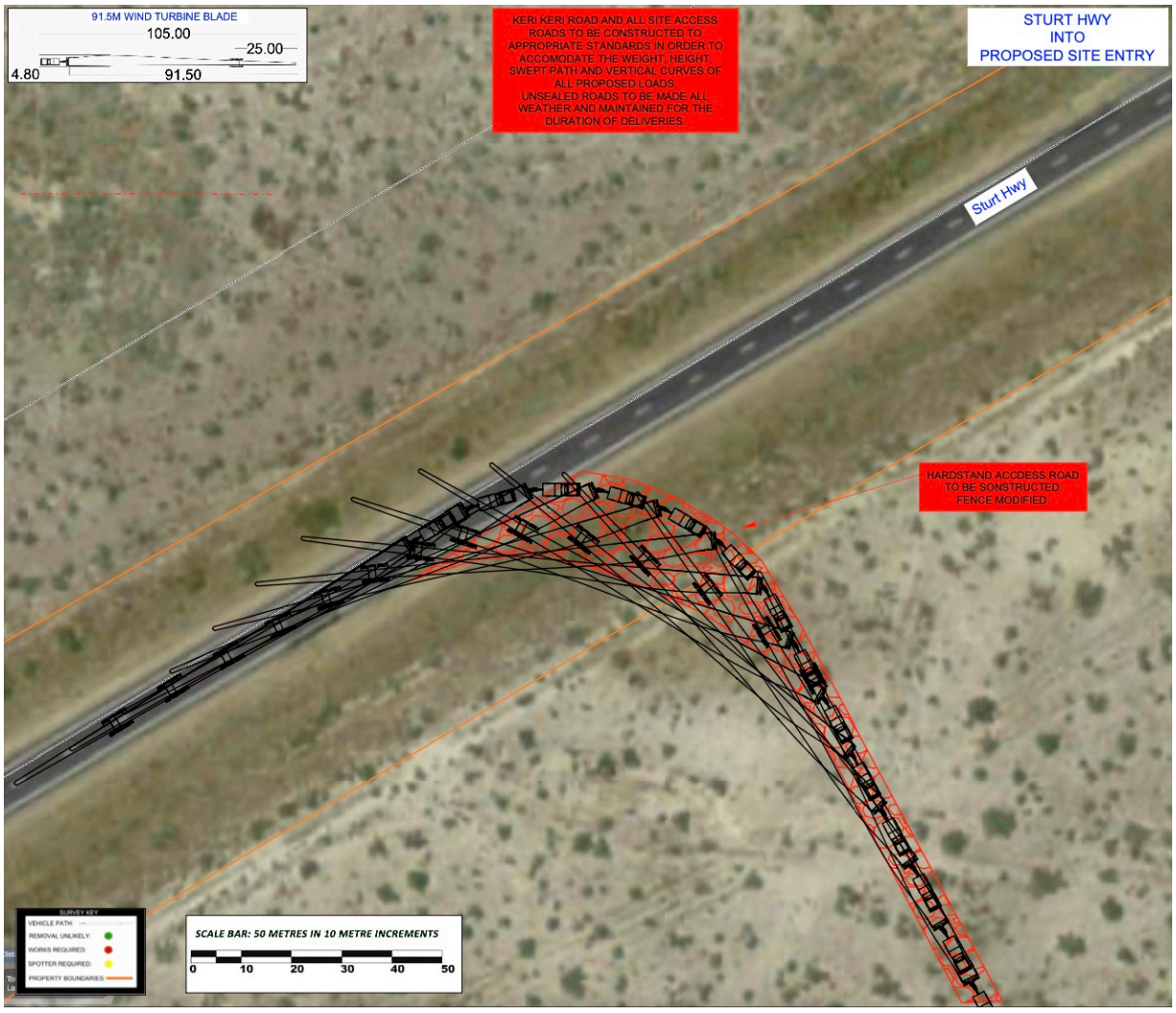


Figure 17 - Sturt Highway into site entrance

GPS LINK FOR THIS LOCATION: https://goo.gl/maps/uUhj8HobAbyn9rcy8

PROCEDURE: Right hand turn

COMMENTS: The site entrances are proposed along this location. The land is very flat with limited vegetation. Client to provide adequate swept path for the blade to enter site.

ROAD MODIFICATIONS: All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

129.1 Km's: Keri Keri Rd into Site Entrance (Typical)

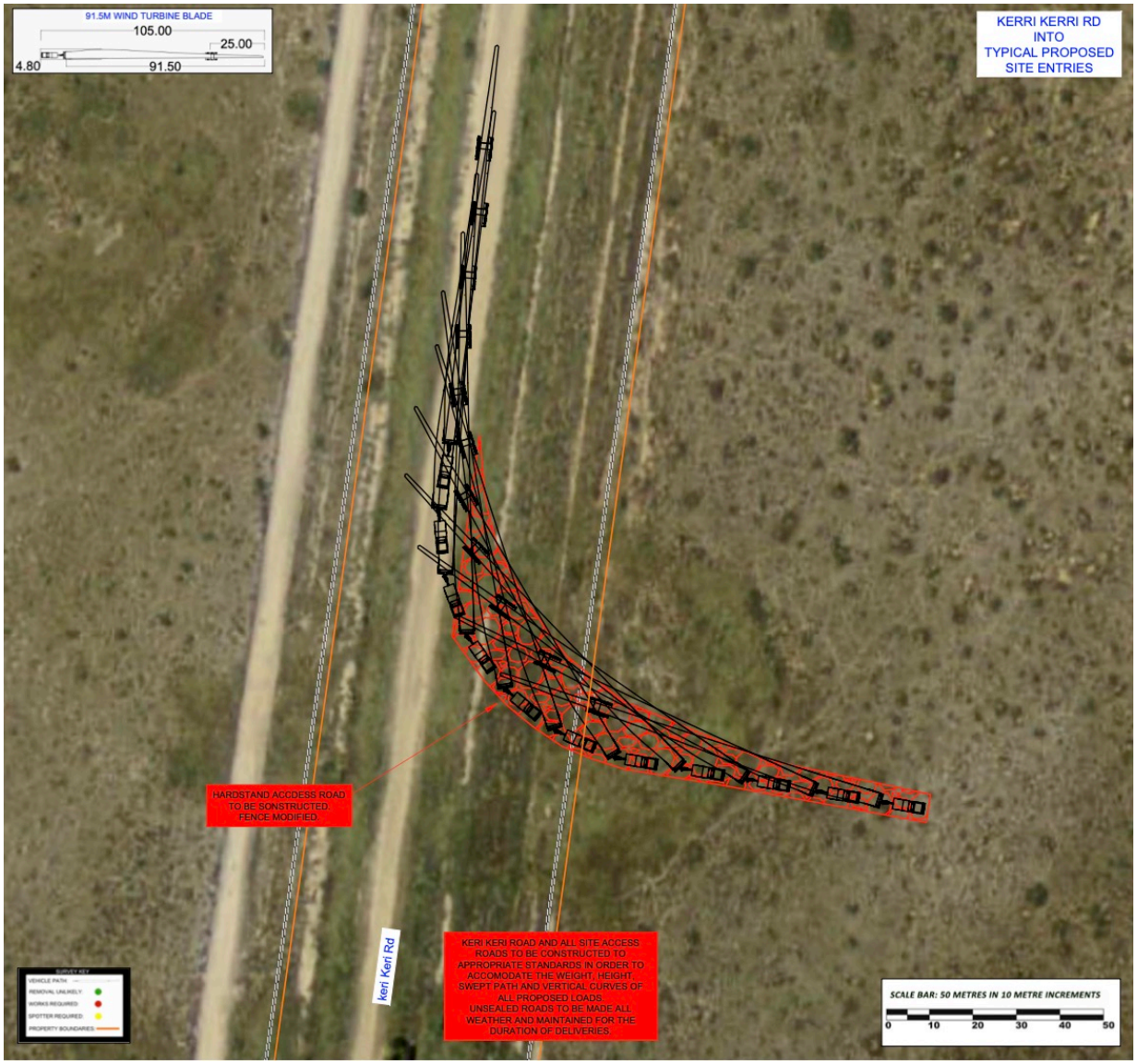


Figure 18 - Keri Keri Rd into Site Entrance (Typical)

GPS LINK FOR THIS LOCATION: https://maps.app.goo.gl/ytL5UYQ4rNfQqTSB8

PROCEDURE: Left hand turn

COMMENTS: 3 x site entrances are proposed along this location. The land is very flat with limited vegetation. Client to provide adequate swept path for the blade to enter site.

ROAD MODIFICATIONS: Keri keri Rd and All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads. Unsealed roads to be made all weather and maintained for the duration of deliveries.

9.0 Conclusion Route 1

After studying all options and undertaking a route survey, this route in its current condition will require a major amount of upgrades before it could be deemed suitable for transporting the proposed components.

The following are the key points that need to be taken into consideration, if the project moves forward with this route.

SWEPT PATH:

- There are numerous sections along the route that need major work to allow a blade of this size through.
- The corners that we consider will need significant work and should be investigated early in the planning stages to avoid delays or rejections are:
  - The right-hand turn from Murray Valley Highway onto the Sturt Highway at Euston
  - The right-hand bend on the Sturt Highway at Balranald

OVERHEAD UTILITIES:

- This route will need to be checked by an authorised scoping company. It is likely that a route of at least 5.6 metres is required for this project.

BRIDGES:

- Majority of the bridges have been used previously for similar loads so it is expected they will be ok. A bridge assessment will still be required.
- The only bridge of concern is the Euston-Robinvale Bridge over the Murray at Robinvale. This bridge has a sign noted saying the bridge has a load limit of 21.0t for a tri-axle group. A bridge assessment should be conducted as soon as possible to check suitability.

RAIL ASSETS:

- Rail overbridges and crossings on route will require approval from authorities before loads can access the routes.

VEGETATION:

- The route requires a moderate amount of vegetation clearing at various locations.

PAVEMENT:

- All roads have adequate highway pavement until Keri Keri Road.
- Keri Keri Road and all unsealed roads to be made all weather and maintained for the duration of deliveries.

ROADWORKS:

- The project will need to start discussions with government authorities at least 18 months prior to turbine transport to understand if the project would conflict with any upcoming roadworks. Once a Transport Management Plan “TMP” has been approved for the transport of the turbines, then the exact movement dates need to be communicated with all relevant authorities to make all road stakeholders are aware of the scheduled movements for each day.
- The project will need to regularly check on any new upgrades not listed in the report. If upgrades have taken place on a section of route after this report has been completed, then a swept path study would need to be undertaken on that section of road to confirm that it can still be used.

SITE ENTRIES:

- All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads.
- Unsealed roads to be made all weather and maintained for the duration of deliveries.

10.0 Route 2: NSW/Victorian border (Mildura) to Keri Keri Windfarm

COMPONENTS: Loads under 40m overall length.
DISTANCE: 199.0 kilometres
GPS LINK: https://goo.gl/maps/Q2aKRTh5KELca7Xv8
ROUTE: Seventh St, Sturt Hwy, Keri Keri Road.

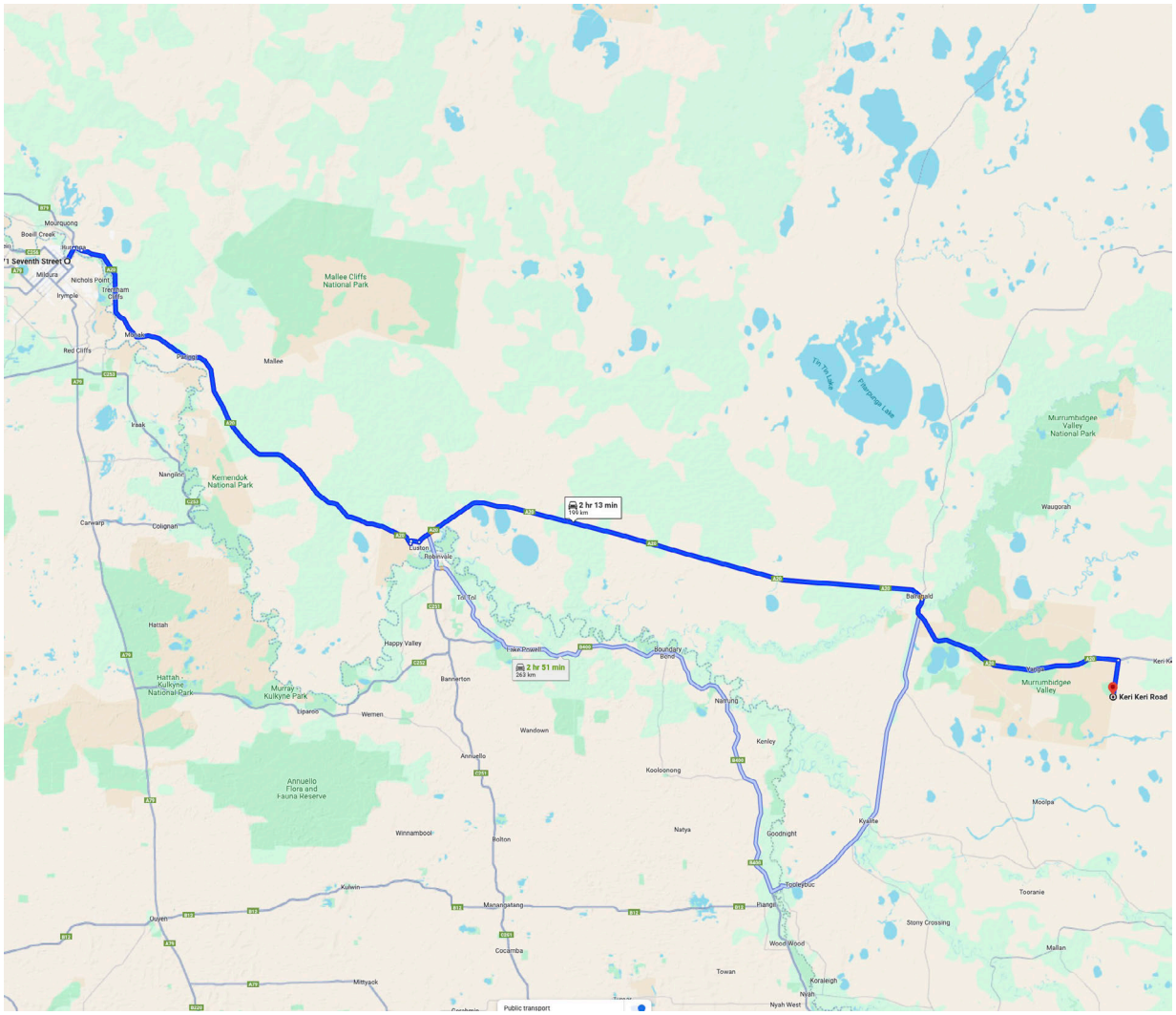


Figure 19 - Route 2

KEY	
MODIFICATIONS REQUIRED	
MINOR WORKS OR CAUTION	
PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
0.0	Mildura	Seventh St E onto Sturt Hwy GPS Link: https://goo.gl/maps/DCWU9cDTpnWQFpudA	6 metres wide	Third Exit on Round-about	Right Hand Turn at round-about
2.2	Buronga	Sturt Hwy GPS Link: https://goo.gl/maps/eSH3JMoHGAk221YVA	6 metres wide	Second Exit on Round-about	Travel right at round-about
25.9	Paringi	Sturt Hwy GPS Link: https://goo.gl/maps/aF7DrHsfBEBnzMBZ8	90.0 metres long 10.0 metres wide	Left Hand Merge	Possible parking on correct side of the road.
78.1	Euston	Sturt Hwy GPS Link: https://goo.gl/maps/4WoDVv7TwnbDad6z5	6 metres wide	First Exit on Round-about	Travel left at round-about
158.4	Balranald	Sturt Hwy (market st) onto Sturt Hwy GPS Link: https://goo.gl/maps/xve4ZqbuRkqqPvVr7	6 metres wide	Right Hand Turn	No problems with this section of road.
194.1	Keri Keri	Sturt Highway onto Keri Keri Road GPS Link: https://goo.gl/maps/uH5pmWwzWvz3TJ4K6		Right hand turn	A large area of hardstand is required on the inside of the corner. Spotter to guide the load throughout the intersection. Police to control traffic, pilots to warm all traffic.
199	Keri Keri	Keri Keri Road into site entrances		Site Entrance	A site entrance is proposed for this location. The land is very flat with limited vegetation. Client to provide adequate swept path for the blade to enter site.

11.0 Conclusion Route 2

After studying all options and undertaking a route survey, this route is suitable in its current condition for transporting the proposed components.

The following are the key points that need to be taken into consideration, if the project moves forward with this route.

LENGTH

- The longest combination that can travel along this route without upgrades is **40m overall length**

OVERHEAD UTILITIES:

- This route will need to be checked by an authorised scoping company. It is likely that a route of at least 5.9 metres is required for this project.

BRIDGES:

- Majority of the bridges have been used previously for similar loads so it is expected they will be ok. A bridge assessment will still be required.

RAIL ASSETS:

- Rail overbridges and crossings on route will require approval from authorities before loads can access the routes.

PAVEMENT:

- All roads have adequate highway pavement up until Keri Keri Road.

SITE ENTRIES:

- All site access roads to be constructed to appropriate standards in order to accommodate the weight, height, swept path and vertical curves of all proposed loads.
- Unsealed roads to be made all weather and maintained for the duration of deliveries.

ROADWORKS:

- The project will need to start discussions with government authorities at least 18 months prior to turbine transport to understand if the project would conflict with any upcoming roadworks. Once a Transport Management Plan “TMP” has been approved for the transport of the turbines, then the exact movement dates need to be communicated with all relevant authorities to make all road stakeholders are aware of the scheduled movements for each day.
- The project will need to regularly check on any new upgrades not listed in the report. If upgrades have taken place on a section of route after this report has been completed, then a swept path study would need to be undertaken on that section of road to confirm that it can still be used.

12.0 References

Rex J Andrews P/L Route survey # 362 REV01
Google Earth/Maps
Nearmaps
ERM
Acciona
NHVR (OSOM)
Australian Load Restraint Guide

Disclaimer: This route study is provided on the basis of information only purposes and is to be used strictly as a guide only; Government approvals would be required before these routes could be deemed suitable for transporting the components over the listed routes.

Any, and all parties using information contained this submission do so at own risk.

RJA accept no responsibility for the use of all information contained within this report.

Actual approved routes may differ from those surveyed.

Proposed routes may change subject to approvals from authorities.

This study was undertaken using data supplied by Rex J Andrews P/L. Equipment and swept paths might vary if using transport methodology other than the data supplied by Rex J Andrews.

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APPENDIX B BAM PLOT DATA

BAM Site Field Survey								
Project:	20-038	Plot Identifier	1	Pic 20x20		Pic 20x50		
Survey date:	29.9.2020		Compass Orientation (head of 20x20 plot)				105	
Recorders		TH, KV	PCT:					
GPS Easting	772320.704	GPS Northing	6141987.99		Datum		Zone	54

FUNCTION

Function attributes for	1

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	1
	Shrub (SG)	5
	Forb (FG)	10
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	1
	TOTAL	17

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	10
	Shrub (SG)	15.8
	Forb (FG)	2.6
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	28.5
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	1								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
euca larg	*Eucalyptus largiflorens*		Myrtaceae	10	2		Tree (TG)	No	
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.2	10		Shrub (SG)	No	
duma flor	*Duma florulenta*	Lignum	Polygonaceae	10	18		Shrub (SG)	No	
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	0.5	100		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	5	8		Shrub (SG)	No	
scle tric	*Slerolaena tricuspis*		Chenopodiace	0.1	5		Shrub (SG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	100		Forb (FG)	No	
cala erem	*Calandrinia sp.*	Small Purslane	Portulaceae	0.2	500		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	10		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	50		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.3	200		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	50		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	50		Forb (FG)	No	
tetr moor	*Tetragonia moorei*		Aizoaceae	1	500		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	0.5	500		Forb (FG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	5		Other (OG)	No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.2	500	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	50	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	2	Pic 20x20		Pic 20x50		
Survey date:	28/09/2020		Compass Orientation (head of 20x20 plot)				130	
Recorders	bnoel kvine thume cvincent		PCT:	15				
GPS Easting	763319	GPS Northing	6146900		Datum		Zone	54

FUNCTION

Function attributes for	2

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	5
	Forb (FG)	7
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	14

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	15
	Shrub (SG)	55.3
	Forb (FG)	10.7
	Grass & grasslike (GG)	0.5
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	81.5
	TOTAL 'HTE'	0.2

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	1		1
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		11.3	

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	20%	8.6%	T2041
	15m	10%		T1922
	25m	4%		T0958
	35m	7%		T1334
	45m	2%		T1632
Bare ground cover	5m	50%	49.0%	
	15m	55%		
	25m	40%		
	35m	30%		
	45m	70%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	2								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**
euca larg	*Eucalyptus largiflorens*	Black Box	Myrtaceae	15	2		Tree (TG)	No	
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No	
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	0.1	3		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	40	200		Shrub (SG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	15	200		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	3		Shrub (SG)	No	
erag brow	*Eragrostis brownii*	Brown's Lovegrass	Poaceae	0.5	1000		Grass & grasslike (GG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	6		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	5		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	0.1	4		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.1	5		Forb (FG)	No	
sarc prae	*Sarcozona praecox*	Sarcozona	Aizoaceae	0.1	4		Forb (FG)	No	
tetr moor	*Tetragonia moorei*		Aizoaceae	0.2	300		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	10	500		Forb (FG)	No	
brom dian	*Bromus diandrus*	Great Brome	Poaceae	0.1	2	*		HTE	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	20	5000	*		No	
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	2	500	*		No	
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	2	*		HTE	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fat	0.5	500	*		No	
mese nodi	*Mesembryanthemum no*	Small Ice Plant	Aizoaceae	0.1	3	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	1	200	*		No	

