PREPARED FOR

Acciona Energy Australia Global Pty Ltd

Keri Keri Wind Farm

Environmental Impact Statement

DATE
17 April 2024

REFERENCE
0617753

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SIGNATURE PAGE

Keri Keri Wind Farm

Environmental Impact Statement

0617753

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REAP DECLARATION

Project details	
Project name	Keri Keri Wind Farm
Application number	SSD-38358962
Address of the land on which the infrastructure is to be carried out	Sturt Highway, Keri Keri NSW 2711
Applicant details	
Applicant name	Acciona Energy Australia Global Pty Ltd
Applicant address	Level 38, Melbourne Central Tower, 360 Elizabeth Street, Melbourne, Victoria 3000
Details of person by whom this EIS was prepared	
Name	Mark Davey
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Professional qualifications	PhD, Masters, Bachelor of Applied Science
Declaration by Registered Environmental Assessment Practitioner	
Name	Michael File
Registration number	8596
Organisation registered with	Member, Planning Institute of Australia
Declaration	The undersigned declares that this EIS: • Has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021; • Contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; • Does not contain information that is false or misleading; • Addresses the Planning Secretary's Environmental Assessment Requirements (SEARs) for the project; • Identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; • Has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement; • Contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; • Contains a consolidated description of the project in a single chapter of the EIS; • Contains an accurate summary of the findings of any community engagement; and • Contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.
Signature	
Date	17 April 2024

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

Acronyms & Abbreviations	Description
AAR	Ancestral Aboriginal Remains
ABN	Australian Business Number
Acciona or the Applicant	Acciona Energy Australia Global Pty Ltd
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRs	*Aboriginal Cultural Heritage Consultation Requirements for Applicants 2010*
ACMA	Australia Communication and Media Authority
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AFLs	Agreement for Leases
AGIA	Agricultural Impact Assessment
AGL	Above ground level
AGRD	*Austroads Guide to Road Design*
AGTM	*Austroads Guide to Traffic Management*
AHIMS	Aboriginal Heritage Information Management System
AIA	Aviation Impact Assessment
AIS	Aviation Impact Statement
ALA	Aircraft Landing Areas
ALARP	Acceptable without obstacle lighting
AM	Amplitude Modulated
AMSL	Above mean sea level
ANOSIM	Analysis of Similarities
APZ	Asset protection zone(s)
AQI	Air quality index
ARGN	Australian Regional GNSS Network
ARP	Aerodrome Reference Point
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ARR	*Australian Rainfall and Runoff: A guide to flood estimation*
AS	Australian Standard
BAM	Biodiversity Assessment Method
BBAMP	Bird and Bat Adaptive Management Plan
BBUS	Bird and Bat Utilisation Survey
BC Act	*Biodiversity Conservation Act 2016*
BCS	Biodiversity Conservation and Science

Acronyms & Abbreviations	Description
BDAR	Biodiversity Development Assessment Report
BEMOP	Bushfire Emergency Management and Operations Plan
BESS	Battery Energy Storage System
BFRMP	Bushfire Risk Management Plan
BSAL	Biophysical strategic agricultural land
bgl	Below ground level
BioNet VIS	BioNet Vegetation Classification
BPESC	*Best Practice Erosion and Sediment Control*
BUS	Bird Utilisation Surveys
BWF	Baldon Wind Farm
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
CBF	Community Benefit Fund
CCC	Community Consultation Committee
CEMP	Construction Environmental Management Plan
CFPA	European Confederation of Fire Protection Associations
CHMP	Cultural Heritage Management Plan
CIA Guidelines	*Cumulative Impact Assessment Guidelines for State Significant Projects*
CLM Act	*Crown Land Management Act 2016*
CNVMP	Construction Noise and Vibration Management Plan
COP	Conference of Parties
CRA	Collision Risk Assessment
CSEP	Community and Stakeholder Engagement Plan
CSP	The Murray River Council Community Strategic Plan
Cth	Commonwealth
CTMP	Construction Traffic Management Plan
dB(A)	A-weighted decibel
DC	Direct current
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DO	Dissolved oxygen
DoD	Commonwealth Department of Defence
DP	Deposited plans
DPE	Department of Planning and Environment

Acronyms & Abbreviations	Description
DPHI	Department of Planning, Housing and Infrastructure
Draft National Guidelines	*Draft National Wind Farm Development Guideline*
EDM	Electronic Distance Measuring
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELF	Extremely low frequency
EMF	Electromagnetic fields
EMI	Electromagnetic Interference
EMS	Environmental Management Strategy
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPBC Regulations	*Environment Protection and Biodiversity Conservation Regulations 2000*
EPC	Engineering, Procurement and Construction
EPIs	Environmental Planning Instruments
EPL	Environmental Protection Licence
EP&A Act	*Environmental Planning & Assessment Act 1979*
ERM	Environmental Resources Management Pty Ltd
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
ESOO	Electricity Statement of Opportunities
EUMETNET	European Meteorological Services Network
FFG Act	*Flora and Fauna Guarantee Act 1988*
FIFO	Fly-in-fly-out
FM	Frequency Modulated
FM Act	*Fisheries Management Act 1994*
ft	Feet
FTE	Full time equivalent
GDEs	Groundwater Dependent Ecosystems
GHG	Greenhouse gas
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GW	Gigawatt(s)
Ha	Hectare(s)
HFC	Hydrofluorocarbons

Acronyms & Abbreviations	Description
HIPAP	*Hazardous Industry Planning Advisory Paper*
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICNG	*Interim Construction Noise Guideline 2009*
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IGS	International GNSS Service
IO	Input-output
IPA	Inner protection zone
ISP	Integrated System Plan
KFH	Key Fish Habitat
Km	Kilometre(s)
Koala SEPP 2021	*State Environmental Planning Policy (Koala Habitat Protection) 2021*
kPa	Kilopascal
kV	Kilovolt(s)
LALC	Local Aboriginal Land Council
LCU(s)	Landscape character units
LEP	Local Environmental Plan
LG Act	*Local Government Act 1993*
LGA	Local Government Area
LGCs	Large-scale Generation Certificates
LIB	Lithium-ion batteries
LLS	Local Land Services
LoS	Level of Service
LRET	Large-scale Renewable Energy Target
LSALT	Grid and Air routes lowest safe altitude
LSC	Land and soil capability
LSPS	*Murray River Local Strategic Planning Statement 2020*
LUCRA	Land Use Conflict Risk Assessment
LVIA	Landscape and Visual Impact Assessment
M	Million
m	Metre(s)
m/s	Metre(s) per second
Mbc	Murrumbidgee Channels and Floodplains

Acronyms & Abbreviations	Description
MDBA	Murray-Darling Basin Authority (MDBA)
Met mast	Meteorological monitoring mast
mG	Milligauss
ML	Megalitre(s)
MNES	Matters of National Environmental Significance
MOS	Manual of Standards
Mt-CO_{2e} pa	Million tonnes CO^2 equivalent per annum
MW	Megawatt(s)
MWh	Megawatt(s) hour
NEM	National Electricity Market
NHMRC	National Health and Medical Research Centre
NHVR	National Heavy Vehicle Regulator
nm	Nautical miles
nMDS	Non-metric multidimensional scaling plot
NML	Noise monitoring locations
Noise Bulletin	*Wind Energy: Noise Assessment Bulletin for State Significant Wind Energy Development*
NPI	*Noise Policy for Industry 2017*
NSW	New South Whales
NTV	Native Title Vision
NVIA	Noise and Vibration Impact Assessment
NVR	Native Vegetation Regulatory
O&M	Operation and maintenance
OLS	Obstacle Limitation Surface
OPERA	Operational Programme for the Exchange of Weather Radar Information
OSOM	Oversized and overmass
PAD(s)	Potential Archaeological Deposits
Paris Agreement	Paris Agreement on Climate Change
PASS	Potential acid sulfate soils
PBP	*Planning for Bush Fire Protection*
PCTs	Plant Community Types
pcu/h	Passenger car units per hour
PHA	Preliminary Hazard Analysis
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PMF	Probably maximum flood

Acronyms & Abbreviations	Description
PMST	Protected matters search tool
PNTLs	Project noise trigger levels
POEO Act	*Protection of the Environment Operations Act 1997*
PP	Pinch point
RAI	Rental Affordability Index
RAPs	Registered Aboriginal Parties
RAVs	Restricted Access Vehicles
RBLs	Rating background noise levels
RET	Renewable Energy Target
REZ	Renewable Energy Zone
RFS	Rural Fire Service
RIV	Riverina IBRA Bioregion
RMRP	*Riverina Murray Regional Plan 2041*
RNP	*Road Noise Policy 2011*
Roadmap	*NSW Electricity Infrastructure Roadmap*
RoG	Rain-on-grid
RRL	Register of Radiocommunications Licences
RSA	Rotor Swept Area
SA	South Australia
SA Noise Guidelines	*Wind Farms Environmental Noise Guidelines*
SCA	State Conservation Area
SCADA	Supervisory Control and Data Acquisition
SDGs	Sustainable Development Goals
SEARs	Secretary's Environmental Assessment Requirements
SEPP	*State Environmental Planning Policy*
SHR	State Heritage Register
SIA	Social Impact Assessment
SIA Guideline	*Social Impact Assessment Guideline for State Significant Projects*
SIA Technical Supplement	*Technical Supplement: Social Impact Assessment Guideline for State Significant Projects*
SIMP	Social Impact Management Plan
SIMPER	Similarity percentage
SISD	Safe Intersection Sight Distance
SODAR	Sonic Detection and Ranging
SOHI	Statement of Heritage Impact

Acronyms & Abbreviations	Description
SSAL	State significant agricultural land
SSD	State Significant Development
SSR	Secondary Surveillance Radar
SVTM	State Vegetation Type Map
SWMP	Soil and Water Management Plan
TBDC	Threatened Biodiversity Data Collection
TEC(s)	Threatened Ecological Communities
TfNSW	Transport for NSW
The Project	Keri Keri Wind Farm
TL	Transmission line(s)
Transport and Infrastructure SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021*
TSP	Total suspended particles
TSRs	Travelling stock reserves
TTIA	Traffic and Transport Impact Assessment
TWF	Tchelery Wind Farm
UCLs	Urban Centres and Localities
UNFCC	United Nations Framework Convention on Climate Change
Vibration Guideline	*Assessing Vibration: A Technical Guideline (DECC, 2006)*
VIC	Victoria
VIS	Vegetation integrity score
VIZ	Visual Influence Zone
VFR	Visual Flight Rules Guide
VPA	Voluntary Planning Agreement
VRE	Variable Renewable Energy
V/C	Volume to Capacity
V/m	Volts per metre
Wakool DCP	*Wakool Development Control Plan 2013*
Wakool LEP	*Wakool Local Environmental Plan 2013*
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WHO	World Health Organisation
WHO Guidelines	*World Health Organisation Guidelines for Community Noise*
WM Act	*Water Management Act 2000*
WMO	World Meteorological Organisation
WMP	Waste Management Plan

Acronyms & Abbreviations	Description
WQOs	Water Quality Objectives
WSP	*NSW Water Sharing Plans*
WTG	Wind turbine generator
WWF	Wilan Wind Farm
ZVI	Zone of Visual Influence

EXECUTIVE SUMMARY

Keri Keri Wind Farm

ENVIRONMENTAL IMPACT STATEMENT

This summary provides a non-technical overview of the project and assessment outcomes only and should be read in conjunction with the environmental impact statement (EIS) and supporting technical reports.

Sustainability is our business

What is the Project?

The Keri Keri Wind Farm (the Project) aims to harness wind energy to provide cheap, reliable and clean electricity for homes and businesses across the National Electricity Market (NEM). The Project will include the construction, operation and decommissioning of a wind farm and battery energy storage system, operating alongside agricultural activities.

The Keri Keri Wind Farm will provide significant economic benefits to the Murray River region and will supply 884 MW of clean, renewable energy, enough to power more than 579,000 NSW homes on average annually.

The Project is located on land predominately used for agricultural activities and is situated about 30 kilometres (km) southeast of Balranald, and 75 km southwest of Hay in the Murray River Local Government Area (LGA) (refer to Figure S1).

The Project is located within the South-West Renewable Energy Zone (REZ), one of five areas identified by the NSW Government with an abundance of high-quality wind and solar resources, proximity to transmission infrastructure, relative land use compatibility.

The Project has gone through a comprehensive design process that considered community and stakeholder feedback, as well constraints identified during detailed environmental, heritage, visual and social studies.

Acciona Energy Australia Global Pty Ltd (the Applicant) intends to bid for access rights to connect to the approved and under construction Project EnergyConnect 330 kilovolts (kV) transmission line (TL), which is owned by TransGrid and intersects the Project Area.

884 MW

Capacity

574 Ha

Footprint

200 MW/ 800 MWh

Battery storage

acciona energía

Who are we?

The Applicant is an Australian subsidiary of Acciona Energía, a global renewable energy company with almost 12 gigawatts (GW) of total installed capacity globally (as of 31 December 2022). Since becoming established in Australia in 2002, Acciona has invested more than AUD $1.5 billion in renewable energy projects locally. The company has a significant pipeline of development projects, including over 2 GW of wind, solar PV and battery energy storage system (BESS) in NSW.

Acciona Energía's purpose is to provide energy solutions that help combat climate change. They want to drive a positive impact that allows for the regeneration of the planet.

Project description

Development footprint covers 1,137 ha with an operational footprint of 574 ha

155 Wind Turbine Generators (WTGs) with an estimated capacity of up to 884 MW

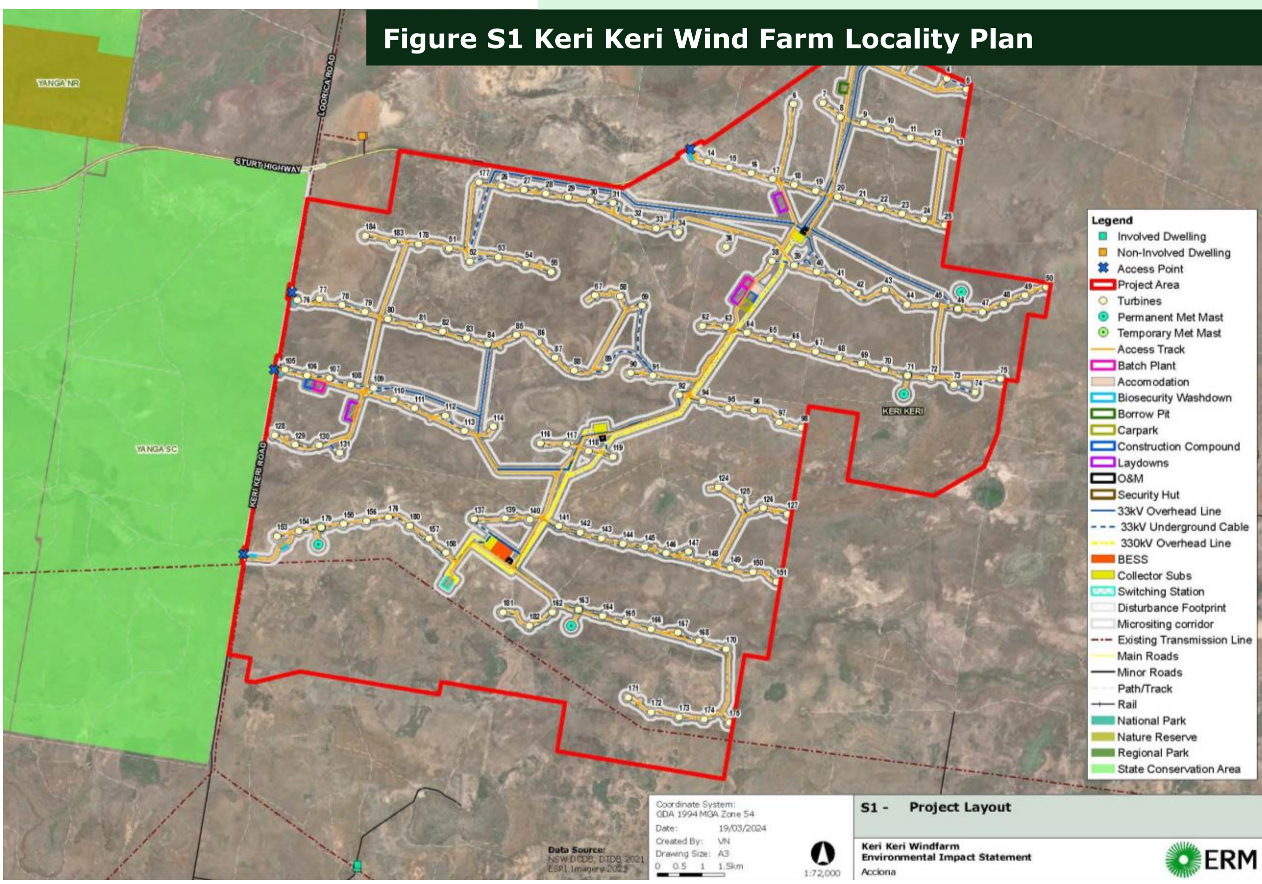
Local road network upgrades

A centralised large-scale battery energy storage system (BESS) with a capacity of up to 200 MW / 800 MWh

Temporary construction facilities and on-site workers accommodation

Electrical infrastructure to connect the Project to the electricity grid, including underground cables and overhead powerlines, substations and transmission lines

Figure S1 Keri Keri Wind Farm Locality Plan



Why is the Project needed?

Both the Commonwealth and NSW Governments have made commitments to increase renewable energy generation and reduce carbon emissions. The Keri Keri Wind Farm will help provide cleaner, cheaper and reliable electricity while also reducing greenhouse gas emissions and the impacts of climate change.

The long-term, regional benefits of the Project:

- Minimise adverse environmental impacts
- Recycle and reuse materials where practical and economically feasible
- Ensure quality, safety and environmental standards are maintained
- Providing an additional income stream for rural landowners connected to the Project
- Employment of approximately 650 construction jobs annually during peak construction, plus 12 permanent operational jobs
- Benefits to local and regional infrastructure and services, such as Community Benefit Fund (CBF) and a Voluntary Planning Agreement (VPA) option
- Economic benefits to the local economy, through procurement of local goods and services and community benefit programs

What is the planning process?

The Keri Keri Wind Farm requires approval under both NSW and Commonwealth environmental and planning legislation. Under NSW planning legislation, the Project is a State Significant Development (SSD) and therefore requires approval under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Project also requires assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to potential impacts on Commonwealth listed threatened species and communities and Commonwealth listed migratory species. The Project was referred under the EPBC Act (EPBC Ref:2022/9176) and was determined to be a controlled action on 02 May 2022.

An EIS has been prepared to outline the Project, its potential impacts (positive and negative), how these impacts are proposed to be mitigated, managed and offset.

The NSW Minister for Planning (or delegate) or the Independent Planning Commission (IPC) will decide if the Project is approved. The IPC will be the approval authority if public objections to the Project exceed 50, if any reportable political donations have been made by the Applicant, or if the Council within which the Project is located objects to the Project.

What is the planning process?

01
Early consultation

Prior to lodging a development application (DA) for an SSD project, the applicant must consult with the Department of Planning, Housing and Infrastructure (DPHI). Following consultation, the Applicant must prepare a Scoping Report to request the environmental assessment requirements (SEARS) for the Project.

The SEARS will identify the information to be included in the Project's Environmental Impact Statement (EIS) and the stakeholder engagement that must be undertaken.

02
Prepare EIS

The Applicant must prepare the EIS in accordance with the SEARS.

The purpose of the EIS is to assess the economic, environmental and social impacts of the project and help the community, government agencies and the consent authority provide feedback on the merits of the project.

03
Exhibit DA

All SSD DAs must be exhibited publicly for at least 28 days.

This acknowledges the importance of stakeholder and community participation in the SSD process and provides an opportunity for people to make submissions on the Project before a final decision is made.

04
Respond to submissions

After exhibition, the Department will publish all submission and ask the Applicant to prepare a Submissions Report.

The purpose of the Submissions Report is to give the Applicant a chance to respond to the issues raised in submissions and help the consent authority evaluate the merits of the DA.

05
Assess DA

After publishing the Submissions Report, the Department will assess the merits of the DA in accordance and prepare an Assessment Report.

This may include further community engagement, requesting additional information from the applicant, seeking advice from Government agencies and independent experts and preparing recommended conditions of consent.

06
Determine DA

The IPC or a delegate of the Minister of Planning will be the consent authority for the DA.

They must evaluate the merits of the DA against the matters in section 415 of the EP&A Act and may approve the DA (subject to modifications or conditions) or refuse it.

Key strategies to avoid, minimise or offset impacts

The Project has been designed in consideration of environmental, social and engineering constraints, including feedback from landowners and the surrounding community.

Key drivers to minimise and avoid environmental and social impacts:

Avoid
In the first instance, all efforts were made to avoid potential environmental and social impacts.

Minimise
Where potential impacts could not be avoided, design principles aimed to minimise environmental and social impacts, as far as feasibly possible.

Mitigate
Mitigation strategies will be implemented to manage the extent and severity of remaining environmental and social impacts.

Offset
Environmental and social offsets will only be used following all efforts to first avoid, minimise and mitigate environmental impacts.

Key design principles:

- Minimise vegetation clearing – WTGs relocated to avoid areas of high biodiversity constraint in the south and north-eastern pocket of the Project Area, associated with the Myall Woodland TEC.
- Protect cultural heritage values – cultural heritage values have been identified in consultation with the Hay, Balranald and Yarkuwa Local Aboriginal Land Councils and impacts avoided where practicable. Preservation and management of Aboriginal sites and heritage values will form a key objective of development controls for Project.
- Minimise land disturbance – site selection considered topographical features and proximity to the Sturt Highway and Project EnergyConnect transmission line to ensure that construction and operation of the wind farm would require minimal earthworks / soil disturbance.
- Protect landscape character– four turbines were removed, and access tracks move to reduce identified visual impacts to neighbouring non-associated dwellings.
- Minimise direct and indirect impacts – reduction of the number of WTGs from 176 to 155 to avoid sensitive Aboriginal cultural heritage, ecological areas, and to minimise potential visual and noise impacts to surrounding dwellings.
- Adopt a flexible approach to design – the design process has been iterative and has progressively responded to identified environmental, cultural and social impacts and constraints. This process will continue through the detailed design process for the Project.

As a result of this iterative design process and after detailed consultation, the development footprint has reduced from 18,055 ha during the scoping stage to 18,012 ha in this EIS.

Key community issues addressed

Social & Economic

Provision of jobs, training and community services

Cultural Heritage

Acknowledgement of Traditional Owners and inclusion for heritage aspects of the Project

Roads & Traffic

Upgrade of roads to support construction traffic and consideration of road safety

Biodiversity

Impacts to birds within the Project Area

Visual and Noise

Alteration to the landscape and local character

Inform, Consult, Involve, Collaborate and Empower.

How has the Applicant engaged with stakeholders?

The Applicant is committed to ensuring community concerns and comments are considered, and that attempts are made to avoid, minimise or mitigate potential impacts to the extent possible. To achieve broad local social acceptance and develop strong local relationships, the Applicant commenced engagement early, during early Project constraints and feasibility assessments.


acciona energía

NEW ENERGY FOR A BETTER PLANET

KERI KERI WIND FARM
DROP-IN INFORMATION SESSIONS

We are investigating a site for a potential wind farm located approximately 50kms east of Balranald and 40km from Moulamein. We'd like the opportunity to show members of the community the proposed layout and get their feedback about the project. This is also an opportunity for the community to share their thoughts on a community benefits program.

Please feel free to drop in and say hello at one of the following venues:

MOULAMEIN
Moulamein Bowling Club
Endeavour Dr, Moulamein NSW 2733
Date: Tuesday, 23rd January 2024
Time: 9.30am - 11.30am
3.30pm - 6.30pm

BALRANALD
Senior Citizens Centre (near IGA) Market St, Balranald, NSW 2715
Date: Wednesday, 24th January 2024
Time: 9.30am - 11.30am
3.30pm - 6.30pm

Find out more
Visit our online Community Hub at community.acciona.com.au/kerikeri to learn more, register for updates, and ask questions about the project.

You can also email us at kerikeriwindfarm@acciona.com or give us a call on 1800 283 550.

Visit our community hub by scanning the QR code

ABOUT ACCIONA ENERGÍA
ACCIONA Energía is the world's largest 100% renewable energy company, built on the principle of 'Community First' projects. Our sites deliver clean and sustainable energy generation while creating jobs, training opportunities and positive impacts throughout the local community.

With over 20 years of experience in Australia, our 'build, own and operate' model sets us apart as a developer that works closely with landowners, neighbours and the community to deliver integrated energy solutions.

Individual and group meetings and public information events have been conducted since Project inception. Throughout engagement activities the Project development team received feedback on a variety of issues from the community and regulators. Due to the high cultural heritage value of the Project, significant consultation has been undertaken with Traditional Owners and Local Aboriginal Land Councils (LALCs).

Feedback from Traditional Owners has contributed to changes in Project design, with the layout of the project changing to avoid areas where high cultural sensitivity was identified.

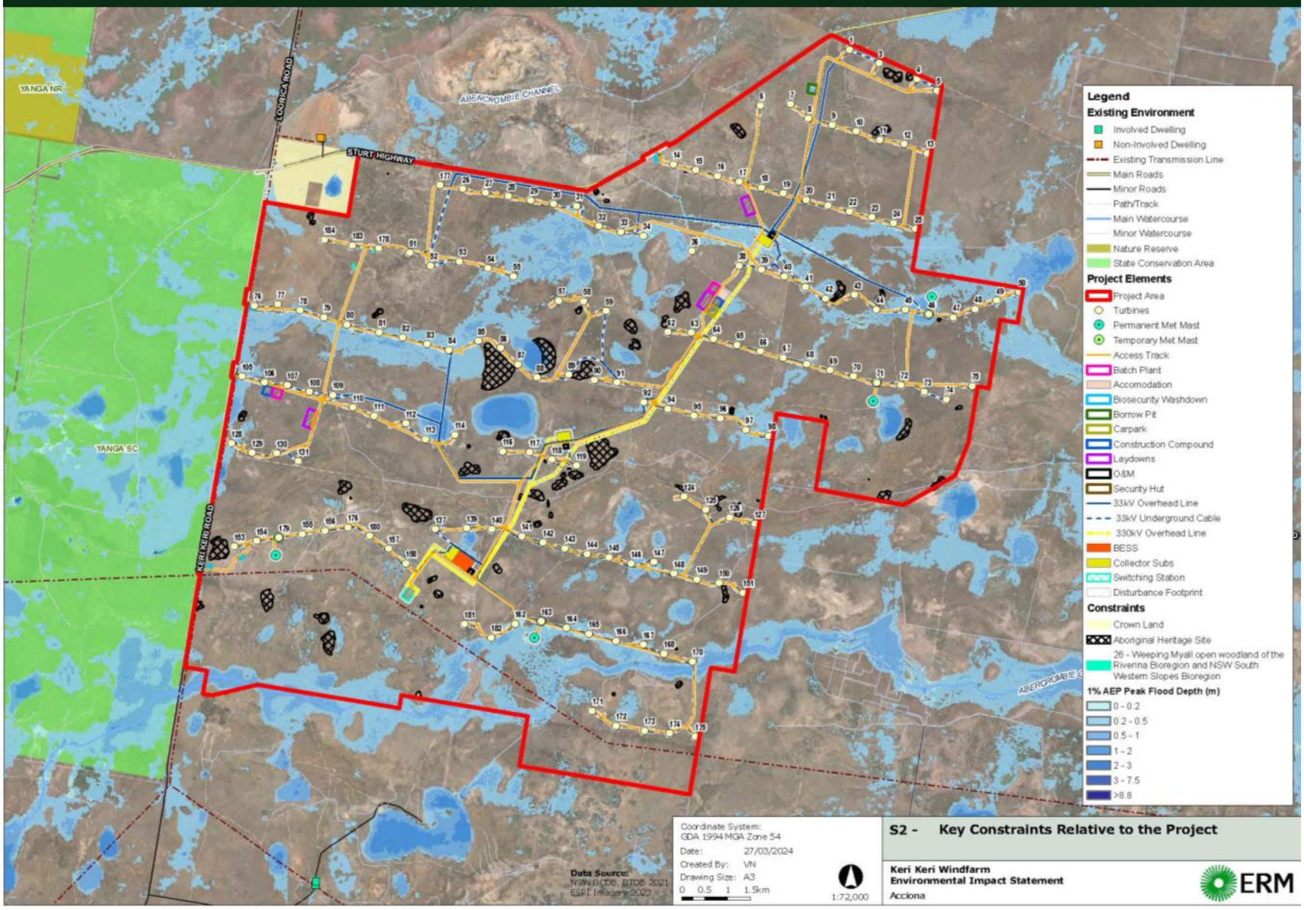
In recognition of the impacts of the Project, and as a key part of the mitigation strategy, the Applicant has entered into an agreement with the host landowner for the Project.

Project constraints

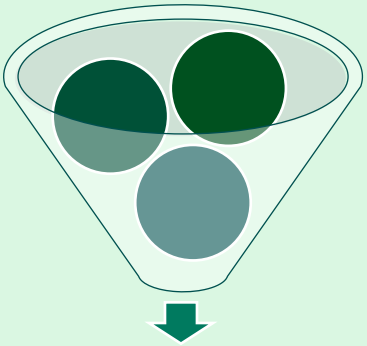
The EIS includes a detailed assessment of the potential environmental, social and economic outcomes of the Project and proposes, where required, mitigation measures to manage adverse environmental, social and economic aspects. A summary of the key findings for each aspect is provided below. Each assessment has been prepared for this EIS in consideration of relevant guidelines, Project SEARs and stakeholder engagement.

Figure S-2 provides a visual representation of the key restraints relevant to the Project elements.