BAM Site Field Survey								
Project:	20-038	Plot Identifier	3	Pic 20x20		Pic 20x50		
Survey date:	29.9.2020		Compass Orientation (head of 20x20 plot)				43	
Recorders		th kv	PCT:					
GPS Easting	771799.742	GPS Northing	6141631.76		Datum		Zone	54
Landform			**Soils**			**Drainage & Slope**		
Morphology	plains		Soil Texture			Slope		
LandF Element			Soil Colour			Aspect		
LandF Pattern			Soil Depth			Drainage		
Microrelief			Geology			Watercourses		

FUNCTION

Function attributes for	3

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	16
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	22

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	10.6
	Forb (FG)	19.4
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	30.3
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	3								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	10	40		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	0.5	3		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	30		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	10		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	30		Grass & grasslike (GG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.1	20		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	50		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	50		Forb (FG)	No	
Cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.1	100		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	25		Forb (FG)	No	
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace	0.1	10		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	30		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	60		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizoceph*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.2	200		Forb (FG)	No	
podo muel	*Podolepis muelleri*	Small Copper-wire Daisy	Asteraceae	1	500		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	20		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	15	500		Forb (FG)	No	
Scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	0.1	5		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	100		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	50		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	2	60		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	15	*		No	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.1	50	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	5	300	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	10	*		No	

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	4	Pic 20x20		Pic 20x50		
Survey date:	29/09/2020		Compass Orientation (head of 20x20 plot)				195	
Recorders	bnoel cvincent		PCT:	28				
GPS Easting	773013	GPS Northing	6146655		Datum		Zone	54
Landform			**Soils**			**Drainage & Slope**		
Morphology			Soil Texture			Slope		
LandF Element			Soil Colour			Aspect		
LandF Pattern			Soil Depth			Drainage		
Microrelief			Geology			Watercourses		

FUNCTION

Function attributes for	4

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	19
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	26

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	6.1
	Forb (FG)	28.4
	Grass & grasslike (GG)	1.2
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	35.8
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for 4

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
duma horr horr	*Duma horrida subsp. hor*		Polygonaceae	0.5	1		Shrub (SG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	5	8		Shrub (SG)	No	
sals aust	*Salsola australis*		Chenopodiace	0.1	1		Shrub (SG)	No	
scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiace	0.5	150		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	500		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	1	200		Grass & grasslike (GG)	No	
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	0.2	100		Grass & grasslike (GG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.1	10		Forb (FG)	No	
bulb bulb	*Bulbine bulbosa*	Bulbine Lily	Asphodelacea	0.1	1		Forb (FG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.2	200		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	20	1000		Forb (FG)	No	
cham drum	*Chamaesyce drummond*	Caustic Weed	Euphorbiacea	0.1	2		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.2	250		Forb (FG)	No	
good pinn	*Goodenia pinnatifida*	Scrambles Eggs	Goodeniaceae	0.5	300		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	30		Forb (FG)	No	
oxal	*Oxalis spp.*		Oxalidaceae	0.1	2		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.5	200		Forb (FG)	No	
ptil spat	*Ptilotus spathulatus f. sp*	Pussy-tails	Amaranthace	0.5	200		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.2	500		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	5	500		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	2		Forb (FG)	No	
sida fibu	*Sida fibulifera*	Pin Sida	Malvaceae	0.1	2		Forb (FG)	No	
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	20		Forb (FG)	No	
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.3	200		Forb (FG)	No	
teuc race	*Teucrium racemosum*	Grey Germander	Lamiaceae	0.1	3		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	2		Forb (FG)	No	
echi plan	*Echium plantagineum*	Patterson's Curse	Boraginaceae	0.1	1	*		No	
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	0.1	12	*		No	
limo loba	*Limonium lobatum*	Winged Sea Lavender	Plumbaginace	0.1	1	*		No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fab	20	2000	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fab	20	2000	*		No	
sile apet	*Silene apetala*		Caryophyllace	0.1	50	*		No	

vulp	*Vulpia spp.*	Rat's-tail Fescue	Poaceae	0.1	1	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey									
Project:	20-038	Plot Identifier	5	Pic 20x20		Pic 20x50			
Survey date:	2.10.2020		Compass Orientation (head of 20x20 plot)				270		
Recorders		KV CV	PCT:						
GPS Easting	772767.57	GPS Northing	6150618.6		Datum		Zone	54	

FUNCTION

Function attributes for	5

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	8
	Forb (FG)	8
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	18

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	18.2
	Forb (FG)	40.7
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	59.2
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm

0.5%=1.4x1.4m

1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	5								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
rhod stua	*Rhodanthe stuartiana*		Asteraceae	40	3000		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	1000		Forb (FG)	No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	30	1000	*		No	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	10	1000	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	10	500	*		No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	17	25		Shrub (SG)	No	
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.1	5		Shrub (SG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	20		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	10		Forb (FG)	No	
trip loli	*Tripogon loliiformis*	Fiveminute Grass	Poaceae	0.2	120		Grass & grasslike (GG)	No	
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace	0.1	1		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	10		Forb (FG)	No	
duma flor	*Duma florulenta*	Lignum	Polygonaceae	0.2	1		Shrub (SG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	10		Grass & grasslike (GG)	No	
conv	*Convolvulus spp.*	A Bindweed	Convolvulacea	0.1	20		Forb (FG)	No	
euph drum	#N/A	Caustic Weed	Euphorbiacea	0.1	5	*		FALSE	#N/A
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.1	1		Shrub (SG)	No	
Mair	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-	Chenopodiace	0.1	15		Shrub (SG)	No	
rhag para	*Rhagodia parabolica*		Chenopodiace	0.1	20		Shrub (SG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.5	4		Shrub (SG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.1	1		Shrub (SG)	No	
scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	0.1	2		Forb (FG)	No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	6	Pic 20x20		Pic 20x50		
Survey date:	29/09/2020		Compass Orientation (head of 20x20 plot)				85	
Recorders	bnoel kvine thume cvincent		PCT:	160				
GPS Easting	227552	GPS Northing	6156383		Datum		Zone	55
Landform			**Soils**			**Drainage & Slope**		
Morphology			Soil Texture			Slope		
LandF Element			Soil Colour			Aspect		
LandF Pattern			Soil Depth			Drainage		
Microrelief			Geology			Watercourses		

FUNCTION

Function attributes for	6

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	9
	Forb (FG)	18
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	30

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	15
	Forb (FG)	16.1
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	31.4
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for 6

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
good pinn	*Goodenia pinnatifida*	Scrambles Eggs	Goodeniaceae	0.1	200		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	5	500		Forb (FG)	No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	15	5000	*		No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	8	20		Shrub (SG)	No	
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiace	1	300		Shrub (SG)	No	
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.1	10		Shrub (SG)	No	
scle tric	*Sclerolaena tricuspis*		Chenopodiace	0.5	5		Shrub (SG)	No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fab	5	2000	*		No	
atri lind	*Atriplex lindleyi*	Eastern Flat-top Saltbush	Chenopodiace	5	10		Forb (FG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	5	8		Shrub (SG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	20		Forb (FG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	20		Shrub (SG)	No	
cala volu	*Calandrinia volubilis*		Portulacaceae	4	200		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	2		Forb (FG)	No	
teuc race	*Teucrium racemosum*	Grey Germander	Lamiaceae	0.1	200		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	30		Forb (FG)	No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	20	*		No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	100		Forb (FG)	No	
disp cras clav	*Disphyma crassifolium s*		Aizoaceae	0.3	100		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.4	30		Forb (FG)	No	
tetr moor	*Tetragonia moorei*		Aizoaceae	0.1	30		Forb (FG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.2	50		Forb (FG)	No	
cras sieb	*Crassula sieberiana*	Australian Stonecrop	Crassulaceae	0.1	1		Forb (FG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	6		Other (OG)	No	
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	0.1	3	*		No	
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.1	4		Shrub (SG)	No	
vitt	*Vittadinia spp.*	Fuzzweed	Asteraceae	0.1	4		Forb (FG)	No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	6	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fab	0.1	5	*		No	
malv prei	*Malva preissiana*	Native Hollyhock	Malvaceae	0.1	5			No	
malv	*Malva spp.*	Mallow	Malvaceae	1	1	*		No	

rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.1	30		Forb (FG)	No	
podo muel	*Podolepis muelleri*	Small Copper-wire Daisy	Asteraceae	0.1	5		Forb (FG)	No	
mair	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-	Chenopodiace	0.1	2		Shrub (SG)	No	
rhag	*Rhagodia spp.*		Chenopodiace	0.1	1		Shrub (SG)	No	
erag	*Eragrostis spp.*	A Lovegrass	Poaceae	0.1	5	*	Grass & grasslike (GG)	No	
bulb bulb	*Bulbine bulbosa*	Bulbine Lily	Asphodelacea	0.1	1		Forb (FG)	No	
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	0.1	3			No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	7	Pic 20x20		Pic 20x50		
Survey date:	1.10.2020		Compass Orientation (head of 20x20 plot)				160	
Recorders		kv	PCT:					
GPS Easting	766040.917	GPS Northing	6148511.32		Datum		Zone	54
Landform			**Soils**			**Drainage & Slope**		
Morphology	plains		Soil Texture			Slope		
LandF Element			Soil Colour	pale grey cracking		Aspect		
LandF Pattern			Soil Depth			Drainage		
Microrelief			Geology			Watercourses		

FUNCTION

Function attributes for	7

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	1
	Forb (FG)	14
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	15

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	20
	Forb (FG)	41.4
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	61.4
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for 7

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	20	70		Shrub (SG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	30		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	75		Forb (FG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.1	50		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	20		Forb (FG)	No	
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	25		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	10		Forb (FG)	No	
good fasc	*Goodenia fascicularis*	Mallee Goodenia	Goodeniaceae	0.1	10		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	50		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	30		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	50		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	40	3000		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	200		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	100		Forb (FG)	No	
zygo glau	*Zygophyllum glaucum*	Pale Twinleaf	Zygophyllacea	0.2	5		Forb (FG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	25		Other	No	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.1	30	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fat	0.2	100	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	10	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	8	Pic 20x20		Pic 20x50		
Survey date:	29.9.2020		Compass Orientation (head of 20x20 plot)				355	
Recorders		kv th	PCT:					
GPS Easting	777575.677	GPS Northing	6148877.74		Datum		Zone	54

FUNCTION

Function attributes for	8

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	8
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	1
	TOTAL	13

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	23.2
	Forb (FG)	50.6
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	73.9
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	8								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	20	50		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	3	8		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	10		Shrub (SG)	No	
sida intr	*Sida intricata*		Malvaceae	0.1	30		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	40		Other (OG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	50		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	15		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	30		Forb (FG)	No	
good fasc	*Goodenia fascicularis*	Mallee Goodenia	Goodeniaceae	0.1	50		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	10	3000		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	40	3000		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	200		Forb (FG)	No	
limo loba	*Limonium lobatum*	Winged Sea Lavender	Plumbaginace	0.1	1	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	10	3000	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	15	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	5	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	9	Pic 20x20		Pic 20x50		
Survey date:	29/09/2020		Compass Orientation (head of 20x20 plot)					
Recorders	bnoel cvincent		PCT:	28				
GPS Easting	228870	GPS Northing	6147404		Datum		Zone	54

FUNCTION

Function attributes for	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	10
	Forb (FG)	8
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	20

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	21.7
	Forb (FG)	12.5
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	34.5
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	9								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
atri numm	*Atriplex nummularia*	Old Man Saltbush	Chenopodiace	0.1	20		Shrub (SG)	No	
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	20		Shrub (SG)	No	
atri	*Atriplex spp.*	A Saltbush	Chenopodiaceae				Shrub (SG)	No	
mair pyra	*Maireana pyramidata*	Black Bluebush	Chenopodiace	20	50		Shrub (SG)	No	
malv prei	*Malva preissiana*	Native Hollyhock	Malvaceae	0.1	10		Shrub (SG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.2	2		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	3		Shrub (SG)	No	
scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiace	0.5	300		Shrub (SG)	No	
scle diva	*Sclerolaena divaricata*	Tangled Copperburr	Chenopodiace	0.5	100		Shrub (SG)	No	
scle tric	*sclerolaena tricuspis*		Chenopodiace	0.1	1		Shrub (SG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.2	20		Grass & grasslike (GG)	No	
erag	*Eragrostis spp.*	A Lovegrass	Poaceae	0.1	15	*	Grass & grasslike (GG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.1	20		Forb (FG)	No	
calo citr	*Calocephalus citreus*	Lemon Beauty-heads	Asteraceae	7	500		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	1	100		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.1	8		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.2	200		Forb (FG)	No	
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	3	500		Forb (FG)	No	
teuc race	*Teucrium racemosum*	Grey Germander	Lamiaceae	0.1	6		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	1	300		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.5	500	*		No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	20	*		No	
limo loba	*Limonium lobatum*	Winged Sea Lavender	Plumbaginace	0.1	1	*		No	
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fat	50	5000	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fat	1	100	*		No	
mese nodi	*Mesembryanthemum no*	Small Ice Plant	Aizoaceae	0.1	1	*		No	
sile apet	*Silene apetala*		Caryophyllace	0.1	5	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	20	*		No	
five minute grass	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A	0		#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	10	Pic 20x20		Pic 20x50		
Survey date:	29.9.2020		Compass Orientation (head of 20x20 plot)				205	
Recorders		th kv	PCT:					
GPS Easting	771903.686	GPS Northing	6146997.64		Datum		Zone	54

FUNCTION

Function attributes for	10

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	5
	Forb (FG)	10
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	16

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	17.2
	Forb (FG)	1.4
	Grass & grasslike (GG)	0.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	18.7
	TOTAL 'HTE'	0.3

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19	1		
5-9	1		
<5			N/A
Length of logs (m)		0	

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	60.0%	4320
	15m	0%		4458
	25m	0%		4751
	35m	100%		4944
	45m	200%		5205
Bare ground cover	5m	2000%	1700.0%	
	15m	1500%		
	25m	2500%		
	35m	1000%		
	45m	1500%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	10								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	5	20		Shrub (SG)	No	
hake leuc	*Hakea leucoptera*	Needlewood	Proteaceae	10	2		Shrub (SG)	No	
mair deca	*Maireana decalvans*	Black Cotton Bush	Chenopodiace	2	5		Shrub (SG)	No	
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.1	10		Shrub (SG)	No	
sida intr	*Sida intricata*		Malvaceae	0.1	30		Shrub (SG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	50		Grass & grasslike (GG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	25		Forb (FG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.1	100		Forb (FG)	No	
cras sieb	*Crassula sieberiana*	Australian Stonecrop	Crassulaceae	0.1	50		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	25		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	20		Forb (FG)	No	
lept bail	*Leptorhynchos baileyi*	Woolly Buttons	Asteraceae	0.1	30		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	200		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	500		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.1	100		Forb (FG)	No	
tetr moor	*Tetragonia moorei*		Aizoaceae	0.5	500		Forb (FG)	No	
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.3	5	*		HTE	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	30	5000	*		No	
sile apet	*Silene apetala*		Caryophyllace	0.1	25	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	20	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	11	Pic 20x20		Pic 20x50		
Survey date:	29.9.2020		Compass Orientation (head of 20x20 plot)				270	
Recorders		th kv	PCT:	160				
GPS Easting	772367.825	GPS Northing	6143106.64		Datum		Zone	54

FUNCTION

Function attributes for	11

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	11
	Grass & grasslike (GG)	1
	Fern (EG)	1
	Other (OG)	0
	TOTAL	16

BAM Attribute (20x20m plot)

	Stratum	Sum	
Count of cover abundance (native vascular plants)	Tree (TG)	0	
	Shrub (SG)	23	
	Forb (FG)	4	
	Grass & grasslike (GG)	25	
	Fern (EG)	0.1	
	Other (OG)	0	
	TOTAL Native	52.1	check! one of the species i
	TOTAL 'HTE'	0.1	

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	11								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
duma flor	*Duma florulenta*	Lignum	Polygonaceae	10	5		Shrub (SG)	No	
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	10	20		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	3	6		Shrub (SG)	No	
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	25	15		Grass & grasslike (GG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	100		Forb (FG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.1	200		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	100		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	100		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	50		Forb (FG)	No	
minu lept	*Minuria leptophylla*		Asteraceae	0.1	100		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	500		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	3	500		Forb (FG)	No	
scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	0.1	5		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	50		Forb (FG)	No	
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	20		Fern (EG)	No	
brom dian	*Bromus diandrus*	Great Brome	Poaceae	0.1	5	*		HTE	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	3	1000	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	10	1000	*		No	
scol hisp	*Scolymus hispanicus*	Golden Thistle	Asteraceae	0.1	5	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	30	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	50	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey									
Project:	keri keri	Plot Identifier	12	Pic 20x20		Pic 20x50			
Survey date:	30/09/2020		Compass Orientation (head of 20x20 plot)				270		
Recorders	bnoel		PCT:	163					
GPS Easting	768578	GPS Northing	615130		Datum		Zone	54	
Dominant Species outside Plot									

FUNCTION

Function attributes for	12

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	23
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	31

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	0.9
	Forb (FG)	53
	Grass & grasslike (GG)	5.4
	Fern (EG)	0
	Other (OG)	1
	TOTAL Native	60.3
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm

0.5%=1.4x1.4m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

1%=2×2m
5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for 12

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	0.5	7		Shrub (SG)	No	
mair deca	*Maireana decalvans*	Black Cotton Bush	Chenopodiace	0.1	20		Shrub (SG)	No	
sals aust	*Salsola australis*		Chenopodiace	0.1	3		Shrub (SG)	No	
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.2	50		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	1	500		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	5	300		Grass & grasslike (GG)	No	
ente acic	*Enteropogon acicularis*	Curly Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
ryti carp	*Rytidosperma carphoide*	Short Wallaby Grass	Poaceae	0.3	50		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	20		Forb (FG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.1	5		Forb (FG)	No	
bulb bulb	*Bulbine bulbosa*	Bulbine Lily	Asphodelacea	0.1	15		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	3		Forb (FG)	No	
cham drum	*Chamaesyce drummond*	Caustic Weed	Euphorbiacea	0.1	4		Forb (FG)	No	
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	5		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.2	50		Forb (FG)	No	
good fasc	*Goodenia fascicularis*	Mallee Goodenia	Goodeniaceae	0.1	10		Forb (FG)	No	
good pinn	*Goodenia pinnatifida*	Scrambles Eggs	Goodeniaceae	5	500		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.5	100		Forb (FG)	No	
lept bail	*Leptorhynchos baileyi*	Woolly Buttons	Asteraceae	0.1	10		Forb (FG)	No	
mair pent	*Maireana pentagona*	Hairy Bluebush, Slender Fissure-	Chenopodiace	0.2	30		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	10		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	20	5000		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	25	5000		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	20		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	20		Forb (FG)	No	
sida fibu	*Sida fibulifera*	Pin Sida	Malvaceae	0.1	5		Forb (FG)	No	
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	0.1	1		Forb (FG)	No	
teuc race	*Teucrium racemosum*	Grey Germander	Lamiaceae	0.1	10		Forb (FG)	No	
vitt cerv	*Vittadinia cervicularis*		Asteraceae	0.1	15		Forb (FG)	No	
wahl	*Wahlenbergia spp.*	Bluebell	Campanulace	0.1	2		Forb (FG)	No	
zygo glau	*Zygophyllum glaucum*	Pale Twinleaf	Zygophyllacea	0.5	30		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	50	*		No	
conv	*Convolvulus spp.*	A Bindweed	Convolvulacea	0.1	50	*		No	
limo loba	*Limonium lobatum*	Winged Sea Lavender	Plumbaginace	0.1	2	*		No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fat	0.5	500	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fat	0.1	50	*		No	

sile apet	*Silene apetala*		Caryophyllace	0.1	20	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	13	Pic 20x20		Pic 20x50		
Survey date:	30/09/2020		Compass Orientation (head of 20x20 plot)				260	
Recorders	bnoel cvincent		PCT:	163				
GPS Easting	769766	GPS Northing	6152905		Datum		Zone	54

FUNCTION

Function attributes for	13

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	20
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	0
	TOTAL	27

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	20.7
	Forb (FG)	22.9
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	43.9
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	13								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	25		Forb (FG)	No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fab	20	5000	*		No	
good pinn	*Goodenia pinnatifida*	Scrambles Eggs	Goodeniaceae	5	1000		Forb (FG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.3	1000		Forb (FG)	No	
calo scab	*Calotis scabiosifolia*	Rough Burr-daisy	Asteraceae	0.1	50		Forb (FG)	No	
sisy irio	*Sisymbrium irio*	London Rocket	Brassicaceae	0.1	8	*		No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.5	300		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.5	500		Forb (FG)	No	
arth minu	*Arthropodium minus*	Small Vanilla Lily	Anthericaceae	0.1	30		Forb (FG)	No	
bulb bulb	*Bulbine bulbosa*	Bulbine Lily	Asphodelacea	0.1	20		Forb (FG)	No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fab	20	5000	*		No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	10	1000		Forb (FG)	No	
conv	*Convolvulus spp.*	A Bindweed	Convolvulacea	0.5	2000	*		No	
lept bail	*Leptorhynchos baileyi*	Woolly Buttons	Asteraceae	5	20		Forb (FG)	No	
sene	*Senecio spp.*	Groundsel, Fireweed	Asteraceae	0.1	10	*		No	
vitt	*Vittadinia spp.*	Fuzzweed	Asteraceae	0.1	2		Forb (FG)	No	
cony	*Conyza spp.*	A Fleabane	Asteraceae	0.1	2	*		No	
ryti	*Rytidosperma spp.*		Poaceae	0.1	10		Grass & grasslike (GG)	No	
sile apet	*Silene apetala*		Caryophyllace	0.1	40	*		No	
myri rhiz	*Myriocephalus rhizocephl*	Woolly-heads	Asteraceae	0.1	20		Forb (FG)	No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	4	*		No	
plantago	#N/A	#N/A	#N/A	0.2	1	#N/A		FALSE	#N/A
zygo glau	*Zygophyllum glaucum*	Pale Twinleaf	Zygophyllacea	0.3	30		Forb (FG)	No	
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	0.1	1	*		No	
sida fibu	*Sida fibulifera*	Pin Sida	Malvaceae	0.1	5		Forb (FG)	No	
carr annu	*Carrichtera annua*	Ward's Weed	Brassicaceae	0.1	2	*		HTE	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	20	50		Shrub (SG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	10		Grass & grasslike (GG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.2	200	*		No	
linu marg	*Linum marginale*	Native Flax	Linaceae	0.1	1		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	50		Forb (FG)	No	
aspe conf	*Asperula conferta*	Common Woodruff	Rubiaceae	0.1	10		Forb (FG)	No	
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.1	4		Shrub (SG)	No	
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	2		Forb (FG)	No	
ryti	*Rytidosperma spp.*		Poaceae	0.1	5		Grass & grasslike (GG)	No	
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	0.1	10	*		No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	1		Shrub (SG)	No	

duma flor	*Duma florulenta*	Lignum	Polygonaceae	0.5	2		Shrub (SG)	No	
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	2		Forb (FG)	No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	1	*		No	
brom cath	*Bromus catharticus*	Praire Grass	Poaceae	0.1	3	*		No	
vulp	*Vulpia spp.*	Rat's-tail Fescue	Poaceae	0.1	15	*		No	
cala volu	*Calandrinia volubilis*		Portulacaceae	0.1	3		Forb (FG)	No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	14	Pic 20x20		Pic 20x50		
Survey date:	28/09/2020		Compass Orientation (head of 20x20 plot)				310	
Recorders	bnoel thume		PCT:	163				
GPS Easting	768076	GPS Northing	6144391		Datum		Zone	54

FUNCTION

Function attributes for	14

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	14
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	20

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	21.3
	Forb (FG)	41.9
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	63.4
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	14								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
podo muel	*Podolepis muelleri*	Small Copper-wire Daisy	Asteraceae	20	500		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	15	500		Forb (FG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	1	300		Shrub (SG)	No	
mair pent	*Maireana pentagona*	Hairy Bluebush, Slender Fissure-	Chenopodiace	0.1	20		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	10		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	5	300		Forb (FG)	No	
pani deco	*Panicum decompositum*	Native Millet	Poaceae	0.1	10		Grass & grasslike (GG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.5	30		Forb (FG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	20	10		Shrub (SG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	12		Forb (FG)	No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fal	3	200	*		No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	5		Forb (FG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.2	3		Shrub (SG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.5	300		Forb (FG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.1	2		Grass & grasslike (GG)	No	
carr annu	*Carrichtera annua*	Ward's Weed	Brassicaceae	0.1	10	*		HTE	
cala volu	*Calandrinia volubilis*		Portulacaceae	0.1	3		Forb (FG)	No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.5	200	*		No	
vitt	*Vittadinia spp.*	Fuzzweed	Asteraceae	0.1	5		Forb (FG)	No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.5	150	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fal	0.1	2	*		No	
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	5		Forb (FG)	No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	1	*		No	
calo sond	*Calocephalus sonderi*	Pale Beauty-heads	Asteraceae	0.1	1		Forb (FG)	No	
abut	*Abutilon spp.*	Lantern-bush	Malvaceae	0.1	1	*		FALSE	
pogo muel	*Pogonolepis muelleriana*		Asteraceae	0.1	3		Forb (FG)	No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	15	Pic 20x20		Pic 20x50		
Survey date:	30.9.20		Compass Orientation (head of 20x20 plot)				100	
Recorders		kv th	PCT:					
GPS Easting	765576.712	GPS Northing	6143424.75		Datum		Zone	54
Landform			**Soils**			**Drainage & Slope**		
Morphology	plains		Soil Texture			Slope		
LandF Element			Soil Colour			Aspect		
LandF Pattern			Soil Depth			Drainage		
Microrelief			Geology			Watercourses		

FUNCTION

Function attributes for	15

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	15
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	22

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	15.9
	Forb (FG)	11.4
	Grass & grasslike (GG)	0.6
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	28
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for 15

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.5	3		Shrub (SG)	No	
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	0.3	5		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	15	12		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	5		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	100		Other (OG)	No	
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	0.5	3		Grass & grasslike (GG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	15		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	20		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	20		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	15		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	50		Forb (FG)	No	
lept bail	*Leptorhynchos baileyi*	Woolly Buttons	Asteraceae	0.1	5		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	300		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	10	500		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	0.1	3		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	200		Forb (FG)	No	
scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	0.1	15		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	15		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	30		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	0.1	5		Forb (FG)	No	
zygo	*Zygophyllum spp.*		Zygophyllacea	0.1	10		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	100	*		No	
brom dian	*Bromus diandrus*	Great Brome	Poaceae	0.1	1	*		HTE	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.1	50	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	4	1000	*		No	
sile	*Silene spp.*		Caryophyllace	0.1	30	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	2	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	50	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	16	Pic 20x20		Pic 20x50		
Survey date:	30.9.20		Compass Orientation (head of 20x20 plot)				150	
Recorders		kv th	PCT:					
GPS Easting	763342.462	GPS Northing	6143769.14		Datum		Zone	54

FUNCTION

Function attributes for	16

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	9
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	14

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	13.2
	Forb (FG)	1.6
	Grass & grasslike (GG)	0.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	14.9
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	16								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	5	30		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	3	4		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	5	400		Shrub (SG)	No	
scle tric	*Sclerolaena tricuspis*		Chenopodiace	0.2	20		Shrub (SG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	20		Grass & grasslike (GG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.2	500		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	50		Forb (FG)	No	
minu lept	*Minuria leptophylla*		Asteraceae	0.1	5		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	100		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	200		Forb (FG)	No	
podo muel	*Podolepis muelleri*	Small Copper-wire Daisy	Asteraceae	0.1	75		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	0.1	5		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.3	400		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.5	300		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	30	*		No	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.1	20	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fal	0.5	200	*		No	
sile	*Silene spp.*		Caryophyllace	0.1	5	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	15	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	17	Pic 20x20		Pic 20x50		
Survey date:	1/10/2020		Compass Orientation (head of 20x20 plot)				85	
Recorders	bnoel		PCT:	164				
GPS Easting	765842	GPS Northing	6150373		Datum		Zone	54

FUNCTION

Function attributes for	17

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	16
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	23

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	15.2
	Forb (FG)	32
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0.2
	TOTAL Native	47.7
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	17								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	15	40		Shrub (SG)	No	
mair	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-	Chenopodiace	0.1	1		Shrub (SG)	No	
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.1	3		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.2	400		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	30		Grass & grasslike (GG)	No	
ente acic	*Enteropogon acicularis*	Curly Windmill Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No	
ryti	*Rytidosperma spp.*		Poaceae	0.1	20		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	500		Forb (FG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.1	1		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	15		Forb (FG)	No	
calo scab	*Calotis scabiosifolia*	Rough Burr-daisy	Asteraceae	0.1	5		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	50		Forb (FG)	No	
good fasc	*Goodenia fascicularis*	Mallee Goodenia	Goodeniaceae	0.1	50		Forb (FG)	No	
good pinn	*Goodenia pinnatifida*	Scrambles Eggs	Goodeniaceae	0.1	50		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	5		Forb (FG)	No	
lept bail	*Leptorhynchos baileyi*	Woolly Buttons	Asteraceae	0.5	10		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	5		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.2	200		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	100		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	30	5000		Forb (FG)	No	
sida fibu	*Sida fibulifera*	Pin Sida	Malvaceae	0.1	5		Forb (FG)	No	
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	50		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	10		Forb (FG)	No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	30	*		No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fat	10	5000	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fat	10	5000	*		No	
sile apet	*Silene apetala*		Caryophyllace	0.1	5	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	4	*		No	
vulp	*Vulpia spp.*	Rat's-tail Fescue	Poaceae	0.1	30	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	18	Pic 20x20		Pic 20x50		
Survey date:	29/09/2020		Compass Orientation (head of 20x20 plot)				315	
Recorders	bnoel cvincent		PCT:	164				
GPS Easting	228127	GPS Northing	6150967		Datum		Zone	54

FUNCTION

Function attributes for	18

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	5
	Forb (FG)	23
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	32

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	25.4
	Forb (FG)	22.3
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	48.1
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	18								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair pyra	*Maireana pyramidata*	Black Bluebush	Chenopodiace	25	100		Shrub (SG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.1	2		Shrub (SG)	No	
sals aust	*Salsola australis*		Chenopodiace	0.1	1		Shrub (SG)	No	
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.1	20		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	5		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	300		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	4		Grass & grasslike (GG)	No	
ente acic	*Enteropogon acicularis*	Curly Windmill Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No	
ryti	*Rytidosperma spp.*		Poaceae	0.1	1		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	3		Forb (FG)	No	
arth minu	*Arthropodium minus*	Small Vanilla Lily	Anthericaceae	0.1	200		Forb (FG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.1	200		Forb (FG)	No	
brac mult	*Brachyscome multifida*	Cut-leaved Daisy	Asteraceae	0.1	1		Forb (FG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.3	200		Forb (FG)	No	
cala volu	*Calandrinia volubilis*		Portulacaceae	0.1	50		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	5		Forb (FG)	No	
calo scab	*Calotis scabiosifolia*	Rough Burr-daisy	Asteraceae	0.1	4		Forb (FG)	No	
chry apic	*Chrysocephalum apicula*	Common Everlasting	Asteraceae	0.1	10		Forb (FG)	No	
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	300		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	10	1000		Forb (FG)	No	
good glau	*Goodenia glauca*	Pale Goodenia	Goodeniaceae	0.1	5		Forb (FG)	No	
good pinn	*Goodenia pinnatifida*	Scrambles Eggs	Goodeniaceae	0.1	5		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	10	1000		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
oxal pere	*Oxalis perennans*		Oxalidaceae	0.1	5		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.1	100		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	200		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.1	10		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	4		Forb (FG)	No	
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No	
teuc race	*Teucrium racemosum*	Grey Germander	Lamiaceae	0.1	200		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	2		Forb (FG)	No	
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	0.1	3	*		No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fal	20	5000	*		No	
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	0.5	500	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	1	400	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	4	*		No	

vulp	*Vulpia spp.*	Rat's-tail Fescue	Poaceae	0.1	5	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	19	Pic 20x20		Pic 20x50		
Survey date:	1.10.2020		Compass Orientation (head of 20x20 plot)				180	
Recorders		kv th	PCT:	164				
GPS Easting	773828.913	GPS Northing	6153635.9		Datum		Zone	54

FUNCTION

Function attributes for	19

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	6
	Forb (FG)	13
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	23

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	25.5
	Forb (FG)	5.5
	Grass & grasslike (GG)	0.4
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	31.5
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m		0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	19								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	20	50		Shrub (SG)	No	
mair pyra	*Maireana pyramidata*	Black Bluebush	Chenopodiace	0.1	10		Shrub (SG)	No	
mala tric	*Malacocera tricornis*	Soft Horns	Chenopodiace	0.1	20		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	5	2030		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.2	50		Shrub (SG)	No	
scle tric	*Sclerolaena tricuspis*		Chenopodiace	0.1	30		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	5		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	30		Grass & grasslike (GG)	No	
ryti	*Rytidosperma spp.*		Poaceae	0.1	10		Grass & grasslike (GG)	No	
aust aris		Plains Grass	Poaceae	0.2	1		Grass & grasslike (GG)	FALSE	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	200		Forb (FG)	No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.1	30		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	30		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	20		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	10		Forb (FG)	No	
Mair cili	*Maireana ciliata*	Fissure Weed	Chenopodiace	0.1	10		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	30		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.4	500		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	0.1	15		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	4	200		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	50		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	25		Forb (FG)	No	
minu lept			Asteraceae	0.1	3		Forb (FG)	FALSE	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	1	200	*		No	
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	15	500	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fat	20	1000	*		No	
mese nodi	*Mesembryanthemum no*	Small Ice Plant	Aizoaceae	0.1	3	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	20	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	20	Pic 20x20		Pic 20x50		
Survey date:	29.9.2020		Compass Orientation (head of 20x20 plot)				60	
Recorders		KV TH	PCT:	164				
GPS Easting	777465.589	GPS Northing	6154385.64		Datum		Zone	54

FUNCTION

Function attributes for	20

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	6
	Forb (FG)	9
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	18

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	5.4
	Forb (FG)	70.9
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	76.6
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	20								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	3	30		Shrub (SG)	No	
malv prei	*Malva preissiana*	Native Hollyhock	Malvaceae	0.1	1		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	2	10		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	5		Shrub (SG)	No	
scle cons	*Sclerolaena constricta*		Chenopodiace	0.1	5		Shrub (SG)	No	
sida intr	*Sida intricata*		Malvaceae	0.1	10		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	3		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	20		Grass & grasslike (GG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.1	5		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	50		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	50		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.2	50		Forb (FG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	5		Forb (FG)	No	
mair cili	*Maireana ciliata*	Fissure Weed	Chenopodiace	0.1	10		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	5		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	10	500		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	60	500		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.2	1000		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	100	*		No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.5	30	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fat	20	1000	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	5	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	10	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	21	Pic 20x20		Pic 20x50		
Survey date:	30.9.20		Compass Orientation (head of 20x20 plot)				50	
Recorders		kv th	PCT:	160				
GPS Easting	769528.797	GPS Northing	6142134.82		Datum		Zone	54

FUNCTION

Function attributes for	21

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	11
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	1
	TOTAL	17

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	7.2
	Forb (FG)	21.5
	Grass & grasslike (GG)	0.1
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	28.9
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	6.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	21								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No	
duma flor	*Duma florulenta*	Lignum	Polygonaceae	3	15		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	4	12		Shrub (SG)	No	
scle tric	*Sclerolaena tricuspis*		Chenopodiace	0.1	3		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	15		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	15		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	100		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	50		Forb (FG)	No	
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace	0.2	60		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	20		Forb (FG)	No	
minu lept	*Minuria leptophylla*		Asteraceae	0.1	10		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	30		Forb (FG)	No	
oxal	*Oxalis spp.*		Oxalidaceae	0.1	10		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	20	1000		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	30		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	10		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	0.5	30		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	50	*		No	
brom dian	*Bromus diandrus*	Great Brome	Poaceae	0.1	2	*		HTE	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	5	500	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fat	20	1000	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	30	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	22	Pic 20x20		Pic 20x50		
Survey date:	1/10/2020		Compass Orientation (head of 20x20 plot)				135	forb grassland
Recorders	bnoel		PCT:	46				
GPS Easting	764358	GPS Northing	6146604		Datum		Zone	54

FUNCTION

Function attributes for	22

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	6
	Forb (FG)	22
	Grass & grasslike (GG)	5
	Fern (EG)	0
	Other (OG)	0
	TOTAL	33

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0.6
	Forb (FG)	5.5
	Grass & grasslike (GG)	11
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	17.1
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	22								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiace	0.1	2		Shrub (SG)	No	
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	0.1	1		Shrub (SG)	No	
mair	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-	Chenopodiace	0.1	3		Shrub (SG)	No	
sals aust	*Salsola australis*		Chenopodiace	0.1	5		Shrub (SG)	No	
scle bico	*Sclerolaena bicornis*	Goathead Burr	Chenopodiace	0.1	12		Shrub (SG)	No	
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.1	200		Shrub (SG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.2	100		Grass & grasslike (GG)	No	
ente acic	*Enteropogon acicularis*	Curly Windmill Grass	Poaceae	0.2	20		Grass & grasslike (GG)	No	
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	10	500		Grass & grasslike (GG)	No	
ryti seta	*Rytidosperma setaceum*	Small-flowered Wallaby-grass	Poaceae	0.1	1		Grass & grasslike (GG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.5	200		Grass & grasslike (GG)	No	
brac dent	*Brachyscome dentata*		Asteraceae	0.1	5		Forb (FG)	No	
brac mult	*Brachyscome multifida*	Cut-leaved Daisy	Asteraceae	0.1	2		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	50		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	20		Forb (FG)	No	
chry apic	*Chrysocephalum apicula*	Common Everlasting	Asteraceae	1	500		Forb (FG)	No	
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	10		Forb (FG)	No	
good fasc	*Goodenia fascicularis*	Mallee Goodenia	Goodeniaceae	0.1	100		Forb (FG)	No	
leio pana	*Leiocarpa panaetioides*	Wooly Buttons	Asteraceae	0.1	20		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	1	400		Forb (FG)	No	
oxal	*Oxalis spp.*		Oxalidaceae	0.1	200		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.1	4		Forb (FG)	No	
podo muel	*Podolepis muelleri*	Small Copper-wire Daisy	Asteraceae	0.1	1		Forb (FG)	No	
ptil nobi	*Ptilotus nobilis*	Yellowtails	Amaranthace	0.1	8		Forb (FG)	No	
ptil spat	*Ptilotus spathulatus f. sp*	Pussy-tails	Amaranthace	0.2	50		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	0.2	8		Forb (FG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	200		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.5	500		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	1		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	3		Forb (FG)	No	
wahl	*Wahlenbergia spp.*	Bluebell	Campanulace	0.1	50		Forb (FG)	No	
zygo glau	*Zygophyllum glaucum*	Pale Twinleaf	Zygophyllacea	1	500		Forb (FG)	No	
conv	*Convolvulus spp.*	A Bindweed	Convolvulacea	0.2	50	*		No	
cony	*Conyza spp.*	A Fleabane	Asteraceae	40	5000	*		No	
cucu	*Cucumis spp.*		Cucurbitaceae	0.1	2	*		No	
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	0.1	5	*		No	

loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	5	10	*		No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fat	0.2	8	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fat	0.1	1	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	4	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	23	23	Pic 20x20		Pic 20x50		
Survey date:	28.9.20		Compass Orientation (head of 20x20 plot)				65	
Recorders		kv, bn, th, cv	PCT:	163				
GPS Easting	767555	GPS Northing	6143953		Datum		Zone	54

FUNCTION

Function attributes for	23

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	6
	Forb (FG)	10
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	19

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0.7
	Forb (FG)	30.9
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0.2
	TOTAL Native	32
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	23								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.2	2		Shrub (SG)	No	
duma horr horr	*Duma horrida subsp. hor*		Polygonaceae	0.2	2		Shrub (SG)	No	
mair deca	*Maireana decalvans*	Black Cotton Bush	Chenopodiace	0.1	5		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	5		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiaceae				Shrub (SG)	No	
scle diva	*Sclerolaena divaricata*	Tangled Copperburr	Chenopodiace	0.1	5		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulacea	0.2	100		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.1	10		Grass & grasslike (GG)	No	
arab nast	*Arabidella nasturtium*		Brassicaceae	0.1	100		Forb (FG)	No	
chry apic	*Chrysocephalum apicula*	Common Everlasting	Asteraceae	0.1	5		Forb (FG)	No	
good hete	*Goodenia heteromera*		Goodeniaceae	0.1	75		Forb (FG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	50		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	3		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	30	1000		Forb (FG)	No	
scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	0.1	5		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	200		Forb (FG)	No	
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	25		Forb (FG)	No	
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	20		Forb (FG)	No	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.5	100	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	2	*		No	
medi	*0*	A Medic	Fabaceae (Fab	20	1,000	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	24	Pic 20x20		Pic 20x50		
Survey date:	19/07/1957		Compass Orientation (head of 20x20 plot)				330	
Recorders	thume bnoel		PCT:	160				
GPS Easting	773847	GPS Northing	6155290		Datum		Zone	54

FUNCTION

Function attributes for	24

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	9
	Forb (FG)	7
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	18

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	30.7
	Forb (FG)	15.8
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	46.8
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	24								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	2		Shrub (SG)	No	
atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	2		Shrub (SG)	No	
mair deca	*Maireana decalvans*	Black Cotton Bush	Chenopodiace	0.1	10		Shrub (SG)	No	
mala tric	*Malacocera tricornis*	Soft Horns	Chenopodiace	0.1	5		Shrub (SG)	No	
malv prei	*Malva preissiana*	Native Hollyhock	Malvaceae	0.1	10		Shrub (SG)	No	
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	10	13		Shrub (SG)	No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.2	1		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	5	1000		Shrub (SG)	No	
scle long	*Sclerolaena longicuspis*		Chenopodiace	15	60		Shrub (SG)	No	
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	0.1	3		Grass & grasslike (GG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.2	20		Grass & grasslike (GG)	No	
atri lind	*Atriplex lindleyi*	Eastern Flat-top Saltbush	Chenopodiace	15	1000		Forb (FG)	No	
brac debi	*Brachyscome debilis*	Weak Daisy	Asteraceae	0.1	1		Forb (FG)	No	
bulb semi	*Bulbine semibarbata*	Wild Onion	Asphodelacea	0.1	1		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.3	500		Forb (FG)	No	
rhod cory	*Rhodanthe corymbiflora*	Small White Sunray	Asteraceae	0.1	5		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.1	2		Forb (FG)	No	
zygo ammo	*Zygophyllum ammophilu*	Sand Twinleaf	Zygophyllacea	0.1	1		Forb (FG)	No	
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	0.1	1	*		HTE	
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	0.1	1	*		No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	15	5000	*		No	
limo loba	*Limonium lobatum*	Winged Sea Lavender	Plumbaginace	0.1	40	*		No	
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	1	1000	*		No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fat	40	5000	*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fat	0.1	1	*		No	
mese nodi	*Mesembryanthemum no*	Small Ice Plant	Aizoaceae	0.1	2	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	50	*		No	
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	4	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	keri keri	Plot Identifier	25	Pic 20x20		Pic 20x50		
Survey date:	1/10/2020		Compass Orientation (head of 20x20 plot)				225	
Recorders			PCT:	164				
GPS Easting	773525	GPS Northing	6151927		Datum		Zone	54

FUNCTION

Function attributes for	25

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	5
	Forb (FG)	12
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	21