Figure S2 Key Constraints Relative to the Project



Social impacts



The social baseline describes the social context in the absence of the Project. It documents the existing social environment, conditions and trends relevant to the impacts identified. The social baseline is the benchmark against which direct, indirect and cumulative impacts are predicted and analysed.

The key drivers of social change as a result of the Project are generally positive and include:

- accommodation arrangements and locations for construction workforce and, to a lesser extent, the operational workforce
- procurement opportunities for local businesses and employment opportunities for the local workforce
- temporary disruptions due to construction related activities (noise, dust, transportation of materials and workers, etc.)
- land use and landscape changes leading to changes in amenity (e.g., visual) and changes to Country (Aboriginal cultural heritage).

The impacts have been assessed based on the likelihood of the impact occurring, the magnitude of the impact if it occurs, and the vulnerability of the impacted receptors. ERM has also considered issues raised by stakeholders during the engagement process and outcomes from technical studies undertaken by the Project (noise, visual, cultural heritage etc.).

A range of social management and mitigation measures to be adopted for the Project may include:

- develop and implement a Construction Environmental Management Plan (CEMP)
- develop and implement the Stakeholder Engagement Plan (SEP)
- develop and implement a Local Employment Plan and Local Content Plan with the Engineering, Procurement and Construction (EPC) Contractor
- develop and implement a Workforce Accommodation Management Plan
- develop and implement CBF, consulting with key stakeholders and publish to the wider community
- engage surrounding landowners and local aerial agricultural and aerial firefighting operators to discuss exclusion zones and address aerial spraying and water bombing concerns
- implementation of the ACHMP informed by the heritage assessments
- monitoring activities through ongoing consultation to assess the efficacy of mitigation measures, report on local employment and procurement and record and publish detailed information on finds available and payments made through the CBF.

Landscape and visual

Photomontage from Willowvale Rest Area, Moir 2024

Key information obtained during stakeholder engagement were visual amenity factors, and the potential of wind farms to add character and interest to the landscape. The community also described the area as flat plains with no trees, "therefore a perfect place for a wind farm".

The Landscape and Visual Assessment (LVIA) was prepared in accordance with the 'Wind Energy: Visual Bulletin' (DPE, 2016) (the Bulletin) and considered the potential visual impacts on residential viewpoints within 8 km of the nearest wind turbine to a dwelling. There were a total of 13 dwellings within 8 km and eight dwelling entitlements located within 5.7 km of a wind turbine.

Changes to the landscape character of the Project were noted to be low to moderate, with the assessment concluding the Project is likely to become a landscape feature, however the landscape has been determined to be of low scenic quality and devoid of significant landscape features.

Visual impact assessment on non-associated dwellings

Of the 13 non-associated dwellings within 8 km of the Project, the LVIA concluded that 11 are likely to have a negligible – low visual impact. Two non-associated dwellings (located within 3,900 m) are likely to have a moderate visual impact rating. Mitigation measures incorporated into the design process, as well as landscape and visual screening, can reduce visual impacts to non-associated dwellings identified as having a moderate visual impact (in further consultation with relevant landowner).

Visual impact assessment of public viewpoints

Public viewpoint analysis was undertaken at 13 locations. Of these, the Project was visible at three public viewpoints, all of which were located along the Sturt Highway. While the assessment determined that the Project would change the character of the surrounding landscape, the landscape was not determined to be sensitive, rare or natural. According to the Bulletin, the existing landscape character is considered of low scenic quality due to it being highly modified and lacking in distinct landscape features.

The requirements for night lighting on met-masts and ancillary infrastructure for this Project is generally limited to security lighting to the substation, and within the operations & maintenance facility. The light sources are limited to low-level lighting for security, nighttime maintenance and emergency purposes. The proposed ancillary infrastructure has been carefully sited to minimise visibility from existing residences and publicly accessible viewpoints. It is unlikely the proposed night lighting associated with the ancillary infrastructure would create a noticeable impact on the existing night-time landscape.

A shadow flicker assessment determined that there would be no shadow flicker on any non-associated dwellings.

Aboriginal cultural heritage

> **The Project design was amended following each of the three heritage surveys conducted across the Project Area. Design refinements were made to avoid and minimise impact to any other Aboriginal heritage sites, where possible. Sites identified as having high potential for impact due to their location within the development footprint may also be able to be further avoided by micro siting of turbines and infrastructure.**

The Project is located within the Hay, Yarkuwa and Balranald Local Aboriginal Land Council (LALC) areas. ERM has prepared an Aboriginal cultural heritage assessment to assess the potential impacts of the Project on Aboriginal cultural heritage. Through a combination of desktop assessment and consultation undertaken during the field surveys and preparation of the report, cultural heritage values for the Project Area were identified. Changes in design were assessed through three survey periods, with Registered Aboriginal Parties present for each.

A total of 218 sites are reported within the Project area (nine previously registered Aboriginal sites and 209 newly recorded sites), comprising artefacts, burials, hearths, shells, earth mounds, modified trees and potential archaeological deposits (PADs). Based on the current permanent development footprint, direct harm to nine sites has been identified. Proposed key measures to manage and mitigate impacts to the identified heritage sites include the following:

- An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed to record and describe the processes and procedures required to be implemented prior to and during the construction and operation of the Project. This will be developed in partnership with the Traditional Owners and should include areas which may be subject to harm and mitigation measures of surface collection.
- Consultation with landholders and Traditional Owners to develop appropriate stock management strategies to limit the further disturbance and damage to Aboriginal cultural heritage sites.
- Consideration of the appointment and training of a Traditional Owner liaison/s to coordinate appropriately informed access for staff and contractors to culturally sensitive areas and provide cultural awareness training.
- Work with the Traditional Owners to develop and implement an additional research project that would extend the understanding of the Aboriginal cultural heritage values within the Project Area beyond the development footprint and place them in context of the broader cultural landscape of the region, and the internationally significant story of this area and its connection to the Willandra Lakes and Lake Mungo.

There are no registered historic heritage sites within or in the vicinity of the Project Area.

Biodiversity impacts

The Project has been designed to avoid impact to remnant woodland vegetation present across the Project Area, wetland areas associated with Abercrombie Creek, resident raptor and threatened raptor nests, threatened ecological communities (TECs) and threatened species habitat.

Potential residual impacts include habitat clearance, noise and disturbance associated with clearing and construction, increased risk of vehicle strike, wind turbine strike and the presence of infrastructure which may create barriers to movement.

Threatened fauna species recorded to have residual impact include:

- Little Eagle (*Hieraaetus morphnoides*)

Threatened flora species recorded include:

- Winged Peppercress (*Lepidium monoplocoides*)
- Chariot Wheels (*Maireana cheelii*)
- Slender Darling Pea (*Swainsona murrayana*)
- Mossgiel Daisy (*Brachyscome papillosa*)

The Plains-wanderer (*Pedionomus torquatus*) has been found within the Project boundary. Areas of suitable habitat have been mostly avoided by the Project and impacted habitat has been determined as foraging habitat only. The Biodiversity Development Assessment Report (BDAR) assessed that there was no significant impact to the Plains-wanderer.

Based on candidate ecosystem credit species, species credit species, and result of field surveys, no species are at risk of Serious and Irreversible Impact (SAII) as a result of the Project.

Little eagle (stockphoto)

Slender Darling Pea

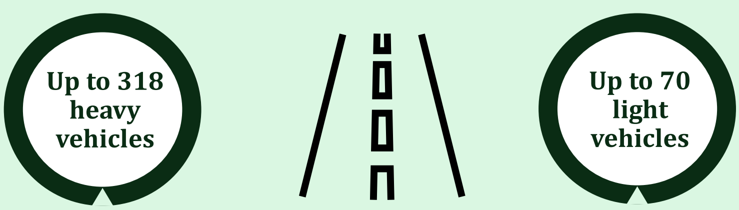
Measures to mitigate against these residual impacts will be implemented through a Construction Environmental Management Plan (CEMP) and Pest Management Control Programs. The CEMP will make provisions for clearing protocols, construction timing, and include measures to minimise soil disturbance, runoff and sediment transfer, artificial light, noise, dust, and vibrations as a result 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.

Where impacts to biodiversity cannot be avoided, the NSW biodiversity assessment process requires use of the NSW Government online calculator to generate biodiversity credits. All credits then need to be offset prior to the impact occurring. Biodiversity offsetting is based on the theory that biodiversity values gained at an offset site will compensate for biodiversity values lost to development at another location to achieve a standard of ‘no net losses of biodiversity. The Applicant will develop a detailed offset strategy for the Project and will consider a few options to secure the biodiversity credits needed.

Transport

Traffic accessing the Project has been assessed from the Port of Newcastle and the Port of Adelaide. OSOM vehicles will approach the site from the east along the Sturt Highway when arriving from the Port of Newcastle, and from the west when approaching from the Port of Adelaide. A feasibility assessment determined that the Port of Newcastle will likely be the preferred transportation route.

- It is anticipated that the peak daily construction movements across the 24-month construction period will comprise 598 general construction heavy vehicle movements, 38 OSOM vehicle movements and 140 light vehicle movements.
- During operation, the Project is expected to generate a minimal level of traffic associated with maintenance and operation services.
- Intersection improvements works at the Sturt Highway / Keri Keri Road intersection are required to accommodate the turning path requirements of OSOM vehicles.
- The sight distances for the access point on Sturt Highway and all three access points on Keri Keri Road exceed the Austroads requirements.
- Based on the expected traffic volumes at the intersection of Sturt Highway and Keri Keri Road during the morning peak hour, this intersection will require a Basic Right Turn (BAR) and Basic Left Turn (BAL) treatment.
- The access location for the WTG blades is via a connection on Sturt Highway and will need to be designed with BAL and BAR turn treatments.



Peak Daily Vehicles During Construction

Before construction, a Construction Traffic Management Plan (CTMP) will be prepared in consultation with Transport for NSW and Murray River Council to make sure road safety and road network operations are maintained. A Driver Code of Conduct will also be implemented to detail the expectations of driver behaviour travelling to and from the Project.

Water, Soils and Agriculture

Water and soil resources

Abercrombie Creek, an ephemeral stream of the Murrumbidgee catchment, flows east to west through the south of the Project Area. There are also several irrigation channels throughout the Project Area; however, all creeks and watercourses within the area are non-perennial, and there are no wetland areas or lakes within the Project Area. Soils across the development footprint were assessed as having a very low erosion hazard, due to favourable climate conditions, and negligible slope gradient across the Project Area.

Project construction and operational water demand can be met through a combination of existing groundwater, surface water (e.g., farm dams), and commercial water supply.

A Soil and Water Management Plan will be developed and implemented to manage potential impacts to soil and water resources.

Flooding

Hydraulic models were developed to simulate the 20%, 5%, 1%, 0.5% and 0.2% Annual Exceedance Probability and probable maximum flood (PMF) events, which concluded:

- flood impacts observed due to the proposed development are considered to be non-detrimental
- generally low flood velocities (<0.4 m/s) were observed for all modelled flood events across the majority of the Project Area
- no significant changes to flood depths, velocities, hazards or hydraulic categories are expected from the development of the Project.

Environmental management measures that would be implemented to manage flood related impacts during the construction and operation of the project include the development and implementation of Emergency Flood Management measures.

Agriculture

The Project Area is located on land zoned RU1 –Primary Production and the impact of the Project on the local and regional agricultural industry was assessed. The area of agricultural production lost during construction and operation is a small fraction of the total agricultural land in the Murray River LGA. Therefore, the impacts of the Project at a regional scale would be minimal:

- The potential loss of grazing income is estimated at approximately $929,832 over a 24-month construction period.
- Grazing can continue across most of the Project Area during operations, except for some permanent infrastructure areas. This may result in a loos of agricultural income during operation of about $9,000 per year. There is no cropping land within the Project Area.
- Other potential impacts include disturbance of livestock by noise and fire risks. However, these impacts are expected to be relatively small and would have a minor effect on productivity.
- The potential spread of weeds by vehicles, machinery, personnel and movement of soil and water is the highest biosecurity risk, however, this can be managed through the introduction of appropriate biosecurity controls.
- Effective mitigation measures would be implemented to reduce the impacts of the Project on the agricultural industry.

The overall Project impact would also have a negligible impact on agricultural support services, processing and value adding industries.

Hazards

Bushfire

Bushfires have occurred in most years in this district, and natural ignitions such as lightning strikes are likely and historically common across the region.

The risk that the wind farm itself will cause a fire is considered low given the application of appropriate protection measures. While not identified as a bushfire prone vegetation community within the current NSW RFS bushfire prone land mapping, fires within grasslands and arid shrublands should not be underestimated and can start and spread quickly. For this reason, ERM have considered these as a bushfire hazard and the following mitigation measures will be implemented:

- A Bushfire Emergency Management and Operations Plan will be prepared in conjunction with relevant stakeholders, including NSW RFS, NSW Fire and Rescue, landowners and adjoining property owners.
- A minimum 20 m APZ is to be established around each wind monitoring mast, the perimeter on all sides of the substations, switching station, BESS and O&M Buildings.
- Minimum APZ of 24m to be established around the accommodation compound.
- the APZ and access roads will be installed prior to the installation of other wind farm project infrastructure.
- Water storage capacity of 50,000 L, to be confirmed in consultation with NSW RFS.

Preliminary hazard analysis

An assessment of the risks associated with battery storage found that, in the unlikely event that they occur, thermal thermal radiation, explosion and toxic gas effects of a BESS fire would be confined within the Project Area, and a separation distance of 3 m between adjacent containers should prevent escalation from an explosion of off gases generated in one container from battery overheating. The separation would also allow enable approach for firefighting purposes, should this be required.

The BESS will also use lithium-Ion phosphate (LFP) batteries which do not cause fire, but there can be circumstances where battery modules catch fire due to leaking coolant or electric faults. In those cases, fire will be constrained by the stainless-steel enclosure and the built-in fire protection devices and will not transfer to nearby containers.

Blade and ice throw

All dwellings and public areas were concluded to be sufficiently far from WTG locations to be at risk of blade throw or ice throw. However, ice throw may present a hazard at substations, O&M facilities and the BESS, albeit it low.

A comprehensive operations and maintenance program will be implemented to ensure that WTG faults are prevented or detected and rectified quickly, minimising the risk of occurrence of a serious or dangerous problem.

Hazards

Telecommunications

WTGs have the potential to interfere with radiocommunication services. Two services that have the greatest potential to be affected are television broadcast signals and fixed point-to-point signals. The assessment concluded that:

- no material near-field effects to point-to-point links are expected because of the Project
- it is unlikely that the Project will cause significant reflection and scattering impacts on the nearby transmitter/receivers
- there are no turbines that will cause diffraction impact to the three point to point links that cross the Project Area
- the Project is unlikely to cause adverse performance of wireless and satellite internet services, broadcast and digital radio, broadcast, digital and satellite television, trigonometry stations, and GPS.

Given the distance from the WTGs, impacts to the survey marks during construction can be avoided. However, if construction works cannot avoid survey marks, a registered surveyor will be engaged and consultation with the NSW Government will be undertaken

Human health

EMFs associated with the generation, distribution and use of electricity is classed as extremely low frequency (ELF) EMF or power frequency EMF, which corresponds to a frequency of 50 Hertz (Hz). Globally, concerns have been raised that EMFs associated with electrical equipment might have adverse human health effects.

A human health and EMF assessment conducted by ERM found that EMF impacts are expected to be negligible as:

- the nearest dwelling to a WTG is about 2.2 km away
- the nearest dwelling to the substations or switchyard, or transmission lines is over 6 km away
- the nearest dwelling to the BESS is over 7 km away.

The Project has been designed to implement prudent avoidance by ensuring appropriate setbacks.

Aviation

An Aviation Impact Assessment has been prepared to assess the proposed Project Layout in relation to existing aircraft approach paths and nearby receptors, including residences and roads.

A risk assessment was conducted that concluded that with appropriate mitigation measures, identified risks were acceptable without aviation lighting.

Mitigation measures to be adopted (among others) include designed air routes and grids, notification and reporting when constructing WTGs, lighting of met masts and micro siting.

Noise

A Noise and Vibration Impact Assessment was conducted for the Project. The worst-case predicted noise levels at the nearest dwellings (Associated and Non-associated) were assessed against criteria from the Wind Energy: Noise Assessment Bulletin (the Bulletin) and no exceedances were observed.

Based on assessment against the noise criteria provided by the Noise Policy for Industry and the Interim Construction Noise Guidelines, no noise impacts have been identified for the construction or operational phases of the Project. As such, specific noise management measures are not required for the Project. However, general good practice environmental noise management measures are recommended to be adopted throughout the Project, including (but not limited to):

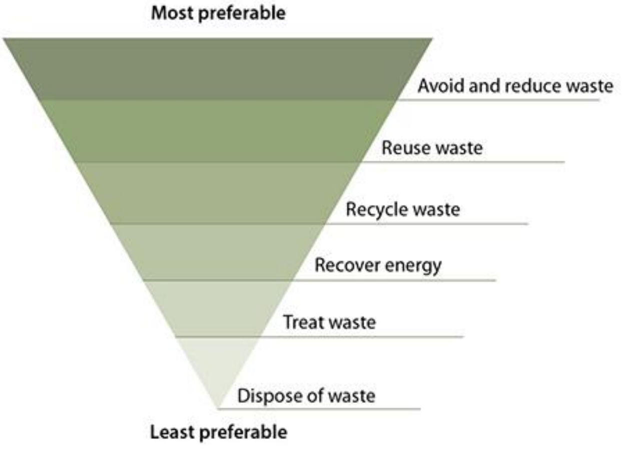
- implementation of a construction noise and vibration management plan (CNVMP)
- avoidance of unnecessary noise due to idling diesel engines or fast speeds
- ensure all machines used on the site are in good condition, with particular emphasis on exhaust silencers, covers on engines and transmissions and squeaking or rattling components, and
- revised noise modelling following the finalisation of selected equipment.

There are no operational mitigation measures required for the Project.

Waste

No waste streams would be associated with the generation of electricity.

Waste generated during construction phase will include green waste and soil from site establishment and earthworks, packaging materials (e.g., carboard, plastics, wooden pallets), and excess construction materials such as electrical cabling, metals. most of the waste generated during the construction phase will be classified as general solid waste. Some types of waste, such as hazardous chemicals, cannot be safely recycled and direct treatment or disposal is the most appropriate management option.



A Waste Management Plan (WMP) will be prepared and will describe the measures to be implemented to manage, reuse, recycle and safely dispose of waste. All waste management on the Project will be carried out in accordance with relevant legislation and guidelines and based on the principles of the waste hierarchy.

At Project retirement, infrastructure and facilities will be decommissioned with the various structures, plant, equipment and buildings de-energised, disconnected, dismantled, demolished and removed. At the end of the infrastructure life, the majority of materials are likely to be recycled or reused in accordance with waste hierarchy principles. Items that cannot be reused or recycled, would be classified and disposed of at suitable facilities following applicable regulations. Batteries would be disposed in accordance with the hazardous waste policies active at the time of decommissioning.

Air quality

The Project will generally contribute to positive air quality outcomes through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of up to 2.6 Mt CO_2e per annum which is a substantial contribution towards a cleaner atmosphere.

Air emissions from the Project are predominantly associated with construction activities which will be temporary and limited to:

- localised dust emissions generated by land disturbance, and
- exhaust emissions of civil construction and vehicle, plant and from the Project Area would mostly be associated.

During operations, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. However, ongoing maintenance of infrastructures and land will result in very minor, localised vehicle emissions and generation of dust from vehicles travelling along unsealed internal access roads.

This would be managed through:

- using water carts during construction for dust suppression
- preparing roadways with coarse gravel or other road coverings
- covering and/or stabilising material loads which may generate dust (such as aggregates) during transport
- managing soil stockpiles
- minimising vegetation clearance
- managing vehicle speed when travelling on unsealed roads
- minimising vehicle movements
- cleaning and washing of vehicles, plant and equipment
- progressive revegetation and stabilisation of disturbance areas no longer required for construction, and
- regular monitoring of environmental conditions during construction (such as wind) that may result in dust generation and implementation of control measures as specified above.

Economics

The construction and operation of the Project will have net positive impacts on the level of economic activity in the regional and NSW economy. The Applicant proposes to work in partnership with local councils and the local community so that, as far as possible, the benefits of the projected economic growth in the region are maximised and impacts minimised.

Average monthly employment is estimated to peak at 650 FTE, with average annual employment for the peak 12 months of construction (year two) being 400 FTE. The annual construction impacts of the Project on the regional economy (during the two-year construction phase) are estimated at up to:

$217M in direct and indirect output

$74M in direct and indirect value-added

$22M in direct indirect household income

524 direct jobs and indirect jobs

The construction of the Project will create demand for regional labour resources and regional inputs to production. However, this is not expected to lead to any significant impacts on regional wages or prices. The Project is estimated to make the following maximum total annual contribution to the regional economy during operation:

$244M in direct and indirect output

$210M in direct and indirect value-added

$1M in direct indirect household income

34 direct jobs and indirect jobs

Conclusion

The Project will contribute significantly to reducing carbon emissions and human induced climate change as part of the necessary and ongoing clean energy transition from fossil fuels. The Project has been carefully designed and sited to minimise environmental impacts in consultation with the local community and relevant stakeholders. The residual environmental and social impacts identified throughout the EIS and technical assessments will be managed and reduced via the proposed mitigation measures.

The Project will:

- assist the Australian and NSW governments to fulfil their targets and policies to increase renewable energy supply and reduce carbon emissions
- assist in meeting energy demand as part of the market transition from traditional energy sources, and
- deliver economic benefits to regional and local communities.

The Project represents a positive addition to the local and wider NSW economy and the National Electricity Market. Through the implementation of proposed mitigation and management measures, it is considered that this Project is consistent with the objects of the EP&A Act and is in the public interest.

1. INTRODUCTION

This section provides an overview of the Keri Keri Wind Farm, details of the Applicant, project background, design strategies, related developments, and any restrictions as each relate to the Project.

Acciona Energy Australia Global Pty Ltd (Acciona or the 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 State Significant Development (SSD) consent for the Project under Part 4, Division 4.7 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). This document constitutes the Environmental Impact Statement (EIS) for the Project, required to be prepared as part of the SSD consent process. The EIS has been prepared to meet the minimum form and content requirements as set out in Part 8, Division 5 of the *Environmental Planning and Assessment Regulation 2021* and has considered the State Significant Development Guidelines.

This EIS covers all aspects of planning, construction, operation, decommissioning, rehabilitation, and environmental management for the Project. These aspects address the:

- Project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the then Department of Planning and Environment (DPE; now the Department of Planning, Housing and Infrastructure (DPHI)) (SSD-38358962, dated 14 April 2022);
- Requirements of other State Government agencies;
- Requirements of Australian Government agencies;
- Matters raised by Murray River Council; and
- Matters raised during the community consultation process.

Specific requirements and where each are addressed in this EIS are presented within **APPENDIX A**.

APPENDIX B provides a concise summary of all management and mitigation measures from this EIS.

1.1 APPLICANT

Acciona is an Australian subsidiary of Acciona Energía, a global renewable energy company with almost 12 gigawatts (GW) of total installed capacity (as of 31 December 2022). Acciona Energía are headquartered in Spain and listed on the Madrid Stock Exchange with a market capitalisation of €10 billion (as of 7 November 2022).

Acciona Energía is a key player in the renewable energy market and the organisation has been carbon neutral since 2016. Acciona Energía aims to lead the transition towards a low-carbon economy and contribute to achieving the United Nation's 17 Sustainable Development Goals through business solutions. Acciona Energía has been named the 'greenest' power generation company worldwide for the seventh consecutive year, according to the 'Top 100 Green Utilities' ranking prepared annually by Energy Intelligence, an independent consulting firm specialising in energy markets.

Since becoming established in Australia in 2002, Acciona has invested more than AUD $1.5 billion in renewable energy projects locally and has constructed five wind farms with a total installed capacity of 600 megawatts (MW). Acciona has recently commenced construction of Australia's largest wind farm – the 1 GW MacIntyre Wind Energy Precinct, which will double Acciona's investment in renewables in Australia. The company has a significant pipeline of development projects, including over 2 GW of wind, solar PV and battery energy storage system (BESS) in NSW. Acciona employs 250 permanent staff in Australia, and has offices in Melbourne, Sydney, and Brisbane. Acciona's Australian Business Number (ABN) and address are listed below:

- ABN: 54 600 910 647; and
- Address: Level 38, Melbourne Central Tower, 360 Elizabeth Street, Melbourne, Victoria 3000.

1.2 PROJECT OVERVIEW

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) (refer **Figure 1-1**). 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).

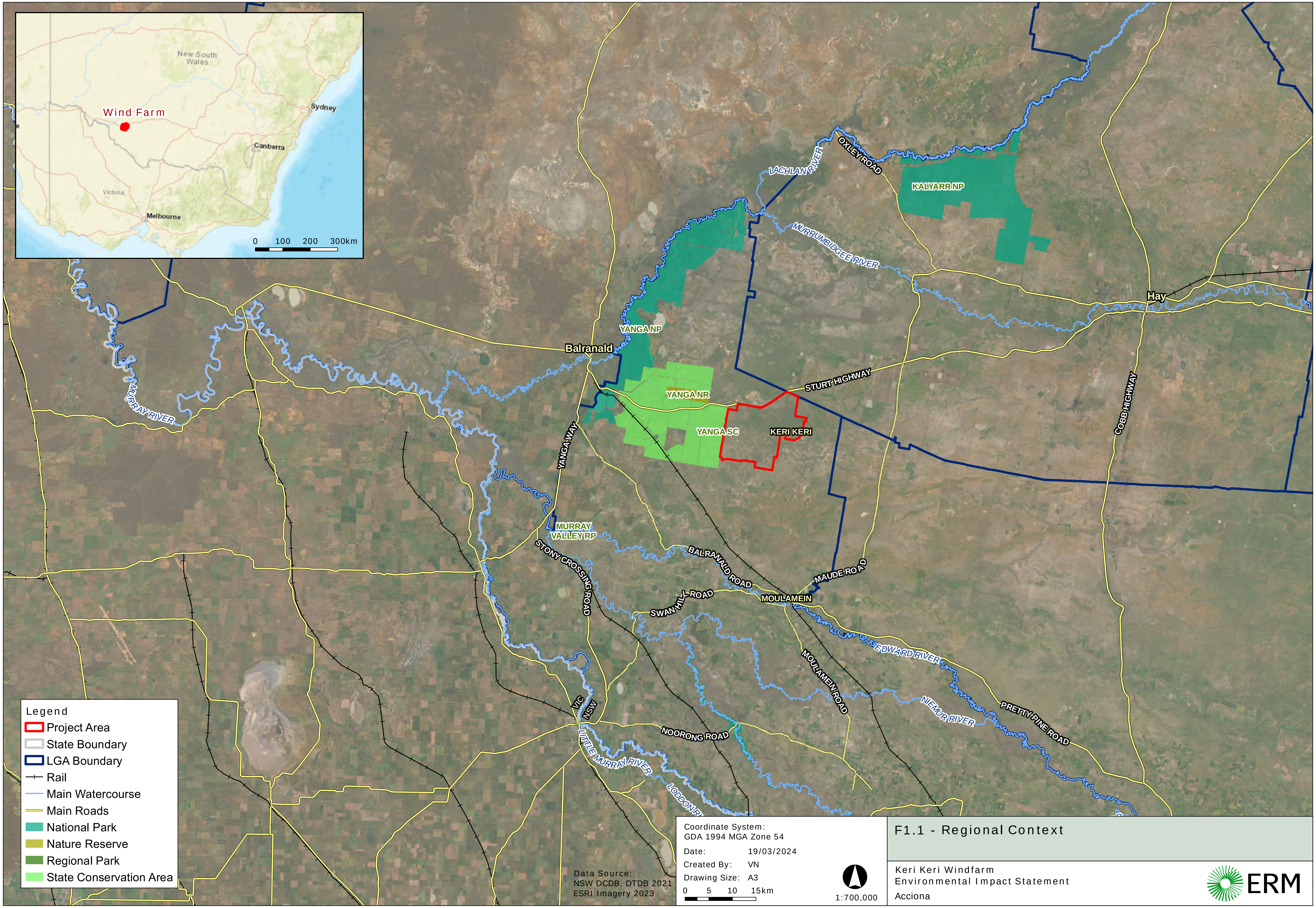
The Project involves the construction, operation, maintenance and, where relevant, decommissioning of:

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

A full description of the project for which SSD consent is sought is provided in **Section 3**.

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

The Project layout overview is provided in **Figure 1-2**. The final layout remains subject to further detailed design and refinement. Any future changes to the design would, where possible, be kept within the disturbance footprint assessed in this EIS. Should the detailed design extend outside of the disturbance footprint assessed in this EIS, the amended design would be subject to SSD assessment requirements and, if required, detailed in an Amendment Report (prior to determination) or Modification Report (after determination).