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	10.4
	Forb (FG)	6.5
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	17.3
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	25								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	10	15		Shrub (SG)	No	
sals aust	*Salsola australis*		Chenopodiace	0.1	20		Shrub (SG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.1	1		Shrub (SG)	No	
scle muri	*sclerolena*	Black Rolypoly	Chenopodiace	0.1	30		Shrub (SG)	No	
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	75		Other (OG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	1		Grass & grasslike (GG)	No	
erag	*Eragrostis spp.*	A Lovegrass	Poaceae	0.1	30	*	Grass & grasslike (GG)	No	
scle tric	*Scleria tricuspidata*		Cyperaceae	0.1	100		Grass & grasslike (GG)	No	
brac mult	*Brachyscome multifida*	Cut-leaved Daisy	Asteraceae	0.1	1		Forb (FG)	No	
bulb bulb	*Bulbine bulbosa*	Bulbine Lily	Asphodelacea	0.1	2		Forb (FG)	No	
calo hisp	*Calotis hispidula*	Bogan Flea	Asteraceae	0.1	50		Forb (FG)	No	
calo scab	*Calotis scabiosifolia*	Rough Burr-daisy	Asteraceae	0.1	1		Forb (FG)	No	
cham drum	*Chamaesyce drummond*	Caustic Weed	Euphorbiacea	0.1	2		Forb (FG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.5	300		Forb (FG)	No	
oxal pere	*Oxalis perennans*		Oxalidaceae	0.1	3		Forb (FG)	No	
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.1	250		Forb (FG)	No	
rhod stua	*Rhodanthe stuartiana*		Asteraceae	0.1	10		Forb (FG)	No	
scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	5	1500		Forb (FG)	No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No	
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	3		Forb (FG)	No	
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	0.1	40	*		No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	15	5000	*		No	
malv prei	*Malva preissiana*	Native Hollyhock	Malvaceae	0.1	2		Shrub (SG)	No	
medi mini	*Medicago minima*	Woolly Burr Medic	Fabaceae (Fab	15	5000	*		No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	.t5		*		No	
medi trun	*Medicago truncatula*	Barrel Medic	Fabaceae (Fab	5	1500	*		No	
sida	*Sida spp.*		Malvaceae	0.1	1	*		No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	50	*		No	
sisy irio	*Sisymbrium irio*	London Rocket	Brassicaceae	0.1	22	*		No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site Field Survey								
Project:	20-038	Plot Identifier	26	Pic 20x20		Pic 20x50		
Survey date:	15.10.20		Compass Orientation (head of 20x20 plot)				110	
Recorders		KV DB	PCT:	163				
GPS Easting	766362	GPS Northing	6144946		Datum	gda934	Zone	54

FUNCTION

Function attributes for	26

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	9
	Forb (FG)	14
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	0
	TOTAL	26

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	3.7
	Forb (FG)	11.3
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	15.3
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

5%=4×5m
25%=10×10m

COMPOSITION & STRUCTURE

Species recorded for	26								
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status
rhod stua	*Rhodanthe stuartiana*		Asteraceae	10	3000		Forb (FG)	No	
plan drum	*Plantago drummondii*	Dark Sago-weed	Plantaginacea	0.1	100		Forb (FG)	No	
mair chee	*Maireana cheelii*	Chariot Wheels	Chenopodiace	0.5	75		Shrub (SG)	No	V
nitr bill	*Nitraria billardierei*	Dillon Bush	Nitrariaceae	2	9		Shrub (SG)	No	
medi	*Medicago spp.*	A Medic	Fabaceae (Fat	0.2	200	*		No	
cala erem	*Calandrinia eremaea*	Small Purslane	Portulacaceae	0.1	50		Forb (FG)	No	
scle brac	*Sclerolaena brachyptera*	Short-winged Copperburr	Chenopodiace	0.3	100		Shrub (SG)	No	
calo cymb	*Calotis cymbacantha*	Showy Burr-daisy	Asteraceae	0.1	60		Forb (FG)	No	
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	15		Grass & grasslike (GG)	No	
rhod pygm	*Rhodanthe pygmaea*	Pigmy Sunray	Asteraceae	0.1	100		Forb (FG)	No	
mair pent	*Maireana pentagona*	Hairy Bluebush, Slender Fissure-	Chenopodiace	0.2	150		Shrub (SG)	No	
good pusi	*Goodenia pusilliflora*		Goodeniaceae	0.1	10		Forb (FG)	No	
alys lini	*Alyssum linifolium*	Flax-leaf Alyssum	Brassicaceae	0.1	15		Forb (FG)	No	
sida cunn	*Sida cunninghamii*	Ridge Sida	Malvaceae	0.1	10		Forb (FG)	No	
calo cune	*Calotis cuneata*	Mountain Burr-Daisy	Asteraceae	0.1	15		Forb (FG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	20		Grass & grasslike (GG)	No	
minu lept	*Minuria leptophylla*		Asteraceae	0.1	5		Forb (FG)	No	
calo citr	*Calocephalus citreus*	Lemon Beauty-heads	Asteraceae	0.1	5		Forb (FG)	No	
mair geor	*Maireana georgei*	Slit-wing Bluebush	Chenopodiace	0.1	5		Shrub (SG)	No	
erod crin	*Erodium crinitum*	Blue Crowfoot	Geraniaceae	0.1	2		Forb (FG)	No	
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.1	10	*		No	
erag	*Eragrostis spp.*	A Lovegrass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	5	*		No	
Atri	*Atriplex spp.*	A Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No	
sida intr	*Sida intricata*		Malvaceae	0.1	20		Shrub (SG)	No	
myri rhiz	*Myriocephalus rhizocepl*	Woolly-heads	Asteraceae	0.1	1		Forb (FG)	No	
rhag	*Rhagodia spp.*		Chenopodiace	0.1	1		Shrub (SG)	No	
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiace	0.3	8		Shrub (SG)	No	
scle atri	*Scleroblitum atriplicinum*	Purple Goosefoot	Chenopodiace	0.1	12		Forb (FG)	No	
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A

BAM Site - Field Survey Form

Survey Name	Stratification / Zone ID		Plot ID	Recorders	Date
Keri Keri Wind Farm	PCT:	164	ERM-4	Lorena/Damien	30/11/2021
	Condition:	Moderate			

Start	WP:	Zone:	55	E:	225643	N:	6151481	Midline bearing:	145

Plant Community Type

PCT ID#	164	**PCT Definition Status**	Approved
PCT Name	Cotton Bush open shrubland of the semi-arid (warm) zone		
PCT associated with TEC	No associated TEC		
TEC List:	0		
Vegetation Formation	Arid Shrublands (Chenopod sub-formation);		**Confidence**
Vegetation Class	Riverine Chenopod Shrublands;		H M L

BAM Attribute (20 x 20m plot)

Growth Form	Count of native richness	Sum of Cover
Trees	0	0
Shrubs	5	75.3
Grasses etc.	2	0.2
Forb	11	11.1
Ferns	0	0
Other	0	0
HTWs	0	0

Foilage Cover scale:
0.1, 0.2, 0.3…..0.9
1,2,3,…….9,
10, 15, 20, 25, ….. 100%

0.1% = 63x63 cm (or a circle 71 cm ∅)
0.5% = 1.4 x 1.4m,
2% = 2 x 2m,
5% = 4 x 5m,
25% = 10 x 10m

BAM Attribute (1000 m plot)

DBH	#Tree Stem Count	# Stems with Hollows
80 + cm		
50 - 79 cm		
30 - 49 cm		
20 - 29 cm		
10 - 19 cm		
5 - 9cm		
<5 cm		
Length of logs (m) (≥10cm, .50cm in length)	0	0

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multistemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)

	Litter cover %					Bare Ground %					Cryptogram %					Rock Cover %				
Subplot score	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
% in each	5	20	5	5	10	60	45	60	70	50										
Average of 5 subplots	9					57														

400m2 Plot: Sheet 1 of #								
Survey Name		**Stratification / Zone ID**	**Plot ID**	**Recorders**			**Date**	
Keri Keri Wind Farm		164	ERM-4	Lorena/Damien			30/11/21	
GF Code	**Family**	**Species**	Cover	Abundance	Stratum	N, E, HTW	BC Act	EPBC Act
(FG)	Asteraceae	*Brachyscome papillosa*	0.1	1		N	V	V
(GG)	Poaceae	*Agrostis spp.*	0.1	50		N	0	0
(GG)	Poaceae	*Austrostipa spp.*	0.1	50		N	0	0
(FG)	Asteraceae	*Brachyscome debilis*	0.1	15		N	0	0
(FG)	Asphodelaceae	*Bulbine semibarbata*	0.1	10		N	0	0
(FG)	Portulacaceae	*Calandrinia volubilis*	0.1	5		N	0	0
(FG)	Geraniaceae	*Erodium crinitum*	0.1	50		N	0	0
(FG)	Euphorbiaceae	*Chamaesyce drummondii*	0.1	50		N	0	0
(FG)	Goodeniaceae	*Goodenia fascicularis*	0.1	10		N	0	0
(SG)	Chenopodiaceae	*Maireana aphylla*	50	60		N	0	0
#N/A	Fabaceae (Faboideae)	*Medicago truncatula*	2	300		E	0	0
(FG)	Asteraceae	*Rhodanthe floribunda*	10	1000		N	0	0
(SG)	Chenopodiaceae	*Sclerolaena brachyptera*	0.1	50		N	0	0
(SG)	Chenopodiaceae	*Sclerolaena diacantha*	0.1	50		N	0	0
(SG)	Chenopodiaceae	*Sclerolaena tricuspis*	0.1	10		N	0	0
(FG)	Malvaceae	*Sida fibulifera*	0.1	30		N	0	0
(SG)	Malvaceae	*Sida intricata*	25	100		N	0	0
#N/A	Brassicaceae	*Sisymbrium irio*	0.1	20		E	0	0
(FG)	Solanaceae	*Solanum esuriale*	0.2	200		N	0	0
(FG)	Asteraceae	*Vittadinia cuneata*	0.1	20		N	0	0
#N/A	Poaceae	*Vulpia myuros*	0.1	50		E	0	0

BAM Site – Field Survey Form

Survey Name		Date 6/2/23	Recorders
Zone:	Datum:	Plot ID: Feb1	Photo #: 1-3
Easting:	Northing:	IBRA region: RIVERINA	Midline bearing from 0 m: NW
VZ / PCT: 163			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values NAT/NON-NAT	
	Count of native richness	Cover
Trees	0	0
Shrubs * (ALL NATIVE)		15%.
Grasses etc.		1% + 10%.
Forbs		5% + 5%
Ferns	0	0
Other SUBSHRUB (ALL NATIVE)		3%.
High threat weed cover *		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	50	50	50	35	30	10	20	10	10	30	2	2	1	10	10	0	0	0	0	0
Average of the 5 subplots	43%.					18%.					5%					0%				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 6/2/23			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(S1)	Nitraria billardierei	N	3.1	S		
G	Vulpia sp.	E	3.1	—		
(F1)	Vittadinia / Minuria - mauve	N	5%	F		
G	Lolium sp.	E	5			
(G1)	Chloris sp.	N	1			
F	Limonium plumbatum	E.	15			
F	Plantago ? lanceolata	N.	0.1			
F	Medicago (seeds only)		—			
F	Solanum ? sida		0.1			
F	Asteraceae sp. - dead, woody		0.2			
SS	Sclerolaena ? birchii		0.1			
SS	Atriplex sp. cordleyae		0.5			
F	Portulaca - native?		0.1			
F	Euphorbia drummondii		0.1			
G?	Eragrostis - native?		0.1			
F	Oxalis sp.	N.	0.1			
F?	Villadunia sp. 2 - white		0.5			
F	Sulene - weed		0.1			
S	Salsola tragus ?		0.5			
S	Sclerolaena muricata var. muricata		0.2	S		
F	Sisymbrium sp.		0.1			
SS	Eriocadia sp. inulans ?		0.1			
G	Weedy grass	E.	5			
F	Ice Plant - Mesumbrianthemum small	E	2.1			
F?	Rhodanthe - small		1			
F	Echium - Patersons curse		0.3			
S.	Chenopodium auricomum ?		2	S		
S	Maireana brevifolia		0.1	S		
S	Ligrum muelleriebakia		0.2	S		
S.	Exocarpus aphyllus ?		0.2			
F.	Sida sp. 2		0.1			
SS	Teucrium racemosum		0.1			
G2	Austrostipa scabra		0.3			
S.	Enchylaena tomentosa (grey)		0.1	S.		

N: native, **E:**exotic, **HTE:** high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Feb1	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S2	Chenopodium nitrariaceum		1	S		
F	Sida sp. 3		0.1			
SS	Sclerolaena diacantha		0.1			
S3	Rhagodia spinescens		2	S		
G	Aristida sp. - native		0.1			
	Crassula colerata	N	0.1	F		

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
			Photo #:
Zone:	Datum:	Plot ID:	Midline bearing from 0 m:
Easting:	Northing:	IBRA region:	
VZ / PCT:			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each																				
Average of the 5 subplots																				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: Fab 2	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 163			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

N/E

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	0	0
Shrubs All Native		10
Grasses etc.		15/3
Forbs		15/3
Ferns	0	0
Other Sub Shrub all native		1
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	25	5	5	20	50	45	75	85	60	30	5	5	2	5	2	0	0	0	0	0
Average of the 5 subplots	21·1.					59·1.					4·1.					0·1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
G	Bromus? rubens	E	1			
(G)	Austrostipa? scabra	N	10			
(G)	Rytidosperma sp	N	1			
(S)	Nitraria billardierei	N	3	S		
G	Walwhalleya proluta	N	0.1			
G	Vulpia sp	E	0.1			
(SS)	Schleroleana bicornis	N	1			
(F)	Rhodanthe sp	N	10			
F	Limonium lobatum	E	3			
F	Asteraceae weed	E	0.1			
(F)	Pimelea ?	N	5			
G	Austrostipa elegantissima	N	1			
F	Spergularia sp		0.1			
(F)	Plantago tenifera	N	0.5			
(SS)	Sclerochlamys brachyptera	N	0.3			
G	Panicum ?	N	1			
S	Salsola tragus	N	2			
(G)	Chloris truncata	N	1			
G	Chloris / Digitaria		0.5			
F	Vittadinia 3	N	1			
S	Exocarpus aphyllus ?	N	0.2	S		
F	Solanum / sida	N	0.1			
G	Lolium sp	E	0.5			
F	Silky Marreana sclerolenoides	N	0.1			
S	Marreana brevifolia	N	0.1			
F	Mesembryanthemum nodiflorum	E	0.1			
F	Vittadinia 4	N	0.2			
(S)	Rhagodia spinescens	N	2	S		
		?1				
(S)	Sclerolaena tricuspis	N	0.5	S		
F	Convolvulus	N	0.1			
G	Avena sp	E	0.5			
F	Sida sp	N	0.1			
F	Sisybrium sp	E	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders	
FEB3		6/2/23		
Zone:	Datum:	Plot ID: Feb3		Photo #: 7–9
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:	
VZ / PCT: 164.				

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs ALL NATIVE		15 %
Grasses etc.		20 % / 0.5
Forbs		3 % / 0.5
Ferns		—
Other SUBSHRUBS		0.1
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	5	15	30	25	15	40	25	25	55	50	45	40	35	5	10	0	0	0	0	0
Average of the 5 subplots	18 %					39 %					27 %					0 %				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet 1 of 1	Survey Name	Plot ID	Recorders
Date: 6/2/23		FEB3.	FR

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(F)	BULBINE SEMICARTA?	N	0.1			
F	CALOCEPHALUS SONDERI	N	0.2			
(S)	NITRARIA BILLARDIERI	N	10	S.		
F	ASTERACEAE WEED	E.	0.1			
(G)	ERAGROSTIS AUSTRALASICA	N	10.			
(S)	MINUARIA SP. CUNNINGHAMII? (SUCCUL)	N	3			
G	BROMUS RUBENS	E	0.1			
S	SCLEROLAENA TRICUSPIS	N	0.5	S		
G	VULPIA SP.	E	0.1			
(G)	CHLORIS TRUNCATA	N	3			
G	CHLORIS / DIGITARIA	N	0.1			
G	RHYTIDOSPERMA SP	N	1			
(G)	MAIWAIWA PROLUTA	N	3			
(S)	MEIRENA SCLEROLAENOIDES	N	0.1			
(F)	RHODANTHE SP	N	2			
F	BRACHYSCOME?	N	0.1			
F	PLANTAGO TERRIFERA	N	0.1			
F	LIMONIUM LOBATUM	E	0.1			
(S)	PHIGOPA SPINESCENS	N	0.2	S		
S	MEIRENA APHYLLA? (EXOCARPUS)	N	0.2	S		
G	AUSTROSTIPA ELEGANTISSIMA	N	1			
S	SCLEROLAENA MURICATA	N	0.1	S		
G	ERAGROSTIS SP. 1	N	0.1			
S	MINUARIA SP 2 (NOT SUCCULENT)	N	0.2			
(M)	ACACIA/ACACIA	N	5			
G	PANICUM SP	N	0.1			
F	PHYLLANTHUS SP (SPURGE)	N	0.1			
S	ENCHYLAENA TOMENTOSA	N	0.1	S.		
(F)	SCLEROLAENA BRACHYPTERA	N	0.1			
G	AUSTROSTIPA SCABRA	N.	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: RED4.	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 163			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	0	0
Shrubs Native only		10
Grasses etc.		5
Forbs		5/0.1
Ferns	0	0
Other Sub Shrubs Native only		0.1
High threat weed cover*		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot) DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	2	3	5	5	15	70	65	65	75	65	25	25	5	15	15					
Average of the 5 subplots	6.5 1.					68 1.					17 %.					0 1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 6/2/23		Feb04.	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
F	Utadinia sp	N	0.1			
(G)	Rytidosperma	N	1			
(G)	Chloris truncata	N	3			
(G)	Wowalkia proleta	N	0.5			
(F)	Rhodanthe	N	5			
(F)	Bulbine sp	N	0.1			
(SS)	Atriplex leptocarpa	N	0.1			
(S)	Maireana aphylla ?	N	10			
(S)	Sclerolaena tricuspis	N	1			
SS	Maireana sclerolaenoides	N	0.1			
(SS)	Austrocarpum acroptera	N	0.1			
G	Eragrostis	N	0.1			
F	Asteraceae weed	E	0.1			
F	Calocephalus sonderi	N	0.1			
F	Brachyscome (Feb03)	N	0.1			
F	Brachyscome lineariloba	N	0.1			
S	Maireana white fuzzy	N	0.1			
S	Rhagodia spinescens	N	0.1			
(S)	Nitraria billardieri	N	0.1			
(F)	Plantago terifera	N	0.1			
F	M./Brachy	N	0.1			
F	Sclerolaena brachyptera	E	0.1			
F	Limonium lobatum	N	0.1			
(SS)	Atriplex lindleyi subsp lindleyi	N	0.1			
SS	Sclerolaena bicornis	N	0.1			
F	Brachyscome sp	N	0.1			
F	Sida	N	0.1			
F	Speragalerina					

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: Feb5	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 164.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	0	0
Shrubs		15
Grasses etc.		5
Forbs		10
Ferns		0.2
Other Sub Shrub		0.1
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	5	5	10	15	10	50	50	40	25	20	10	15	10	5	10	0	0	0	0	0
Average of the 5 subplots	9					37					10					0				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 6/2/23		Feb 5	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(S)	Maireana appressa	N	15	S		
(G)	Rytidosperma	N	3			
G	Walwhalleya proluta	N	0.5			
(Forb)	Marsilea	N	0.2			
(G)	Chloris truncata	N	0.5			
(Forb)	Vittadinia	N	5			
(Forb)	Rhodanthe	N	5			
(Forb)	Plantago turrifera	N	0.3			
G	Panicum	N	0.1			
S	[redacted] Sclerolaena stelligera	N	0.2			
F	Bulbine sp	N	0.1			
F	[redacted] Asteraceae weed	E	0.1			
F	Sida sp	N	0.1			
(S)	Nitraria billardiera	N	0.1	S		
F	Spergularia	N	0.1			
F	[redacted] Goodenia sp 1	N	0.1			
G	Lachnagrostis sp	N	0.1			
~~G~~	~~Planted Festuca~~	~~N~~	—			
F	Selenium / Sida	N	0.1			
S	Maireanna georgei	N	0.1	S		
F	Unknown open capsule		0.1			
S	[redacted] Selsolus tragus	N	0.1	S		
F	Limonium lobatum	E	0.1			
F	Goodenia sp 2	N	0.1			
(G)	Austrostipa scabra	N	1			
(SS)	Sclerolaena birchii	N	0.1			
(S)	Rhagodia spinescens	N	0.1	S		
F	Convolvulus	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders	
		7/2/2023		
Zone:	Datum:	Plot ID: F.b.6		Photo #: 16-19
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:	
VZ / PCT: 163.				

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

Nat n/i wd.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	0	0
Shrubs		0.5
Grasses etc.		10/0.1
Forbs		55/10
Ferns	0	0
Other Cheilopods		2
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	55	50	40	30	40	30	15	30	30	15	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	45 %					22 %					0 %					0 %				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 7/2/2023	Feb 7		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(F)	Rhodanthe sp	N	50			
(F)	Convolvulus sp	N	0.2			
(C)	Atriplex ~~sp~~ lindleyi subsp. inflata	N	0.1	SG		
(C)	Sclerolaena muricata var villosa	N	0.5	SG		
F	Centaurea? melitensis	E	0.10			
(G)	Rytidosperma	N	10			
(G)	Austrostipa scabra	N	1			
(C)	Salsola tragus	N	0.2			
(F)	Brachy/Vit	N	0.2			
F	Bulbine sp	N	0.1			
C	Atriplex ~~sp~~ leptocarpa	N	0.1	SG		
F	Limonium lobatum	E	0.1			
F	Asteraceae weed	~~N~~ E	0.3			
C	Sclerolaena muricata var muricata	N	0.1	SG		
F	Sida sp	N	0.1			
G	Lolium sp	E	0.1			
F	Sagina sp	E	0.1			
C	Maireana ~~sp~~ georgei	N	0.1	SG		
(S)	Nitraria billardierei	N	0.2	S		
(G)	Wallwhalia ~~sp~~ proluta	N	0.1			
F	Sida sp 2 long stipule	N	0.1			
F	Echium plantagineum	E	0.1			
F	Erodium sp	E	0.1			
F	Solanum nigrum	E	0.1			
F	Hollyhock	exh	0.1			
C	Atriplex ~~sp~~ semibarata	N	0.1	SG		
(S)	Rhagodia spinescens	N	0.1	S		
F	Plantago drummondii	N	0.1			
S	Lycium ferocissimum	E	0.1			
F	Jerusalem cleome	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	FR
Zone:	Datum:	Plot ID: Feb-7	
Easting:	Northing:	IBRA region:	Photo #: 20-22
VZ / PCT: 44.		Midline bearing from 0 m:	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		1.1.
Forbs		30.1. 10.1
Ferns		5.1. 10.1
Other CS.		
High threat weed cover		10.1.

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	25	15	15	25	15	60	70	75	40	75	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	19.1					60.1					0.1.					0.1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet 1 of 1	Survey Name	Plot ID	Recorders
Date: 7/2/23.		Feb 7	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(G)	Austrostipa scabra	N	25%			
(G)	Rytidosperma sp.	N	5%			
(F)	Rhodanthe	N	1%			
(S)	Sclerolaena microcalyx var ulosa	N	1%	SG		
(C)	Sclerolaena bicornis	N	2%	SG		
(C)	Salsola tragus	N	3%	SG		
(F)	Minuria sp 2 (non-fleshy)	N	2%			
F	Asteraceae weed sp.1	E	0.2%			
F	Asteraceae weed sp.2	E	0.1%			
F	Bulbine sp	N	0.1%			
C	Maireana aphylla	N	0.3%	SG		
(F)	Sida (hnn shrubby)	N	0.2%			
C	Sclerolaena brachyptera	N	0.1%	SG		
F	Sida sp.2 (grey hairy)	N	0.1%			
(G)	Walwallia sp.	N	0.1%			
(G)	Astrebla pectinata	N	0.1%	SG		
(C/S)	Rhagodia spinescens	N	0.3%	SG		
F	Velleia sp.	N	1%			
(C/S)	Sclerolaena lanicuspis	N	0.1%			
F	Plantago turrifera	N	0.1%			
F	Echinopogon sp.	E	0.1%			
C/S	Nitraria billardieri	N	0.1%	SG		
C/S	Maireana brevifolia	N	0.1%	SG		
F	Convolvulus	N	0.1%			
G	Vulpia sp.	E				

N: native, **E:**exotic, **HTE:** high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	
Zone:	Datum:	Plot ID: Feb 8	Photo #: 23-25
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 163.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	0	0
Shrubs		5
Grasses etc.		25
Forbs		15 10.2
Ferns	0	0
Other Chenopods		5
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	20	20	30	50	20	50	60	40	30	30	1	0	0	5	5	0	0	0	0	0
Average of the 5 subplots	26.1.					42.1.					2.1.					0.1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:	Feb 8		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(F)	Rhodanthe 1	N	5			
F	Sida arcy	N	0.3			
F	Convolvulus sp	N	0.3			
F	Vittadinia sp (small)	N	1			
(C)	Sclerolaena bicornis	N	2	SG		
(G)	Eulidosperma setacea	N	10			
(G)	Austrostipa scabra/nodosa ?	N	15			
F	Bulbine sp	N	0.1			
(S)	Nitraria billiardieri	N	3	S		
F	Asteraceae weed	E	0.1			
F	Sida sp bright green	N	0.1			
(C)	Salsola tragus	N	0.5	SG		
(C)	Sclerolaena muricata var villosa	N	1	SG		
(S)	Rhagodia spinescens	N	1	S		
C	Mairemma aphylla	N	0.1	SG		
F	Roepera glauca	N	0.1			
(F)	Plantago terifera	N	0.1			
(F)	Trachymene rarenosecum	N	2			
F	Minuria sp (non-fleshy)	N	0.5			
(F)	Rhodanthe 2	N	5			
(S)	Sclerolaena tricuspis	N	0.2	SG		
F	Sisymbrium sp	E	0.1			
F	~~Aese~~ Tetragonia sp	N	0.1			
(G)	Wollastonia prolata	N	0.1			
F	Leptorhynchos / Waitzia yellow flower	N	0.1			
F	Erigeron	E	0.1			
F	Goodenia sp	N	0.1			
G	Eragrostis australasica	N	0.1			
F	Centaurium	N or E	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	
Zone:	Datum:	Plot ID: F20 #9	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 44			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		25.1.
Grasses etc.		10.1.
Forbs		10.1, 0.5.
Ferns		
Other		2.1.
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	30	25	20	20	20	50	40	65	30	55	0.1	2	5	25	15	0	0	0	0	0
Average of the 5 subplots	23.1.					49.1.					9.5.1.					0.1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 7/2/2023	Feb 9		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(SCS)	Maireana aphylla	N	20%	SG		
F	Asteraceae leaf	E	1%			
(L)	Rhodanthe sp.	N	5%			
(G)	Austrostipa sp.	N	2%			
(G)	Rytidosperma sp.	N	5%			
(CS)	Rhagodia spinescens	N	0.3%	SG		
(F)	Vittadinia sp.	N	1%			
(C)	Solanlaena bicornis	N	1%	SG		
C	Solanlaena muricata var villosa	N	0.1%	SG		
(S)	Atriplex lindleyi subsp conduplicata	N	0.1%			
F	Sida (long stipule)	N	0.1%			
(CS)	Nitraria billardieri	N	3%	SG		
F	Bulbine sp	N	0.1%			
F	Podanaya leptera	N	0.1%			
F	Speraularia sp	N	0.1%			
(F)	Brachyscome/Vittadinia	N	5%			
G	Chloris truncata	N	0.1%			
(CS)	Enneapogon intravaginus	N	0.1%	SG		
(G)	Lachnostis sp	N	0.2%			
F	Pilotus macrocephalus	N	0.1%			
S	Salsola tragus	N	0.1%			
(C)	Melaleuca lanceolata	N	0.2%			
C	Scleroleana bicornuta	N	0.1%			
C	Atriplex leptocarpa	N	0.1%			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	
Zone:	Datum:	Plot ID: Feb10	
Easting:	Northing:	IBRA region:	Photo #:
VZ / PCT: 153			Midline bearing from 0 m:

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	—	—
Shrubs		15
Grasses etc.		10/0.5
Forbs		5/0.2
Ferns	—	—
Other Chenopods		5
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	40	75	30	10	30	45	15	40	40	20	5	5	5	5	25	0	0	0	0	0
Average of the 5 subplots	37.1.					32.1.					9.1.					0.1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 7/2/2023		Feb10	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
F	Erodium ~~chr~~ crinitum	N	0.1			
F	Dysphania pumilio?	N	0.1			
F	Convolvulus Broadleaf	N	0.1			
F	Sida grey	N	0.3			
(F)	Tetragonia sp	N	7			
F	Calloltis strispidula	N	0.1			
F	Vittadinia purple	N	0.3			
F	Convolvulus fine leaf	N	0.2			
(C)	Scleralaena bicornus	N	3			
(E)	Rhodanthe	N	1			
F	Silene sp	E	0.1			
(S)	Maireana aphylla	N	10			
(G)	Wallwhollia prostrata	N	0.5			
(C)	Austrostipa	N	5			
(G)	Rytidosperma	N	1			
(H)	Sowerbaea	N	2			
G	Vulpia	E	0.1			
F	Whalenbergia sp	N	0.2			
F	Asteraceae seed	E	0.1			
F	Oxalis sp	N	0.1			
F	Heliotropium	E	0.1			
F	Sida grey big	N	0.1			
G	Austrostipa sp 2	N	0.1			
C	Atriplex ~~sp~~ cardiegea	N	0.2			
(S)	Rhagodia spinescens	N	5			
G	Chloris truncata	N	0.3			
(E)	Finadia elans	N	0.3			
F	Portulaca oleraceae	N	0.1			
F	Calocephalus sonderi	N	0.1			
F	Erigeron	E	0.1			
(C)	Salsola tragus	N	0.1			
F	Limonium lobatum	E	0.1			
G	Chloris / Digitaria	N	0.1			
F	Solanum sp	N	0.1			

N: native, **E:**exotic, **HTE:** high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

F Bulbine
F Minuria Non Shiny
F Sisymbrium
G Panicum
F Goodenia sp

N 0.1
N 0.1
E 0.1
N 0.1
N 0.1
N 0.1

G Schismus barbatus E 0
F Plantago terrifera N

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	
Zone:	Datum:	Plot ID: Feb11	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 153			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	—	—
Shrubs		10
Grasses etc.		85
Forbs		10/0.1
Ferns	—	—
Other Chenopods		3
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	30	20	40	30	20	30	40	25	30	30	20	10	20	20	45	0	0	0	0	0
Average of the 5 subplots	28·1.					31·1.					23·1.					0·1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Fcb11	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
F	Minuria sp	N	0.1			
(G)	Amphipogon sp	N	15			
(G)	Rytidosperma	N	10			
(C)	Sclerolaena bicornis	N	2			
(S)	Maireana aphylla	N	10	S		
(T)	Rhodanthe	N	5			
(S)	Rhagodia spinescens	N	0.1	S		
(C)	Salsola tragus	N	0.2	SG		
(T)	Vittadinia	N	1			
F	Solanum sp	N	0.1			
F	Plantago heterosa	N	0.1			
F	Convolvulus sp	N	0.1			
F	Tagetes minuta	N	0.1			
F	Native Asteraceae	N	0.1			
F	Echium plantagineum	E	0.1			
F	Rutidosis sp	N	0.1			
(T)	Brachy / Vit	N	0.3			
(G)	Whiskwholl a prolixa	N	0.2			
G	Chloris truncata	N	0.2			
F	Sida sp	N	0.1			
F	Asteraceae weed	E	0.1			
F	Limonium lobatum	E	0.1			
(C)	Sclerolaena brachyptera	N	0.1	SG		
F	Euphorbia drummondii	N	0.1	SG		
F	Asteraceae Native grey leaf	N	0.1			
F	Finadia cunninghamii	N	0.1	SG		
G	Chloris / Digitaria	N	0.1			
F	Silvereas ? (Triptilodiscus pygmaeus)	N	0.1			
F	Erigeron	E	0.1			
F	Sida grewioides	N	0.1			
F	Calocephalus sonderi	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	
Zone:	Datum:	Plot ID: Feb 12	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 153.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	—	—
Shrubs		10
Grasses etc.		25
Forbs		5
Ferns	—	—
Other Cheno		# 3
High threat weed cover		

Cover: 0.1, 0.2, 0.3…. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot score % in each	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
	10	5	25	30	5	40	15	25	2	30	20	30	15	20	15	0	0	0	0	0
Average of the 5 subplots	15 %.					22.5 %.					20 %.					0 %.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Feb12	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S	Melaleuca aphylla	N	5			
E	Rhodanthe	N	2			
S	Melaleuca glomerata	N	3			
G	Rhidosperma	N	10			
G	Austrostipa	N	10			
F	Vittadinia	N	1			
C	Sclerolaena bicornis	N	3			
G	Chloris truncata	N	2			
G	Wolwhalleia prolixa	N	1			
G	Panicum sp	N	0.2			
F	Solanum sp	N	0.2			
F	Plantago turbora	N	0.1			
F	Convolvulus sp	N	0.3			
F	Sida sp	N	0.3			
S	Rhagodia spinescens	N	2			
F	Sisymbrium	E	0.1			
C	Santalum acuminatum	N	0.2			
F	Bulbine sp	N	0.1			
F	Asteraceae weed	E	0.1			
F	Spergularia	N	0.1			
F	Calocephalus sonderi	N	0.1			
F	Goodenia sp	N	0.1			
G	Chloris / Digitaria	N	0.1			
F	Euphorbia drummondii	N	0.1			
F	Asteraceae native grey leaf	N	0.1			
F	Tuecrium sarcinosum	N	0.1			
F	Sand weed		0.1			
F	Oxalis perennans	N	0.1			
C	Eucalyptus nutans	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		7/2/2023	
Zone:	Datum:	Plot ID: Feb 13	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 44.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		1
Grasses etc.		5/0.2
Forbs		5/5 10
Ferns	—	—
Other Chenopod.		15
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot score % in each	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
	25	30	30	30	40	30	40	40	30	20	0	2	0	5	0	0	0	0	0	0
Average of the 5 subplots	31%					32%					1.5%					0.1%				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Feb 13	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
C	Salsola kraegia	N	10			
	Asteraceae weed	E	3			
C	Sclerolaena bicornis	N	0.2			
F	Limonium lobatum	E	5			
F	Rhodanthe	N	1			
F	Cida sp	N	0.1			
F	Villadinia sp	N	0.5			
C	~~Enchylaena~~ Sclerolaena	N	0.5			
	~~Sclerostegia~~ Sclerostegia					
S	Sclerolaena muricata var muricata	N	1			
G	Austrostipa scabra	N	0.2			
	~~Maireana~~					
S	Maireana brevifolia	N	0.5			
	~~Sclerolaena muricata var muricata~~					
G	Rytidosperma	N	0.2			
G	Lolium sp	E	0.1			
F	Echium (paterssons curse)	E	0.1			
	~~Erodium cicutarium~~					
G	Whitwhollia prolata	N	0.2			
F	Solanum sp	N	0.1			
F	Convolvulus sp	N	0.1			
S	Atriplex ~~sp~~ semibaccata	N	0.1			
G	Chloris truncata	N	0.2			
F	Villadinia white	N	0.1			
G	~~Hordeum~~ Grass Avena?	E	0.1			
F	Plantago lanceolata	N	0.1			
F	Cataehyrchus?	E	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		3/2/2023	
Zone:	Datum:	Plot ID: Peak	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 1591.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		5
Grasses etc.		40
Forbs		30
Ferns		1
Other Lomandra		2.5
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	50	40	20	15	30	30	30	20	30	30	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	28.1.					35.1.					0.1.					0.1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:	Feb 14		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(C)	Atriplex semibacc	N	10	SG		
C	Sossia australis	N	0.2	SG		
F	Asteraceae weed	E	0.2			
(E)	Eucalyptus blakelyi	N	1			
C	Sclerolaena brachyptera	N	0.1			
(C)	Atriplex lindleyi	N	5			
(S)	Sclerolaena muricata	N	3	S		
(G)	Grass 1 small	N	5			
(G)	Grass 2	N	2			
C	Not bred	N	3			
(S)	Old man	N	2	S		
(S)	Dichondra	N	0.2			
C	Sclerolaena birchii/diacantha	N	0.1			
F	Asteraceae 3 leaves		0.1			
(S)	Nitraria billardieri	N	0.1	S		
F	Centaurea	E	0.1			
(C)	Atriplex leptocarpa	N	2	SG		
F	Asteraceae native	N	0.1			
F	Tetragonia	N	0.1			
(F)	Bulbine sp	N	0.1			
F	Mesembryanthemum	E	0.1			
F	Boggan flea	N	0.1			
F	Sisymbrium	E	0.1			
(G)	Austrostipa	N	0.1			
F	Linaria lobelia	E	0.1			
	~~Atriplex semibacc~~					
	Atriplex ? holocarpa		5			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		8/3/2023	
Zone:	Datum:	Plot ID: 1 of 5	
Easting:	Northing:	IBRA region:	Photo #:
VZ / PCT: 44			Midline bearing from 0 m:

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other Chenopod		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	5	20	10	10	50	50	50	60	20	50	0	0	2	0	5	0	0	0	0	0
Average of the 5 subplots	13%					52%					1.5%					0%				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
(C)	Ptilotus gaudichaudii	N	3			
C	Eucalyptus sp	N	5			
(C)	Solanum ausfrale	N	3			
(S)	Rhodanthe floribunda	N	2			
(F)	Sida longipila	N	0.3			
S	Maireana aphylla	N	1			
S	Nitraria billardieri	N	0.1			
C	Rostraria adscendens	N	5			
C	Sclerolaena tricuspis/divaricata	N	0.1			
C	Cenchrus ciliaris	E	0.1			
	Acacia sp seed	E	0.1			
S	Sclerolaena minicuspis	N	0.5			
S	Atriplex holocarpa?	N	0.1			
(F)	Vittadinia	N	0.5			
(F)	Wahlenbergia preissii	N	0.1			
F	Mesembryanthemum	E	0.1			
C	Sclerolaena brachyptera	N	0.1			
F	Plantago hirtella	N	0.1			
	Salsola					
(C)	Atriplex leptocarpa	N	1			
G	Lolium	E	0.1			
S	Rhagodia spinescens	N	0.1			
C	Chloris truncata	N	0.1			
F	Sida intricata	N	0.1			
F	Stemodia	E	0.1			
C	Atriplex nitrariacea	N	0.1			
S	Maireana					
C	Atriplex bunburyana	N	0.1			
C	Atriplex semibaccata	N	0.3			
	Red Pond grasses	N	0.1			
F	Boerhavia sp	N	0.1			
(F)	Maireana brevifolia	N	0.1			
	Hairy white flower		0.2			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: tebo16	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 44			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	30	30	15	40	80	40	35	70	20	5	2	2	2	5	3	0	0	0	0	0
Average of the 5 subplots	39 %					34 %					3 %					0 %				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet 1 of ___	Survey Name	Plot ID	Recorders
Date: 8/2/23	Feb16		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
F	Rhaphanthe(barbarum	N	10.1			
F	Mesumbrianthum sp	N	0.5/			
F	Pimelea curviflora	N	3.2/			
F	Cuda (hamistrate)	N	0.1/			
CS	Melaleuca uncifolia	N	SG<->10/.			
G	Austrostipa scabra	N	2/.			
CS	Atriplex leptocarpa	N	3/.			
G	Rytidosperma sp.	N	0.5/.			
CS	Rhagodia spinescens	N	2/.			
CS	Melaleuca uncifolia	N	SG<->0.3/.			
CS	Nitraria billardierensis	N	SG<->2/.			
CS	Sclerolaena stelligera	N	0.2/			
F	Asteraceae (weed)	E	0.1/.			
CS	Sclerolaena biramisdiaramina	N	0.5/.			
F	Bulbine sp	N	0.1/.			
CS?	Not brev	N	0.1/.			
	Yellubeam (white flower)	N	0.1/.			
F	Hibiscus sp (mauve flower)	N	1/.			
F	Sida virgata	N	0.2/.			
F	Sisymbrium sp	E	0.1/.			
G	Grass sp. 2 (Yanga grass)	N	0.4/.			
F	Plantago lanceolata	N	0.1/.			
G	Grass sp 1	N	0.5/.			
F	Echium plantagineum	E	0.1/.			
CS	Sclerolaena brachyptera	N	0.1/.			
CS	Salsola australis	N	0.1/.			
CS	Enchylaena tomentosa	N	3.2/.			
G	Walwhalleya proluta	N	0.1/.			
F	Calocephalus sonderi	N	0.1/.			
G	Avena sp Hummata	N	0.1/.			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		8/2/2023	
Zone:	Datum:	Plot ID: Feb 17	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 153.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	70	15	35	45	40	20	70	5	5	10										
Average of the 5 subplots	41·1.					20	22·1				0·1.					0·1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
F	Rhodanthe	N	1			
S	Maireana brevifolia	N	0.5			
C	Sclerolaena bicornis	N	0.2			
C	Atriplex semibaccata	N	0.1			
(G)	Austrostipa	N	15			
F	Asteraceae seed	E	0.1			
S	Nitraria billardieri	N	5			
C	Sclerolaena bicornis/diacantha	N	1			
C	Not brew	N	0.3			
S	Rhagodia spinescens	N	1			
C	Sclerolaena tenuicuba tricuspis	N	1			
C	Atriplex leptocarpa	N	0.1			
F	Sida corrugata	N	0.1			
F	Vittadinia	N	0.1			
C	Atriplex lindleyi	N	0.3			
C	Salsola australis	N	0.1			
F	Plantago turbera	N	0.1			
F	Centaurium	E	0.1			
F	S. sumbiense	E	0.1			
(G)	Chloris truncata	N	0.1			
(G)	Grass sp 1	N	1			
C	Atriplex cordieri	N	0.2			
F	Sida long shafte	N	0.1			
F	Plantago drummondii?	N	0.1			
F	Mesembryanthemum	E	0.2			
C	Enchylaena tomentosa	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: FCB18	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 160			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	45	50	20	40	30	50	50	10	50	20										
Average of the 5 subplots	33.1.					35.1.					0.1.					0.1.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
Fer	Nadyee	N	5			
S	Muelenbeckia .	N	2			
G	Austrostipa	N	0.1			
F	Centaurea	E	0.1			
F	Euphorbia esc sp		10			
S	Nitella goose foot	N	2			
	Sow thistle	E	0.1			
F	Malva m	N	0.1			
F	Convolvulus	N	0.1			
F	V. thuf...	N	0.1			
F/F	Crassula Sieberiana	N	0.2			
F	Tetragonia tetragonioides	N	0.1			
F	Brachyscome sp.1	N	0.1			
F	Euphorbia drummondii	N	0.1			
	Wot bogan flea		0.1			
	Cyperaceae eragrostis		0.1			
F	Asteraceae sp	N	0.1			
F	grey Asteraceae		0.2			
F	Tim's spotting plant		0.1			
F	Sonchus sp	E	0.1			
	Juncus	N	0.1			
G	Wolfiella gratiola	N	0.1			
	Bulbine sp	N	0.1			
F	Echium sp		0.1			
S	Nitraria billardieri	N	0.1			
F	Tetragonia tetragonioides	N	0.1			
G	Grass sp 2	N	0.1			
G	Poa sp	E	0.1			
[illegible]	[illegible]	[illegible]				
	Sclerolaena		0.1			
F	Alternanthera denticulata	IE	0.1			
[illegible]	Sclerolaena muricata	N	0.1			
F	Scotch thistle	E	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		8/2/2023	
Zone:	Datum:	Plot ID:	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 17			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	10	15	15	5	0	80	60	80	80	90	3	15	10	5	5					
Average of the 5 subplots	9 %					79 %					7.5 %					0 %				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S	Maireanna aphylla	N	[illegible]			
F	Calocephalus Sonder	N	0.1			
F	Sida lorna Shpale	N	0.1			
C	Androsthoa sericea	N	0.5			
G	Wolwhsttia ~~sp~~ prolata	N	0.2			
R	~~Fenell~~ R. ingadospermum	N	0.1			
F	~~Ril~~ P. pentea rotifera	N	0.1			
F	Rhodanthe floribunda	N	0.3			
C	Sclerolaena brachyptera	N	0.2			
C	Sclerolaena [illegible]	N	0.1			
F	Sida intricata	N	0.2			
S	Nitraria billardieri	N	10			
F	Dulcine	N	0.1			
C	Sclerolaena tricuspis	N	0.1			
F	Vittadinia	N	0.1			
G	Chloris truncata	N	0.1			
F	Asteraceae weed	E	0.1			
S	Rhagodia spinescens	N	0.1			
C	Euphorbia drummondii	N	0.1			
G	Gram sp b	N	0.1			
F	Plantago drummondii	N	0.1			
F	Plantago varia	N	0.1			
C	Eremophila [illegible]	N	0.5			
C	Sclerolaena muricata	N	0.3			
F	Fleabane sp	E	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID:	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT:			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	25	20	30	25	20	15	20	5	20	30	2	5	0	0	10					
Average of the 5 subplots	24%					18%					3.5%									