F1.1 - Regional Context

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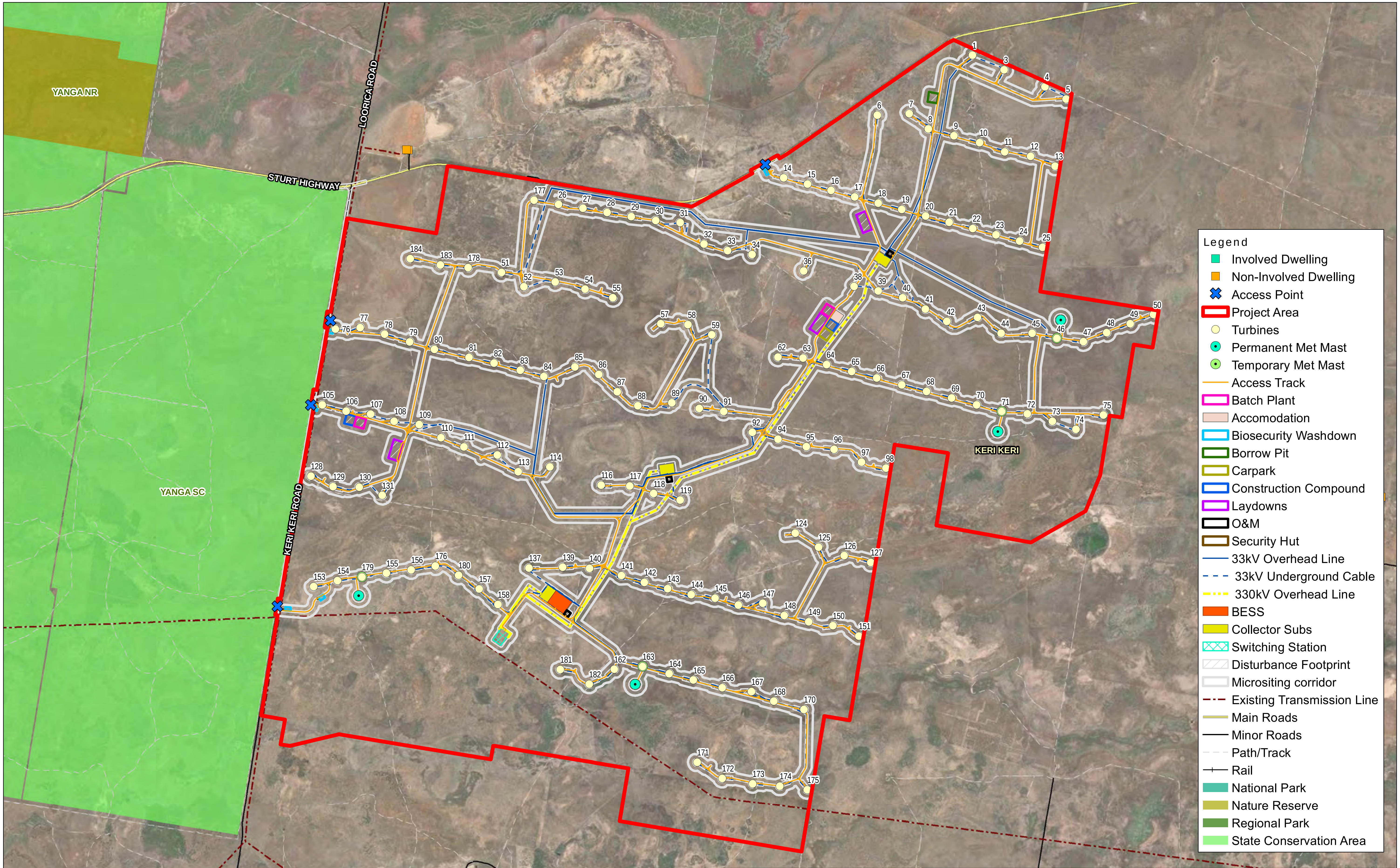

Coordinate System:
GDA 1994 MGA Zone 54

Date: 19/03/2024

Created By: VN

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F1.2 - Project Layout

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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1.3 PROJECT OBJECTIVES

The Project has the following social, economic and environmental objectives:

- Support the transition of the energy sector away from a centralised system of large fossil fuel generation, towards a decentralised system of widely dispersed, renewable energy production;
- Provide renewable energy production that contributes to offsetting the forecast retirement of NSW coal-fired power stations, including the 1,680 MW Liddell Power Station (closed during April 2023), the 2,880 MW Eraring Power Station (scheduled to close in 2025), the 1,320 MW Vales Point Power Station (scheduled to close in 2029), the 2,640 MW Bayswater Power Station (scheduled to close between 2030 and 2033), and the 1,400 MW Mount Piper Power Station (scheduled to close in 2040);
- Contribute to meeting increasing energy demand in NSW and throughout the National Electricity Market (NEM);
- Provide dispatchable energy through a proposed grid-scale BESS;
- Contribute to greenhouse gas (GHG) emissions reductions in the order of 2.6 million tonnes CO_2 equivalent per annum (Mt-CO_2e pa), supporting the NSW and Australian Government commitments to of net zero by 2050;
- Contribute materially to NSW and Australian Government renewable energy targets;
- Deliver economic benefits to NSW, regional and local communities, including (approximately):
  - Positive average annual construction impacts to the regional economy including:
    - $217 million (M) in annual direct and indirect output;
    - $74 M in annual direct and indirect value add;
    - $22 M in annual direct and indirect household income;
    - 524 direct and indirect jobs;
  - Positive average annual construction impacts to the NSW economy including:
    - $340 M in annual direct and indirect output;
    - $135 M in annual direct and indirect value add;
    - $93 M in annual direct and indirect household income;
    - 910 direct and indirect jobs;
  - Providing a diversified income stream through payments to associated landholders;
  - Provide benefits to regional infrastructure and services through the establishment of a 'Community Benefit Fund';
- Minimise adverse environmental impacts;
- Recycle and reuse materials where practical and economically feasible;
- Ensure quality, safety and environmental standards are maintained; and
- Liaise and work proactively with the community and all potentially affected stakeholders in the identification, mitigation and/or monitoring of any potential environmental impacts.

1.4 PROJECT BACKGROUND

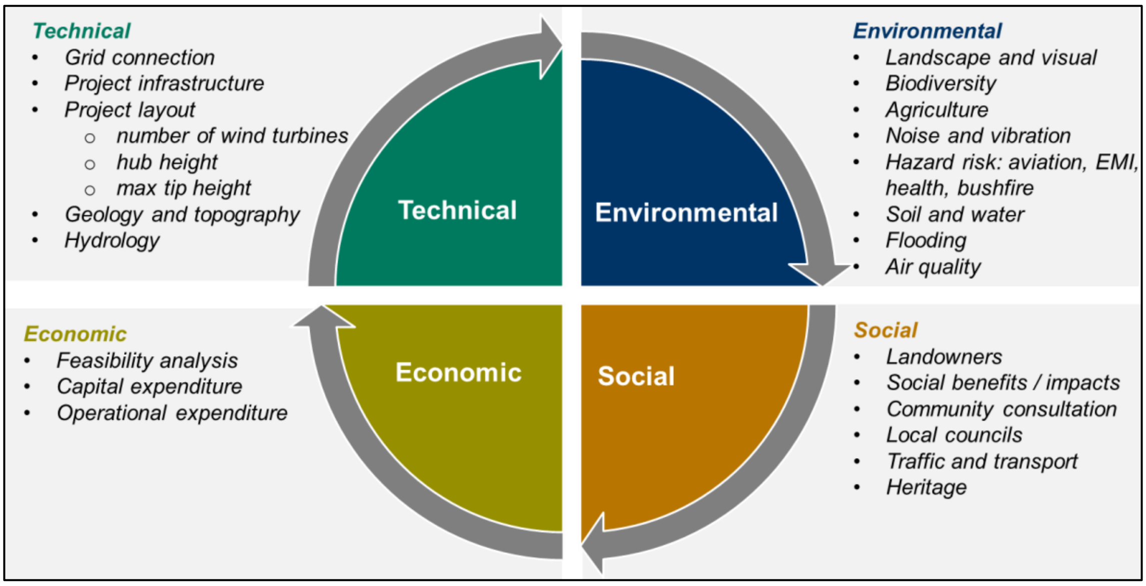
1.4.1 PROJECT HISTORY

- Milestone 1 - Execution of Agreement for Leases (AFLs):
  - The Applicant has been in discussion with the landowner at Keri Keri Station about developing wind, solar and battery project at their property since 2019;
  - Adjacent properties included in 2019 were lots 12/DP751231, 19/DP751175 11/DP1120173, 14/DP751231 and 13/DP7511231. This secured land of 18,012 ha under Access License in September 2020;
  - AFL was executed with the respective landowners in September 2021;
- Milestone 2 - Met Mast Installation:
  - Met Mast was installed and commissioned in March 2022 to capture wind data for energy resource analysis and for project feasibility studies;
- Milestone 3 - SEARs issued:
  - SEARs approved the scoping report for the project in April 2022;
- Milestone 4 - Lead Planning and Environmental Consultant conducted site surveys:
  - Biodiversity surveys for all four seasons were undertaken from November 2021 to October 2023;
  - Cultural Heritage surveys were conducted between April 2022 to August 2022;
  - Confirmation of suspected Ancestral Aboriginal Remains (AAR) was identified and recorded with Heritage NSW in March 2023;
  - Bird and Bat Utilisation Survey (BBUS) was undertaken for all the four seasons that was concluded in November 2023;
- Milestone 5 - Community Consultation and Engagement:
  - Consultation and engagement with the community commenced in November 2021;
- Milestone 6 – Project Layout:
  - During the initial scoping report stage of the project, a total of 176 WTGs of the 5.7 MW Nordex turbine model (1003.2 MW) were proposed;
  - Scoping Report was submitted in March 2022;
  - After conducting Cultural Heritage Surveys in April 2023, the turbine numbers were reduced to 159 WTGs of the 5.7 MW Nordex turbine model (906.3 MW) to avoid impacts to cultural and aboriginal heritage;
  - Currently the project layout consists of 155 WTGs of the 5.7 MW Nordex turbine model (883.5 MW) after considering noise and visual impact assessment outcomes.

1.4.2 DESIGN APPROACH

A multivariable and iterative design approach has been employed for the Project, taking into consideration a range of technical, environmental, social, and economic opportunities and constraints (refer **Figure 1-3**).

FIGURE 1-3 MULTIVARIABLE AND ITERATIVE DESIGN APPROACH



Design iterations for the WTGs, ancillary infrastructure and the transmission line corridor have progressed with key drivers being measures to minimise and avoid environmental and social impacts in line with the following Avoid-Minimise-Mitigate-Offset design hierarchy:

- Avoid – in the first instance, all efforts were made to avoid potential environmental and social impacts;
- Minimise – where potential impacts could not be avoided, design principles aimed to minimise environmental and social impacts, as far as feasible;
- Mitigate – mitigation strategies will be implemented to manage the extent and severity of remaining environmental and social impacts; and
- Offset – environmental and social offsets shall be used only as applicable, following all efforts to first avoid, minimise and mitigate environmental impacts.

Design evolution and impact minimisation is outlined in **Section 2.3.4**.

1.5 RELATED DEVELOPMENT

The Project is part of the proposed Keri Keri Renewable Energy Hub which, in addition to this Project, includes a proposed 400 MW direct current (DC) solar facility. The development of the two electricity generating components of the Keri Keri Renewable Energy Hub will progress separately. Specifically:

- The Project, including BESS, is expected to be progressed first; and
- The Keri Keri Solar Farm, located to the southwest of the Project, will be subject to a separate SSD development application and approvals process.

While the Project will operate independently, the Keri Keri Solar farm may utilise infrastructure developed as part of the Keri Keri Wind Farm, subject to timing of construction and approvals processes. Shared infrastructure may include:

- BESS, substation / switching station;
- Road access, internal road network; and
- O&M facilities.

1.6 RESTRICTIONS OR COVENANTS

No known restrictions or covenants apply to the Project Area.

2. STRATEGIC CONTEXT

This section identifies the key strategic issues that are relevant to the development of the Project. It discusses how the Project aligns with International, Australian and NSW Government policies and strategic goals, discusses alternatives to the Project and modifications made to the proposed design during development of the Project, key potential risks, and potential cumulative impacts.

2.1 CONTRIBUTION TO THE NATIONAL ELECTRICITY MARKET

The NEM is one of the world's longest interconnected power systems, stretching around 5,000 km from far-north Queensland to Port Lincoln in South Australia, and across Bass Straight to Tasmania (AEMO, 2021). Once constructed, the Project aims to connect to the NEM through Project EnergyConnect or through transmission infrastructure established for the South West REZ. The Project will deliver renewable, low-cost energy to the NEM, contributing to offsetting the generation that will be lost with the closure of coal-fired power stations and contributing to the Australian and NSW Government net-zero emissions target.

The Australian Energy Market Operator (AEMO) provides annual reports relating to the NEM. The 'Electricity Statement of Opportunities' (ESOO) provides updated forecasts for demand and supply of electricity (AEMO, 2023a). The 'Integrated System Plan' (ISP) is a whole-of-system plan that provides an integrated roadmap for the efficient development of the NEM over the next 20 years and beyond (AEMO, 2023b).

The draft 2024 ISP (AEMO, 2023b) highlights the planned retirement of all of NSW existing coal fired electricity generation by 2040; however, it forecasts that the remaining coal fleet will close two to three times faster than dates announced. Three of these, accounting for over 6 GW of generation, are planned to retire before 2030, specifically:

- AGL's Liddell power station (2.00 GW) which closed in April 2023;
- Origin Energy's Eraring power station (2.92 GW) which is scheduled to close in August 2025, seven years ahead of its previously planned retirement; and
- Delta Energy's Vales Point B power station (1.32 GW) which is expected to close in 2029.

The draft 2024 ISP also states that almost triple the grid-scale variable renewable energy is required by 2030, seven-fold renewable energy generation by 2050, and four times the firming capacity is needed across the NEM to meet demand. This translates to the installation of approximately 6 GW of new renewable generation capacity every year across the NEM, compared to the current rate of almost 4 GW. Overall, the installed capacity of renewable energy must increase from the current 19 GW to 126 GW of utility-scale wind and solar.

The AEMO 2023 ESOO notes the substantial pipeline of future renewable projects in various stages of development. These projects total 248.4 GW and are spread across all NEM regions, including NSW. **Figure 2-1** illustrates the forecast generation pipeline – existing, committed, anticipated, and proposed – of renewable energy projects .

FIGURE 2-1 PROPOSED PROJECTS BEYOND THOSE ALREADY COMMITTED

Source: AEMO's 2023 Electricity Statement of Opportunities (AEMO, 2023)

Previous ISPs identified the locations of proposed REZs in Australia that can connect to existing transmission networks, and that these REZs had 'the potential to foster a more holistic approach to regional employment, economic opportunity and community participation' (AEMO, 2022).

The Project is located within the South West REZ, which is identified as a proposed REZ in the ISP and the NSW Electricity Infrastructure Roadmap, as described in **Section 2.2.6.4**. The Project will respond to Phase 2 of the ISP: 'Renewable generation development to replace energy provided by retiring coal-fired generators and supported by the actionable ISP projects'. Phase 2 will be achieved through the development of Variable Renewable Energy (VRE) in the South West REZ. The Project will generate enough clean energy to power up to 579,000 homes annually.

The Project will contribute to the projected nine-fold increase in utility-scale VRE required to meet the optimal development pathway for the NEM. The Project proposes to connect to Project EnergyConnect, subject to the Applicant gaining Access Rights, and will include a BESS that will provide dispatchable energy capabilities including potential energy arbitrage, demand management and ancillary services opportunities. The Project will therefore augment the security and reliability of the electricity system in the NEM, through consistent energy generation and energy storage.

2.2 ALIGNMENT WITH POLICY AND STRATEGIC GOALS

Increased adoption of renewable energy generation will assist Australia to transition from traditional fossil fuel energy production, which is linked to anthropogenic climate change, atmospheric pollution, water pollution, land pollution and human health impacts. Critically, reducing carbon emissions through replacement of traditional energy sources with renewable energy will assist to minimise the effects of climate change, benefitting current and future generations in line with the principles of Ecologically Sustainable Development (ESD).

In addition to achieving the objectives outlined in **Section 1.3**, the Project will assist to achieve objectives of the following International, Australian and NSW Government policies and strategic goals:

- United Nations Sustainable Development Goals (SDGs);
- United Nations Framework Convention on Climate Change (UNFCC) Conference of Parties 28 (COP28), Dubai 2023;
- UNFCC COP27, Egypt 2022; UNFCC COP26, Glasgow 2021; UNFCC COP21, Paris 2015;

- The Australian Government's Renewable Energy Target;
- Greenhouse gas emissions reduction targets described in the *Climate Change Act 2022*;
- NSW Net Zero Plan Stage 1: 2020 – 2030;
- NSW Electricity Strategy;
- NSW Transmission Infrastructure Strategy;
- NSW Electricity Infrastructure Roadmap;
- NSW South West Renewable Energy Zone;
- Contributing to the NEM;
- Riverina Murray Regional Plan;
- Murray River Local Strategic Planning Statement 2020-2040; and
- Murray River Community Strategic Plan 2022-2032.

2.2.1 UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The *United Nations 2030 Agenda for Sustainable Development* includes global SDGs to build a more sustainable and resilient future. The 17 SDGs and 169 individual targets seek to improve economic, social, and environmental sustainability. All Member States of the United Nations (including Australia) agreed to work towards achieving the SDGs by 2030. The SDGs of relevance to the Project include:

- Goal 7: Affordable and clean energy. The objectives of the goal are to ensure access to affordable, reliable, sustainable, and modern energy for all. Target 7.2 states '*By 2030, increase substantially the share of renewable energy in the global energy mix'*;
    - The Project will increase the amount of renewable energy in the global energy mix.
- Goal 8: Decent Work and Economic Growth. The objectives of the goal are to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. Target 8.2 states '*Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors*';
    - The Project will diversify employment opportunities in the region, and introduce innovative technology services to the local economy; and
- Goal 11: Sustainable Cities and Communities. The objectives of this goal are to make cities and human settlements inclusive, safe, resilient, and sustainable. Target 11.6 states '*By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management';*
    - The Project aims to minimise per capita environmental impacts of cities by providing clean, reliable renewable energy, reducing pollutants to air, and reducing waste compared to traditional coal-fired power.

2.2.2 UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE CONFERENCE OF PARTIES 21

The UNFCC COP21 developed the Paris Agreement on Climate Change (Paris Agreement) which outlines a framework for all countries to take climate action from 2020 and builds upon the international efforts in the period up to 2020. The aim of the Paris Agreement is to limit emissions globally to net zero in the second half of this century. Australia is one of 195 countries that signed on to the Paris Agreement and has set a target to reduce emissions. Australia's emissions reduction target of 43% below 2005 levels by 2030 and net zero emissions by 2050 is now legislated.

The Project will contribute to meeting Australia's commitments under the Paris Agreement through the generation of renewable wind energy, which will result in a net reduction in greenhouse gas emissions of approximately 2.6 Mt-CO_2e pa.

2.2.3 UNFCC COP26, 27 & 28

COP26 was the 26th climate change COP held in Glasgow in late 2021. A key outcome of COP26 was agreement to 'revisit and strengthen …2030 targets (Paris Agreement targets) in nationally determined contributions…by the end of 2022' (UNFCCC, 2021). Ahead of COP26 and the Group of 20 (G20) Summit in Rome (also in 2021), the Australian Government committed to achieving net zero greenhouse gas emissions by 2050.

COP27 was held in Egypt during November 2022 and further highlighted the urgency required to deliver on the Paris Agreement targets and avoid 1.5 ^{o}C global temperature rise.

COP28 was held in Dubai between 30 November and 12 December 2023, and emphasised the need to fast tracking the energy transition and reducing emissions before 2030 to keep the 1.5^{o}c target within reach was set as a priority. A key outcome of COP28 was commitment to tripling renewable energy capacity globally and doubling the global annual rate energy efficiency improvements by 2030.

The Project will contribute to meeting both Australian and NSW emissions reduction commitments through the generation of renewable wind energy.

2.2.4 AUSTRALIAN GOVERNMENT RENEWABLE ENERGY TARGET

The Renewable Energy Target (RET) is an Australian Government scheme which has been in operation since 2001. It is designed to reduce emissions of GHG in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources. The RET operates as two schemes – small- and large-scale - of which the Large-scale Renewable Energy Target (LRET) is relevant for this Project. The LRET encourages investment in large-scale renewable energy projects like wind farms, and incentivises the development of renewable energy power stations through a market for the creation and sale of certificates called Large-scale Generation Certificates (LGCs).

Renewable energy power stations accredited in the LRET are able to create LGCs for electricity generated. LGCs can then be sold to entities with liabilities under the LRET (mainly electricity retailers) to meet their compliance obligations. One LGC can be created for each MWh of eligible renewable electricity produced by an accredited renewable power station.

Liable entities are required to buy LGCs from the market and surrender these certificates to the Clean Energy Regulator on an annual basis. LGCs can also be sold to companies and individuals looking to voluntarily offset their energy use and emissions.

The RET target for energy from large-sale renewable projects is 33,000 GW hours. Investment in renewable energy systems remains strong and target has not acted as a cap on new investment as the competitiveness of renewable energy no longer relies on the generation of LGCs (Clean Energy Regulator, 2020).

Once constructed, the Project will contribute toward the LRET target and will be an eligible large-scale generator under the RET.

2.2.5 CLIMATE CHANGE ACT 2022

The Australian Government *Climate Change Act 2022* legislates Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and reducing Australia's net greenhouse gas emissions to zero by 2050. The Project will assist in achieving this target by providing an estimated reduction in GHG emissions of approximately 2.6 Mt-CO_2e pa.

If approved, the Project could be constructed and operational before 2030, which is the year that many nations have pledged significant GHG emissions reductions relative to 2005 levels.

2.2.6 NSW GOVERNMENT COMMITMENTS

2.2.6.1 NET ZERO PLAN STAGE 1 2020-2030

The NSW Government Net Zero Plan Stage 1: 2020–2030 (DPIE, 2020a) sets the foundation for action on climate change and how the NSW Government will deliver on its objective to achieve net zero emissions by 2050, as outlined in the NSW Climate Change Policy Framework (OEH, 2016). The Plan is the NSW Government's overarching strategy to reduce emissions and mitigate the impacts of climate change.

In September 2021, the NSW Government announced ambitious new GHG emissions reductions targets of 50% below 2005 levels by 2030 (Net Zero Plan Stage 1: 2020 – 2030 Implementation Update - September 2021). Subsequently, in December 2022 the NSW Government strengthened these targets, announcing the aim to achieve 70% GHG emissions reduction by 2035 (Net Zero Plan Stage 1: 2020 – 2030 Implementation Update – December 2022).

This Project will help give effect to the Net Zero Plan, including the NSW Government's updated 2030 and 2035 targets by providing an estimated reduction in greenhouse gas emissions of approximately 2.6 Mt-CO_2e pa.

2.2.6.2 NSW ELECTRICITY STRATEGY

The *NSW Electricity Strategy* (DPIE, 2019a) is the NSW Government's plan to achieve reliability, affordability, and sustainability for the NSW electricity system, and will support an estimated $8 billion of private investment in NSW's electricity system over the next decade.

The NSW Government's Electricity Strategy aims to improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, and government-caused delays, and to encourage investment in new price-reducing generation and energy saving technologies. The Strategy identifies the NSW Government's commitment to energy security, including additional capacity increases via interconnector projects and the rolling out of REZs. The Strategy aligns closely with the NSW Government's *Net Zero Plan Stage 1: 2020 – 2030*, and supports a new affordable and reliable energy system by:

- Delivering the coordinated REZ in the South West region;
- Saving energy via the Energy Security Safeguard;
- Supporting the development of new electricity generators;
- Setting a target to increase the state's energy resilience; and
- Making it easier to do energy business in NSW.

The Project is consistent with the Strategy as it provides renewable energy generation and storage capacity that, together with other renewable generation projects, is expected to result in lower cost of energy in the NEM. The Project will also contribute to greater energy resilience using BESS stabilisation technology and the future supply of electricity to the NEM with the impending closure of coal fired power stations over the next 20 years.

2.2.6.3 NSW TRANSMISSION INFRASTRUCTURE STRATEGY

The *NSW Transmission Infrastructure Strategy* (DPE, 2018) is the NSW Government's plan to unlock private sector investment in priority energy infrastructure projects, which can deliver least-cost energy to customers. The Strategy forms part of the government's broader plan to make energy more affordable, secure investment in new power generation and network infrastructure and ensure new technologies deliver benefits for consumers.

The *NSW Transmission Infrastructure Strategy* seeks to help meet future energy needs by facilitating new transmission that could support up to 17,700 MW of new electricity generation. Other benefits include improved energy reliability, security, timely project delivery, increased affordability, and access to cheaper electricity.

The Project will include a 330 kV transmission line to connect the Project to a new electrical switchyard, located adjacent to Project EnergyConnect, which is proposed to traverse the Project Area. The Project proposes to connect to Project EnergyConnect, subject to successfully gaining access rights. If this is achieved, the Project will align with the aims of the *NSW Transmission Infrastructure Strategy* by increasing NSW's electricity linkages with neighbouring states. The Project will contribute to the development of the South West REZ, which will result in an overall increase to NSW's energy capacity.

2.2.6.4 NSW ELECTRICITY INFRASTRUCTURE ROADMAP

The *NSW Electricity Infrastructure Roadmap* (Roadmap), released in November 2020 is the NSW Government's plan to transform the NSW electricity sector into one that is clean, cheap, and reliable. The Roadmap builds on the *NSW Electricity Strategy* (DPIE, 2019a) and the *NSW Transmission Infrastructure Strategy* (DPE, 2018). It sets NSW on a plan to replace its ageing coal-fired power stations with a coordinated portfolio of generation, storage, and network investment.

The Roadmap emphasises the need to transition to renewable energies, noting four of the State's five coal fired power stations are expected to close within the next 15 years, namely:

- AGLs Liddell power station (2.00 GW), which closed during April 2023;
- Origin Energy Eraring power station (2.92 GW) is scheduled to close in August 2025, seven years ahead of its previously planned retirement;
- Vales Point B power station (1.32 GW) is expected to close in 2029;
- AGLs Bayswater power station (2.72 GW), scheduled to close between 2030 and 2033, and
- Energy Australia's Mt Piper (1.4 GW), the youngest of NSW's coal-fired power stations, in 2040.

These power stations currently provide around three quarters of NSW electricity supply and two thirds of the firm capacity (DPIE, 2020d).

Enabled by the *Electricity Infrastructure Investment Act 2020* (NSW), the Roadmap sets out a coordinated framework to support $32 billion in private investment in at least 12 GW of renewable energy generation infrastructure and at least 2 GW of long-duration storage infrastructure by 2030 (DPIE, 2020d). The Roadmap seeks to reduce greenhouse gas emissions from NSW electricity generation by 90 million tonnes by 2030, helping deliver on NSW's emissions targets (DPIE, 2020d).

The Project will provide a significant amount of renewable energy annually to help offset the retirement of coal-fired power stations in NSW. The Project will assist in meeting the NSW Government's emissions reduction targets, and NSW's energy generation and storage requirements. The Project will also contribute to the development of the South West REZ, which will add to the regional growth and investment in regional NSW.

2.2.6.5 SOUTH WEST RENEWABLE ENERGY ZONE

The *NSW Electricity Strategy* (DPIE, 2019a) and *Electricity Infrastructure Roadmap* (DPIE, 2020d) provide the framework to establish the state's first five REZs in strategic areas across the state, including in the South West region. The REZs will play a significant role in delivering renewable energy generation and storage to help replace existing fossil fuel power stations as they come to their end of operational life.

The South West region has been identified as one of five REZs to be created in NSW, with others being declared/proposed in the New England, Central-West Orana, Illawarra, and Hunter-Central Coast regions of NSW. REZs combine wind, solar, hydroelectric and energy storage, together with high-voltage transmission lines, to generate and deliver renewable energy. By connecting multiple generators and storage in the same area, REZs capitalise on economies of scale to deliver renewable electricity for homes and businesses in NSW.

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 population density of the South West REZ is considerably lower than other REZs.

The South West REZ was declared by the NSW Minister for Energy 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 objectives of REZs are to:

- Deliver affordable energy into the future;
- Diversify the NSW energy mix;
- Expand electrical transmission capabilities; and
- Open new parts of the NEM for energy generation in locations that can benefit from diverse weather patterns.

The Project is strategically located within the South West REZ and aligns with the strategic objectives of the South West REZ (as identified above). The Project will deliver affordable clean energy, contribute to the diversification of the NSW energy sector, and facilitate the expansion of electrical transmission 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.

2.2.6.6 NSW WIND ENERGY FRAMEWORK

The NSW Government's Wind Energy Framework aims to provide clarity, consistency, and transparency for both industry and the community in relation to the assessment and decision-making on wind energy projects.

The Wind Energy Framework includes the following documents:

- Wind Energy Guideline;
- Wind Energy: Visual Assessment Bulletin;
- Wind Energy: Noise Assessment Bulletin;
- Standard Secretary's Environmental Assessment Requirement; and
- Wind Energy Framework Q&As.

This EIS for the Project has been prepared in accordance with the Wind Energy Framework.

2.2.6.7 RIVERINA MURRAY REGIONAL PLAN

The Riverina Murray Regional Plan 2041 (RMRP) is a 20-year blueprint for the future of the Riverina Murray Region. The RMRP provides a framework for guiding land use plans, development proposals, and infrastructure funding decisions over the next 20 years and includes both priority and longer-term actions (DPE, 2023).

The Project aligns with Objective 13 of the RMRP - Support the transition to net zero by 2050, which recognises the Riverina Murray's climate, resources and strategic connections place it in a strong position to capitalise on the net zero target, with a focus on the South West REZ.

2.2.6.8 MURRAY RIVER LOCAL STRATEGIC PLANNING STATEMENT 2020

The Murray River Local Strategic Planning Statement 2020 (LSPS) outlines the social, environmental, and economic land use needs throughout the Murray River Council LGA (MRC, 2020). The LSPS was adopted by Murray River Council on 30 June 2020 and aims to guide planning decisions on future land uses. Specifically, it identifies:

- A 20-year vision for land use within the Murray River LGA;
- Shared community values and characteristics that contribute to the area's local identity;
- An approach to managing growth and change in the future;
- Strategic investigations required for future development; and
- Relevant Actions to guide and inform future development throughout the Murray River LGA.

Renewable energy is addressed in Planning Priority 9 – Climate Change and natural hazards of the LSPS, which states that Council will 'promote local renewable energy projects by collaborating with energy providers and implementing best practice waste management' to achieve this priority (MRC, 2020, p. 66). The Project is consistent with Planning Priority 9 and responds to climate change through the development of a new renewable energy project within the LGA.