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S	Senna artemisioides	N	0.1			
C	Callitris glaucophylla	N	0.1			
G	Eragrostis eriopoda	N	1			
C	Acacia aneura	N	0.5			
F	Rhodanthe floribunda	N	3			
I	Tetragonia	N	0.1			
F	Solanum	N	0.1			
F	Fabiana sp	N	0.1			
C	Wollastonia prolixa	N	0.1			
I	Cenchrus setaceus	E	0.1			
F	Sida spinosa stipule	N	0.1			
G	Aristida sp 2	N	0.1			
W	Cyperus gracilis	N	0.1			
F	Bidens cernua weed	E	0.1			
S	Nitraria billardieri	N	0.2			
C	Sclerolaena birchii/diacantha	N	0.2			
C	Sclerolaena bicornis	N	0.2			
C	Eucalyptus normantonensis	N	0.2			
C	Corymbia terminalis	N	1.5			
S	Rhagodia spinescens	N	0.2			
F	Sonchus oleraceus	E	0.1			
C	Not brew	N	0.1			
Tor	Nadoo	N	0.1			
C	Corymbia sp 1	N	10			
F	Withania somnifera	N	0.1			
C	Atriplex holocarpa	N	0.1			
F	Plantago hookeri	N	0.1			
C	Atriplex leptocarpa	N	0.1			
C	Atriplex semibaccata	N	0.1			
C	Salsola australis	N	0.1			
C	Atriplex microcarpa	N	0.1			
F	Melaleuca sp	E	0.1			
	Not brown Clea		0.1			
	Echium sp		0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

1* Tiny small plant
1* other small plant

i

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		9/2/23	
Zone:	Datum:	Plot ID: Feb21	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 160			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	10	10	10	35	40	65	80	25	20	30	✓	✓	60	5	40	✓	✓	✓	✓	✓
Average of the 5 subplots	20%					44%					21%					0%				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet 1 of 1	Survey Name	Plot ID	Recorders
Date: 9/2/23	Feb21		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
SC	Nitraria billardierss	N	10	SG		
G	Poacum sp.		0.5			
F	Solanum sp.	N	0.2			
F	Rhodanthe floribunda	N	1.1			
G	Grass sp 2	N	0.1			
F	Calocephalus sonderi	N	0.2			
GS	Eindadia nutans	N	0.1			
SC	Rhagodia spinescens	N	0.2	SG		
G	Chloris truncata	N	0.5			
CS	Scleroleana tricuspis	N	5	SG		
F	Sida (Inna stipulata)	N	0.1			
CS	Maireana aphylla	N	2.	SG		
F	Asteraceae weed	E	0.1			
G	Chloris Divaricata		0.1			
G	Rhodanthe sp	N	0.1			
G	Austrostipa scabra	N	0.1			
SC	Scleroleana muricata	N	0.1	SG		
F	Nadia fern	N	0.1			
F	Mamaa-leanifera	N	0.1			
G	Elymus scabrissima ?		0.1			
F	Pimelea curviflora	N	0.1			
G	Eragrostis australasica	N	0.1			
CS	NOT Brev	N	0.1			
G	Walwhalleya proluta	N	0.2			
F	Convulvulus (pink?)	N	0.1			
F	Villarsia sp	N	0.1			
F	Blue devil thing		0.1			
F	Medicago sp.		0.1			
F	Sisymbrium sp	E	0.1			
F	redstem white flowers		0.1			
F	Oxalis perennans	N	0.1			
G						

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: Feb 2-2	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 164			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3…. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30,…100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	5	20	20	10	15	60	70	10	85	80	0	5	10	0	0	0	0	0	0	0
Average of the 5 subplots	14%					62%					3%					0%				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:	Feb 22		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S	Maireanna brevifolia	N	0.1			
S	Nitraria billardieri	N	5			
S	Sclerolaena diacantha	N	5			
F	Rhodanthe floribunda	N	0.5			
F	Pimelea curviflora	N	0.1			
C	Sclerolaena brachyptera	N	0.1			
S	Ichaganthera spinescens	N	0.1			
G	Chloris truncata	N	0.1			
G	Chloris / Digitaria	N	0.1			
F	Plantago ~~duricoma~~ heterophylla	N	0.1			
F	Solanum	N	0.1			
G	Wollwhaltia gracilis	N	0.1			
F	Vittadinia	N	0.1			
G	Austrostipa	N	0.2			
G	grass sp 1	N	0.1			
F	Sida corrugata	N	0.1			
F	Calocephalus sonderi	N	0.1			
G	Rytidosperma	N	0.1			
C	Sclerolaena birchii / diacanthum	N	0.1			
S	Maireanna aphylla	N	1			
C	jelly bean red berry (Sclerolaena)	N	0.1			
C	Atriplex lindleyi	N	0.1			
F	Bulbine sp	N	0.1			
F	~~Plantago~~ ~~Minuta~~ Centaurium	E	0.1			
F	Vittadinia 2	N	0.1			
C	Goats head	N	0.1			
G	Grass sp1	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID: 1 to 3	Photo #:
Easting:	Northing:	IBRA region: ~~42~~	Midline bearing from 0 m:
VZ / PCT: 163			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	10	10	~~60~~ 15	5	15	~~30~~ 80		40	85	65	5	5	40	5	5					
Average of the 5 subplots	11%					62%					12%					0%				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Feb 23	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S	Nitraria billardierei	N	3			
S	Sclerolaena tricuspis	N	5			
G	Rytidosperma	N	0.1			
C	Grass 2	N	0.1			
F	Viola sp	N	0.1			
F	Plantago turrosa	N	0.1			
F	Lepidium phlebopetalum	N	0.1			
F	Rhodanthe Flanbrandii	N	0.2			
F	Minuria succulent / dissing white	N	0.2			
C	Sclerolaena brachyptera	N	0.5			
G	grass sp 1	N	0.1			
~~F~~	~~Atriplex vesicaria~~	~~N~~				
G	Chloris truncata	N	0.1			
G	Wollowhalia paluta	N	0.1			
F	Pimelea curviflora	N	0.2			
F	Bulbine sp	N	0.1			
F	Asteraceae weed	E	0.1			
F	Other Asteraceae weed	E	0.1			
C	Maireana aphylla	N	0.5			
F	Sida long stipule	N	0.1			
G	Lolium	E	0.1			
F	Cenchrus sp	E	0.1			
C	Mesembrianthemum	E	0.1			
F	Brachyscome	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
		9/2/23	
Zone:	Datum:	Plot ID: feb24	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT: 153.			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	40	30	15	15	5.	10	25	30	60	85	40	20	20	10	5.	—	—	—	—	
Average of the 5 subplots	21%.					42%.					19%.					0%.				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 9/2/23	Feb24.		

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
CS	Atriplex limbleyi	N	0.3			
CS	Sclerolaena muricata	N	20	CSG		
CS	Rhagodia spinescens	N	0.1	CSG		
F	Rhodanthe floribunda	N	0.1			
G	Grass sp.1		0.2			
F	Asteraceae weed	E	0.1			
CS	Nitraria billiardierei	N	3	SG		
CS	Sclerolaena brachyptera	N	0.5			
CS	Mesembrianthum	N	0.2			
CS	"Nat Brev"	N	0.2			
F	Plantago-ternifera	N	0.1			
CS	"Jellybean" red berry	N	0.1			
F	Asteraceae weed sp.3	E	0.1			
FA	" " sp.2	E	0.1			
G	Chloris truncata	N	0.1			
G	Grass sp.2	N	0.1			
F	Bulbine sp.	N	0.1			
CS	Atriplex microcarpa	N	0.1			
G	Walwhalleya proluta	N	0.1			
F	Vittadinia sp.	N	0.1			
CS	Atriplex-saltbush	N	0.1			
G	Rhytidosperma sp.	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders	
		9/2/2023		
Zone:	Datum:	Plot ID: Feb25		
Easting:	Northing:	IBRA region:		Photo #:
VZ / PCT: 164			Midline bearing from 0 m:	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees	—	—
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	5	40	5	15	5	80	10	50	60	40	10	3	20	10	40					
Average of the 5 subplots	14 %					49 %					17 %					0 %				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Feb 25	

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G)	Voucher	Photo #
S	Nitraria billiardierei	N	5%			
F	Asteraceae weed	E	0.1			
F	Pimelea curviflora	N	0.2			
G	Sclerolaena brachyptera	N	3%			
F	Rhodanthe	N	0.2			
C	Sclerolaena tricuspis	N	5			
F	Minuria denticulata	N	0.1			
F	Calocephalus sonderi	N	0.2			
S	Maireana aphylla	N	0.5			
S	Rhagodia spinescens	N	0.1			
C	Mesembryanthemum	E	3%			
G	Grass sp 2	N	0.1			
G	Chloris truncata	N	0.1			
C	Goats head	N	0.1			
G	grass sp 1	E	0.1			
F	Wilsonia	N	0.1			
F	Centaurium	E	0.1			
G	Rhytidosperma	N	0.1			
F	Bulbine sp	N	0.1			
F	Asteraceae weed 3	E	0.1			
G	Wolfsbadia proleda	N	0.1			
F	Plantago terrifera	N	0.1			
G	Eragrostis australasica	N	0.1			
C	Sclerolaena [illegible]	N				
C	Atriplex lindleyi	N	0.1			
C	Atriplex vesicaria	N	0.1			

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site - Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 10/10/23	KORI KORI.	BAM PLOT 2	CHRIS + LORENA

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	MAerian aphylla		10	90	
	Hydrostipa scab		0.1	25	
	Rytidosperma setacea		10	2000	
	" 'small'		5	500	
	" 'hairy blue'		1	1000	
	Vittadinia cynoeat		1	20	
	Rhodanthe floribunda		4	2000	
	Leptorhynchos baileyi		2	50	
	Plantago cunning?		2	3500	
	~~Brachyscome~~				
	Schoenia cassiniana (grey)		1	20	
	Medicago	E	1	30	
	Goodenia		0.1	2	
	Bulbine sp.		0.2	60	
	Schoenia cassiniana		0.1	2	
	Rytido sp. "teeny"		1	2000	
	Vulpia bromoides	E	0.1	30	
	Sonchus ~~oleraceus~~ asper	E	0.1	20	
	Plechy unknown (5) =Roeperaglauca	N	0.1	3	
	Brassica tha → 5=Carrichtera annua	E	0.1	4	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
KERI KERI				10/10/23		CITRIS & LORENA	
Zone:		Datum:		Plot ID:	BAM PLOT 2		
Easting:	270° NW	Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description	SOME BUCKLING FROM GRAZERS, RED KANGA CRACKED CRUST SURFACE FINE CLAY - RABBIT SCATS.						

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	25	20	20 15	10	25	60	40	50	75	30										
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

73°C.

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 11/10/23	KERIKERI	BAM PLOT 12	CHARLIS D. + LOREN B.

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	NOT PCT 17! DOM BY M. aphylla				
	and Nitraria comomo-. Some pluggily				
	No lignum in sight (100s of metres)				
	Mairéana aphylla		15	80	
	Nitraria billardiera		10	50	
	Rhodanthe floribunda		30	4000	
	Calocephalus sonderi		0.1	5	
	Medicago		1	500	
	Plantago coming?		0.2	1000	
	~~Maireana~~ Sclerolaena diacantha				
	Barley		0.2	200	
	Sonchus oleracea.		0.1	15	
	Small chloris-like grass		0.2	50	
	Austrostipa scabra		0.1	7	
	~~Maireana~~ Sclerolaena brachyptera		2	1000	
	Sida		0.1	5	
	Hyalosperma semisterile		20	2000	
	Sclerolaena tricuspis		1	15	
	~~Atriplex~~ Chenopodium cursispicatum.		0.1	1	
	volubile		0.1	1	
	Maireana pentagona?			200	
	Succulent daisy		0.1	25	
	Roepaera glauca		0.1	1	
	Einadia nutans		0.1	1	
	Big dog-tail grass.		0.1	1	
	Hyalosperma setacea		0.1	25	
	Rhyhidosa 'hairy blue'		0.1	50	
	Grey daisy		0.1	1	
	Rhyhidosa 'small'		0.1	20	
	~~Maireana~~ Atriplex vesicaria		0.1	6	
	Bulbine semibar.		0.1	1	
	Atriplex ? simpsonii hands.		0.1	1	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HT

N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% 25% = 10 x 10 m. Include cover of trees not rooted within plot.

Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
Zone:		Datum:		Plot ID:			
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot) GF Code	Sum values: Count of native richness	Sum values: Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot) DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	30	5	25	35	15	60	50	5	5	15	/	/	25	20	40	/	/	/	/	/
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*

***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 11/10/23	KERI KERI	BAM PLOT 1	CHRIS D + LORRAINE B

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Maireana aphylla		10	250	
	Austrostipa scabra		2	200	
	Rytidosperma setacea		5	500	
	" " "blue hairy"		20	1000	
	Vulpia bromoides	E	1	1000	
	Rhodanthe floribunda		2	500	
	Medicago	E	2	300	
	Crassula sp.		0.1	10	
	Goodenia		0.1	1	
	Cirsudia nutans		0.1	2	
	Brassicaceous weed.	E	0.1	50	
	Sclerolaena diacantha		1	100	
	Bulbine semibarbata		0.1	10	
	C. Twin purslane C. velutile		0.1	1	
	Leptorhynchus baileyi		0.1	1	
	Plantago cunning		2	1500	
	Sonchus oleac		0.1	5	
	Calotis sp.		0.1	1	
	Chrysocephalum apiculatum		0.1	1	
	Boerhavia	E	0.1	20	
	Oxalis		0.1	4	
	Small yellow brassicaceae thing	E	0.1	1	
	Austrostipa nitida		0.1	10	
	baby purslane thing		0.1	10	
	Maireana lendlegii		0.1	1	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
KURI KURI							
Zone:		Datum:		Plot ID:			
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot)			
DBH	#Tree Stems Count	#Trees with Hollows	
80 + cm *(count)*			
50 – 79 cm *(count)*			
30 – 49 cm *(count)*			
20 – 29 cm *(count)*			
10 – 19 cm *(yes/no)*			
5 – 9 cm *(yes/no)*			
<5 cm *(yes/no)*			
Length of logs (m)	Tally:	Total:	

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each																				
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

Weedy, sheep runs. pluggy.

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 13/10/23	KERI KERI	BAM PLOT 8	CHRIS D

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G) ABUNDANCE	Voucher	Photo #
	Maireana aphylla	2	2	25		
	Sonchus oleracea	E	0.1	200		
	Erodium	E	0.1	15		
	Sterolaena muricata		1	20		
	Rytidosperma setacea		3	250		
	Barley	E	0.1	50		
	Medicago praecox	E	2	2000		
	Rhodanthe floribunda		20	5000		
	Vittadinia cuneata		2	100		
	Carex pseudocuprina-like		1	100		
	Einadia nutans		0.2	12		
	Rytidosperma "blue hairy"		0.2	50		
	Austrostipa scabra		0.2	25		
	Calotis scabiosifolia var. scabiosifolia		0.1	30		
	~~sheep sorrel-like herb~~		~~0.1~~	~~10~~		
	Vulpia brom.	E	0.2	200		
	Sida 'small leaf brandy' intricata		0.2	40		
	Wahlenbergia Rigidula		0.1	1		
	Big dogtail grass (s)	E	0.1	5		
	Muellerbeckia		0.1	4		
	~~Unknown small shrub (Spiky deadheads)~~		~~0.2~~	~~10~~		
	Sida 'big leaf basal resprout' corrugata		0.1	20		
	Salsola australis		0.2	10		
	Convolvulus microsepalus		0.1	50		

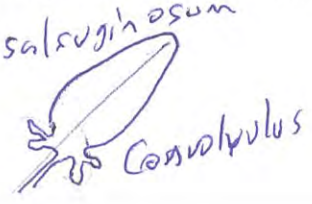
N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

Wobbly brsh = Osteocarpum salsuginosum



BAM Site – Field Survey Form

Survey Name		Date	Recorders	
Zone:	Datum:	Plot ID:		Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:	
VZ / PCT:				

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3…. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	25	75	75	75	10	10	5	70	5	80	2	ONE	ONE	0	0	/	/	/	/	/
Average of the 5 subplots																				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Plot 10	

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Maireana aphylla		15	30	
	Rhodanthe floribunda.		30	1000	
	Medicago praecox		5	200	
	~~Austrostipa~~ scabra.		10	400	
	Vulpia.		0.2	200	
	Plantago Cunninghamia		0.2	500	
	Sclerolaena bracyptera		0.1	20	
	Vittadinea		~~5~~	~~50~~	
	Rytidosperma fluffy		0.1	50	
	~~Bromus~~. Hordium sp.		0.1	50	
	Mulline		0.1	20	
	Sida woody		0.5	100	
	Sonchus.		0.1	30	
	Sclerolaena ducantha.		0.1	50	
	~~Spikey seed~~? Carichtera annua		0.1	5	
	Cullotis		0.1	30	
	Sclerolaena muricata		0.1	1	
	Vittadinea annual		0.2	40	
	Asteraceae weed-		0.1	2.	
	seedy medicago?		.		
	Sida soft		0.1	2.	
	Chloris like (black)		0.1	20	
	Salsola australis		0.1	1	
	Empty seed husk		0.1	20	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
Zone:		Datum:		Plot ID:	Plot 10		
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	10	15	20	5	20	70	80	30	25	10	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Plot 09	

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Maireyana aphylla		30	60	
	Nitrariyum Bill		0.5	5	
	Bromus	20	E0	1000	
	Medicago praecox		2	600	
	Aristida/Astrostipa scabra		20	1000	
	Rytodisperma hirsuta		0.2	300	
	Rhodanthe floribunda		10	300	
	Vittadinia	5		150	
	Sclerolaena dicantha		0.1	50	
	Sonchus oleraceus		0.1	6	
	Einadia nutans.		10	30	
	Oxalis perennans		0.2	20	
	Plantago cunninghamia		0.1	500	
	Vulpia		10	700	
	Sclerolaena tricuspis		0.2	10	
	maireana sp.		0.1	5	
	Rhagodia spinescens		0.2	8	
	Sida intricata		0.1	20	
	Calotis scabiosifolia		0.2	60	
	Sclerolaena brachyptera		0.1	15	
	Crassula sieberiana		0.1	20	
	Calandrinia volubilis		0.1	20	
	Atriplex		1	20	
	Leptorychus ?(S)		0.1	20	
	Chloris truncata		0.1	20	
	Erodium aureum		0.1	20	
	Atriplex		0.1	10	
	Bulbine		0.1	10	
	Atriplex (similrons)		0.1	2	
	Brassica		0.1	5	
	musk seed		0.5	100	
	sea lavender		0.1	20	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
Zone:		Datum:		Plot ID:	Plot 09		
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	2	5	10	5	5	15	5	5	5	15	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:	BAM04		Lorena + Freya

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Maerana aphylla.		20	100	
	Nitravium Bill		5	4	
	Barley grass Bromus sp.	i	1	100	
	Rhodanthe floribunda		25	800	
	Austrostipa Scabra		25	1000	
	Rythdosperma fluffy		15	500	
	Sclerolaena diacuthos		5	200	
	Medicago praecox		20	500	
	Vulpia		0.1	200	
	Rhagadonia spinosa		0.1	10	
	Plantago Cunninghamia		0.05	500	
	Vittadinia brachyotera		05	3080	
	Sclerolaena brevis		0.1	10	
	Salsola australis		0.1	1	
	Calotis scabiosifolia		0.1	30	
	Sida woody		0.1	5	
	Sonchus		0.1	5	
	Einadia nutans.		0.1	1	
	Woodsorrel		0.1	3	
*	Sclerolaena muricata.		0.1	5	
	Bulbine		0.1	3	
	Leptorynchus sp!		0.1	5	
*	seedy		5	500	
	Sclerolaena tricuspis		0.1	10	
	Brassica sp.		0.1	1	
	Ptilotus spathulatus.		0.1	10	
	Atriplex lindleyi		0.1	1	
	Plantago drummondii		0.1	50	
	* Empty shell husk - Centaurium similar		0.1	200	
	Calocephalus sonderi		0.1	5	

dead

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
						Lorena + Freya	
Zone:		Datum:		Plot ID:	BAM 04		
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	10	5	5	7	15	45	60	10	15	10	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

Hight WEED COVER.
NUMEROUS SHEEP RUNS WITHIN. (BARE).

266 W. Start.

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 13/10/23	KERI KERI - SPRING	BAM PLOT 7	CHRIS D & LORENA B.