2.2.6.9 MURRAY RIVER COUNCIL COMMUNITY STRATEGIC PLAN 2022-2032

The Murray River Council Community Strategic Plan 2022-2032 (CSP) is a 10-year plan which outlines the long-term vision of the communities within the Murray River LGA (MRC, 2023). It was adopted by Murray River Council in April 2022 and aligns with the Riverina Murray Regional Plan 2041 and other strategic documents. The CSP provides a road map for guiding decisions in relation to planning and investment throughout the LGA. It was developed through a collaboration between the Murray River Council and the local community following extensive consultation.

The Project responds to the strategic theme of 'A place of prosperity and resilience', which states that the Murray River LGA should 'encourage and support economic development across the region' including 'alternative and renewable energy investment opportunities' (MRC, 2022, p. 38). Therefore, the Project is consistent with the CSP.

2.3 PROJECT ALTERNATIVES

2.3.1 DO NOTHING

The ‘do nothing’ option needs consideration as it represents the status quo and avoids potential development impacts. But it does not realise the Projects benefits. The land would remain as grazing agricultural land if the ‘do nothing’ option occured.

Section 6.3.3 provides further discussion of development impacts and the accompanying mitigation and management measures. These sections conclude that with appropriate mitigation and management measures, the Project will not have a substantial negative impact on environmental aspects.

Not proceeding with the Project would forgo the benefits outlined in **Section 1.3** and **Section 2.1**, particularly those relating to Australian, NSW, and regional policies, and strategies to decarbonise the NEM. Should the Project not proceed, the estimated 2.6 Mt-CO_2e pa reduction in greenhouse gas emissions would not be realised.

Given the benefits of the Project as discussed in **Section 1.3**, **2.1** and **3.8**, and the manageability of potential impacts, ‘do nothing’ was not the preferred option for strategic, economic, social, and environmental reasons.

2.3.2 SITE SELECTION

The Project Area is identified as a highly suitable site for the proposed wind farm development. During the site selection process for the Project, various criteria were considered, including:

- Proximity and access to existing 330 kV line;
- Accessibility to the Project via a major road;
- An area that would avoid or limit the need to remove native vegetation or impact on other environmental values;
- A site with topographical features that would require minimal earthworks/ soil disturbance;
- A site with minimal flooding or bushfire risk;
- Minimal impact on surrounding privately or publicly owned land; and
- Minimal environmental impacts.

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.

2.3.3 SITE ALTERNATIVES

A project of this magnitude requires significant land area, proximity to existing or proposed transmission networks and available network capacity. Many alternative sites were limited in providing these critical elements.

Due to the wind resource, sparsely populated locality, the proposed route of Project EnergyConnect, and being located within the South West REZ, it is considered that the site is optimal for wind energy generation.

Further, as part of the site identification process, engagement with Murray River Shire Council was undertaken to identify potential areas for renewable energy development in the locality, prior to engaging with the host landholders. Refer to Section 5 for further information relating to Project engagement and consultation.

2.3.4 DESIGN EVOLUTION AND IMPACT MINIMISATION

Since the conception of this Project, the design has evolved through consideration of technical, environmental, social, and commercial constraints. This has included consideration of the outcomes of engagement with associated landowners, non-associated landowners, the community, local government, State and Australian Government Agencies, and business and stakeholder groups. Both the engagement and technical studies undertaken to inform the EIS has shaped the Project layout presented in this EIS.

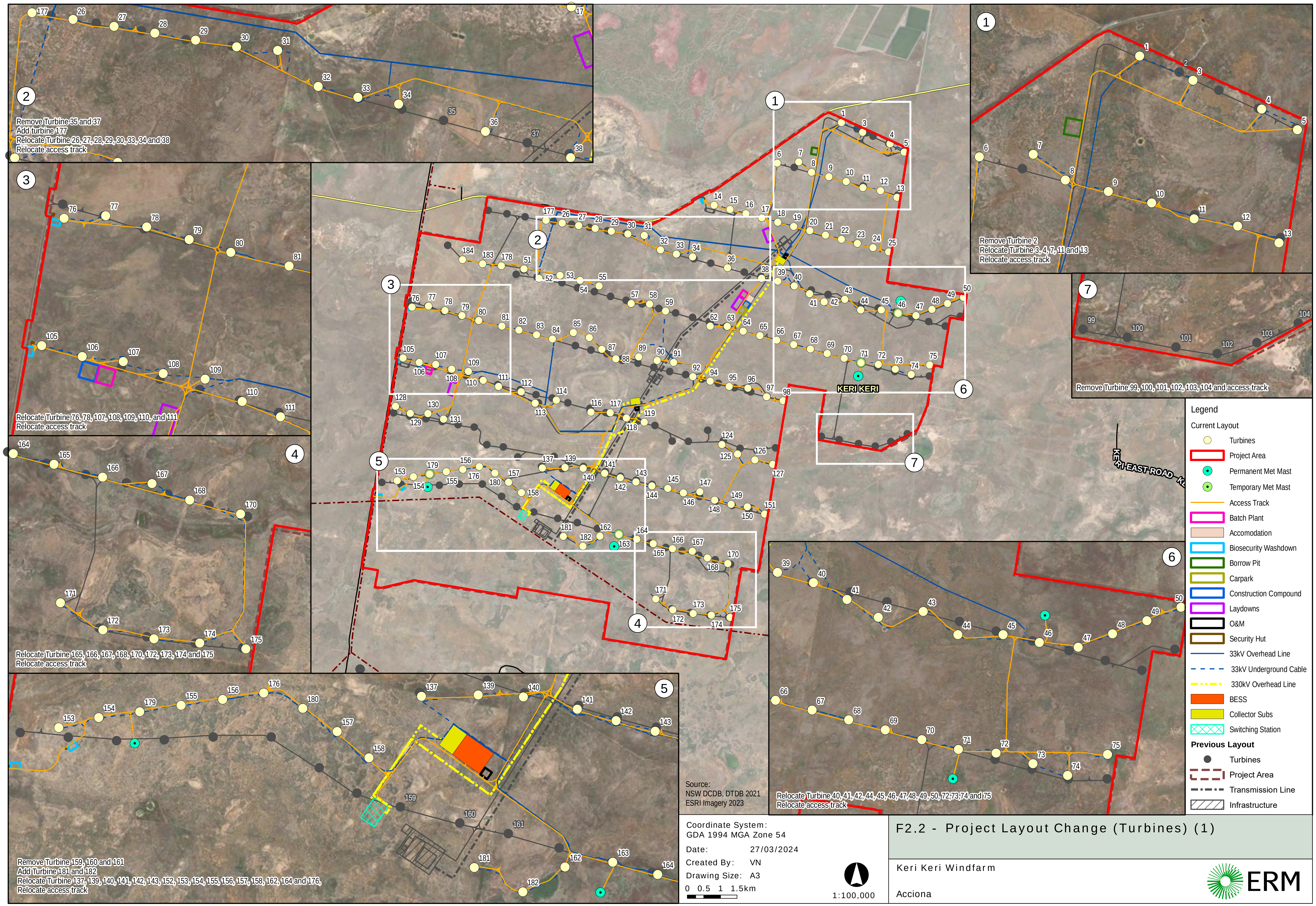
The Applicant has commissioned environmental assessment of the Project Area in accordance with the SEARs and has modified the project layout based on the outcomes of these assessments, consideration of technical, environmental surveys and assessments, constructability, and community feedback (refer **Section 5**). This section describes Project alternatives that were considered, and modifications that were made to previous designs.

The Project originally consisted of up to 176 WTGs (refer Scoping Report (ERM, 2022)) and has since been refined to up to 155 WTGs to avoid sensitive Aboriginal cultural heritage, ecological areas, and to minimise potential visual and noise impacts to surrounding dwellings.

Figure 2-2 to **Figure 2-4** illustrates the evolution of the Project layout since the scoping phase. **Table 2-1** outlines the evolution of Project. It is expected that some further adjustment may be necessary in response to feedback received during exhibition of the EIS.

TABLE 2-1 PROJECT REFINEMENTS AND RATIONALE SINCE SCOPING PHASE

Project Component	Scoping Report	Project	Refinement Rationale
Project Area	18,055 ha	18,012 ha	Reduction in total project area, WTGs and ancillary infrastructure avoided and reduced potential impacts to biodiversity, cultural heritage and visual impacts, as discussed in Section 6.1, 00 and 6.6. **Biodiversity:** WTGs relocated to avoid areas of high biodiversity constraint in the south and north-eastern pocket of the Project Area. **Cultural heritage:** Project infrastructure, such as internal access tracks, were reconfigured to avoid areas of cultural heritage sensitivity. **Visual impact:** WTGs removed from the north-western pocket of the Project Area to reduce potential visual impact to the nearest non-associated dwellings and a public viewpoint.
No. of WTGs	176 WTGs	Up to 155 WTGs	
WTG dimensions (maximums)	Hub height up to 200 m Tip height up to 291.5 m	No change	
Indicative WTG model	Nordex / N163-5.X / 5.7 MW	No change	
Electrical Reticulation Network	1 x 330 kV main substation and 2 x 132 kV collector substations	3 x 330 kV main substations	
	~ 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	



Coordinate System: GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

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F2.2 - Project Layout Change (Turbines) (1)

Keri Keri Windfarm

Acciona

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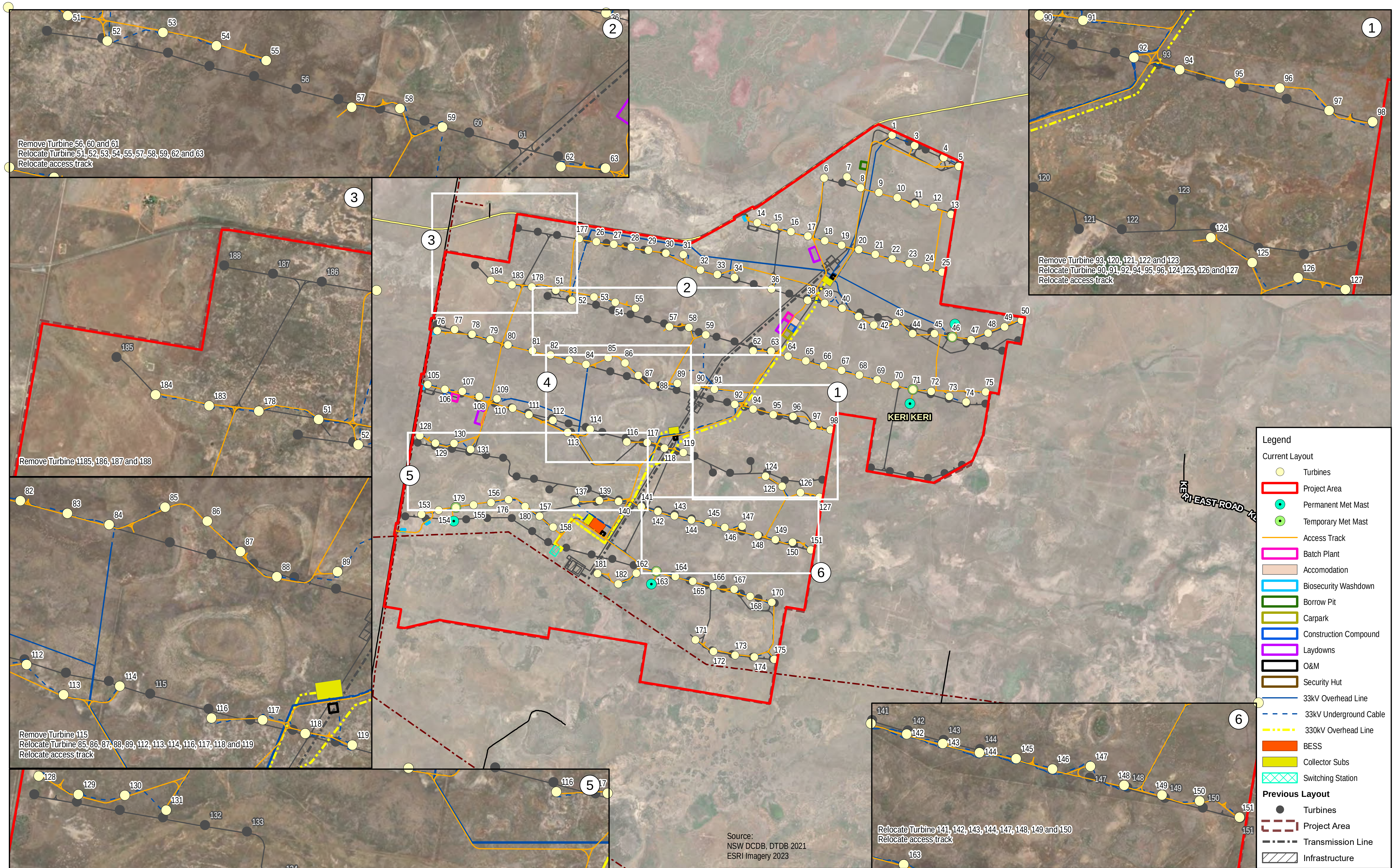

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F2.3 - Project Layout Change (Turbines) (2)

Keri Keri Windfarm

Acciona

ERM

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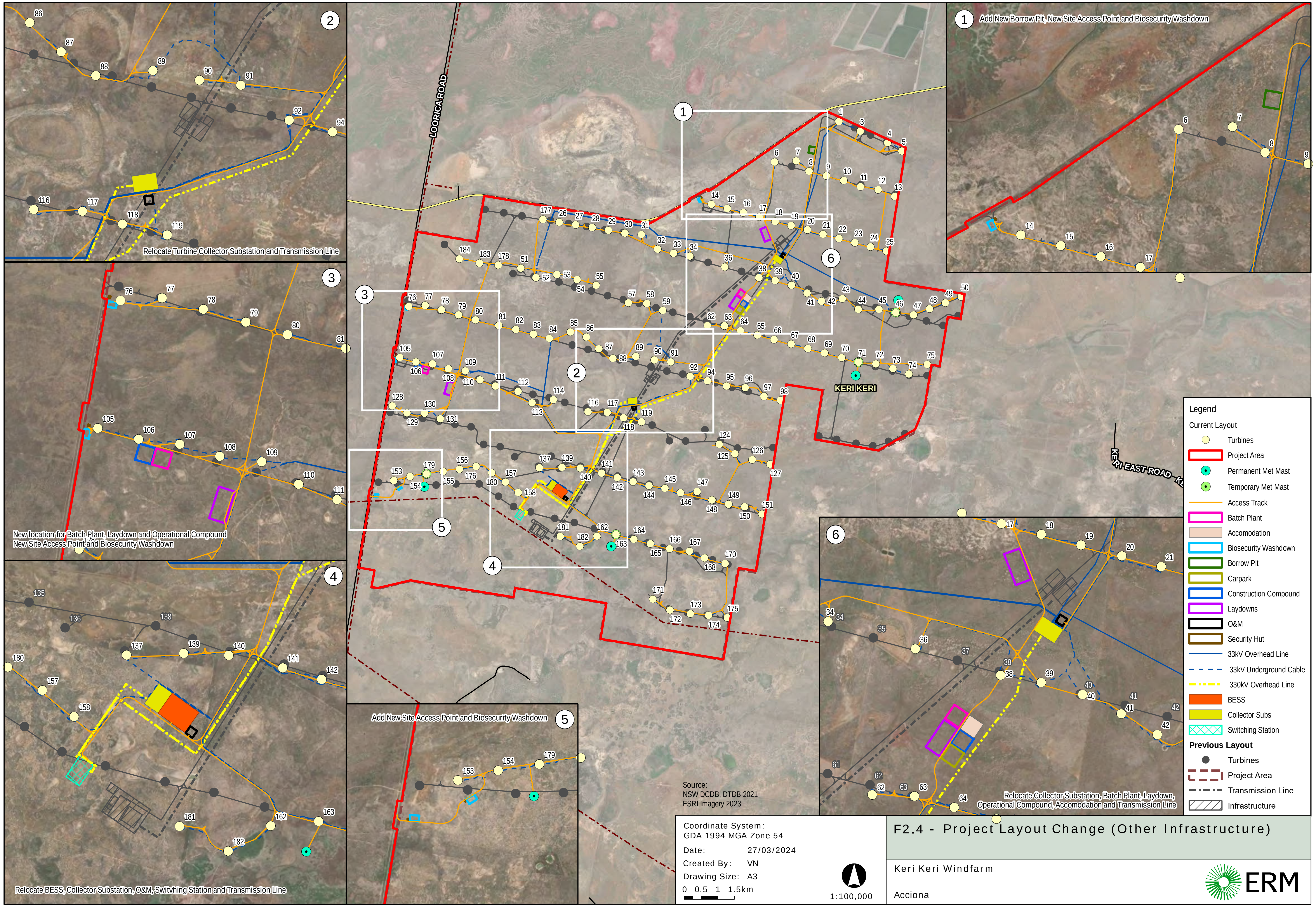

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

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0 0.5 1 1.5km

1:100,000

F2.4 - Project Layout Change (Other Infrastructure)

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2.3.5 ALTERNATIVE TRANSPORT ROUTES

The Transport Route Assessment Report (refer **Appendix J**) identifies the proposed transport route for oversized and overmass (OSOM) vehicles. The Applicant has identified that the preferred transport routes from the port to Project site are via the Port of Newcastle and Port of Adelaide.

Alternate transport routes were assessed; however, they presented additional impacts relating to road upgrades, traffic management, and Project expenses.

Further discussion of these transport routes is provided in **Section 3.4.4** and **Appendix J**.

2.4 KEY POTENTIAL RISKS

Potential risks of the Project on environmental and social aspects are investigated in detail in **Section 6**. Key potential risks to the Project are summarised in **Table 2-2**.

Section 6 demonstrates how key aspects and risks have been assessed and can be avoided or mitigated with appropriate safeguards.

TABLE 2-2 PROJECT KEY RISKS

Aspect	Risk Summary and Findings
Biodiversity	<u>Risk summary:</u> • Potential for the Project to disturb vegetation and cause loss of habitat that may impact threatened or endangered species. <u>Assessment findings:</u> • The Project design has aimed to avoid areas of biodiversity values. • A suite of mitigation measures to avoid and further minimise direct, indirect and prescribed impacts will be implemented, such as the development of a Bird and Bat Adaptive Management Plan (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. • No serious and irreversible impact entities were identified. • No areas of threatened ecological community (TEC) overlap the disturbance footprint.
Aboriginal Heritage	<u>Risk summary:</u> • Potential for the construction and operation of the Project to impact on Aboriginal heritage objects and cultural values in the area. <u>Assessment findings:</u> • A total of nine previously registered Aboriginal sites are within the Project Area. • A total of 209 new sites with similar features to the existing sites were identified within the Project Area. • Design refinements have been made to avoid all Aboriginal Ancestral Remains and minimise impact to any other Aboriginal heritage sites, where possible, including micrositing of WTGs and other infrastructure.
Landscape and Visual	<u>Risk summary:</u> • Potential for the Project to impact on landscape character values of the locality and result in an unreasonable loss of visual amenity to surrounding landholders. <u>Assessment findings:</u> • Of the 13 non-associated dwellings identified with 8 km of a Project WTG, 11 were deemed to have negligible or low visual impact; • Two dwellings (19 and 99) were deemed to have the potential for moderate visual impact. Practical and feasible mitigation measures are proposed and will mitigate the impact.

Aspect	Risk Summary and Findings
Agriculture, Soils and Land Uses	Risk summary: • Potential for the construction and operation of the Project to impact on existing agricultural land uses at the site and adjacent land. Assessment findings: • Impacts of the Project on agricultural activities and productivity would be low due to the small amount of agricultural land that would be permanently removed from production, the low likelihood of biosecurity risks and low potential for cumulative impacts. • Although permanent access tracks and WTG hardstand areas would affect soil characteristics to the extent that they would no longer be productive pasture areas, impacts are within acceptable limits as only a small percentage of the overall Project Area will be affected.
Noise	Risk summary: • Potential for the Project to cause unreasonable noise disturbance to surrounding landholders from the construction and operation of WTGs and associated infrastructure. Assessment findings: • Relevant noise criteria were achieved at all associated and non-associated dwellings.
Traffic and Transport	Risk summary: • Potential for traffic generated by the Project during construction and operation to impact on the road network. • Potential for OSOM vehicles used along haulage routes during construction, operation and decommissioning to impact on the road network. Assessment findings: • Traffic impacts from the Project have been assessed as negligible with the local road network likely to maintain Level of Service A (good operation) throughout construction and operation. • Impacts on the road network by OSOM vehicles will be mitigated via a Transport Management Plan which will include detailed information regarding traffic management and mitigation, necessary intersection upgrades and route selection.

Hazards and Risks	Risk summary:
	• Potential for the operation of the WTGs and associated infrastructure to impact aviation and telecommunication operations and to create hazards such as blade throw and bushfire.
	Assessment findings:
	• The Project is unlikely to cause material electromagnetic interference to:
	  ◦ Wireless and satellite internet services;
	  ◦ Broadcast, digital and satellite radio and television;
	  ◦ Trigonometry stations;
	  ◦ GPS;
	  ◦ Point-to-point microwave links; or
	  ◦ Mobile voice-based communications.
	• An aviation assessment determined that the Project:
	  ◦ Will not penetrate any Obstacle Limitation Surfaces or PANS-OPS surfaces;
	  ◦ Will impact on two grid Lowest Safe Altitudes which will be mitigated by raising to 2300 feet above mean sea level (AMSL);
	  ◦ Will impact on nearby designated air routes which will be mitigated by raising to 2300 feet AMSL;
	  ◦ May cause wake turbulence effects on aircraft operating in the vicinity which will be mitigated by contacting owners of landing ground within three nautical miles south of Project Area and Jeraly Station aircraft landing area;
	  ◦ Will not have an impact on operational airspace;
	  ◦ Is wholly contained within Class G airspace; and
	  ◦ Is outside the clearance zones associated with civil aviation navigation aids and communication facilities.
	• A Bushfire Report has considered bushfire impacts and found that:

Aspect	Risk Summary and Findings
	◦ The risk of fire caused by the wind farm is minimal; ◦ A proposed upgrade to the internal road network would increase firefighting access and assist to reduce the likelihood of a widespread fire; and ◦ Due to the location of the Project Area within a bushfire prone landscape, a Bushfire Emergency Management and Operations Plan should be prepared in conjunction with relevant stakeholders. • A Preliminary Hazards Report found that: ◦ Potential risk of injury or property damage from WTG blade throw has been assessed as very low as: ▪ All nearby dwellings are greater than 500 m from a WTG (which is a distance considered to be of very low risk of blade throw occurrence); ▪ The proposed development complies with the relevant DPIE criteria for land use safety planning; and ▪ Analysis found a very low likelihood of blade throw events occurring and a very low likelihood of a blade being thrown a significant distance. ◦ The thermal radiation, explosion and toxic gas effects of BESS fires would be confined within the site and there would be no potentially injurious offsite effects.
Water	Risk summary: • Potential for the Project to impact flood behaviour including post-development flood levels, depths velocities and flood hazard category. • Potential for the Project to impact surface and groundwater traversing the site and surrounding water courses. Assessment findings: • These estimated flood impacts were considered non-detrimental. No significant flood hazards were identified, nor significant changes to existing flood function were anticipated as a result of the Project. • There are relatively low hazards along the Abercrombie Creek (up to Hazard Category H3), it is considered that there will be sufficient time (3-7 day critical duration) for staff to evacuate. Emergency management measures may be required to mitigate risks associated with access or isolation during flood events. • A SWMP will be prepared prior to the commencement of construction works and it will be accompanied by Progressive ESCP to mitigate potential soil and water impacts arising from the Project. All necessary mitigation measures will be implemented to manage potential impacts to adjacent areas, including Yanga SCA.
Social and Economic	Risk summary: • Potential for the Project to impact on local and regional economy via employment generation, community benefit programs and use of services. Assessment findings: • The Project represents a $2.8 billion AUD investment in NSW economy. • During construction, 650 FTE jobs are anticipated to be created, generating up to 524 direct and indirect jobs in the region and up to 910 direct and indirect jobs in NSW. • During the Operation Phase, the Project is expected to generate up to 34 direct and indirect jobs regionally and up to 132 direct and indirect jobs in NSW. • A Construction Environmental Management Plan, Stakeholder Engagement Plan and Traffic Management Plan will be developed to mitigate and manage construction impacts to the local community and environment. • The Project has committed to establishing a Community Benefit Fund, for community funding initiatives such as the provision of vocational training scholarships, improving road infrastructure, telecommunications coverage and housing security. • A preliminary Social Impact Management Plan (SIMP) have been developed, focusing on effective, adaptive, and actionable measures and includes consideration of the likelihood of their implementation and sustainability from the community's perspective.

2.5 POTENTIAL CUMULATIVE IMPACTS

The Project is in the South West REZ. The objectives of the REZ are to facilitate the coordinated development of renewable energy generation projects, energy storage and transmission. This means that the region is planned to have a significant number of renewable energy developments, as well as other major projects that may lead to cumulative impacts relating to agricultural and land use conflicts, Aboriginal cultural heritage, biodiversity, landscape and visual, traffic and transport, noise and vibration, aviation safety, and social and economic. Potential cumulative impacts of the Project are investigated further in **Section 6**.

3. PROJECT DESCRIPTION

This chapter presents a detailed description of the proposed works associated with the construction, operation, maintenance and decommissioning phases of the Project and provides a detailed overview of the proposed wind farm layout and infrastructure components.

3.1 OVERVIEW

The Project involves the construction, operation, maintenance and decommissioning of a wind farm, with up to 155 WTGs, together with associated and ancillary infrastructure.

The Project design has been revised and refined in response to the identification and assessment of environmental constraints, constructability requirements, and consideration of the outcomes of agency, landowner, and community consultations (refer **Section 2.3** for further discussion of alternatives considered).

Table 3-1 provides an overview of the Project components. The Disturbance Footprint is the area of land that has been assessed in this EIS and is shown in **Figure 3-1**. The Disturbance Footprint allows for micrositing (refer **Section 3.3.8**), construction activities and disturbance that may extend beyond the Permanent Disturbance Footprint but will be rehabilitated following construction activities.

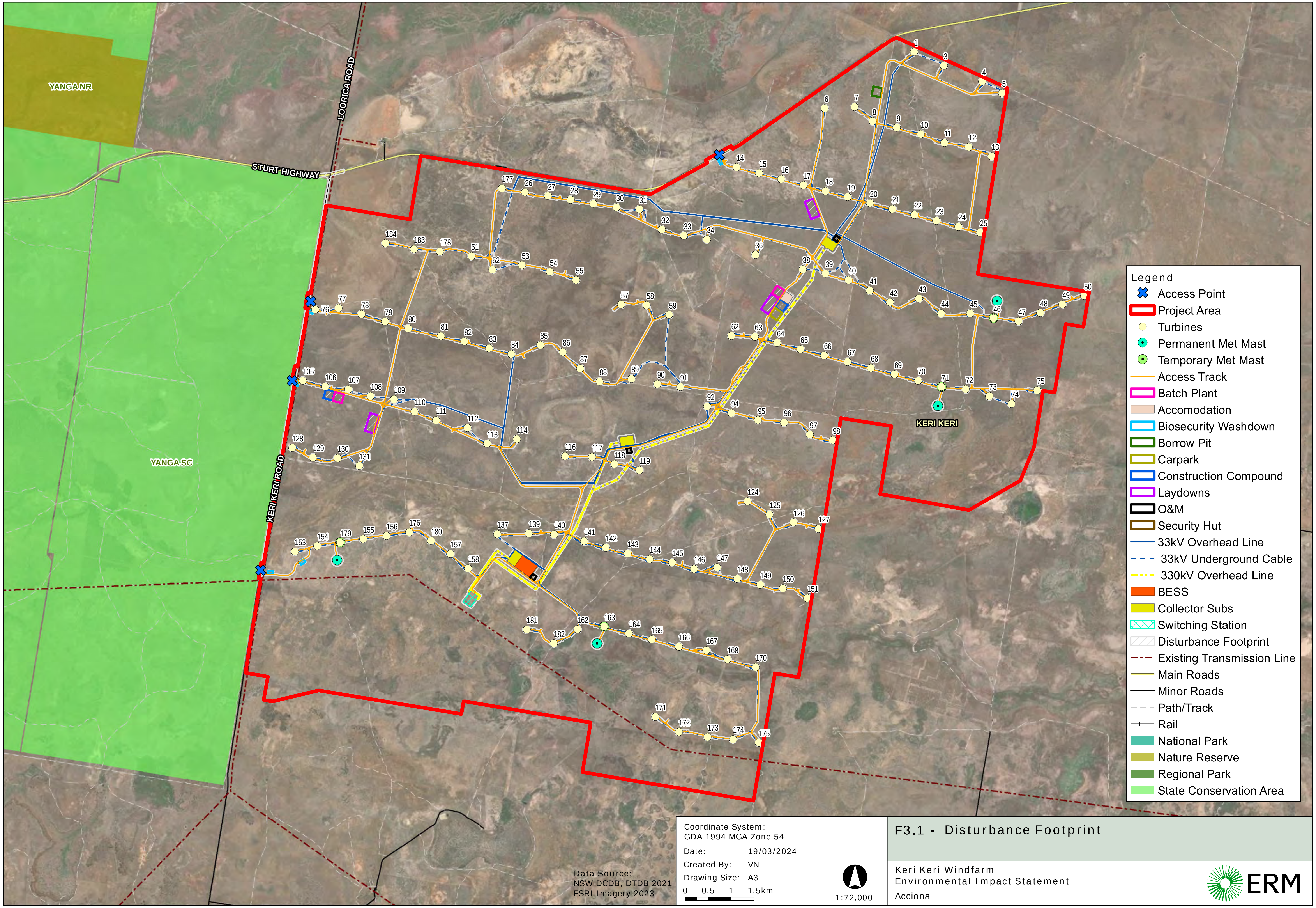
The Permanent Disturbance Footprint is the area of land that will remain disturbed throughout the operational life of the Project and is shown in **Figure 3-2**. Infrastructure coordinates are provided in **Table 3-6**

TABLE 3-1 PROJECT OVERVIEW

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.	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.	Up to 574 ha

Project Component	Description	Quantity
WTGs		
Rotor diameter	Up to 183 m	155 WTGs
Blade length	Up to 91.5 m	
Uppermost blade tip	Up to 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
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 a 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 aides	3
Security hut	20 m x 20 m at site access point	4
Biosecurity wash bays	70 m x 110 m at site access point	At each access point
New internal access tracks and drainage	Approximately 15 m wide 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

Project Component	Description	Quantity
Temporary Facilities		
Temporaray worker accommodation camp	200 m x 200 m (plus adjacent car park 100 m x 100 m)	1
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 up to 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
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



Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 19/03/2024
Created By: VN
Drawing Size: A3

F3.1 - Disturbance Footprint

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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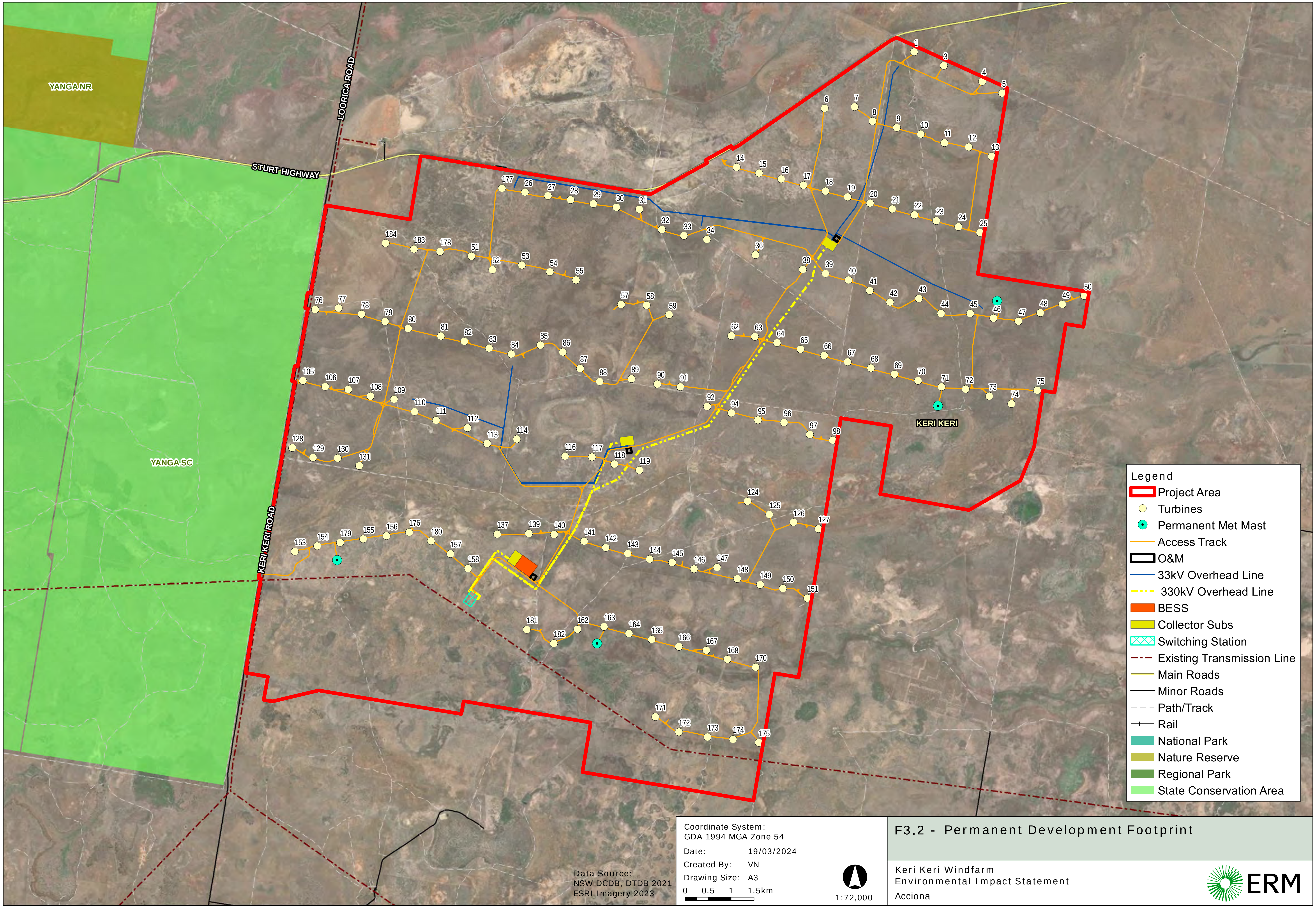

Coordinate System:
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Date: 19/03/2024

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F3.2 - Permanent Development Footprint

Keri Keri Windfarm
Environmental Impact Statement
Acciona

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3.2 SITE DETAILS

3.2.1 ASSOCIATED DWELLINGS

The Project Area is entirely located on land zoned RU1 – Primary Production. The area surrounding the Project Area is also generally zoned RU1 – Primary Production, except for the Yanga State Conservation Area to the west of the Project Area, which is zoned C1 – National Parks and Nature Reserves. The Project will not impact any C1 zoned land.

The land within the Project Area is primarily freehold with small areas of Crown land associated with paper roads, for which the Applicant will seek closure during the EIS development. The Project Area is currently used for sheep grazing and cropping. **Table 3-2** outlines the Lot and Deposited Plans (DP) associated with the Project Area.

The Applicant has entered an 'Option to Lease' Agreement with one landholder hosting Project infrastructure (encompassing 66 individual lots). Cadastral boundaries are shown in **Figure 3-3**.

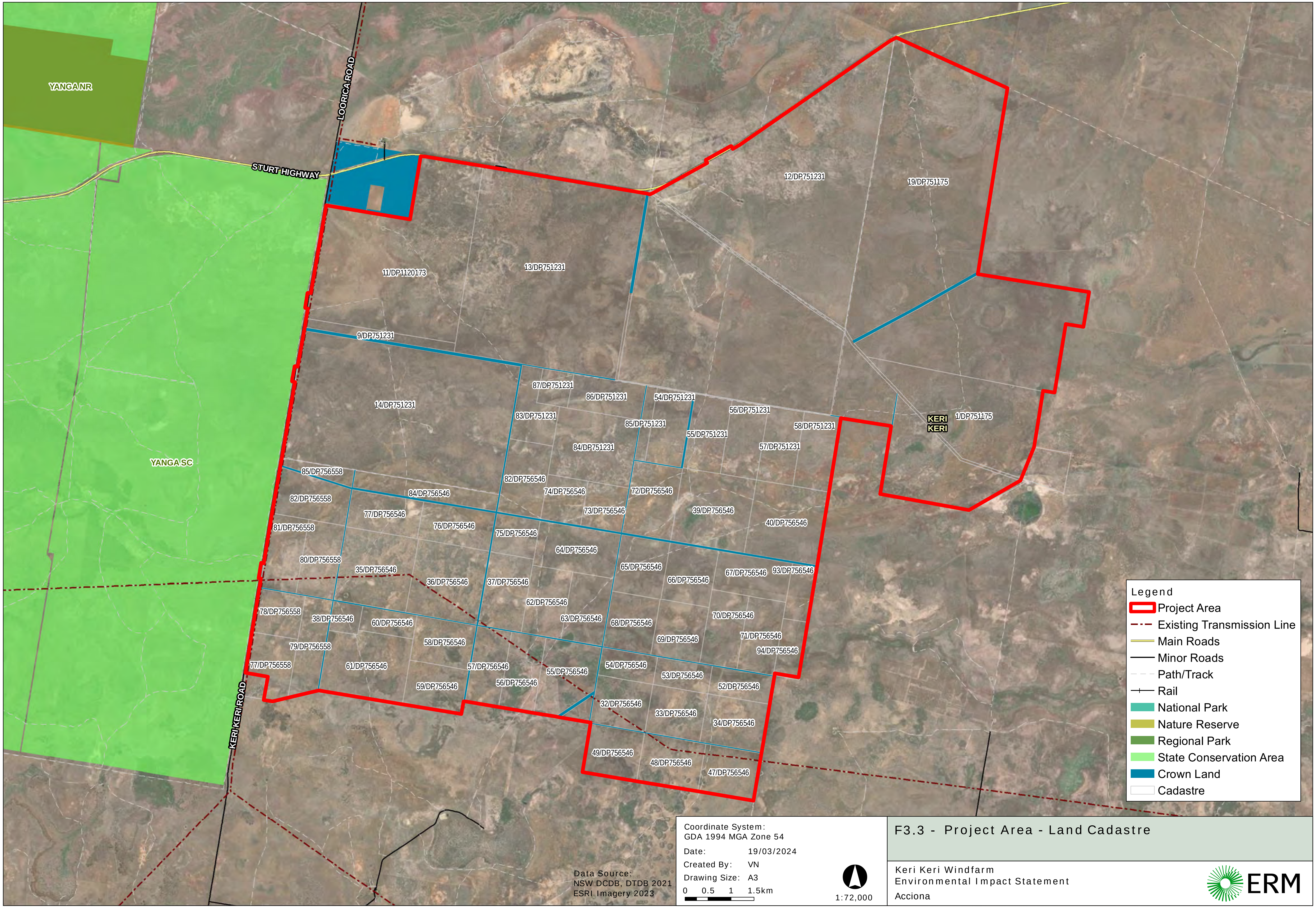
TABLE 3-2 PROJECT AREA LOT AND DP DETAILS

Lot	DP
9, 12, 13, 14, 54, 55, 56, 57, 58, 83, 84, 85, 86, 87	751231
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
77, 78, 79, 80, 81, 82, 85	756558
11	1120173
1, 19	751175

Additional allotments associated with road upgrades outside the Project Area are shown in **Table 3-3** and shown in **Figure 3-4**. These lots are also part of the land to which this application relates.

TABLE 3-3 LAND TITLES OF ROAD UPGRADES

Lot/DP	Lot/DP	Lot/DP	Lot/DP
1/439587	2/792299	2/1097368	332/1176879



Coordinate System:
GDA 1994 MGA Zone 54

Date: 19/03/2024

Created By: VN

Drawing Size: A3

F3.3 - Project Area - Land Cadastre

Keri Keri Windfarm
Environmental Impact Statement
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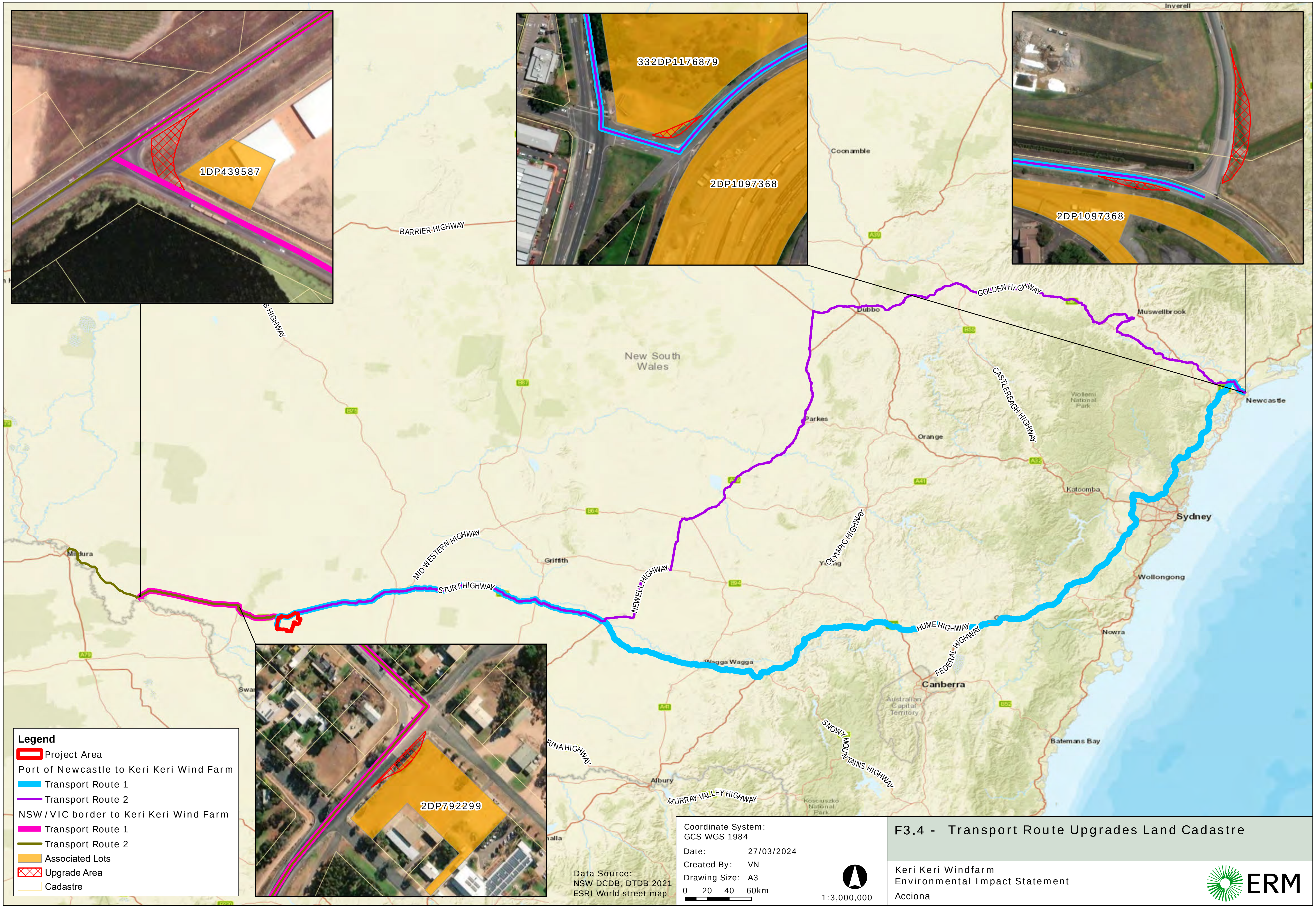

Legend

- Project Area
- Port of Newcastle to Keri Keri Wind Farm
  - Transport Route 1
  - Transport Route 2
- NSW/VIC border to Keri Keri Wind Farm
  - Transport Route 1
  - Transport Route 2
- Associated Lots
- Upgrade Area
- Cadastre

Data Source:
NSW DCDB, DTDB 2021
ESRI World street map

Coordinate System: GCS WGS 1984

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 20 40 60km

1:3,000,000

F3.4 - Transport Route Upgrades Land Cadastre

Keri Keri Windfarm
Environmental Impact Statement
Acciona

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3.2.2 CROWN LAND

Broadly speaking, Crown land refers to any land which is held by the Crown and is not held in freehold by another person. Crown land is regulated by State government legislation, principally the *Crown Land Management Act 2016* (NSW) and the *Roads Act 1993* (NSW) and certain requirements must be met before Crown land can be dealt with by, for example, being leased or sold. While there are no Crown Lands within the Project Area, there are several Crown paper roads (refer **Figure 3-3**).

3.2.3 RESIDENTIAL PROPERTIES

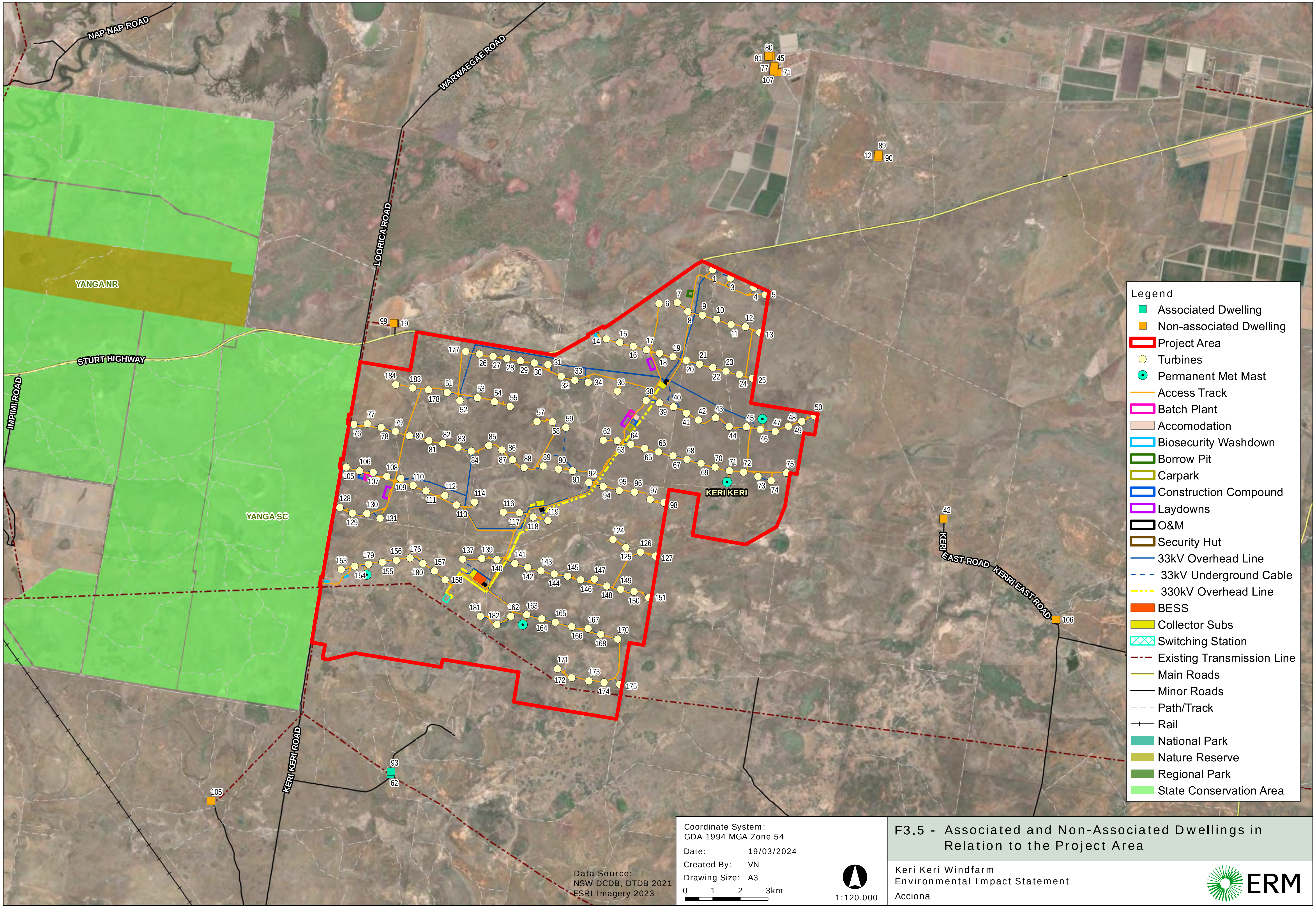
For the purposes of this EIS, dwellings whose owners are hosting Project infrastructure are referred to as 'associated' dwellings, with all other dwellings within the relevant assessment area (generally up to 8.0 km) to a wind turbine generator referred to as 'non-associated' dwellings. Some EIS appendix technical studies refer to these as 'involved' and 'non-involved', respectively.

There are two associated and 13 non-associated dwellings within 8 km of the Project Area.

Figure 3-5 shows the location of associated and non-associated dwellings in relation to the Project Area and **Table 3-4** provides the respective distance to the nearest WTG.

TABLE 3-4 DISTANCE FROM NEAREST WTG TO RESIDENTIAL DWELLINGS

Nearest Dwelling ID	Dwelling Type	Distance to Nearest WTG (m)	Nearest WTG #	Nearest Dwelling Coordinates (GDA94 Zone 56)	
				X	Y
12	Non-associated	6,423	5	783072.3706	6160303.942
19	Non-associated	2,218	184	765553.1947	6154292.271
42	Non-associated	5,924	75	785448.9886	6147201.572
45	Non-associated	8,026	1	779190.4956	6163975.682
62	Associated	6,568	181	765409.4487	6137970.421
70	Non-associated	7,614	1	779341.4263	6163502.456
71	Non-associated	7,525	1	779423.9765	6163383.393
77	Non-associated	7,714	1	779326.3451	6163611.994
80	Non-associated	7,987	1	779120.7634	6163954.101
81	Non-associated	8,002	1	779099.3321	6163974.738
89	Non-associated	6,519	5	783100.9734	6160404.739
90	Non-associated	6,490	5	783111.6891	6160359.098
93	Associated	6,493	181	765421.3607	6138049.36
99	Non-associated	2,227	184	765520.591	6154300.024
107	Non-associated	7,529	1	779288.6812	6163430.098



Coordinate System:
GDA 1994 MGA Zone 54

Date: 19/03/2024

Created By: VN

Drawing Size: A3

0 1 2 3km

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F3.5 - Associated and Non-Associated Dwellings in Relation to the Project Area

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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3.2.4 POTENTIAL DWELLINGS

3.2.4.1 APPROVED DWELLINGS AND DWELLINGS UNDER ASSESSMENT

Based on a review of publicly available development application records (within 5 km radius of a proposed turbine) on the Hay Council and Murray River Council websites as of 20 February 2024:

- No dwellings approved in the past five years;
- One development application for 1543 Tchelery Road, Moulamein is currently 'determined' (PAN-266654) and one under 'review of determination' (PAN-281738);
- It is noted that 1543 Tchelery Road, Moulamein is a host landowner for the proposed Baldon Wind Farm directly east of the Project Area.

The noise and visual impacts with respect to the majority of land constituting Lot 29 and 73 at 1543 Tchelery Road, Moulamein has been assessed as achieving the operational noise criteria and having a low visual impact rating without any mitigation measures. Refer to **Section 6.4** and **Section 6.6** respectively for details.

3.2.4.2 DWELLING ENTITLEMENTS

The Wind Energy Guideline for State Significant Wind Energy Development (DPE, 2016) states that DPE and the consent authority will consider existing dwelling entitlements on land within the vicinity of a wind energy project in the assessment and determination of that project.

Existing dwelling entitlements are available under the provisions of the Wakool Local Environmental Plan (being relevant the LEP) and the provisions of State Environmental Planning Policy (Exempt and Complying Development Codes) Amendment (Inland Code) 2018. Exercising existing dwelling entitlements requires development consent under the EP&A Act.

The controls for establishing existing dwelling entitlements in the Wakool LEP and the Inland Code are multifaceted and not simply determined by lot size. Additional development standards require the consideration of (among other matters) provisions of previous repealed versions of the LEPs, and lot aggregations. Records of dwelling entitlements are not readily available to the public. Similarly, an assessment of compliance with the requirements and standards of the Inland Housing Code cannot reasonably be undertaken in the absence of detailed information on house designs, site conditions and compliance with standards.

Potential dwelling entitlements were determined by identifying all lots within a 5 km radius of any proposed turbine locations and excluding:

- Crown land or State-owned land;
- Lots with associated dwellings;
- Lots with existing dwellings that have been assessed in this EIS;
- Lots that do not meet the applicable minimum lot size development standard for the erection of dwelling houses under clause 4.2A of the Wakool LEP;
- Lots that do not have direct access to a public road or formed Crown road; and
- Lots with over 66% bushfire prone land within the relevant lot.

Applying the above criteria, eight lots were identified (including Lot 29 and 73 at 1543 Tchelery Road, Moulamein).

All eight lots were assessed as predominantly achieving the operational noise criteria, with only small areas within some allotments slightly above the operational nighttime criteria of 40 dB(A). It should be noted that these landowners are associated with other wind developments so may face complications if seeking subdivision due to their proximity to other projects (e.g. Baldon Wind Farm).

Potential visual impact at these eight lots is more difficult to assess given that the location, orientation, elevation, design and surrounding vegetation of future dwellings is unknown. However, it is reasonable that mitigation methods may be incorporated into the design process for any future development applications for a dwelling on any of these lots to reduce visual impacts to an acceptable level. Impacts to these dwellings are further discussed in Section 6.6.

3.3 PROJECT COMPONENTS AND LAYOUT

3.3.1 WIND TURBINE GENERATORS

The Project will involve the construction and operation of up to 155 WTGs.

The WTG model selected for the Project is the Nordex N163-5.X, which based on current technology represents the 'worst-case' impact assessment for the Project, for example in the modelling of noise and visual impacts on nearby receivers. To achieve visual consistency through the landscape, and minimise noise generation, the WTGs will include:

- Uniformity in the colour, design, height and rotor diameter;
- Use of simple muted colours and non-reflective materials to reduce visibility and avoid drawing the eye (i.e. RAL 7035 light grey); and
- Avoidance of unnecessary lighting, signage and logos.

The WTGs will not require obstacle lighting to maintain an acceptable level of aviation safety (Aviation Projects, 2024; **Appendix L**).

Table 3-5 details specifications of the WTG model. **Table 3-6** provides the central coordinates and maximum elevation of the WTGs. **Figure 3-6** illustrates typical components of a WTG.

TABLE 3-5 WTG MODEL SPECIFICATIONS

Feature	Specification
Make / Model / Power	Nordex / N163-5.X / 5.7 MW
Power Regulation	Pitch regulated with variable speed
Operating data Rated power Cut-in wind speed Cut-out wind speed Wind class Standard operating temperature range	 5,700 MW 3 metres per second (m/s) 26 m/s IEC 2A -20°C to 43°C
Sound power Maximum	 109.2 dB(A)
Rotor Rotor diameter Swept area Brake system	 183 m^2 26,302.2 m^2 Aerodynamic brake (pitch) and holding disc brake

Feature	Specification
Tip height	Up to 291.5 m
Blade Length (incl. nacelle)	Up to 91.5 m
Hub height	Up to 200 m
Maximun clearance (space between ground and lowest point of blade)	100 m
Electrical Frequency Converter	50 hertz (Hz)
Gearbox Type	3-stage

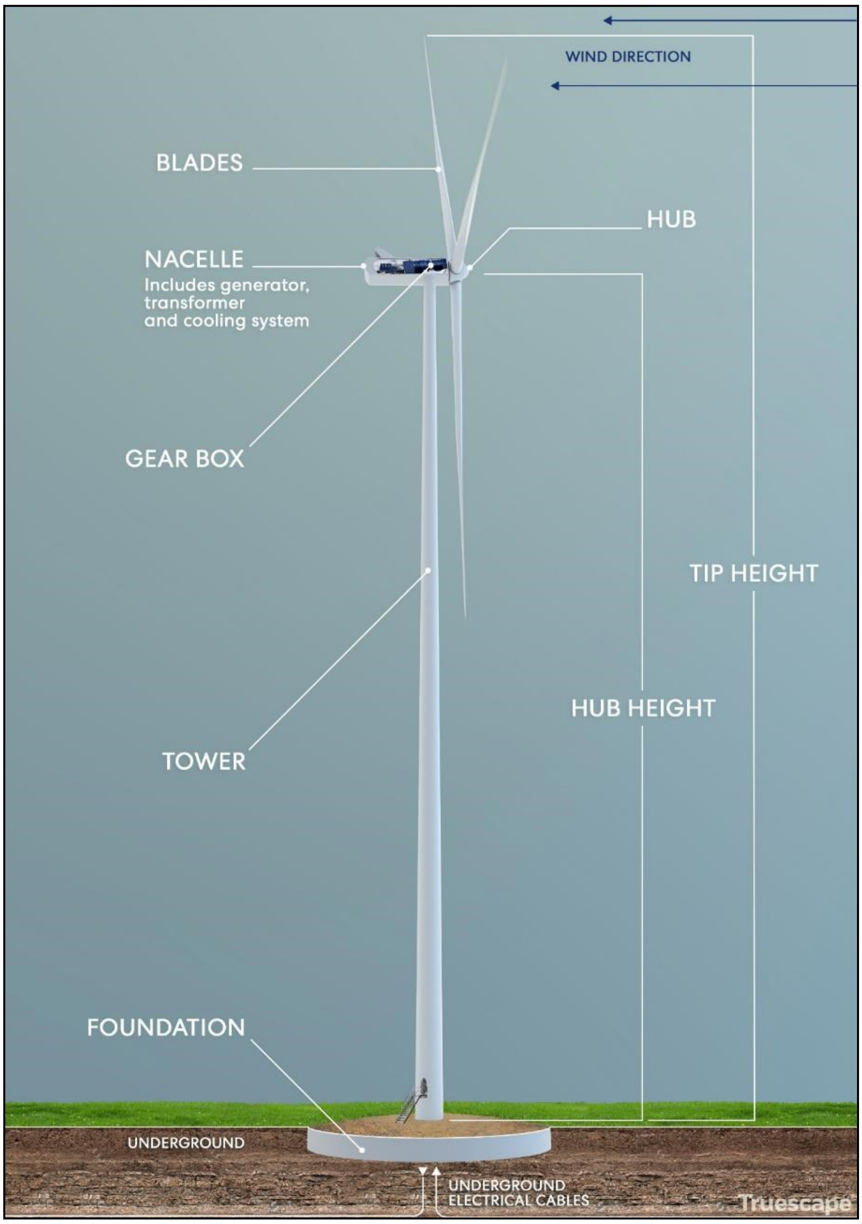
TABLE 3-6 WIND TURBINE GENERATOR COORDINATES