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G) ABUNDANCE	Voucher	Photo #
	Maireana aphylla		10	120		
	Rhodanthe floribunda		~~40~~	5000		
	Medicago	E	20	2000		
	Erodium	E	0.1	2		
	Lolium	E	0.1	50		
	Barley	E	0.1	300		
	Austrostipa scabra.		~~[illegible]~~	500		
	Plantago cunninghamii.		15	5000		
	Scleranthus woolly brachypodus		~~0.2~~	~~50~~ 50		
	Sonchus oleracea	E	0.1	30		
	Atriplex 'Simpsons Flyers'		0.2	10		
	Sclerolaena diacantha		1	100		
	Wallwegia Rigid Panic		0.1	4		
	Austrostipa 'blue hairy'		0.1	40		
	Bulbine semibarbata.		0.1	20		
	Vulpia bromoides	E	0.1	100		
	~~Rytidosperma setaceum~~.		~~0.1~~			
	Austrostipa nitida		0.1	20		
	Einadia nutans		0.1	2		
	Vittadinia cuneata		0.1	60		
	Sclerolaena "Green'n gold" ~~bicornis~~ divaricata		0.1	~~2~~ 4		
	Unknown herb (E).		0.1	5		
	~~Native leaf thing Chris~~			←		
	C. volubile		0.1	15		
	Lilaea subulata 'pyramidata' woody.		0.1	1		
	Goodenia serrata		0.1	1		

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'
Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*
Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000
Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders	
KERI KERI		13/10/23	CHRIS D. & LORENA B.	
Zone:	Datum:	Plot ID: BAM PLOT 7		Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:	
VZ / PCT:				

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot score % in each	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
	15	10	15	5	60	30	65	5	75	10	20	5	60	2	30	/	/	/	/	
Average of the 5 subplots																				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 10/10/23	KERIKERI	BAM 6	LORENA BAILE AND CHRIS DONK

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Nitraria billadeirei		20	20	
	Rhodanthe floribunda		15	1000	
	Austrostipa scabra		5	200	
	Medicago	E	10	1000	
	Barley	E	5	2000	
	~~Sonchus~~ Sonchus oleracea	E	0.1	50	
	Bulbine semibacatlea		0.1	500	
	Vittadinia cuneata		1	200	
	Rytidosperma setacea		10	400	
	Rytidosperma sp. 'hairy blue'		0.1	10	
	Plantago cunninghamii		0.1	500	
	Sclerolaena diacantha (grey)		0.3	60	
	~~Rytidosperma sp. 'short'~~		~~0.1~~	~~3~~	
	Atriplex curvispicatum		0.1	3	
	Sclerolaena muricata		0.2	10	
	~~Rytidosperma racemosa~~				
	Atriplex acutebractea		0.1	1	
	Funkey burr weed	E	0.2	50	
	Leptorhynchos baileyi		0.1	3	
	Vulpia bromoides	E	0.2	200	
	Maireana aphylla		0.2	8	
	Goodenia (tall)		0.1	2	
	Sida cunninghamii		0.1	1	
	Yellow ~~thing~~ weed brassica	E	0.1	100	
	Oxalis ~~sp.~~ (~~small~~) corniculata	E	0.1	20	
	Chenopodium nitrariaceum.		0.1	1	
	Little grass (5)	E	0.1	100	
	Ukuen succulent (small flower) (3)		0.1	1	
	Ukuen succulent (5)		0.1	1	
	Atriplex baileyi		0.1	1	
	Chenopodium curvispicatum		0.1	5	
	Einadia nutans		0.1	1	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

Erodium cicutarium	E	0.1	1
Sclerolaena brachyptera		0.1	1
Echium plantagineum	E	0.1	1

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
Zone:		Datum:		Plot ID:	Plot 6		
Easting:		Northing:		VZ/PCT	bw/163	Midline bearing from 0 m:	222°
Site Description							

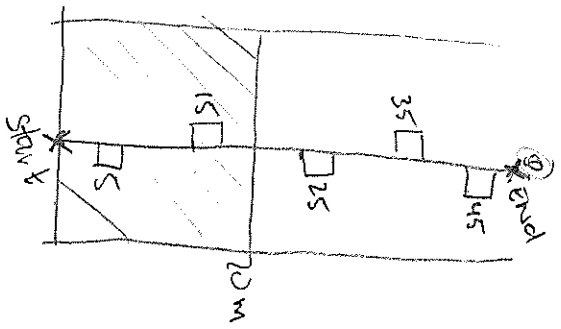
Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values		*Sum values may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot* *Growth form definitions provided in Appendix F of BAM 2020* ***Grass-like** = Sedges and rushes* ***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*
GF Code	**Count of native richness**	**Cover**	
TG - trees			
SG - shrubs			
GG - Grasses and Grass-like			
FG - Forbs			
EG - Ferns			
OG - other			
High threat weed cover			

BAM Attribute (1000m² plot)			*For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.* *For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.* *Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.*
DBH	**#Tree Stems Count**	**#Trees with Hollows**	
80 + cm *(count)*			
50 – 79 cm *(count)*			
30 – 49 cm *(count)*			
20 – 29 cm *(count)*			
10 – 19 cm *(yes/no)*			
5 – 9 cm *(yes/no)*			
<5 cm *(yes/no)*			
Length of logs (m)	Tally:	Total:	

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	5	8	5	1	2	0	85	75	25	80										
Average of the 5 subplots																				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*



BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date: 11/10/23	KERI KERI	BAM PLOT 11	CHRIS D & LORENA B.

GF Code	Top 3 native species in each growth form group: full species name mandatory. All other native and exotic species: full species name where practicable	N, E or HTE	Cover	Stratum (E,M,S,G) ← Abundance	Voucher	Photo #
	Maerianga phylla		20	100	~~100~~	
	Austrostipa scabra.		20	2000	~~500~~	
	Rytidosperma 'blue hairy'		2	~~300~~ 1000		
	~~" "~~ ~~thinly~~					
	Plantago cunn?		0-2	2000		
	Raoulia glauca		0.1	1		
	Rhodanthe floribunda		~~2~~ 2	1000		
	Medicago	HTE	5	1000		
	Sclerolaena diacanthus		2	50		
	Furkey Brassica ~~co~~	E	0.1	1		
	Unknown (like Livum) herb small, unbranched (S)		0.1	1		
	Rytidosperma setacea.		~~0.2~~ 0-2	30		
	Maerianna bradyphera		~~0.2~~	~~20~~		
	Calotis cymbacantha		0-2	500		
	Small Chloris-like grass (S).		1	300		
	Vittadinia cuneata		0.1	50.		
	Nitraria		1	3		
	Einadia nutans.		0.5	10		
	Sclerolaena tricuspis.		0.5	10		
	Vulpia brom.		0.1	100		
	Oxalis E.		0.1	1		
	Sonchus oleracea		0-1	25		
	Erodium	E	0.1	2		
	Austrostipa nitida		0.1	5		
	Whalwega		0.1	~~0~~ 1		
	Crassula		0-1	500		
	Sida		0-1	1		
	Calandrinia Tufty volubile Purslane		0-1	1		

N: native, **E**:exotic, **HTE**: high threat exotic, **GF** – circle code if 'top 3'

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

Abundance: 1, 2, 3, ….10, 20, 30, ….. 100, 200,…., 1000

Stratum: E – emergent, C – canopy, M – mid-storey / sub canopy, S – shrub layer, G – ground layer

BAM Site – Field Survey Form

Survey Name		Date	Recorders
Zone:	Datum:	Plot ID:	Photo #:
Easting:	Northing:	IBRA region:	Midline bearing from 0 m:
VZ / PCT:			

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04ha base plot.

BAM Attribute (400m² plot)	Sum values	
	Count of native richness	Cover
Trees		
Shrubs		
Grasses etc.		
Forbs		
Ferns		
Other		
High threat weed cover		

Cover: 0.1, 0.2, 0.3….. 1,2,3,……,10, 15, 20, 25, ….. 100% (foliage cover). *Note: 0.1% cover is approx.. 63x63 cm or a circle about 71 cm diameter, 0.5% approx. 1.4 x 1.4m, 2% cover is approx. 2 x 2m, 5% = 4 x 5m, 25% 10 x 10m*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
<5 cm		
Length of logs (m) (≥ 10 cm diameter, >50cm in length)	Tally:	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multi-stemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)																				
	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	2	1	1	1	5	45	30	5	15	5										
Average of the 5 subplots																				

Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter)

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:			

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Maireana aphylla		20	60	
	Medicago ~~sp~~ praecox		40	600	
	Austrostipa scabra		20	800	
	Plantago drummondii		0.1	100	
	Plantago cunninghamii		1	500	
	Rhodanthe floribunda.		0.5	100	
	Rytidosperma hairy.		5	500	
	Sclerolaena diacantha		1	80	
	~~brocksonia~~ Oxalis perennans		0.2	30	
	Ptilotus spathulatus.		0.1	100	
	Wahlenbergia		0.1	20	
	Rhagodia spinescens		0.3	5	
	Chloris truncata		0.2	50	
	Bulbine		0.1	5	
	Chrysocephalum apiculatum		1	20	
dead	* Sclerolaena tricuspis.				
	~~Chrysocephalum~~ Calotis scabiosifolia				
	Sida ~~soft~~ ~~fibrifera~~ corrugata.		0.1	10	
	Salsola australis		0.1	20	
	Nitraria billardierei		0.2	1	
	Sida ~~woody~~ intricata?		0.1	50	
	Senecio		0.1	10	
	Sclerolaena bicuspis.		0.1	20	
	Cirsium vulgare		0.1	1	
	Vulpia		0.2	100	
	~~Sida sterilis~~		~~0.2~~	~~50~~	
	Rytidosperma setacea.		0.2	50	
	Atriplex cardiocarpa		0.1	1	
	~~Sweet fluffy~~		0.1	5	
	Bromus sp		0.1	30	
	Wahlenbergia sulcata ?! /				
	Cenicerella.				

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
Zone:		Datum:		Plot ID:	BAM05		
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

Sum values may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
***Other** = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea*

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
Subplot	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
score % in each	3	15	5	5	2	15	20	20	25	15	2	10	1	0	20	0	0	0	0	0
Average of the 5 subplots																				

*Litter cover: the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

BAM Site – Plot Species List

400m² plot: Sheet ___ of ___	Survey Name	Plot ID	Recorders
Date:		Plot 03	

GF Code	Record all species in 20x20m plot. Full species name is mandatory. All other native and exotic species: full species name where practicable – need to determine if Native/Exotic	N, E or HTE	Foliage Cover	Abundance	Photo # or voucher #
	Austrostipa Scabra		70	2000	
	Medicago sp		15	500	
	Plantago cunninghamii		0.2	200	
	Squirrel fescue - Vulpia		10	1000	
	Calotis Scabiosifolia		5	300	
	~~Austro~~ Rhitodisperma setacea		0.2	80	
	Maireana aphylla		8	20	
	Rhodanthe floribunda.		5	300	
	Sonchus. asper.		0.1	20	
	Vittadinea cuneata.		0.1	30	
	Austrostipa nitida		0.1	20	
	Scleroleana tricuspis.		0.2	20	
	Rytidosperma bulbosa		0.1	3	
	* Centaurium like		0.1	100	
	Sclerolaena dicantha.		0.2	40	
	Nitrarium billardieri		0.1	1	
	Patersons curse. - Echium plantagineum		0.1	1	
	~~Forktip wallaby grass~~		~~0.2~~	~~80~~	
	~~Leptorynchus~~				
	Elymus		0.1	10	
	Plantago sp.		0.1	100	
	Sida		0.1	20	
	Woodrose		0.1	30	
	Linum lobuatum		0.1	20	
	Ragodia spinescens.		0.1	5	
	Erodium sp. Crinitum		0.1	5	
	Brassica sp		0.1	1	
	Brachy grass		0.5	200	
	Wahlenbergia		0.1	10	

GF Code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other. No growth form for E or HTW.
N: native (use PlantNet), **E:** exotic, **HTW:** high threat weed (HTW list provided on gov website).
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, 4, 5, 10, 15, 20, 25, ...100%; **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m. Include cover of trees not rooted within plot.
Abundance: Count 1, 2, 3 ..., when ≤10, estimate when >10, 20, 30 ... 100, 200, 300 ..., 1000, 2000, 3000 ... (as integer values).

BAM Plot Site – Field Survey Form

Survey Name				Date		Recorders	
BAM03				12/10/23		Lorena + Freya	
Zone:		Datum:		Plot ID:			
Easting:		Northing:		VZ/PCT		Midline bearing from 0 m:	
Site Description							

Record easting and northing (UTM) at 0m on midline. Plot should not be established in ecotone, or within 50m of road/clearing where possible.

BAM Attribute (400m² plot)	Sum values	
GF Code	Count of native richness	Cover
TG - trees		
SG - shrubs		
GG - Grasses and Grass-like		
FG - Forbs		
EG - Ferns		
OG - other		
High threat weed cover		

***Sum values** may be completed after data collection. Not required while in the field. Determined from species data collected from 400m² plot*

Growth form definitions provided in Appendix F of BAM 2020
***Grass-like** = Sedges and rushes*
Other = tree fern, palm, cycad, vine, epiphyte and lithophyte, xanthorrhoea

BAM Attribute (1000m² plot)		
DBH	#Tree Stems Count	#Trees with Hollows
80 + cm *(count)*		
50 – 79 cm *(count)*		
30 – 49 cm *(count)*		
20 – 29 cm *(count)*		
10 – 19 cm *(yes/no)*		
5 – 9 cm *(yes/no)*		
<5 cm *(yes/no)*		
Length of logs (m)	Tally:	Total:

For a multi-stemmed tree, the largest living stem DBH is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of trees/stags rooted within the plot containing hollows. Hollow is >5cm, >1m above ground, with appeared depth.

Log must be ≥ 10 cm diameter. Count logs entirely or partly on the ground. Only count length within the plot.

BAM Attribute (1 x 1 m plots)	Litter cover %					Bare ground cover %					Cryptogam cover %					Rock cover %				
	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
Subplot score % in each	2	5	1	10	2	3	10	5	30	50	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	4					19.6					0					0				

***Litter cover:** the percentage ground cover of all plant material that has **detached** from a plant and forms part of the litter layer on the ground surface (must be on the ground), including leaves, seeds, twigs, branchlets and branches (<10 cm in diameter). Litter from native and exotic species (combined) is recorded for this attribute.*
***Subplots:** Subplots must alternate side of midline - at 5m must be on the right hand side of midline, at 15m on left hand side…*

BAM Site - Field Survey Form

Survey Name	Stratification / Zone ID		Plot ID	Recorders	Date
Keri Keri Wind Farm	PCT:	160	160-1	Mark Aitkens Robert Ashworth Freya Robinson	20/12/2023
	Condition:	Moderate			

Start	WP:	Zone:	54	E:	769539	N:	6143515	Midline bearing:	145
Finish	WP:	Zone:		E:		N:			

Plant Community Type

PCT ID#	160	**PCT Definition Status**	Approved
PCT Name	Nitre Goosefoot shrubland wetland on clays of the inland floodplains		
PCT associated with TEC	Has associated TEC		
TEC List:	Listed BC Act,CE: Artesian Springs Ecological Community in the Great Artesian Basin (Part) ;		
Vegetation Formation	Freshwater Wetlands;		**Confidence**
Vegetation Class	Inland Floodplain Shrublands;		H M L

BAM Attribute (20 x 20m plot)

Growth Form	Count of native richness	Sum of Cover
Trees	0	0
Shrubs	4	21.5
Grasses etc.	3	0.5
Forb	6	0.8
Ferns	1	10
Other	0	0
HTWs	0	0

Foilage Cover scale:
0.1, 0.2, 0.3…..0.9
1,2,3,……9,
10, 15, 20, 25, ….. 100%

0.1% = 63x63 cm (or a circle 71 cm ∅)
0.5% = 1.4 x 1.4m,
2% = 2 x 2m,
5% = 4 x 5m,
25% = 10 x 10m

BAM Attribute (1000 m plot)

DBH	#Tree Stem Count	# Stems with Hollows
80 + cm		
50 - 79 cm		
30 - 49 cm		
20 - 29 cm		
10 - 19 cm		
5 - 9cm		
<5 cm		
Length of logs (m) (≥10cm, .50cm in length)	0	0

Counts apply when the number of tree stems within a size class is ≤ 10. Estimate can be used when > 10 (eg. 10, 20, 30….100, 200). For a multistemmed tree, only the largest living stem is included in the count / estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)

		Litter cover %					Bare Ground %					Cryptogram %					Rock Cover %				
Subplot score % in each	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45	5	15	25	35	45
	30	40	5	30	10															
Average of 5 subplots	23																			

400m2 Plot: Sheet 1 of #								
Survey Name		**Stratification / Zone ID**	**Plot ID**	**Recorders**			**Date**	
Keri Keri Wind Farm		160	160-1	Mark Aitkens Robert Ashworth Freya Robinson			20/12/23	
GF Code	**Family**	**Species**	Cover	Abundance	Stratum	N, E, HTW	BC Act	EPBC Act
(SG)	Chenopodiaceae	*chenopodium nitrariaceum*	20	50		N	0	0
(SG)	Chenopodiaceae	*Sclerolaena muricata*	0.3	20		N	0	0
(SG)	Polygonaceae	*Duma florulenta*	1	5		N	0	0
(FG)	Asteraceae	*Rhodanthe floribunda*	0.2	30		N	0	0
(EG)	Marsileaceae	*Marsilea drummondii*	10	1000		N	0	0
(GG)	Poaceae	*Austrostipa scabra*	0.3	50		N	0	0
(GG)	Poaceae	*Chloris truncata*	0.1	20		N	0	0
#N/A	Brassicaceae	*Sisymbrium spp.*	0.2	100		E	0	0
(FG)	Chenopodiaceae	*Atriplex lindleyi*	0.1	5		N	0	0
#N/A	Poaceae	*Hordeum spp.*	0.5	500		E	0	0
#N/A	Fabaceae (Faboideae)	*Medicago spp.*	0.2	50		E	0	0
(FG)	Asteraceae	*Calotis spp.*	0.2	100		N	0	0
(FG)	Euphorbiaceae	*Chamaesyce drummondii*	0.1	1		N	0	0
(GG)	Poaceae	*Bromus spp.*	0.1	50		N	0	0
#N/A	Caryophyllaceae	*Silene spp.*	0.2	200		E	0	0
(SG)	Chenopodiaceae	*Rhagodia spinescens*	0.2	3		N	0	0
#N/A	Poaceae	*Vulpia spp.*	0.1	50		E	0	0
(FG)	Asteraceae	*Vittadinia spp.*	0.1	5		N	0	0
(FG)	Asteraceae	*Sonchus spp.*	0.1	1		N	0	0

APPENDIX C BIODIVERSITY CREDIT REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id
00029215/BAAS17034/24/00046438

Proposal Name
Keri Keri WF

BAM data last updated *
14/03/2024

Assessor Name
Matt J Davis

Report Created
12/04/2024

BAM Data version *
67

Assessor Number
BAAS18090

BAM Case Status
Finalised

Date Finalised
12/04/2024

Assessment Revision
0

Assessment Type
Major Projects

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Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cotton Bush open shrubland of the semi-arid (warm) zone												
3	164_Moderate	Not a TEC	97.6	97.6	855.7	PCT Cleared - 8%	High Sensitivity to Gain			1.50		31315
											Subtotal	**31315**

Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones											
4	163_Moderate	Not a TEC	92.2	92.2	268.6	PCT Cleared - 26%	High Sensitivity to Gain			1.50	9282
										Subtotal	**9282**
Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion											
1	44_Low	Not a TEC	42.8	42.8	4.8	PCT Cleared - 73%	High Sensitivity to Gain			2.00	102
										Subtotal	**102**
Nitre Goosefoot shrubland wetland on clays of the inland floodplains											
2	160_Moderate	Not a TEC	75.1	75.1	1.8	PCT Cleared - 28%	High Sensitivity to Gain			1.50	52
										Subtotal	**52**
										Total	**40751**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Brachyscome papillosa / Mossgiel Daisy (Flora)									
160_Moderate	75.1	75.1	1.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	51
164_Moderate	97.6	97.6	787.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	38442
163_Moderate	92.2	92.2	232.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	10706
								Subtotal	**49199**
Hieraaetus morphnoides / Little Eagle (Fauna)									
164_Moderate	97.6	97.6	7.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	281
163_Moderate	92.2	92.2	8.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	299
								Subtotal	**580**

Maireana cheelii / Chariot Wheels (Flora)									
164_Moderate	97.6	97.6	767.7	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	37458
163_Moderate	92.2	92.2	1.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	84
								Subtotal	**37542**
Swainsona murrayana / Slender Darling Pea (Flora)									
160_Moderate	75.1	75.1	1.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	51
164_Moderate	97.6	97.6	787.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	38442
								Subtotal	**38493**

BAM Candidate Species Report

Proposal Details

Assessment Id 00029215/BAAS17034/24/00046438	Proposal Name Keri Keri WF	BAM data last updated * 14/03/2024
Assessor Name Matt J Davis	Report Created 12/04/2024	BAM Data version * 67
Assessor Number BAAS18090	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 0	Date Finalised 12/04/2024	

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List of Species Requiring Survey

Name	Presence	Survey Months
Ardeotis australis Australian Bustard	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Brachyscome papillosa Mossgiel Daisy	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Lepidium monoplocoides Winged Peppercress	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Maireana cheelii Chariot Wheels	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Swainsona murrayana Slender Darling Pea	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Austral Pillwort	Pilularia novae-hollandiae	Refer to BAR
Bindweed	Convolvulus tedmoorei	Species is vagrant
Claypan Daisy	Brachyscome muelleroides	Refer to BAR
Koala	Phascolarctos cinereus	Habitat constraints
Lanky Buttons	Leptorhynchos orientalis	Habitat degraded
Menindee Nightshade	Solanum karsense	Species is vagrant Geographic limitations
Pink Cockatoo	Lophochroa leadbeateri	Habitat constraints
Pink-tailed Legless Lizard	Aprasia parapulchella	Refer to BAR

Plains-wanderer	Pedionomus torquatus	Habitat constraints
Red Darling Pea	Swainsona plagiotropis	Habitat degraded Geographic limitations
Silky Swainson-pea	Swainsona sericea	Habitat degraded
Small Scurf-pea	Cullen parvum	Habitat degraded Geographic limitations
Turnip Copperburr	Sclerolaena napiformis	Habitat degraded Geographic limitations
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00029215/BAAS17034/24/00046438	Keri Keri WF	14/03/2024
Assessor Name	Report Created	BAM Data version *
Matt J Davis	12/04/2024	67
Assessor Number	Assessment Type	BAM Case Status
BAAS18090	Major Projects	Finalised
Assessment Revision		Date Finalised
0		12/04/2024