WTG No.	Coordinates (GDA94 Zone 56)		WTG No.	Coordinates (GDA94 Zone 56)	
	X	Y		X	Y
1	777090.69	6156229.09	85	768965.65	6149862.15
3	777736.50	6155932.93	86	769450.47	6149705.34
4	778570.84	6155585.12	87	769829.64	6149353.55
5	779003.46	6155333.99	88	770249.00	6149066.43
6	775144.51	6155005.12	89	770942.54	6149126.29
7	775798.55	6155035.37	90	771503.68	6149010.78
8	776189.57	6154725.10	91	772005.53	6148952.23
9	776712.10	6154585.09	92	772591.03	6148526.13
10	777234.63	6154445.07	94	773115.58	6148383.97
11	777750.44	6154255.11	95	773692.79	6148228.55
12	778279.70	6154165.05	96	774259.94	6148176.70
13	778782.94	6153963.05	97	774825.22	6147916.26
14	773233.04	6153725.51	98	775323.24	6147790.09
15	773718.79	6153595.50	105	763796.04	6149087.01
16	774200.33	6153466.46	106	764288.55	6148955.04
17	774681.08	6153337.51	107	764786.06	6148896.08
18	775162.32	6153208.66	108	765270.63	6148750.03
19	775643.69	6153079.67	109	765779.09	6148680.48
20	776136.62	6152947.57	110	766227.95	6148412.11
21	776615.69	6152819.14	111	766691.96	6148224.75
22	777094.42	6152690.86	112	767380.23	6148061.27
23	777573.32	6152562.57	113	767804.49	6147715.93

WTG No.	Coordinates (GDA94 Zone 56)		WTG No.	Coordinates (GDA94 Zone 56)	
	X	Y		X	Y
24	778052.00	6152434.28	114	768449.76	6147813.94
25	778525.00	6152307.40	116	769498.44	6147446.21
26	768627.06	6153184.03	117	770085.98	6147427.73
27	769125.21	6153100.91	118	770572.57	6147271.06
28	769620.92	6153019.67	119	771112.47	6147139.83
29	770116.55	6152933.75	124	773469.70	6146462.03
30	770613.81	6152854.11	125	773943.95	6146176.13
31	771113.27	6152807.63	126	774470.48	6146002.79
32	771605.24	6152369.90	127	775013.49	6145866.03
33	772085.81	6152239.89	128	763566.66	6147625.59
34	772582.65	6152157.40	129	764020.51	6147415.89
36	773637.55	6151825.22	130	764551.64	6147404.40
38	774670.36	6151505.59	131	765025.71	6147234.80
39	775162.41	6151416.76	137	768023.18	6145750.39
40	775663.02	6151272.63	139	768713.56	6145768.86
41	776130.49	6151040.29	140	769260.94	6145745.31
42	776567.83	6150790.08	141	769914.09	6145594.08
43	777195.07	6150872.10	142	770385.17	6145455.20
44	777679.46	6150547.44	143	770859.59	6145328.40
45	778308.50	6150547.85	144	771343.22	6145208.02
46	778816.04	6150441.52	145	771825.90	6145132.22
47	779357.98	6150374.49	146	772304.22	6144995.55
48	779836.35	6150559.78	147	772803.51	6145030.61
49	780314.72	6150745.06	148	773245.63	6144780.43
50	780791.75	6150930.17	149	773745.28	6144650.06
178	766782.62	6151888.35	150	774239.71	6144574.16
52	767920.45	6151501.63	151	774766.07	6144358.87
53	768557.36	6151598.97	153	763623.59	6145371.78
54	769171.94	6151448.09	154	764108.74	6145492.76
55	769739.93	6151276.32	179	764607.14	6145564.92
57	770721.65	6150741.25	155	765109.31	6145642.74
58	771274.64	6150727.51	157	767002.65	6145323.98
59	771763.46	6150515.69	162	769766.85	6143682.63

WTG No.	Coordinates (GDA94 Zone 56)		WTG No.	Coordinates (GDA94 Zone 56)	
	X	Y		X	Y
62	773117.68	6150059.33	163	770346.37	6143737.37
63	773629.46	6150043.29	164	770889.87	6143590.56
64	774110.65	6149906.79	165	771384.10	6143460.55
65	774621.53	6149769.90	166	771973.90	6143306.30
66	775132.41	6149633.01	167	772572.58	6143227.00
67	775643.29	6149496.12	168	773030.72	6143026.74
68	776154.17	6149359.23	170	773648.30	6142859.16
69	776665.05	6149222.34	171	771461.54	6141780.12
70	777175.93	6149085.45	172	771975.56	6141452.57
71	777686.81	6148948.56	173	772596.62	6141342.66
72	778213.53	6148898.83	174	773151.33	6141292.28
73	778725.18	6148748.07	175	773713.71	6141220.21
74	779208.00	6148586.56	176	766110.44	6145792.56
75	779767.48	6148877.92	177	768130.42	6153267.93
76	764067.98	6150632.17	156	765613.25	6145714.93
77	764572.31	6150663.85	180	766584.55	6145603.77
78	765069.80	6150527.89	158	767387.11	6145004.32
79	765584.99	6150373.76	182	769253.37	6143378.98
80	766089.59	6150220.49	181	768663.11	6143675.61
81	766796.59	6150052.98	51	767465.63	6151792.25
82	767309.09	6149937.47	183	766212.43	6151946.50
83	767849.03	6149792.80	184	765598.13	6152074.00
84	768327.29	6149663.44			

FIGURE 3-6 TYPICAL COMPONENTS OF A WTG (INDICATIVE, NOT TO SCALE)



FOUNDATIONS

The exact size and type of tower foundation will be based on subsurface soil conditions and the results of geotechnical surveys undertaken during the detailed design phase, prior to commencement of construction.

The three common types of foundations used for WTGs are gravity foundations, rock anchors and pile foundations or a combination of these depending on geotechnical conditions. The most common type of foundation is the gravity foundation in which an area is excavated suitable to support the burying of a 'pedestal' design of concrete and reinforced steel sufficient to create a stable foundation. These are typically 3-5 m deep and 20 to 30 m in diameter depending on the tower design. The volume can be between 600-900 m^3 depending on the turbine, geotechnical conditions and other environmental factors.

WTG foundations are excavated using mechanical equipment, assisted by controlled blasting if required due to ground conditions. Topsoil and spoil from excavations will be stockpiled for reuse to backfill over the foundation and for vegetation rehabilitation of the Project Area. Excess materials will be utilised at other parts of the Project Area or exported offsite for beneficial reuse at an approved location or disposed at a licensed landfill facility.

Figure 3-7 shows a typical gravity foundation. The gravity foundation is then backfilled so that only the connection to the base tower section is visible above ground as shown in **Figure 3-8**.

FIGURE 3-7 TYPICAL FOUNDATION BEING CONSTRUCTED

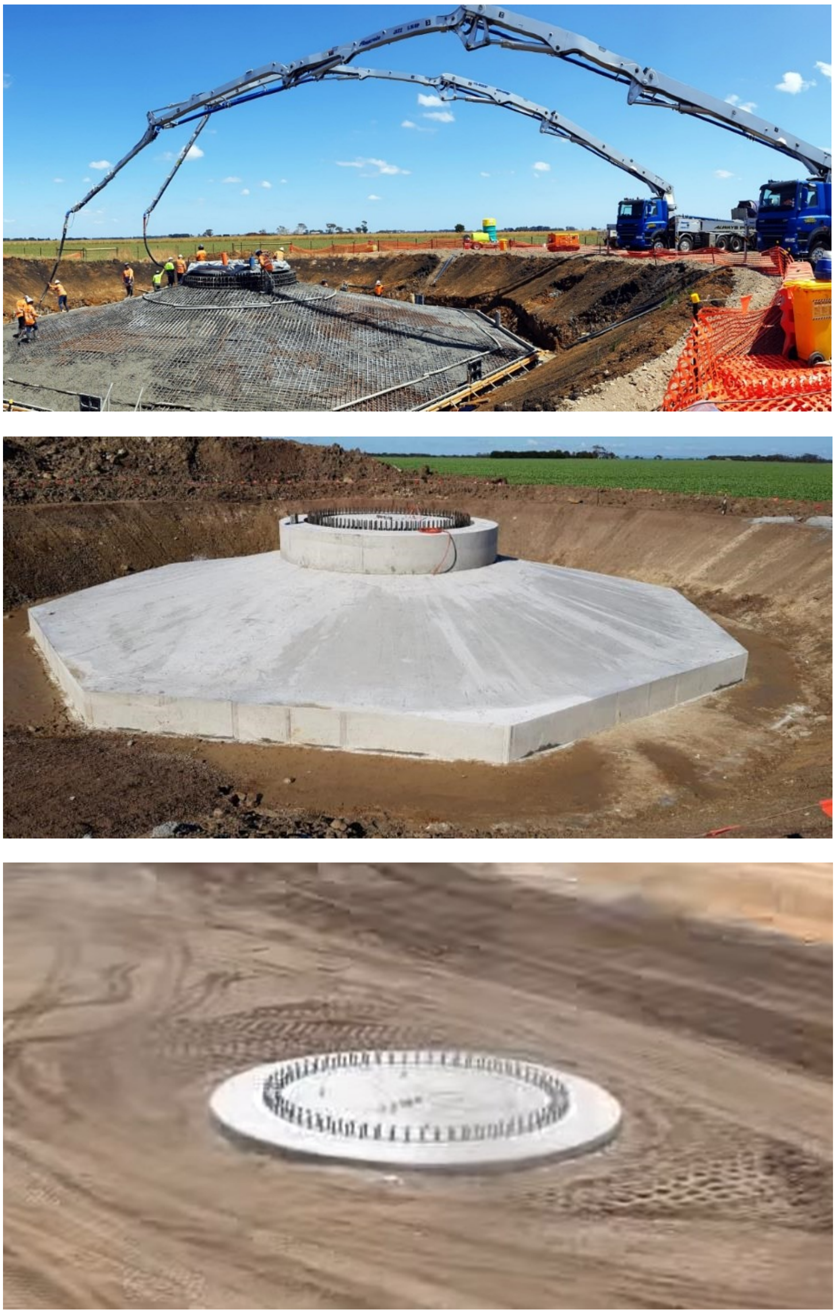


FIGURE 3-8 TYPICAL FOUNDATION POST-CONSTRUCTION

HARDSTANDS

A hardstand will be constructed adjacent to the base of each WTG to enable the assembly and erection of the tower, nacelle and blade components. Each hardstand will consist of gravel, which will be compacted and graded suitably to form a roughly rectangular area. The hardstand will include arrangements for crane boom assembly and support pad to store blades prior to construction. The hardstand area will be level with the WTG foundation with a bearing capacity of 250 kilopascal (kPa). The towers, nacelles and blades will be lifted off delivery trucks using mobile cranes. Larger cranes will then assist in the installation of the tower sections, nacelle and blades.

The total area of each WTG hardstand during construction will be approximately 2.83 ha, subject to the topography of the surrounding land. After rehabilitation following the construction process, the hardstand area will reduce to approximately 0.67 ha.

Figure 3-9 illustrates a typical hardstand area.

A portion of the hardstand will be maintained during Project operations to allow for maintenance and future decommissioning of the WTGs. There may be an opportunity to revegetate the assembly portions of the hardstand to allow grazing activities to resume in these areas if not required for wind farm operations.

FIGURE 3-9 TYPICAL HARDSTAND AREA

3.3.2 ELECTRICAL RETICULATION

3.3.2.1 HIGH VOLTAGE TRANSMISSION LINE

A 330 kV single or double circuit, three phase, twin conductor bundle overhead transmission line connection with a total length of approximately 20.0 km will connect the Project to a new switchyard in the south of the Project Area and subsequently to Project EnergyConnect.

The proposed design of the overhead 330 kV transmission line is as follows:

- Up to 70 m high, single circuit lattice steel tower, spaced approximately 500 m apart, subject to terrain and final design;
- Towers generally require concrete footings for each of the four legs and a temporary disturbance area of approximately 30 m in diameter during construction;
- Twin aluminium conductor bundles attached to ceramic insulators in the centre and the ends of the tower cross arm;
- Each conductor bundle will include orange balls for visual identification and an earth shield wire/s, protecting the line from lighting strikes; and
- A 60 m wide easement with unformed access tracks up to 3 m wide (equivalent to a farm track) to facilitate operational access by Transgrid (for maintenance, repair and hazard reduction).

Figure 3-10 provides an example of the typical steel lattice tower structure proposed for the transmission line.

It may also be possible to utilise a monopole design in place of a steel lattice tower. Monopoles would be up to 50 m high and spaced approximately 200-250 m apart, subject to terrain. The monopoles would utilise a concrete footing.

Access to the transmission line for construction will be via existing property accesses and farm tracks.

For the safe operation of the transmission line, certain activities will be restricted within the easement area such as planting and growing trees, construction of buildings, or erection of antennae or masts. The transmission line will not affect the ongoing use of the land for agricultural purposes such as grazing.

FIGURE 3-10 TYPICAL STEEL LATTICE TOWER STRUCTURE

MEDIUM VOLTAGE RETICULATION

The internal electrical reticulation network, which connects the WTGs to the substations, will comprise approximately 175.3 km of underground and 64.5 km of overhead 33 kV cables. WTGs are connected in strings (typically between three to six WTGs per string), which are then connected to the onsite substations. Where possible the cabling will be in underground trenches, which run parallel to the access track. Where deviation from the access track is required due to geotechnical or other constraints, or to reduce overall cable length, these deviations will be positioned to minimise impact to ecological and heritage areas of high significance.

The trenching for underground electrical cabling will be approximately 0.6 m wide per circuit by 1 m deep, located within a works area of approximately 5 m to accommodate the mobile plant and stockpiling of spoil and bedding sand. Trenches will be progressively backfilled during the construction works.

Prior to excavating the cable trench, the topsoil is stripped and windrowed separately from excavated subsoils to preserve soil structure and the seedbank. The electrical reticulation is placed on bedding sands at approximately 750 mm below ground level (bgl). Once the cables are installed, another layer of sand may be placed above the cable prior to the trench being backfilled with excavated material with the excavated topsoil replaced providing a soil profile that assists revegetation of the disturbed areas. Cables will be protected in accordance with Australian Standard (AS) 3000:2007 Electrical Installations.

Where ground conditions are not suitable for open cut trench installation, overhead single circuit electricity lines will be installed using concrete poles. The aboveground conductors may have orange balls for visual identification.

SUBSTATIONS

Three 330 kV substations will be constructed in the Project Area to transform the 33 kV received from the internal electrical reticulation network to the 330 kV transmission voltage.

Each substation would occupy a site with a maximum expected area of 6 ha (200 m x 300 m) and will contain transformers, associated high voltage switchgear and control and protection equipment as well as a communication tower, and drainage and oil containment system. A security fence will surround the substations. Maintenance lighting will be installed at the onsite substations for night work including emergency operations. Gravel hardstand will be placed under and around the substation compounds to restrict vegetation growth and provide a safe working environment in accordance with the relevant Australian Standards.

Internal structures within the fenced substation compounds will include:

- Control building/control room, switch room approximately 5 m high;
- 33/330 kV power transformers approximately 10 m high;
- Lightning protection masts approximately 25 m high;
- Associated high voltage switchgear including busbars, circuit breakers, disconnectors – approximately 10 m high; and
- Communications tower up to 80 m high.

A 35 m bushfire asset protection zone (APZ) will surround each substation. **Figure 3-11** provides an example of a wind farm substation.

FIGURE 3-11 TYPICAL SUBSTATION

SWITCHYARD

A switchyard with approximate dimensions of 200 m by 300 m for physical electrical components including required earth works will be located within a site with a maximum expected area of 6 ha. The switchyard will connect the Project transmission line to the planned NSW-SA interconnector, Project EnergyConnect, which is currently under construction. **Figure 3-2** shows the wind farm layout plan including the location of the switchyard. A 35 m APZ will surround the switchyard. **Figure 3-12** shows an image of a typical wind farm switchyard.

FIGURE 3-12 TYPICAL SWITCHYARD

BATTERY ENERGY STORAGE SYSTEM (BESS)

A BESS will be located adjacent to the south substation, occupying an area of approximately 12 ha (400 m by 300 m). The BESS would utilise lithium-ion technology with a rated capacity of up to 200 MW/800MWh (4 hours), subject to detailed economic and technical considerations. The BESS will likely utilise a pre-assembled and pre-tested, fully integrated system that includes the battery modules, inverters, thermal management system, circuit breakers and other controls.

A Heating, Ventilation, and Air Conditioning (HVAC) system will actively cool the BESS. The BESS will be temperature monitored, and the automated control system will stop its operation if the temperature exceeds pre-set levels to prevent overheating (e.g., if all air conditioning units fail). The BESS will include a gravel surface and a 35 m APZ to minimise the risk of fire escaping from the facility and the risk of external fire affecting the facility.

The model and design specification of the BESS will be determined during detailed design. However, the final model and design specifications will remain within the specifications assessed under the State Environmental Planning Policy (SEPP) Resilience and Hazards in the Preliminary Hazard Analysis (PHA) (Arriscar, 2024).

Figure 3-13 provides an illustration of a typical BESS model and layout.

FIGURE 3-13 TYPICAL BESS 200 MW/800 MWH

3.3.3 PERMANENT OPERATIONS AND MAINTENANCE FACILITIES

Three permanent site O&M facilities, each occupying an area of up to 1 ha (100 m x 100 m), will be constructed to provide for all operations and maintenance activities associated with the Project. **Figure 3-2** shows that the O&M facilities will be located in the:

- South of the Project Area, adjacent to the BESS;
- Centre of the Project Area adjacent to the central collector substation; and
- North of the Project Area adjacent to the northern collector substation.

Figure 3-14 provides an example of a typical O&M facility.

The buildings of the O&M facility will contain the control room, switch room, and storage shed with workshops. The control room will contain an office, communications equipment, and staff amenities (toilet, kitchen, first aid, potable water supply, etc.).

The compound will include a static water supply for firefighting/bushfire management (may be part of above water supply) as well as a septic system. Guttering and a water tank will collect rainwater. The control room, switch room and storage shed will each contain essential fire safety equipment, including fire extinguishers and hose reels.

Adequate rubbish waste/facilities providing appropriate waste stream separation using onsite skip bins emptied weekly or as required. Waste will not be retained permanently onsite.

Car parking facilities for employee and service vehicles will be located adjacent to the facilities. The parking and vehicle manoeuvring areas will be sealed with crushed road base or asphalt.

During the long-term operational phase, the O&M facilities collectively will cater for up to 12 permanent staff. Whilst most activity is anticipated to occur during business hours Monday to Friday, access to the Project Area will be required on a 24-hour basis, seven days a week.

The O&M facilities will be constructed of low-combustibility or non-combustible materials in accordance with the National Construction Code (ABCB, 2022). The O&M facilities will be an insulated, free standing construction with steel frame affixed to a concrete base. The building will utilise Colorbond® cladding in a colour shade designed to match the surrounding landscape.

Maintenance lighting will be installed at the O&M facilities for night work including emergency operations. All maintenance lighting will be designed to reduce disturbance to neighbouring properties and will be used only when there are staff onsite or during emergencies. Continuously operating security lighting would be installed on posts up to 3.5 m high adjacent to security fencing and O&M facility.

Additionally, there will be a double skinned/bunded container set on a concrete base for the storage of oils, greases and other liquid substances with a safety shower on the outside of the building.

FIGURE 3-14 EXAMPLE O&M FACILITY

3.3.4 SITE ACCESS POINTS

The Project Area will be accessed at four locations; three along Keri Keri Road along the western boundary and one along Sturt Highway along the northern boundary (refer to **Figure 1-2**).

Each site access point construct and operate a biosecurity wash bay nearby to sanitise plant, equipment and vehicles entering and exiting the Project Area to reduce the risk of spreading harmful pathogens and contaminants during construction and operation. Each wash bay will be approximately 0.8 ha (70 m x 110 m).

Each site access point will construct and operate a security hut nearby for surveillance of the Project Area boundaries at these points. Each security hut will be approximately 400 m^2 (20 m x 20 m).

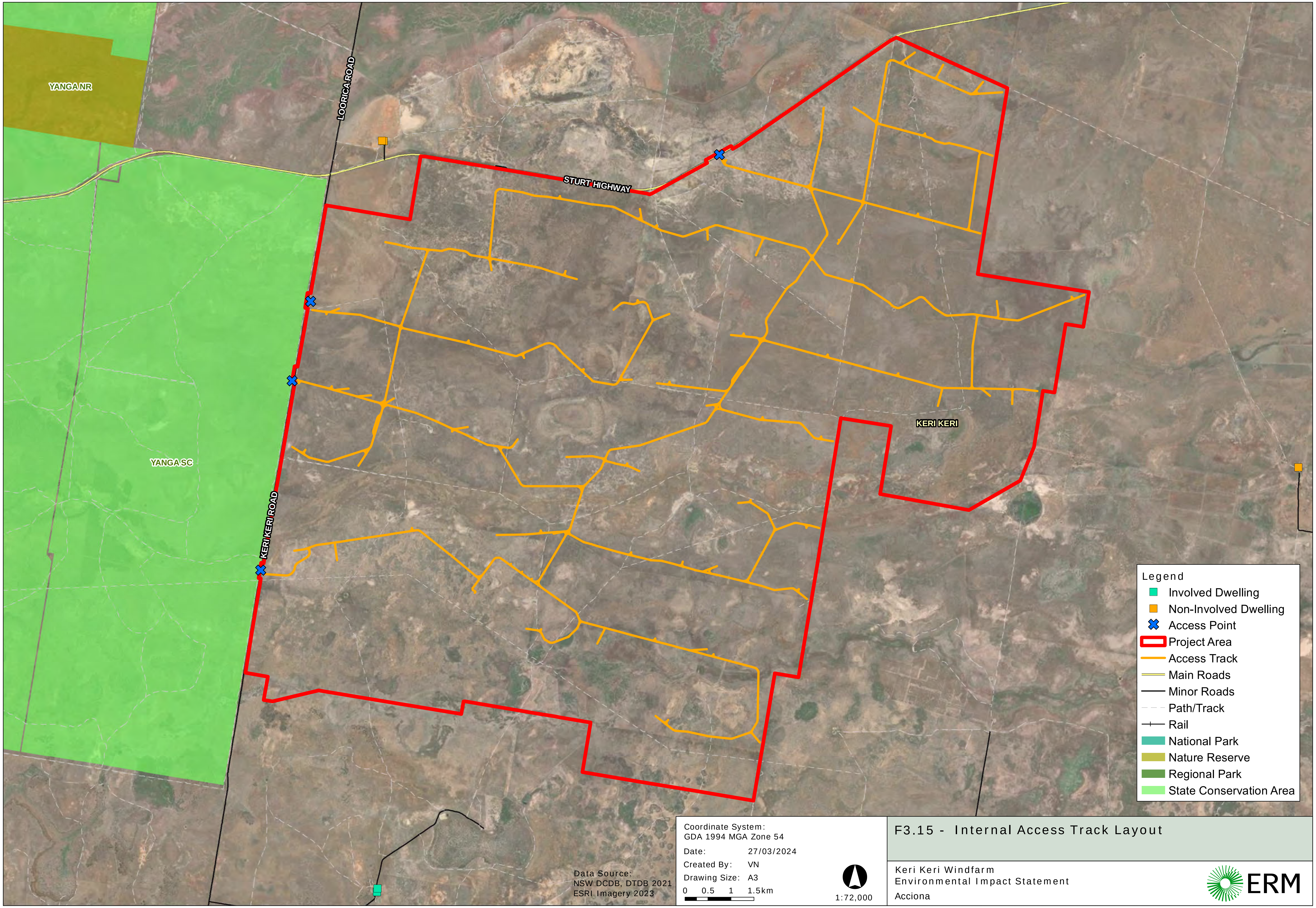
3.3.5 INTERNAL ACCESS TRACKS

The construction and maintenance of the Project will require construction of up to approximately 148.3 km of new private access tracks within the Project Area. These tracks will connect to existing roads. The tracks will provide ongoing access to the WTGs and other Project infrastructure including the transmission line. Where practicable, the internal access track network will be aligned along the route of existing farm tracks to reduce impacts to biodiversity and to provide upgraded access for ongoing agricultural activities.

The internal access tracks are proposed to be accessed off Keri Keri Road and Sturt Highway, as further discussed in **Section 3.4.4**.

The internal access tracks will typically be 5.5 m trafficable width on straights, with localised widening on curves and where required to support transportation of the over-dimensional WTG component vehicles. The internal access tracks will be constructed using unsealed pavements and will be generally in accordance with the Australian Road Research Board Unsealed Roads Manual.

Figure 3-15 shows the proposed internal access track network, in addition to the access points to the Project Area.



Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 0.5 1 1.5km

1:72,000

F3.15 - Internal Access Track Layout

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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3.3.6 METEOROLOGICAL MONITORING MASTS

The Project includes the commissioning and decommissioning of four temporary met masts for power testing, and installation of up to four permanent met masts (refer to **Figure 3-1** for locations). Each met mast will be located close to a WTG location and will have a maximum height of approximately 159 m above ground level (AGL). The permanent met masts assist in verifying the performance of the WTGs during operation of the Project.

The met masts consist of a buried concrete base foundation and guy wires which are attached to buried anchor points. These will be marked using three-dimensional coloured objects attached to the wire or cables (for example spheres or pyramids) if necessary. The Project also includes the decommissioning and removal of four existing met masts used during project development to measure the wind resource within the Project Area. **Figure 3-16** depicts a typical met mast.

FIGURE 3-16 INDICATIVE MET MAST

3.3.7 TEMPORARY FACILITIES

Construction of the Project will require a range of temporary buildings and facilities for construction personnel and equipment. These will include a construction compound (including site offices, car parking, and amenities for the construction workforce), mobile concrete batching plants, laydown and storage areas for the temporary storage of construction materials, plant, equipment and WTG components, workers accommodation, and temporary power supply for construction. **Figure 3-1** provides the locations of the temporary facilities.

Chain link fencing up to 2 m high and CCTV may be used around the temporary construction compounds, concrete batching plants, and materials storage and laydown areas, as required.

All temporary facilities will be removed and will be revegetated / remediated following commissioning, or as agreed with by the landowner.

3.3.7.1 CONSTRUCTION COMPOUNDS

Two construction compounds are proposed where each will be approximately 1 ha (100 m x 100 m) and located in the northern and southern regions of the Project Area. The compounds will comprise of site buildings, offices, amenities and car parking.

3.3.7.2 LAYDOWN AREAS

Three laydown areas are proposed where each will be approximately 3 ha (200 m x 150 m) and located in the northern, central and southern regions of the Project Area. The laydown areas will store materials, plant and equipment during construction.

3.3.7.3 CONCRETE BATCHING PLANTS

The foundations for each WTG will be constructed with steel reinforced concrete. Concrete and aggregate will also be used as required for electrical infrastructure, internal access tracks, O&M facilities, substations and the switchyard. Up to two temporary mobile concrete batching plants and rock-crushing facilities will be established within the Project Area. While the exact details of the facilities will be determined closer to construction, the area required for the plant and storage of materials will be approximately 150 m by 100 m.

The temporary mobile concrete batching plants will be designed to produce sufficient concrete quantity for one foundation per working day, and will comprise:

- Cement silos;
- Stockpile areas for the storage of the aggregates, sand and other raw materials;
- Water tanks;
- Wastewater settling pit (to recycle water and prevent cement wash out overflowing onto unsealed ground and entering waterways);
- Parking for truck mixers and pumps;
- Fuel bunker and bunded area for concrete additives; and
- Rock crushing facility.

It is anticipated the cement will be stored in a silo adjacent to the batching process machinery. Concrete agitator trucks will transfer the concrete from the batch plant to the WTG foundation locations. Water to be used for concrete and general Project construction is discussed in **Section 3.4.6**.

Given the demand for concrete and rock for access road and hardstand construction crushing operations will exceed the license threshold of 150 tonnes per day or 30,000 tonnes per year. Therefore, an Environmental Protection Licence (EPL) from the Environment Protection Authority (EPA) (under the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act), will be required. The daily onsite rock crushing capacity will be quantified following pre-construction geotechnical assessments to determine the availability of suitable onsite material.

3.3.7.4 BORROW PIT

One borrow pit is proposed on-site approximately 4 ha (200 m x 200 m) and located in the north-east region of the Project Area. Use of materials sourced from the on-site borrow pit will be primarily for structural fill, bulk earthworks, pavement materials, and potentially concrete aggregates. This will require confirmation through geotechnical testing prior to works commencing.

3.3.7.5 WORKERS ACCOMMODATION CAMP

One workers accommodation camp is proposed on-site approximately 4 ha (200 m x 200 m) and located in the western region of the Project Area. The camp will accommodate up to 650 FTE (full time equivalent) workers to facilitate 100% of the peak construction workforce. A carpark will be adjacent to the camp and approximately 1 ha (100 m x 100 m).

Each compound will include accommodation and amenity facilities, car parking, food and catering facilities, recreational facilities, first aid facilities and telecommunication services for personal use. Accommodation facilities will consist of prefabricated demountable units, that will be delivered and installed on site.

A temporary construction compound (1.6 ha) will also be installed and include storage areas, material stockpile, and temporary power supply during Project construction.

3.3.8 MICROSITING

The layout presented in this EIS may require refinement based on detailed geotechnical investigations and selection of the final WTG model. As such, the Applicant requires the ability to micro-site Project infrastructure. This will allow the design to be adjusted to, for example, avoid unnecessary excavation, vegetation clearing, or to benefit constructability, plant and equipment access. To allow the Applicant to make general design refinements without the need to modify the application, the EIS has assessed impacts for an area that includes temporary and permanent Project infrastructure with, generally, a 100 m micro-siting buffer applied. This means that micro-siting assumes a worst-case assessment of impacts with the intention to refine final layouts to minimise impacts prior to construction.

3.4 PROJECT CONSTRUCTION

3.4.1 DURATION AND STAGING

Construction activities will be progressive across the Project Area over a period of approximately 24 months, with peak construction activities to occur over approximately 12 months.

Construction of the substations, 330 kV transmission line connection and switchyard will be undertaken in parallel with the installation of the WTGs and construction of the O&M facility. Construction of the wind farm may be staged subject to factors including but not limited to the availability of contractors, equipment, workers and housing, equipment transport constraints, equipment and contractor pricing, energy market pricing and availability of energy offtake, project funding requirements, the final project as approved, and relevant development consent conditions. Some of these factors can only be determined after development consent and with further investigations required to inform the project design, procurement and commercialisation. If construction and / or operation is to be undertaken in stages, notification of such will be provided to DPHI.

3.4.2 CONSTRUCTION HOURS

Construction of the Project will generally occur in accordance with the hours specified in the DECC (2009) *Interim Noise Construction Noise Guideline*, with hours extended on Saturdays, as outlined below:

- Monday to Friday: 7.00am to 6.00pm;
- Saturday: 8.00am to 6.00pm; and
- No works on Sunday or public holidays.

Some out of hours work may be required, including:

- Logistics and safety requirements imposed by relevant regulatory authorities (e.g., NSW Police);
- Blade and tower transport outside of peak traffic conditions on state and regional roads;
- Emergency work to avoid the loss of lives, property, and/or to prevent environmental harm;
- Works that do not cause noise emissions above 35 dB(A) at any nearby non-involved dwellings not located on the site;
- Weather conditions such as high winds during the day necessitating WTG crane lifts at night;
- Temperature conditions requiring concrete pours during the early morning; and
- Extended concrete pours into the evening to complete a foundation.

If a need to work outside the recommended standard hours is identified, it would be carried out in accordance with the Environmental Management Strategy and associated sub-plans.

3.4.3 CONSTRUCTION WORKFORCE

Up to 650 FTE jobs will be generated during construction. Construction personnel are expected to comprise a mix of local workers and specialist contractors likely sourced from outside the region.

The Project will develop and use an on-site accommodation camp during construction with the capacity to house the full workforce (refer **Section 3.3.7.5**).

3.4.4 TRANSPORT ROUTE AND SITE ACCESS

Figure 3-17 shows the preferred access routes for the blades and the other components, in addition to the Project access route for construction and operation vehicles, as described in the below sections.

The traffic and transport assessment and the transport route assessment are provided in **Appendix J**, with key information provided in **Section 6.5**.

3.4.4.1 LIGHT VEHICLES

At peak construction, it is estimated that up to 650 workers (FTE) will be on-site. All workers will be housed within an on-site accommodation camp. Car parking will be provided adjacent to the accommodation (refer **Section 3.3.7.5**).

3.4.4.2 HEAVY VEHICLES

Heavy vehicles will be required to transport materials and equipment associated with the Project construction. It is anticipated that heavy vehicles will consist of vehicles up to and including 26 m long semi-trailers and B-Doubles (standard vehicles) and ‘truck and dogs’, concrete trucks and water tankers. The use of temporary onsite concrete batching plants will reduce the number of external concrete truck movements to and from the Project Area.

3.4.4.3 OVERSIZE OVERMASS

There will be several OSOM vehicle movements to facilitate transport and delivery of major WTG components and large substation equipment (e.g., battery storage, transformers), O&M facility, and water tanks.

Major WTG components to be transported include:

- Blades;
- Hubs;
- Nacelles;
- Power trains;
- Cooler tops; and
- Tower segments.

The Applicant intends to use either the Port of Newcastle or Port of Adelaide in SA for the import of Project infrastructure. While the Applicant has assessed the suitability of these transport routes from port to Project, this EIS has only considered the transport route that falls within the jurisdiction of NSW legislation.

The transport route assessment has identified two transport route options from the Port of Adelaide via the VIC border to the Project Area:

- Route 1 (blades) – VIC border at Robinvale: via Robinvale-Sea Lake Road, Murray Valley Highway, Sturt Highway, and Keri Keri Road; and
- Route 2 (loads under 40 m overall length) – VIC border at Mildura: via Seventh Street, Sturt Highway, and Keri Keri Road.

From the Port of Newcastle, two transport route options traverse NSW to the Project Area:

- Route 1 (blades and components under 5.25 m loaded height) – Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, M1 Motorway, M2 Motorway, M7 Motorway, M5 Motorway, Hume Highway, Sturt Highway, and Keri Keri Road; and
- Route 2 (components under 5.9 m loaded height and under 55 m overall length) - Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, Golden Highway (via Denman Road, Bengalla Road, Wybong Road and Wargundy Road), Boothemba Road, Troy Bridge Road, Bunglegumbie Road, Mitchell Highway, Manildra Street, Derribong Avenue, Algaiah Street, Tomingley Road, Newell Highway (via Thomas Street, Moulden Street, Henry Parkes Way, Westlime Road, Hartigan Avenue, Compton Road and Showground Road), Sturt Highway, and Keri Keri Road.

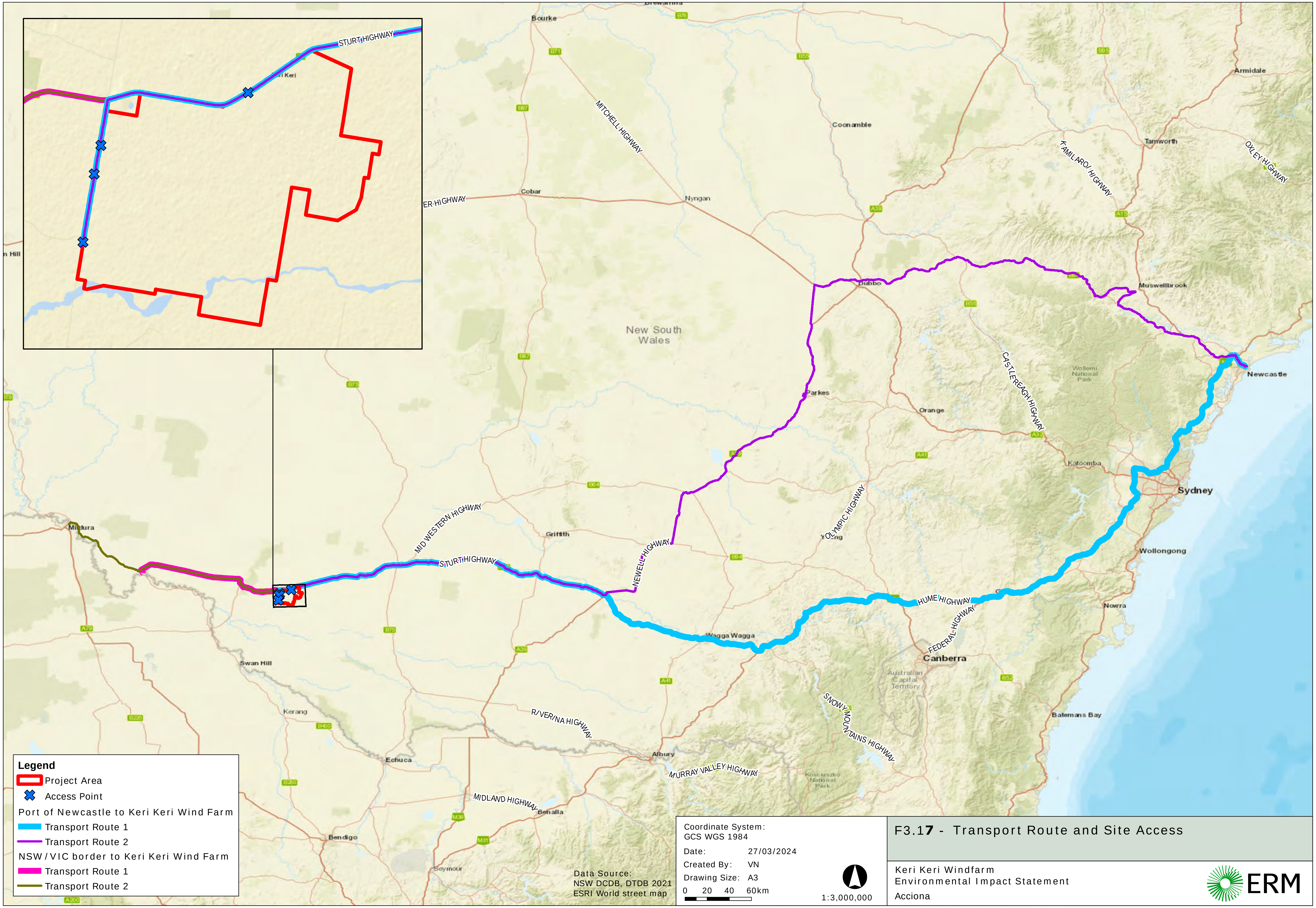
3.4.4.4 RESTRICTED ACCESS VEHICLES

Due to the size of the WTG components and some substation components, Restricted Access Vehicles (RAVs) will be required to transport these to the Project Area. RAV deliveries are OSOM and require permits that specify the designated route for travel, the number of escorts required and the time in which the RAVs can travel through certain road zones.

Whilst RAVs will contribute a small percentage of trips for the Project during construction, they will be the most critical from a vehicle access perspective and will require some upgrades to the existing road network (refer **Section 6.5**).

In addition, cranes will be required during construction to facilitate the erection of the WTGs. It is anticipated that the Project will use several cranes at any one time. These will be transported using RAVs.

The final RAV route will depend on further consultation and approval from the relevant road authorities including Transport for NSW and local councils as well as private property owners along the route where widening and blade swing area may extend beyond the road reserve boundary.



F3.17 - Transport Route and Site Access

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3.4.5 ROAD UPGRADES

The Transport Route Assessment (RJA, 2024; **APPENDIX J**) from the Victorian border to the Project Area, included an assessment of potential road network upgrades required to facilitate delivery of the Project infrastructure to the Project Area. This included a swept path analysis for the transportation of the 91.5 m long blades to identify 'pinch points', and identification of suitable areas where vehicles could pull over for fatigue breaks or emergency parking. Several road upgrades were identified as necessary to facilitate the proposed OSOM movements, including, but not limited to, the site entrances along Sturt Highway and Keri Keri Road, and at the intersection of Sturt Highway and Keri Keri Road.

The upgrades are required to ensure sufficient space for oversized vehicle passage, and may include intersection widening, trimming and removal of vegetation, removable signs and infrastructure, and the relocation of overhead wires.

Section 6.5 and **Appendix J** further describes road upgrades.

3.4.6 RESOURCE REQUIREMENTS

Construction materials including gravel, aggregate and sand will be required for the concrete batch plant and construction of hardstands to support Project infrastructure, including internal access tracks and installation of electrical cabling. It is proposed to utilise an on-site borrow pit for these resources.

As a worst case scenario, gravel, aggregate and sand can be sourced externally from existing operating quarries. Existing operating quarries in the Project locality (less than 200 km from site entries) and their material resources are shown in **Table 3-7**.

TABLE 3-7 EXISTING OPERATING QUARRIES IN PROJECT LOCALITY

Facility	Location	Aggregate	Sand	Concrete	Road base
Mallee Quarries Pty Ltd	3367 Murray Valley Highway, Tol Tol VIC	✓			✓
Boral Quarries Irymple (Dareton)	549 Sandilong Avenue Irymple VIC	tbc	tbc	tbc	tbc

If needed from external sources, construction materials will be transported by trucks and stockpiled within the laydown areas and at the concrete batch plants. Construction equipment such as excavators, bulldozers, trenching machines and trucks will be sourced locally from the Riverina Murray region, subject to availability and cost. Steel used for concrete foundations will be sourced from within NSW, subject to availability and cost.

Approximately 160.5 megalitres (ML) of water would be required during the construction phase, primarily for concrete (approximately 14 ML), road works and earthworks (approximately 100 ML), and dust suppression (approximately 40 ML). Water for road works and dust suppression can be of lower quality than is required for concrete production.

Water will likely be sourced from landholder dams/bores within the Project Area.

The Soils and Water Assessment (refer **Section 6.8**) provides a further discussion of water access licenses and other requirements.

Potable water will also be required for staff amenities during operation and will be collected in rainwater tanks installed at the O&M facility.

3.4.7 POST CONSTRUCTION SITE REHABILITATION

When construction is completed, all temporary plant and equipment will be removed, and disturbed areas will be re-covered with topsoil for natural recover. Adequate sediment, soil and erosion controls will be put in place during ground disturbing works and rehabilitation activities in accordance with the *Managing Urban Stormwater: Soils and Construction - Volume 1* (The 'Blue Book') (Landcom, 2004).

Post-construction rehabilitation requirements and processes will be detailed in the Environmental Management Strategy (Rehabilitation Management Plan) to be prepared prior to commencement of construction of the Project and undertaken in accordance with relevant conditions of the development consent for the Project.

3.5 PROJECT OPERATION

Upon commissioning, the Project will be operational 24 hours per day, seven days per week. The Project will be monitored and controlled by a remote supervisory control and data acquisition (SCADA) from a control room located within the O&M facility. Where required, assistance from an offsite SCADA engineering team may be sought. The SCADA system is designed to maximise the power output, allow for remote control of the WTGs and monitor the efficiency of the power plant.

While the wind farm will be monitored remotely, the WTG and other equipment will require regular maintenance. Site maintenance will be undertaken by site staff on an ongoing basis with activities scheduled consistently throughout the year. Site maintenance will include maintenance of the WTGs, reticulation network, access roads, substations, and transmission line.

Most repairs can be undertaken during routine maintenance; however, circumstances may arise where additional specialist technical maintenance staff are required (e.g., such as unplanned equipment failure). For some WTG components, maintenance or replacement may need to be undertaken using a crane.

Daily maintenance will occur during standard working hours. Outside of emergencies or major asset inspection or maintenance programs, night works or works on Sundays or public holidays will be minimal.

3.6 DECOMMISSIONING AND REHABILITATION

The WTGs have an expected operating life of up to 30 years, at the end of which there are three main options for consideration:

- Continue the use of the site as a wind farm using the existing WTGs (subject to condition of equipment);
- Replace the WTGs with technology current at that time and continue the use of the site as a wind farm for a further term; or
- Decommission the Project and remove the WTGs and ancillary infrastructure in accordance with the Environmental Management Strategy which will be prepared for the Project.

When decommissioning occurs:

- Key stakeholders including landholders will be consulted;
- All above ground structures not required for the ongoing agricultural use of the land, including the WTGs, transformer stations, and substation, will be removed and the land rehabilitated to ensure it can be returned to agricultural use;
- Access tracks and hardstands not requested by the landowner to be retained will be removed and land rehabilitated and returned to agricultural use; and
- Below ground infrastructure, including cabling and the WTG foundations, will be left in situ to avoid further disturbance and minimise clearing of revegetated areas. The infrastructure will be removed to a minimum of 0.5 m below the ground surface and where required will be covered in clean fill material and topsoil prior to revegetation. Rehabilitated areas will be adequately graded to reflect the slope of the surrounding area and to mitigate the risk of soil erosion.

All materials removed from the Project Area will be sorted and packaged for reuse and/or recycled where possible in accordance with the waste hierarchy.

A Decommissioning and Rehabilitation Plan will be prepared for the Project no less than five years prior to decommissioning and / or in accordance with any project approval requirements. It is anticipated that the decommissioning and rehabilitation phase would take up to 18 months to complete, with the Project Area being returned, as far as practicable, to its condition prior to the commencement of construction.

The Applicant has entered long-term lease agreements with the associated landholders for the construction and operation of the Project. The terms of these agreements make express provision for the Applicant's decommissioning obligations. Until decommissioning is complete, lease fees are payable to the associated landholders.

3.7 FUTURE LAND SUBDIVISION

Transgrid requires freehold title to the switchyard lot(s) to proceed with the construction of the relevant electrical connections and infrastructure. The Project would require the future creation of title(s) in a subdivision of Lot 36 DP756546 to enable land ownership of the switchyard assets to be transferred to Transgrid. Transgrid will obtain freehold title through either transfer, dedication or acquisition.

The Project may require the creation of title(s) to enable land ownership of the three substation assets within the following respective lots:

- Lot 36 and Lot 75 DP756546;
- Lot 84 DP756546; and
- Lot 12 DP756546.

Figure 3-18 identifies the indicative subdivision(s).

Legend

- Project Area
- Access Track
- O&M
- 33kV Overhead Line
- 33kV Underground Cable
- 330kV Overhead Line
- BESS
- Collector Subs
- Switching Station
- Disturbance Footprint
- Existing Transmission Line

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 50 100 150m

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F3.18 - Indicative Subdivision(s)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

0617753_KKWF_EIS_G026_R0.mxd

3.8 COMMUNITY BENEFIT FUND

The Applicant intends to provide a Community Benefit Fund (CBF) from the commencement of construction, to support initiatives during the construction period and for the life of the Project, and will use best endeavours to meet emerging guidelines in relation to benefit sharing from the NSW Government.

The broad intention of the CBF is that funds would be allocated to support non-profit organisations, community programs/events, local businesses, training, and services / infrastructure. Acciona Energia will work with the local communities of the Keri Keri wind farm to identify opportunities for long term benefits. The CBF may be comprised of a Voluntary Planning Agreement (VPA) with Murray River Council, along with an annual small grants/scholarship program. For clarity, this contribution would be in addition to the Access Fee and the proportion of which goes to community benefit.

4. STATUTORY CONTEXT

This section outlines the key statutory consideration for the Project under the Environmental Planning and Assessment Act 1979, and other relevant NSW and Commonwealth legislation pursuant to the requirements of the State significant development guidelines – preparing an environmental impact statement (DPIE, 2022).

4.1 POWER TO GRANT APPROVAL

Approval for the Project is sought under Part 4, Division 4.7 of the EP&A Act, which outlines the approval pathway for development deemed to be SSD. Section 4.36(2) of the EP&A Act provides for the declaration of a project as SSD.

SEPPs relevant to the approval of the Project include the *State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP)* and *State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP)*.

Clause 20 of Schedule 1 of the Planning Systems SEPP prescribes that development for the purpose of 'electricity generating works' that has a capital investment value of more than $30 M is SSD. The Project involves development for the purpose of electricity generating works using wind power, which will have a capital investment value of more than $30 M.

Therefore, the Project is classified as SSD under Part 4 of the EP&A Act and the Development Application for the Project will be subject to the requirements of Division 4.7 of the EP&A Act.

Under section 4.5 of the EP&A Act and section 2.7 of the Planning Systems SEPP, the consent authority is the Minister for Planning and Homes unless any of the following circumstances applies, in which case the consent authority is the Independent Planning Commission:

- Murray River Council makes a submission by way of objection under the mandatory requirements for community participation;
- 50 or more submissions (other than from a council) are made by way of a unique objection under the mandatory requirements for community participation; or
- The Proponent has disclosed a reportable political donation.

4.2 PERMISSIBILITY

The permissibility of wind farm developments in NSW is determined by the Transport and Infrastructure SEPP.

Section 2.36(1) of the Transport and Infrastructure SEPP states that 'electricity generating works' may be carried out with development consent on land within a prescribed rural, industrial or special use zone. The Project Area is zoned in its entirety as RU1 – Primary Production under the Wakool Local Environmental Plan 2013 (Wakool LEP).

RU1 is a prescribed rural zone, and therefore the Project is permissible with consent under the provisions of section 2.36(1) of the Transport and Infrastructure SEPP. The construction of the transmission line and switching station is permissible as infrastructure that is ancillary to the dominant use (i.e., the wind farm).

4.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Approval from the Minister for the Australian Government's Department of Climate Change, Energy, the Environment and Water (DCCEEW) is required for any action that will or is likely to have a significant impact on one or more Matters of National Environmental Significance (MNES).

The Project was referred under the EPBC Act (EPBC Ref: 2022/9176) and was determined to be a controlled action on 2 May 2022.

Supplementary SEARs were issued detailing the requirements of the Australian Government for the EIS.

The Project will be assessed in accordance with the bilateral assessment agreement *Amending Agreement No. 1*.

As such, it will be assessed in the manner specified in Schedule 1 to that Agreement including addressing the matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Regulations).

The controlling provisions that apply to the Project under the EPBC Act were determined to be:

Listed threatened species and communities (sections 18 and 18A). Refer **Section 6.1** and **Appendix G**.

4.4 OTHER APPROVALS

Other approvals required under relevant NSW and Commonwealth legislation are detailed in **Table 4-1**. A statutory compliance table which identifies all the relevant statutory requirements for the Project and indicates where they have been addressed is included in **Appendix C**.

TABLE 4-1 OTHER APPROVALS REQUIRED

Approval Category	Legislation	Requirement
Commonwealth Approvals	*Native Title Act 1993*	Under Section 13 of the *Native Title Act 1993*, an individual can apply to the Federal Court for a determination of native title. The Native Title Vision (NTV) online mapping tool (NTT, 2023) currently indicates there are no Native Title claims over the Project Area, as reported in the Aboriginal Cultural Heritage Assessment Report (ACHAR) (refer **Section 6.2** and **APPENDIX H**).
	Civil Aviation Regulations 1988	The Civil Aviation Regulations require any potential aviation obstacles and hazards be assessed under the *National Airports Safeguarding Framework Guideline D: Managing Wind Turbine Risk to Aircraft* and the reporting of tall structures to the Civil Aviation Safety Authority (CASA) and Airservices. A detailed assessment in accordance with the regulations and consultation with the relevant agencies has been undertaken as part of the preparation

Approval Category	Legislation	Requirement
		of the EIS (refer **Section 6.7.1** and **APPENDIX L**).
	Radio Communications Act 1992	Any electrical component installed in Australia must comply with the *Radiocommunications Act 1992* and associated notices. All installations on the wind farm will comply with the Act, including affixation of relevant compliance markers to the equipment. The original equipment manufacturers must guarantee compliance. Final wind farm layout and design will be designed to ensure compliance with the 2020 ICNIRP Health Guidelines (refer **Section 6.7.2** and **APPENDIX M**).
Consistent Approvals Section 4.42 of the EP&A Act outlines that these approvals cannot be refused if necessary for carrying out an approved SSD and are to be consistent with the terms of the SSD approval	*Roads Act 1993*	The Project will require consent from the appropriate road authority under section 138 of the Roads Act 1993 for any works undertaken on public roads. The impacts of the Project on roads and traffic are assessed in the traffic and transport assessment (refer **Section 6.5** and **Appendix J**).
	Protection of the Environment Operations Act 1997 (POEO Act)	Under the provisions of schedule 1, section 16 of the POEO Act, activities requiring an EPL include crushing, grinding or separating of materials. Under the provisions of schedule 1, section 17 of the POEO Act, activities requiring an EPL include 'electricity works (wind farms)'. Accordingly, an EPL will be required for the Project.
Other Approvals	*Water Management Act 2000* (WM Act)	The Project may require water access licences under the *Water Management Act 2000*. The Soils and Water Assessment (refer **Section 6.8**) provides a further discussion on water access licences.
	Conveyancing Act 1919	The final development footprint will require a lease from the owners of the affected land. Lease of a wind farm site is treated as a lease of premises regardless of whether the lease will be for more or less than 25 years. The Applicant will register a plan of subdivision with respect to the wind farm site. Therefore, there will be no basis upon which the Registrar-General may refuse to register the lease under s 23F of the *Conveyancing Act 1919* (NSW) (Section 3.7).
	Biodiversity Conservation Act 2016 (BC Act)	Part 7, s7.9 of the BC Act specifies that 'an application for development consent under Part 4 of the EP&A Act' for SSD must be accompanied by a Biodiversity Development Assessment Report (BDAR) report 'unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to

Approval Category	Legislation	Requirement
		have any significant impact on biodiversity values. The BDAR (refer **Section 6.1** and **APPENDIX G**) has been prepared to accompany the EIS and provides a discussion of the management and protection of listed threatened species of native flora and fauna and TECs. The BDAR assesses biodiversity offsets consistent with the Biodiversity Offset Scheme. Given the Project is SSD, entry into the Biodiversity Offset Scheme is automatically triggered.
	Local Government Act 1993 (NSW)	The *Local Government Act 1993* (LG Act) outlines processes for local government and sets out the powers of local councils. Approval is required under section 68 of the LG Act to carry out water supply and sewerage work. Water tanks and septic or pump out sewage may be installed at the O&M Facility for which approval from Murray River Council will be sought.
	*Crown Land Management Act 2016 (*NSW)	The Project Area includes several Crown paper roads. The Project Area does not include any Crown land parcels (refer **Figure 3-3**), as discussed in **Section 3.2.2**. Access rights, in the form of easements or licences, will be obtained as required in relation to all Crown paper roads in accordance with the processes contained in the *Crown Land Management Act 2016* (CLM Act).
Approvals not required under SSD Section 4.41 of the EP&A Act states the following approvals; permits etc are not required for an approved SSD.	*Fisheries Management Act 1994* (FM Act)	The Project will not require a dredging or reclamation work permit under section 201, a marine vegetation regulation of harm permit under section 205, or a passage of fish not to be blocked permit under section 219.
	Heritage Act 1977	The Project will not require a Part 4 approval to carry out an act, matter or thing referred to in section 57(1), or an excavation permit under section 139.
	National Parks and Wildlife Act 1974	The Project will not require an Aboriginal heritage impact permit under section 90.
	Rural Fires Act 1997	The Project will not require a bush fire safety authority under section 100B, as the development does not involve subdivision for residential or rural residential development.
	Water Management Act 2000	The Project will not require a water use approval under section 89, a water management work approval under section 90, or an activity approval (other than an aquifer interference approval) under section 91.

4.5 MANDATORY MATTERS FOR CONSIDERATION

The consent authority is required to consider a range of matters when deciding whether to grant consent for the Project. These are referred to as mandatory considerations, which are detailed in **Table 4-2** below.

TABLE 4-2 MANDATORY CONSIDERATIONS

Statutory Reference	Mandatory Consideration
Considerations under the EP&A Act and Regulation	
Section 1.3 - Objects of the Act	Pursuant to section 1.3 of the EP&A Act, the Project meets the objectives of: Section 1.3 (a) as it will allow for the existing land use to continue, while providing associated landowners with an additional source of income. Section 1.3(b) as it will facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in the preparation of this EIS (**Section 7**). Section 1.3(c) this EIS has assessed the potential impacts of the project in accordance with the requirements of relevant policy and guidelines, and will provide an economic stimulus to the region through employment, sourcing of local materials, plant and equipment, and the establishment of a Community Benefit Fund (**Section 3.8**). Section 1.3(e) as it has considered impacts to biodiversity values and has avoided or minimised these through design refinements and recommended mitigation measures (**Section 6.1**; **APPENDIX G**). Section 1.3(f) as it has considered impacts to built and cultural heritage values and has avoided or minimised these through design refinements and recommended mitigation measures (**Section 6.2**; **Section 6.3**; **APPENDIX H**). Section 1.3(g) as it has considered visual and landscape impacts and has avoided or minimised these through design refinements or mitigation measures (**Section 6.6**; **APPENDIX K**). Section 1.3(h) as it has considered all relevant aspects in the design of buildings associated with the Project, including the health and safety of proposed occupants of buildings (**Section 3.3**; **Section 6.7.3**). Section 1.3 (i) as it has worked and engaged with both State and local government through the development of the Project to date (**Section 5**; **APPENDIX D**). Section 1.3 (j) as it has worked and engaged with the community and stakeholders through the development of the Project to date (**Section 5**; **APPENDIX D**).
Section 4.15 - Evaluation	This EIS has considered the relevant provisions of the Planning Systems SEPP, Transport and Infrastructure SEPP, Resilience and Hazards SEPP and the Wakool LEP (**Section 4**). This EIS has considered the likely impacts of the development, including environmental impacts on both the natural and built environment, and social and economic impacts (**Section 6.12**; **Section 6.13**) in the locality. This EIS has and will continue to consider any submissions made in accordance with the Act or the regulations, and the public interest.
Considerations under other legislation	
Civil Aviation Regulations 1988 (Cth)	An Aviation Impact Assessment has been undertaken to support the Project (refer **Section 6.7.1**; **APPENDIX L**).
Radio Communications Act 1992 (Cth)	An EMI assessment has been undertaken for the Project (refer **Section 6.7.2**; **APPENDIX M**).

Statutory Reference	Mandatory Consideration
Biodiversity Conservation Act 2016 (NSW)	A BDAR pursuant to section 7.14 of the BC Act has been undertaken for the Project (**Section 6.1**; **APPENDIX G**).
Considerations under relevant Environmental Planning Instruments (EPIs)	
State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 3 Hazardous and offensive development Chapter 4 Remediation of land	Chapter 3 of Resilience and Hazards SEPP assesses the potential hazards associated with the Project by providing definitions and guidelines for hazardous industry, offensive industry, hazardous storage establishments, and offensive storage establishments. In accordance with section 3.7 of the Resilience and Hazards SEPP, consideration has been given to current circulars or guidelines published by DPE relating to hazardous or offensive development, including: *Hazardous Industry Planning Advisory Paper No 3 – Risk Assessment* *Hazardous Industry Planning Advisory Paper No 12 – Hazards* Refer to Section 6.7.5 and Appendix O for further detail. Chapter 4 of the Resilience and Hazards SEPP promotes the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. Under section 4.6 of the Resilience and Hazards SEPP, a consent authority is required to consider whether a proposed development site is affected by soil or other contaminants before granting consent. The Soils and Water Assessment (**Section 6.8**) provides a further discussion on the potential contamination risk associated with the Project. Noting the agricultural land use across the Project Area, the assessment considered the historical land use that may have resulted in contamination within and surrounding the Project Area.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Chapter 3 Koala habitat protection 2020	Chapter 3 of the Biodiversity and Conservation SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas. Chapter 3 applies to land zoned *RU1 – Primary Production* Zone within the Murray River LGA, as defined in Schedule 1 of *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021). Schedule 1 of Koala SEPP 2021 also provides that the Project is located within the Northern Tablelands Koala Management Area. The proposed works include the removal of up to 1130.93 ha of native vegetation, and of this, 0 ha is considered to be Koala habitat. The impact of the Project on the koala and koala habitat is detailed and assessed in the BDAR (**Section 6.1**; **APPENDIX G**).
State Environmental Planning Policy (Primary Production) 2021	The Primary Production SEPP contains planning provisions to manage primary production and rural development, including supporting sustainable agriculture for the protection of prime agricultural land of state and regional significance, as well as regionally significant mining and extractive resources. The Project will not impede agricultural use of the land.
State Environmental Planning Policy (Transport and Infrastructure) 2021	Transport and Infrastructure SEPP provides greater consistency and flexibility in the development of key transport and infrastructure works. Relevantly, section 2.36(1) provides that the development of electricity generating works may be carried out with consent in a prescribed rural zone, which includes the *RU1 – Primary Production* Zone.
State Environmental Planning Policy (Planning Systems) 2021	**Section 4.1** describes that the Project has met the relevant criteria under the provisions of the Planning System SEPP for it to be classified SSD.