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Australian Painted Snipe	Rostratula australis	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Black Falcon	Falco subniger	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Blue-billed Duck	Oxyura australis	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Brolga	Grus rubicunda	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Diamond Firetail	Stagonopleura guttata	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion

Dusky Woodswallow	Artamus cyanopterus cyanopterus	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Freckled Duck	Stictonetta naevosa	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Grey Falcon	Falco hypoleucos	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Little Eagle	Hieraaetus morphnoides	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Little Pied Bat	Chalinolobus picatus	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Magpie Goose	Anseranas semipalmata	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Pied Honeyeater	Certhionyx variegatus	163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Pink Cockatoo	Lophochroa leadbeateri	163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones

Plains-wanderer	Pedionomus torquatus	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
Redthroat	Pyrrholaemus brunneus	163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
Spotted Harrier	Circus assimilis	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
White-bellied Sea-Eagle	Haliaeetus leucogaster	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
White-fronted Chat	Epthianura albifrons	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
		164-Cotton Bush open shrubland of the semi-arid (warm) zone
		163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones
White-throated Needletail	Hirundapus caudacutus	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion
		160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains

Threatened species Manually Added

None added

BAM Predicted Species Report

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00029215/BAAS17034/24/00046438

Assessment name
Keri Keri WF

BAM data last updated *
14/03/2024

Assessor Name
Matt J Davis

Report Created
12/04/2024

BAM Data version *
67

Assessor Number
BAAS18090

Assessment Type
Major Projects

BAM Case Status
Finalised

Assessment Revision
0

Date Finalised
12/04/2024

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Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	44_Low	44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Low	4.78	2	

2	160_Moderate	160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Moderate	1.84	1	
3	164_Moderate	164-Cotton Bush open shrubland of the semi-arid (warm) zone	Moderate	855.73	7	
4	163_Moderate	163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Moderate	268.58	7	

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00029215/BAAS17034/24/00046438

Proposal Name
Keri Keri WF

BAM data last updated *
14/03/2024

Assessor Name
Matt J Davis

Assessor Number
BAAS18090

BAM Data version *
67

Proponent Names

Report Created
12/04/2024

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Major Projects

Date Finalised
12/04/2024

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

PCT
164-Cotton Bush open shrubland of the semi-arid (warm) zone

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Not a TEC	4.8	0	102	102
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Not a TEC	1.8	0	52	52
164-Cotton Bush open shrubland of the semi-arid (warm) zone	Not a TEC	855.7	0	31315	31315
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Not a TEC	268.6	0	9282	9282

44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Riverine Plain Grasslands This includes PCT's: 44	Riverine Plain Grasslands >=70% and <90%	44_Low	No	102	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Inland Floodplain Shrublands This includes PCT's: 17, 24, 25, 115, 160, 161, 240, 241, 247, 261, 271, 375	Inland Floodplain Shrublands <50%	160_Moderate	No	52	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains

163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands <50%	163_Moderate	No	9282	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

164-Cotton Bush open shrubland of the semi-arid (warm) zone

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands <50%	164_Moderate	No	31315	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Brachyscome papillosa / Mossgiel Daisy	**160_Moderate, 164_Moderate, 163_Moderate**	1021.6	49199.00
Hieraaetus morphnoides / Little Eagle	**164_Moderate, 163_Moderate**	16.3	580.00
Maireana cheelii / Chariot Wheels	**164_Moderate, 163_Moderate**	769.5	37542.00
Swainsona murrayana / Slender Darling Pea	**160_Moderate, 164_Moderate**	789.2	38493.00

Credit Retirement Options

Like-for-like credit retirement options

Brachyscome papillosa / Mossgiel Daisy	Spp	IBRA subregion

	Brachyscome papillosa / Mossgiel Daisy	Any in NSW
Hieraaetus morphnoides / Little Eagle	Spp	IBRA subregion
	Hieraaetus morphnoides / Little Eagle	Any in NSW
Maireana cheelii / Chariot Wheels	Spp	IBRA subregion
	Maireana cheelii / Chariot Wheels	Any in NSW
Swainsona murrayana / Slender Darling Pea	Spp	IBRA subregion
	Swainsona murrayana / Slender Darling Pea	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00029215/BAAS17034/24/00046438

Proposal Name
Keri Keri WF

BAM data last updated *
14/03/2024

Assessor Name
Matt J Davis

Assessor Number
BAAS18090

BAM Data version *
67

Proponent Name(s)

Report Created
12/04/2024

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Major Projects

Date Finalised
12/04/2024

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

PCT
164-Cotton Bush open shrubland of the semi-arid (warm) zone

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Not a TEC	4.8	0	102	102.00
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Not a TEC	1.8	0	52	52.00
164-Cotton Bush open shrubland of the semi-arid (warm) zone	Not a TEC	855.7	0	31315	31315.00
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	Not a TEC	268.6	0	9282	9282.00

44-Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Riverine Plain Grasslands This includes PCT's: 44	Riverine Plain Grasslands >=70% and <90%	44_Low	No	102	Murrumbidgee,Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Grasslands	Tier 2 or higher threat status	44_Low	No	102	IBRA Region: Riverina, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
160-Nitre Goosefoot shrubland wetland on clays of the inland floodplains	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Inland Floodplain Shrublands This includes PCT's: 17, 24, 25, 115, 160, 161, 240, 241, 247, 261, 271, 375	Inland Floodplain Shrublands <50%	160_Moderate	No	52	Murrumbidgee,Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region

	Freshwater Wetlands	Tier 4 or higher threat status	160_Moderate	No	52	IBRA Region: Riverina, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
163-Dillon Bush (Nitre Bush) shrubland of the semi-arid and arid zones	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands <50%	163_Moderate	No	9282	Murrumbidgee,Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Arid Shrublands (Chenopod sub-formation)	Tier 4 or higher threat status	163_Moderate	No	9282	IBRA Region: Riverina, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
164-Cotton Bush open shrubland of the semi-arid (warm) zone	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

Riverine Chenopod Shrublands This includes PCT's: 157, 158, 159, 163, 164, 168, 195, 196, 211, 212, 216, 236, 254, 377, 466	Riverine Chenopod Shrublands <50%	164_Moderate	No	31315	Murrumbidgee,Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Arid Shrublands (Chenopod sub-formation)	Tier 4 or higher threat status	164_Moderate	No	31315	IBRA Region: Riverina, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Brachyscome papillosa / Mossgiel Daisy	**160_Moderate, 164_Moderate, 163_Moderate**	1021.6	49199.00
Hieraaetus morphnoides / Little Eagle	**164_Moderate, 163_Moderate**	16.3	580.00
Maireana cheelii / Chariot Wheels	**164_Moderate, 163_Moderate**	769.5	37542.00
Swainsona murrayana / Slender Darling Pea	**160_Moderate, 164_Moderate**	789.2	38493.00

Credit Retirement Options

Like-for-like options

	Spp	IBRA region
Brachyscome papillosa/ Mossgiel Daisy	**Brachyscome papillosa**/Mossgiel Daisy	Any in NSW

Brachyscome papillosa/ Mossgiel Daisy	**Variation options**		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Hieraaetus morphnoides/ Little Eagle	Spp	IBRA region	
	Hieraaetus morphnoides/Little Eagle	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Maireana cheelii/ Chariot Wheels	Spp	IBRA region	
	Maireana cheelii/Chariot Wheels	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Swainsona murrayana/ Slender Darling Pea	Spp	IBRA region	
	Swainsona murrayana/Slender Darling Pea	Any in NSW	
	Variation options		

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Murrumbidgee, Darling Depression, Lachlan, Lachlan Plains, Lower Slopes, Murray Fans, Robinvale Plains and South Olary Plain. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

APPENDIX D BAT CALL ANALYSIS REPORT SUMMER 2022

Bat Call Analysis Report

Keri Keri Wind Farm Project

Prepared for ERM

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Report Number: ME22019_Bat Call Analysis Keri Keri Wind Farm

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Document Records - Quality

TITLE	Bat Analysis for the Keri Keri Wind Farm
FILED AS	ME22019_Bat Call Analysis Keri Keri Wind Farm

Revision	Date	Prepared by (name/title)	Reviewed by (name/ title)	Approved by (name/title)
Version A	09/05/2022	Kelly Matthews, Principal Ecologist	ERM	Client

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1.0 Introduction

1.1 Background

Green Tape Solutions were commissioned to undertake bat call analysis for the Keri Keri Wind Farm project located near Mildura in New South Wales.

1.2 Scope of Work

The specific scope of works for this report includes the following:

- Outline the methodology used to analyse the microbat call within the subject site; and,
- Present the findings of all of the bat call surveys conducted at the project site;

2.0 Methodology

2.1 Capture Technique

Microbat calls were sampled using eight Anabat Swift detectors (Titley Electronics). Passive monitoring was undertaken from 16 February to 8 March 2022. The original call files display Australian Eastern Standard Time. The data was analysed using Anabat Insight.

Monitoring commenced at dusk (approximately 1800 hours) and continued until dawn (approximately 0530 hours). Ultrasonic call monitoring surveys on anabat detectors were conducted using full-spectrum fitted with omnidirectional ultrasonic microphone.

2.2 Call Identification

Anabat recordings were analysed using Anabat software (Anabat Insight). Identifications were made by categorising call shape and frequency, with a species match given in consideration to region, known bat distributions, and habitats present. The focus of the bat surveys was to assess the presence of bat species found within the Project Area, and to assess the potential for rare and threatened species to occur.

Call identification for this dataset was based on call keys and descriptions published for Queensland (Reinhold *et al.*, 2001) and New South Wales (Pennay *et al.*, 2004).

Species' identification was further refined using the probability of occurrence of each species based on their geographic distribution (Churchill, 2008, Van Dyck and Strahan, 2008). Species nomenclature used in this report follows Churchill (2008).

The reliability of identification is as follows:

- **Definite** - one or more calls where there is no doubt about the identification of the species;
- **Probable** - most likely to be the species named, low probability of confusion with species that use similar calls; and,
- **Possible -** call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

2.3 National Standard

The format and content of this report complies with the nationally accepted standards for the interpretation and reporting of Anabat and Songmeter data (Reardon, 2003), which is currently available from the Australasian Bat Society at www.ausbats.org.au.

3.0 Results

3.1 Total Species Recorded

The majority of calls were considered to be of medium to good quality calls.

We note that the anabat (SD card 8) did not record any call. There might have been issues with the batteries or the device itself.

A total of 32,912 sequence files were analysed. A proportion of these files (13,565) in this dataset contained background noise or resulted in poor quality calls that did not provide bat calls for analysis. While some call sequences were recognised as bat calls, the quality was not sufficient to assign species identification.

A summary of the species identified through bat call analysis is provided in **Table 1**.

Table 1: Summary of bat call analysis

Species	Biodiversity Act	EPBC Act	1	2	3	4	5	6	7
Austronomus australis	LC	NOC	Definite	Definite	Definite	Definite	Definite		Definite
Chalinolobus gouldii	LC	NOC	Definite	Definite		Definite	Definite	Definite	Definite
Chalinolobus morio	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Myotis macropus	V	NOC	Possible	Possible	Possible	Possible		Possible	Possible
Nyctophilus geoffroyi	LC	NOC		Possible	Possible	Possible		Possible	
Nyctophilus gouldii	LC	NOC		Possible	Possible	Possible		Possible	
Ozimops planiceps	LC	NOC	Definite		Definite	Definite			
Ozimops ridei	LC	NOC	Definite	Definite	Definite	Definite			Definite
Saccolaimus flaviventris	V	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Scotorepens balstoni	LC	NOC		Definite	Definite	Definite	Definite		Definite
Scotorepens greyii	LC	NOC	Definite	Definite	Definite	Definite	Definite	Definite	Definite
Vespadelus darlingtoni	LC	NOC	Probable	Possible	Probable	Probable	Probable	Possible	
Vespadelus regulus	LC	NOC	Possible	Possible	Possible	Possible	Possible	Possible	
Vespadelus vulturnus	LC	NOC	Possible	Possible	Possible	Possible	Possible	Possible	

LC: Least Concern, NOC: Not of Concern, V: Vulnerable

3.2 Samples of Calls / Sequences Files

Samples of call extracted from the dataset for each species identified is provided in the following figures

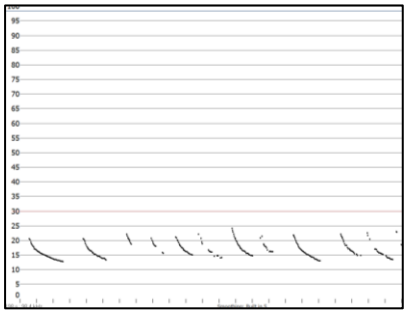
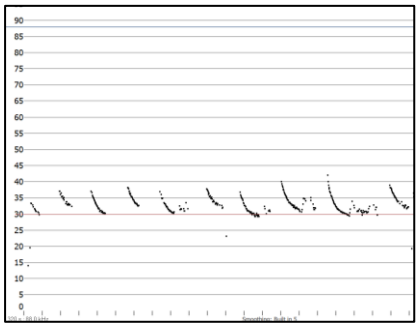
Species	Calls	Known distribution (Extract from Ausbats maps from Australian Bat Society)
Figure 1: *Austronomus australis* This bat is easily recognised by its constant frequency calls range in bandwidth from 10.5 to 15 kHz (Pennay *et al.*, 2004).		
Figure 2: *Chalinolobus gouldii* This species has a curved shape call with characteristic frequency 28 to 34kHz. Pulse alternates in frequency and mostly down-sweeping tail or no tail.		

Figure 3: *Chalinolobus morio*

C. morio has a down-sweeping tail curved pulse with characteristic frequency 47.5 to 53 kHz. It has often a very brief characteristic section.

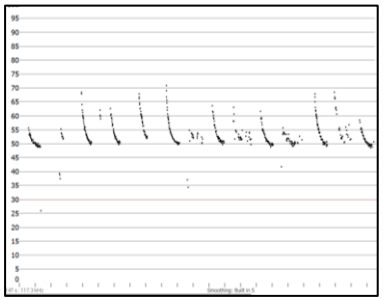




Figure 4: *Myotis macropus*

Near-vertical pulse dropping to about 30 to 35-50kHz. *M. macropus* mostly have a pulse interval of less than 75ms and usually have one kink close to the middle so that the second part has a lesser slope than the first (Reinhold, 2001).

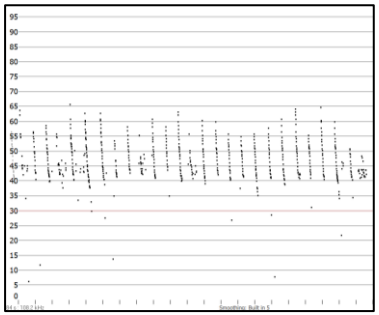
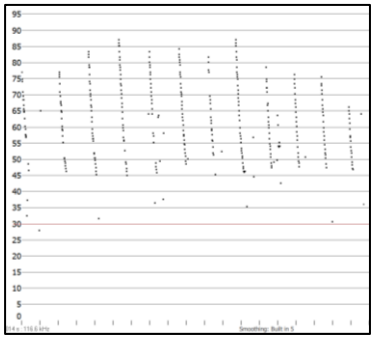




Figure 5: *Nyctophilus spp*

This species displays a near-vertical pulse, characteristic frequency between 80 and 35KHz (Pennay *et al*, 2004).

The species from this genus cannot be distinguished from each other. There are two species that are known to occur in the project area.





N. geoffroyi



N. gouldi

Figure 6: *Ozimops planiceps*

This bat calls are flat and its characteristic is between 24 and 29 kHz.

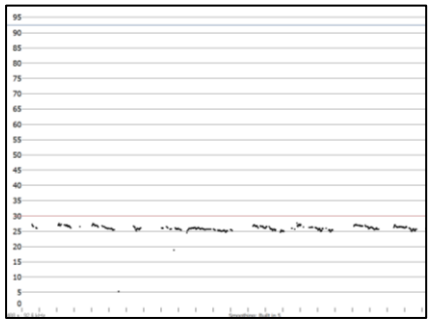




Figure 7: *Ozimops ridei*

O. ridei calls are flat and sometimes a bit curved with frequency a bit lower than 30kHz. Characteristic frequency of this species is between 28 to 36 kHz.

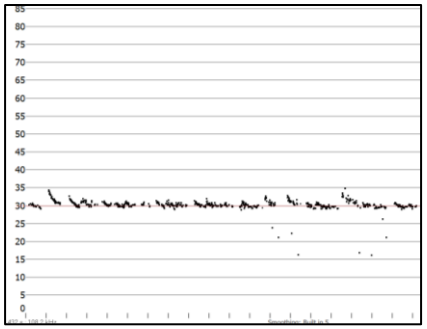




Figure 8: *Saccolaimus flaviventris*

Curved, characteristic frequency 18 to 21.5 kHz. The characteristic frequency does not go above 22 kHz. Other species that could overlap do not occur in this area.

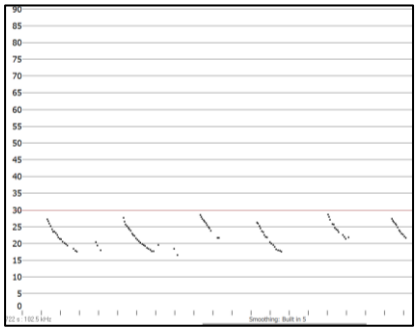




Figure 9: *Scotorepens balstoni*

Pulse of this species is curved with tail variable. Characteristic frequency 31 to 35 kHz and the frequency of the knee 33 to 37 kHz.

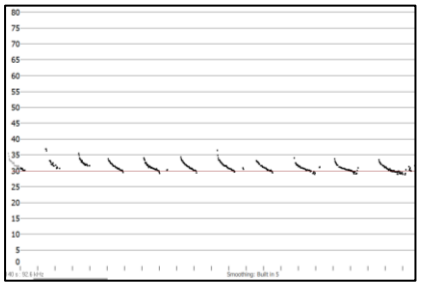




Figure 10: *Scotorepens greyii*

S. greyii has a curved and up-sweeping tail pulse but sometime down-sweeping or absent. Its characteristic frequency is between 36 to 41.5 kHz.

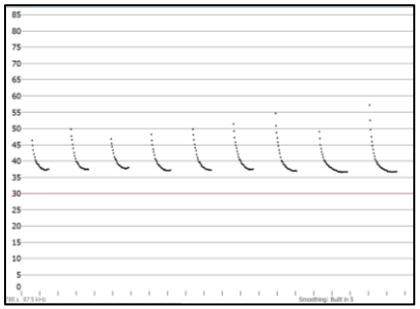




Figure 11: *Vespadelus darlingtoni*

This species call has a curved call with no tail or sometime an up-sweeping tail. The call's characteristic frequency is between 42.5 to 48.5 kHz. Characteristic section is often, but not always, relatively long.

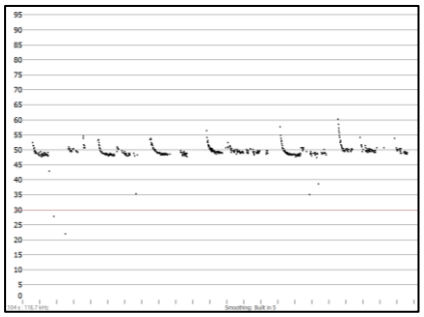




Figure 12: *Vespadelus regulus*

Characteristic frequency varies significantly over distribution from 40 to 55 kHz. Call shape also varies between regions (see regional information). Characteristic frequency 45 to 47 kHz (n = 19). Curved with up-sweeping tail.
It cannot be distinguished from *V. vulturnus*, or some *V. darlingtoni* when up-sweeping tail.

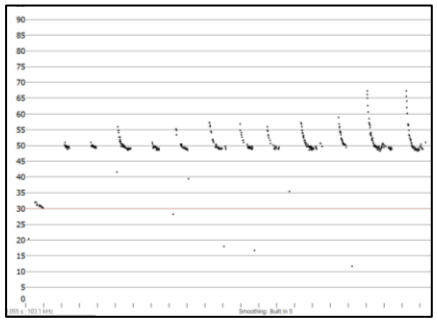
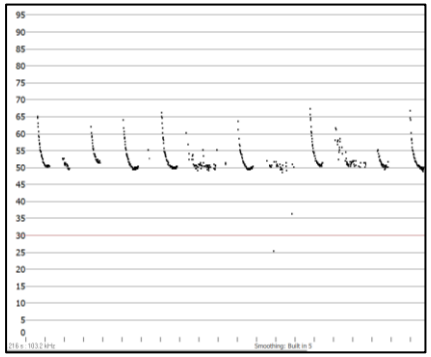




Figure 13: *Vespadelus vulturnus*

Curved and up-sweeping tail calls with characteristic frequency between 45 to 53 kHz.

It cannot be distinguished from *V. regulus*, or some *V. darlingtoni* when up-sweeping tail.





4.0 References

CHURCHILL, S. 2008. *Australian Bats,* Sydney, Allen and Unwin.

DEWHA 2010. Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. *In:* DEPARTMENT OF THE ENVIRONMENT WATER HERITAGE AND THE ARTS (ed.). Canberra.

PENNAY, M., LAW, B. A. & REINHOLD, L. 2004. Bat calls of New South Wales: Region based guide to the echolocation calls of microchiropteran bats. *In:* NSW DEPARTMENT OF ENVIRONMENT AND CONSERVATION (ed.). Hurstville.

PWCNT 2002. Key to the Bat Calls of the Top End of the Northern Territory. *In:* PARKS AND WILDLIFE COMMISSION OF THE NORTHERN TERRITORY (ed.). Damian J. Milne.

REARDON, T. 2003. Standards in bat detector based surveys. *Australasian Bat Society* Newsletter 20.

REINHOLD, L., LAW, B., FORD, G. A. & PENNAY, M. 2001. *Key to the Bat Calls of South-east Queensland and North-east New South Wales*, Queensland Department of Natural Resources and Mines.

VAN DYCK, S. & STRAHAN, R. 2008. *The Mammals of Australia (Third Edition); ,* Sydney, New Holland.

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