Statutory Reference	Mandatory Consideration
Wakool Local Environmental Plan 2013	The Project is consistent with the provisions of the Wakool LEP as demonstrated in **Section 4.5.1**.
Considerations under Development Control Plans	
Wakool Development Control Plan 2013	The Wakool Development Control Plan 2013 (Wakool DCP) is the relevant DCP that supports the controls contained within the Wakool LEP under the provisions of Division 3.6 of the EP&A Act. Under section 2.10 of the Planning Systems SEPP, DCPs do not apply to SSD projects.

4.5.1 CONSIDERATION OF LOCAL ENVIRONMENTAL PLANS

The relevant LEP for the Project is the Wakool LEP 2013.

4.5.1.1 CLAUSE 1.2 – AIMS OF PLAN

The aims of the Wakool LEP that are relevant to the Project include:

Part 1, Section 1.2, 2 (a)

to reinforce the strong rural character of Wakool,

Part 1, Section 1.2, 2 (b)

to encourage the continued use of agricultural land for primary production,

Part 1, Section 1.2, 2 (c)

to avoid the unnecessary fragmentation of rural land,

Part 1, Section 1.2, 2 (d)

to encourage sustainable economic growth and development within Wakool,

Part 1, Section 1.2, 2 (e)

to identify, protect, conserve and enhance Wakool's natural assets,

Part 1, Section 1.2, 2 (f)

to identify and protect Wakool's built and cultural heritage assets for future generations,

Part 1, Section 1.2, 2 (h)

to protect environmentally sensitive land and conserve native vegetation habitats and threatened species,

Part 1, Section 1.2, 2 (i)

to give priority to the protection, conservation and enhancement of indigenous and non-indigenous cultural heritage, The Project meets the aims of the Wakool LEP as the proposed layout has been designed to maximise the use of existing disturbed areas and to avoid or minimise impact to identified biodiversity and Aboriginal cultural heritage values, and land of significance for agricultural purposes. Progressive design iterations for the turbines, ancillary infrastructure, and the transmission line corridor have continued with key drivers being measures to minimise and avoid environmental and social impacts in line with the Avoid-Minimise-Mitigate-Offset design hierarchy.

Further, the Project will create a range of social and economic benefits which will create substantial capital investment in Murray River region. The Applicant commits to implementing a CBF for the life of the Project as described in **Section 3.8**.

4.5.1.2 OBJECTIVES OF ZONE RU1 – PRIMARY PRODUCTION

The objectives of the Wakool LEP RU1 Land Zone that area relevant to the Project include:

- To allow the development of complementary non-agricultural land uses that are compatible with the character of the zone;
- The Project meets the objectives of the RU1 Zone under the Wakool LEP, as it will primarily be developed on agricultural land, which has been previously generally disturbed and/or historically cleared. Wind farms are very much compatible with existing farming operations as the turbines occupy only a small amount of land, and landowners are able to continue normal grazing or cropping activities adjacent to these; and
- The Project will further provide a diversified income stream for rural landholders and neighbours through payments to host landholders and the Community Benefit Fund. The income provided to landowners hosting wind farm infrastructure can help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.

4.5.2 OTHER EP&A ACT CONSIDERATIONS

When undertaking an assessment of a development application, a consent authority is required, pursuant to section 4.15 of the EP&A Act, to take into consideration a range of matters. The EP&A Act requires that both the natural and built environments and the social and economic impacts in the locality are considered.

The matters outlined in section 4.15(1) have been considered in **Table 4-3** to summarise the likely impacts of the Project on the natural and built environment.

TABLE 4-3 SECTION 4.15(1) ASSESSMENT

Matter for Consideration	Comment
a) the provisions of – (i) any environmental planning instrument.	The provisions of relevant EPIs relating to the Project are summarised and addressed in the statutory compliance table in Appendix C.
a) the provisions of – (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument	There are no draft EPIs relevant to the Project.

Matter for Consideration	Comment
has been deferred indefinitely or has not been approved).	
a) the provisions of – (iii) any development control plan.	Development control plans do not apply to SSD under the provisions of section 2.10 of SEPP (Planning Systems) 2021.
a) the provisions of – (iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4.	A CBF may be comprised of a VPA with Murray River Council. Refer to **Section 5** for further details.
a) the provisions of – (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph).	The provisions of the EP&A Regulation and their relevance to the Project are addressed within Appendix C. Clause 61 of the EP&A Regulations provides Additional matters that consent authority must consider. None of these matters are relevant to the project.
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Assessment of the key environmental and social impacts relating to the Project is provided in Section 6, and the corresponding specialist assessments that accompany the EIS.
(c) the suitability of the site for the development.	The suitability of the Project Area for the purposes of a wind farm is discussed in **Section 2**.
(d) any submissions made in accordance with the Act or the regulations.	The EIS will be placed on exhibition by DPE for a minimum period of to 28 days and submissions will be considered by the consent authority during the assessment of the Project.
(e) the public interest.	The EIS and supporting specialist assessments have concluded that the Project is compatible with the existing agricultural uses evident in the area, can appropriately manage potential environmental and social impacts, and accords with the planning and environmental provisions relevant to the Project Area. The principles of sustainable development are key to decision-making processes concerning the development of new energy resources. A key principle underlying the notion of sustainable development is the concept of intergenerational equity. Intergenerational equity is premised on the idea that ‘the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations’. Intergenerational equality relating to energy production has two requirements: 1) Sustainable mining and use of fossil fuels; and 2) Increasingly substitute energy sources that result in less greenhouse gas emissions for energy sources that result in more greenhouse gas emissions. As a result, the Project is regarded to be in the public interest.

5. ENGAGEMENT

This section provides an overview of the engagement activities carried out before and during the preparation of the EIS. It also provides an indicative overview of community engagement planned during future phases of development of the Project.

5.1 INTRODUCTION

Stakeholder engagement is an integral part of any major development. As part of the development of the Project and preparation of the EIS, consultation has been and will continue to be undertaken with a range of stakeholders including local and NSW Government agencies, the community, special interest groups, and neighbouring and proximate landholders.

A Community and Stakeholder Engagement Plan (CSEP) has been prepared for the Project in accordance with the *Undertaking Engagement Guidelines for State Significant Projects* (NSW DPE, Oct 2022). A summary of how engagement undertaken by the Applicant has been used to inform this EIS is provided as **Appendix D**.

In addition to the engagement undertaken by the Applicant, engagement has been undertaken as part of the Social Impact Assessment (SIA) for the Project, in accordance with the requirements of the *Social Impact Assessment Guideline for State Significant Projects* (DPE, 2023) (SIA Guideline) and the SEARs. The SIA is provided as **Appendix S** and summarised in **Section 6.13**.

5.1.1 ENGAGEMENT OBJECTIVES

The Applicant is committed to ensuring community concerns and comments are considered, and that attempts are made to avoid, minimise or mitigate potential impacts to the extent possible.

The engagement objectives for the Project as contained in the CSEP are as follows:

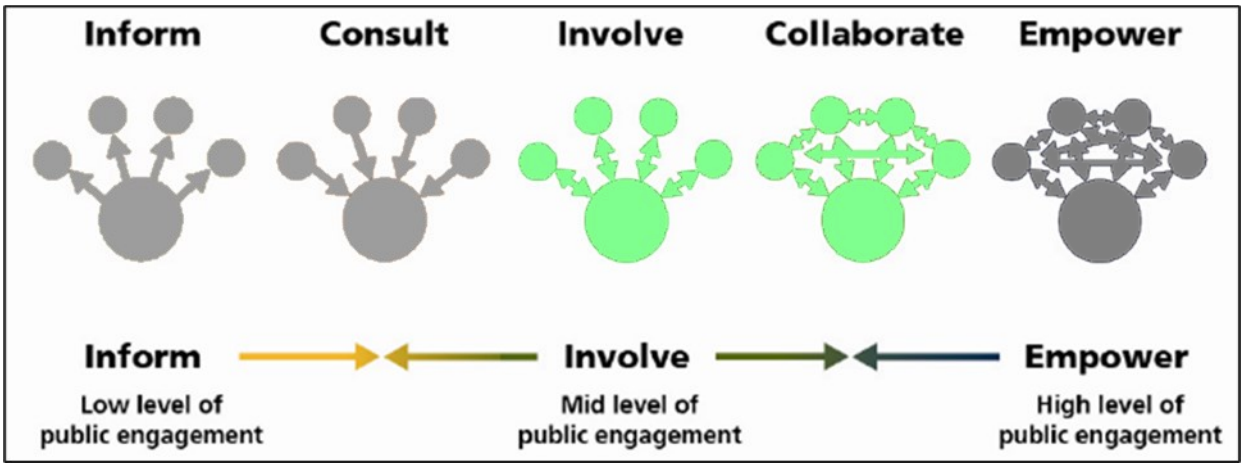
- Identify and engage with the local community and key stakeholders;
- Build a foundation of strong relationships and community support;
- Ensure stakeholders are informed, consulted and involved;
- Wherever possible, activities will continue to be conducted with emphasis on stakeholder collaboration and empowerment;
- Uphold the four Clean Energy Council's principles (accepted rules of conduct) of community engagement which include: openness, inclusiveness, responsiveness and accountability; and
- Provide an accessible complaints management process as a mechanism for feedback to Acciona.

Inherent in these objectives is the need to engage with the community in a timely manner. Importantly, the outcome of community engagement activities is to maintain the Applicant's 'social licence to operate' by developing positive relationships built on trust and transparency.

To achieve broad local social acceptance and develop strong local relationships, the Applicant commenced engagement early, during early Project constraints and feasibility assessments. This engagement focussed on the community, using engagement principles tailored to the local context (refer **Figure 5-1**).

Acciona recognises that providing the community with the information they need to be involved in a meaningful way fosters sustainable decision making.

FIGURE 5-1 KERI KERI COMMUNITY ENGAGEMENT APPROACH



5.1.2 KEY STAKEHOLDERS

Key stakeholders identified as potentially having an interest in the Project are listed in **Table 5-1** below.

TABLE 5-1 KEY STAKEHOLDERS

Stakeholders	Specific Parties
Host landowners	• Landowners who have agreed to host infrastructure
Neighbours	• Immediate neighbours (i.e., directly adjoining landowners) • Neighbouring dwellings within 10 km of a potential turbine location
Surrounding communities	• General public living outside of the 10 km radius of a potential turbine • Surrounding communities include Balranald and Moulamein
Aboriginal communities	• Traditional Custodians (refer to **Section 6.2**) • Registered Aboriginal Parties and Aboriginal groups • Local Aboriginal Land Council – Hay, Balranald and Yarkuwa • NSW Aboriginal Land Council • Aboriginal Affairs NSW • Native Title Service Provider for Aboriginal Traditional Owners
Local community organisations and businesses	• Moulamein Community Development Inc • Growing Business Industry & Tourism Advisory Committee • Local business (primary producers, landscape suppliers, retail, service and hospitality, accommodation providers, trades) • Country Women's Associations • Lions & Rotary Clubs • Local action groups • Balranald Discovery Centre and other tourism providers
Local council, state and federal elected members	• Murray River Council, Mayor, General Manager and elected councillors • Hay Shire Council, Mayor, General Manager and elected councillors • Balranald Shire Council, Mayor, General Manager and elected councillors

Stakeholders	Specific Parties
State and federal agencies	• Department of Planning and Environment • Transport for NSW • Department of Premier and Cabinet • National Parks and Wildlife Service, NSW • Local Land Services, NSW • Environmental Protection Authority • Crown Lands • Regional NSW – Mining, Exploration and Geoscience • Department of Primary Industries • TransGrid • Telco Authority • Murray Local Land Services • Forestry Corporation NSW • Fire and Rescue NSW and NSW Rural Fire Service • Department of Defence, Civil Aviation and Safety Authority, Airservices Australia • Regional Development Australia • Australian Energy Infrastructure Commissioner • Emergency service departments • Office of the Registrar of the Aboriginal Land Rights Act and National Native Title Tribunal
Local media	• Newspapers • Community newsletters (e.g., Moulamein Wongi) • Community Facebook Groups (e.g., The Balranald Link)
Local schools, religious organisations, clubs, training providers	• Balranald Central School • Moulamein Public School • TAFE NSW (Hay, Griffith, Sunraysia, Finley) • Charles Sturt University (Wagga Wagga) • Sureway Employment and Training (Hay, Balranald) • Summit Employment and Training • Recreation facilities – Balranald Golf Club, Moulamein Bowling Club, Moulamein Football Netball Club, Balranald Football Netball Club, Balranald Bowling Club, Balranald Discovery Centre

5.2 ENGAGEMENT CONDUCTED

5.2.1 LOCAL COMMUNITY

A range of engagement tools have been used to engage with and seek feedback from the local community as detailed in **Table 5-2** below.

TABLE 5-2 ENGAGEMENT TOOLS

Engagement Tool	Description
Project microsite and Online Community Hub	Acciona launched a Project microsite in February 2022. The microsite is specific to the Project, and includes key project information and community benefits, in addition to the communication channels for stakeholders to get in touch with the Project team. The Project microsite provides a link to the Online Community Hub created using EngagementHQ (now Social Pinpoint as of December 2023). From the Online Community Hub, the community is able to download the Project Factsheet, FAQ Sheet, read latest updates, and get in touch with the Project Team.

Engagement Tool	Description
	
Communication Channels	Throughout preparation of the EIS, stakeholders have been able to make direct enquiries to the Project team through the following channels: Phone: 1800 283 550 Email: kerikeriwindfarm@acciona.com Post: PO Box 24110, Melbourne VIC 3001 Q&A tool via the online community hub: www.community.acciona.com.au/kerikeri The Project team aim to respond to enquiries within three business days.
Community Information Sessions	Community information sessions (drop-in sessions) were facilitated by Acciona in Balranald and Moulamein in February 2022 and January 2024. Community members had the opportunity to ask questions, express concerns, and provide feedback directly to Acciona representatives.
Flyover Video	To assist with community engagement and to provide an understanding of the size, workings and a visual imagery of the wind farm, Acciona will create a 3D Fly through Animation of the Keri Keri Wind Farm. The video provides a visual representation of the entire Project including WTGs, ancillary infrastructure, and the overhead transmission line. The video will be used to engage and consult with our stakeholders via meetings, the website, conferences and social media.
Digital Platforms	Acciona understands that different social media platforms appeal to different audiences, and the importance of using a variety of platforms to interact with and keep the public informed. Acciona leverage a variety of digital and social media platforms including the Acciona website (www.acciona.com.au), Twitter, Facebook, YouTube, Instagram and LinkedIn to increase awareness of projects and to connect with the community.

5.2.2 GOVERNMENT AGENCIES

Details of consultation undertaken with public authorities during the EIS phase is outlined in **Table 5-3** below. Consultation has occurred with all local, State or Commonwealth Government authorities listed in the SEARs.

TABLE 5-3 ENGAGEMENT WITH GOVERNMENT AUTHORITIES

Government Agency	Summary	Reference
Murray River Council	• In September 2022, Acciona Energía presented to Council with Project update. • Introductory Project letter sent via email by ERM on 5 October 2022. • Telephone consultation between Tremain Ivey Advisory and biosecurity officers to identify the main biosecurity	Stakeholder Engagement, **APPENDIX D** Agricultural Impact Assessment, **APPENDIX Q**

Government Agency	Summary	Reference
	risks associated with the Project and recommended mitigation measures. • Request for consultation sent via email on 24 February 2023 by ERM to Community and Economic Development Acting Director to identify issues and opportunities relating to Projects social impacts. No response received to date. • Acciona presented to Council with Project update in January 2024. • In February 2024, Acciona attended a meeting held with Murray River Council about benefits sharing.	Social Impact Assessment, **APPENDIX S**
Balranald Shire Council	• In September 2022, Acciona Energía presented to Council with Project update. • Request for consultation sent via email on 3 March 2023 by Aviation Projects to inform Aviation Impact Assessment. No response received to date. • Online interview between ERM Social Consultant and Ray Mitchell (Health & Development Officer) on 9 March 2023 to identify issues and opportunities relating to Projects social impacts. • Acciona presented to Council with Project update in January 2024.	Aviation Impact Assessment, **APPENDIX L** Social Impact Assessment, **APPENDIX S**
Hay Shire Council	Online interview between ERM Social Consultant and Jack Terblanche (Director Planning and Development) and Ali McLean (Economic Development Officer) on 9 March 2023 to identify issues and opportunities relating to Projects social impacts.	Social Impact Assessment, **APPENDIX S**
Balranald Local Aboriginal Land Council	• Introductory Project letter sent via email by ERM on 23 November 2022. • Since lodgement of the Scoping Report, several phone calls and emails have been exchanged as part of the development of the ACHAR, including a Project update letter on 16 February 2023. • Acciona meet with the Balranald LALC in September 2023 to present to Council with Project updates and to introduce Acciona's First Nation Manager.	Stakeholder Engagement, **APPENDIX D** ACHAR Consultation Log, **APPENDIX H**
Hay Local Aboriginal Land Council	Since lodgement of the Scoping Report, several phone calls and emails have been exchanged as part of the development of the ACHAR, including a Project update letter on 16 February 2023.	ACHAR Consultation Log, **APPENDIX H**
DPE's Biodiversity, Conservation and Science Directorate	Introductory Project letter sent via email by ERM to South West Branch on 5 October 2022. Response received 18 October 2022 from a Senior Project Officer reiterating requirement to demonstrate avoidance of impacts to threatened species under the Biodiversity Assessment Method and	Stakeholder Engagement, **APPENDIX D**

Government Agency	Summary	Reference
	seeking to be kept up to date with EIS lodgement.	
NSW National Parks and Wildlife Service	• Introductory Project letter sent via email by ERM on 5 October 2022. • Initial contact made and meeting held during the Scoping Phase of the project, i.e., In 2021; • Introductory letter sent via email by ERM on 5 October 2022; • Communication ongoing with Acciona regarding a meeting to provide a Project update, particularly in relation to Yanga National Park; • Stakeholder receives relevant project communications, including invitation.	Stakeholder Engagement, **APPENDIX D**
Heritage NSW	Introductory Project letter sent via email by ERM on 5 October 2022. Response received 13 October 2022 from Manager Assessments with no issues raised.	Stakeholder Engagement, **APPENDIX D**
Murray Local Land Services	• Introductory Project letter sent via email by ERM on 5 October 2022. • Telephone consultation between Tremain Ivey Advisory and biosecurity officers on to identify the main biosecurity risks associated with the Project and recommended mitigation measures.	Stakeholder Engagement, **APPENDIX D**
Hay Local Land Services	Introductory Project letter sent via email by ERM on 23 November 2022.	Stakeholder Engagement, **APPENDIX D**
DPE Water Group	Introductory Project letter sent via email by ERM on 5 October 2022.	Stakeholder Engagement, **APPENDIX D**
WaterNSW	Introductory Project letter sent via email by ERM on 5 October 2022. Response received 12 October 2022 from Catchment and Asset Protection Adviser requesting that the Applicant keeps WaterNSW updated to the progression of the Project and notify any impact to WaterNSW telecommunications assets.	Stakeholder Engagement, **APPENDIX D**
Environment Protection Authority	Introductory Project letter sent via email by ERM on 23 November 2022.	Stakeholder Engagement, **APPENDIX D**
Crown Lands	• Expression of Interest to purchase the crown roads associated within the Project layout boundary has been submitted to the Department of Crown Lands. Currently the Department is reviewing the application, and it will be sent to the Ministers Office for final approval for purchase.	Stakeholder Engagement, **APPENDIX D**
Regional NSW – Mining, Exploration & Geoscience	Introductory Project letter sent via email by ERM on 23 November 2022. Response received 1 December 2022 from a MEG representative with no issues raised.	Stakeholder Engagement, **APPENDIX D**

Government Agency	Summary	Reference
Department of Primary Industries – Agriculture and Fisheries divisions	Introductory Project letter sent via email by ERM on 5 October 2022.	Stakeholder Engagement, **APPENDIX D**
Transport for New South Wales	Project update provided March 2024 via email.	Stakeholder Engagement, **APPENDIX D**
TransGrid	• Introductory Project letter sent via email by ERM on 3 November 2022. Response received 15 December 2022 from Easements and Development Assessment Advisor with no issues raised.	Stakeholder Engagement, **APPENDIX D**
NSW Telco Authority	Introductory Project letter sent via email by ERM on 30 November 2022. Response received on 22 December 2022 from Principal Spectrum Engineer with no issues raised.	Stakeholder Engagement, **APPENDIX D**
NSW Rural Fire Service	Introductory Project letter sent via email by ERM on 5 October 2022. Response received 8 March 2023 from Supervisor – Development Assessment with no issues raised and advice consistent with that provided in previous correspondence dated 5 May 2022. A request for consultation was sent via email by the Middleton Group on 24 October 2022 to inform the EMI Study. Following initial RFS response on 13 April 2023 from Development Assessment and Planning Coordinator – Planning and Environment Services, South. Further clarification sought on 13 April 2023 however no further response received to date.	Stakeholder Engagement, **APPENDIX D** EMI Study, **APPENDIX M**
Commonwealth Department of Defence	Request for consultation sent via email on 3 March 2023 by Aviation Projects. No response received to date.	Aviation Impact Assessment, **APPENDIX L**
Civil Aviation Safety Authority	Request for initial assessment of Project WTGs and meteorological masts for aviation safety. CASA provided no initial concerns regarding the Project but reserved right to make final assessment upon receipt of the Aviation Impact Statement.	Aviation Impact Assessment, **APPENDIX L**
Airservices Australia	Introductory Project letter sent via email by ERM on 5 October 2022. Response received 8 November 2022 from Airport Development & Engagement Advisor noting that assessment will commence upon receipt of the Aviation Impact Statement. Request for consultation sent via email on 3 March 2023 by Aviation Projects. No response received to date.	Stakeholder Engagement, **APPENDIX D** Aviation Impact Assessment, **APPENDIX L**
Economic Development Team from the	Meeting held on 30-Jan-2024 to introduce the Project Team an, provide an update on the Project, seek initial feedback and	Stakeholder Engagement, **APPENDIX D**

Government Agency	Summary	Reference
Department of Regional NSW	identify opportunities to work together in the region.	

5.2.3 ABORIGINAL COMMUNITY CONSULTATION

Consultation with the Aboriginal community has been led by ERM as part of the development of the Aboriginal Cultural Heritage Assessment Report (ACHAR). Consultation was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010).

Consultation with the Aboriginal community is described in Section 4 of the ACHAR (**APPENDIX H**) and includes a description of how the Aboriginal community were notified of the Project and how Registered Aboriginal Parties (RAPs) were involved throughout the development and undertaking of the heritage surveys.

A workshop with the RAPs was held on the 23 February 2023 in Balranald. Representatives of the Project Team in attendance included two Stakeholder and Community Liaison Officers from Acciona, Damian Wall of Red-gum Environmental Consulting, Dr Colin Pardoe (Forensic Anthropologist), two ERM Heritage Consultants, and the ERM social impact lead (joint author of the SIA).

The workshop allowed an opportunity to discuss:

- Key topics relating to the Project, including construction, employment and training, cultural access, tourism and cultural heritage research;
- Outcomes of heritage fieldwork and the significance and intangible values of its findings;
- Social impacts and opportunities; and
- Heritage management recommendations and opportunities.

A further meeting was held in September 2023 to build on workshop outcomes, such as the development of cultural heritage training.

5.2.4 SERVICE PROVIDERS

Engagement with service providers is a requirement of the SEARs. Optus and Telstra were contacted by the Middleton Group for the preparation of the EMI study (refer to **Section 6.7.2** and **APPENDIX M**). No issues were raised during consultation.

5.3 COMMUNITY VIEWS

Throughout the engagement activities described in **Section 5.2.1**, the Project development team received feedback on a variety of matters from the community which assisted to inform this EIA. Community views are summarised in **Appendix D**.

5.4 ONGOING ENGAGEMENT

5.4.1 ENGAGEMENT PRIOR TO APPROVAL

Engagement with stakeholders will continue throughout the EIS exhibition, Response to Submissions, and determination. This engagement will include:

- Meetings with Murray River Council and Balranald Shire Council;

- Maintaining the Project website and other social media channels for the Project;
- Project updates uploaded to Project website and advertised in the local newspaper;
- Continuation of consultation with community and regulatory stakeholders via various forums, including meetings, presentations, drop-in sessions, attendance at community events;
- Ongoing monitoring of 1800 phone, email and post box for complaints and other feedback from the community; and
- Regularly monitor, review and adapt the Stakeholder Engagement Strategy over time to ensure it remains effective and encourages community participation. The effectiveness will be judged against the provisions of the Undertaking Engagement Guidelines for State Significant Projects (NSW DPE, Oct 2022), community and stakeholder feedback. Reviews will be conducted at least annually, or as necessary based on information obtained through engagement activities.

5.4.2 ENGAGEMENT POST APPROVAL

The Applicant intends on continuing engagement throughout the development of the Project. Proposed post-approval engagement activities are detailed in **Table 5-4**. In addition, this will include any engagement requirements specified in the Conditions of Consent for the Project.

TABLE 5-4 POST APPROVAL – PROPOSED ACTIVITIES BY PROJECT PHASE

Activity	Pre-construction	Construction	Commissioning and Operations	Decommissioning	Deliverable	Timeline / Frequency
Project-specific website, email address, and free call 1800 community hotline	✓	✓	✓	✓	Stakeholders can access Keri Keri Project staff through these communication options, providing opportunity for feedback, support and complaints. Copies of the current newsletter and other relevant project and construction updates will be accessible via the Keri Keri website. A free call 1800 number has been established to take project enquiries and complaints. This number will be prominent to the community on media releases, the Project website, and newsletters.	Ongoing
Personal Visits	✓	✓	✓	✓	Personal visits to host landowners and close neighbours to provide project information to keep them informed about progress of development activities. This engagement will continue throughout the development and construction phases of the Project.	As required

Activity	Pre-construction	Construction	Commissioning and Operations	Decommissioning	Deliverable	Timeline / Frequency
Sponsorship / Small Grants Program	✓	✓	✓		Program to assist local community organisations to implement local community projects and events. That enhance education, health, environmental and renewable initiatives.	Annually
Community Benefit Fund		✓	✓		Program to establish community funding initiatives, such as the provision of vocational training scholarships, improving road infrastructure, telecommunications coverage, and housing security.	Annually
Scholarship Program			✓		Improve access and affordability to higher education and skills development for local students. Four students per year granted a scholarship for the operating lifetime of the wind farm.	Annually from operations onwards
Local Jobs – traineeships, apprenticeships	✓	✓	✓	✓	Local jobs and training opportunities.	Recruitment to start from prior to construction
Information Hub	✓	✓			Provide timely communication and education about the Project.	Weekdays
Management of Cultural Heritage	✓	✓	✓	✓	Develop Cultural Heritage Management Plan (CHMP). Conduct cultural heritage surveys and assessments. Discuss and implement training, apprenticeship and employment opportunities.	Ongoing
Publications	✓	✓	✓	✓	Newsletters, fact sheets	Ongoing
Events and promotion	✓	✓	✓		Attendance at local events.	As required
Presentations and Site Tours	✓	✓	✓	✓	Improve knowledge and understanding of renewable and wind farm operations for students, residents and visitors to the area. Provide presentations and site tours on request.	Ongoing
Project briefings	✓	✓			Presentations to public authorities to create awareness of project progress. Presentations to Councillors and staff to discuss progress and relevant management plans.	As required

6. ASSESSMENT AND MITIGATION OF IMPACTS

6.1 BIODIVERSITY

6.1.1 INTRODUCTION

A Biodiversity Development Assessment Report (BDAR) was prepared for the Project and is provided in **Appendix G**. The BDAR assessed the potential impacts to biodiversity values that may result from the Project, and identifies mitigation and risk management measures to implement to minimise these impacts.

The BDAR was prepared to address the requirements of the SEARs and supplementary SEARs (**Appendix A**), and with consideration of relevant stakeholder engagement (**Section 5**) and legislation.

The BDAR was also prepared in accordance with the following guidelines:

- Biodiversity Assessment Method (BAM) (DPIE, 2020b) applies to the Project under the transitional provisions in section 6.31 of the Biodiversity Conservation Regulation 2017; and
- 'Developments adjacent to National Parks and Wildlife Service Lands' (DPIE, 2020e).

The Draft Native Vegetation Regulatory (NVR) Map (accessed 21st November 2023), which designates areas of land where clearing of native vegetation is categorised as regulated or exempt under Part 5A of the *Local Land Services Act 2013*, was reviewed. The Draft NVR map for the Project area identifies the Subject Land (as defined in Section 6.1.2) contains small areas of Category 1 – Exempt Land; however, the majority is mapped as 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 the subject of approval and has been considered throughout this BDAR in accordance with the BAM.

6.1.2 METHODOLOGY

The biodiversity features and values associated with the Project have been assessed through desktop and field methods at various scales. The following terminology was adopted in the BDAR:

- The Subject Land refers to the area of land that comprises the Disturbance Footprint (= 1,137 ha; area of permanent and temporary direct impacts) as well as the micro-siting corridor (3,091.7 ha) applied to this. The Subject Land encompasses 4,228.7 ha; and
- The Assessment Area includes the Subject Land with a 500 m buffer for subsequent landscape assessment.

Refer to **Figure 6-1** which presents the Subject Land and Assessment Area.

Impacts to biodiversity values within the Subject Land have been assessed in accordance with the BAM. The scope of the BDAR included:

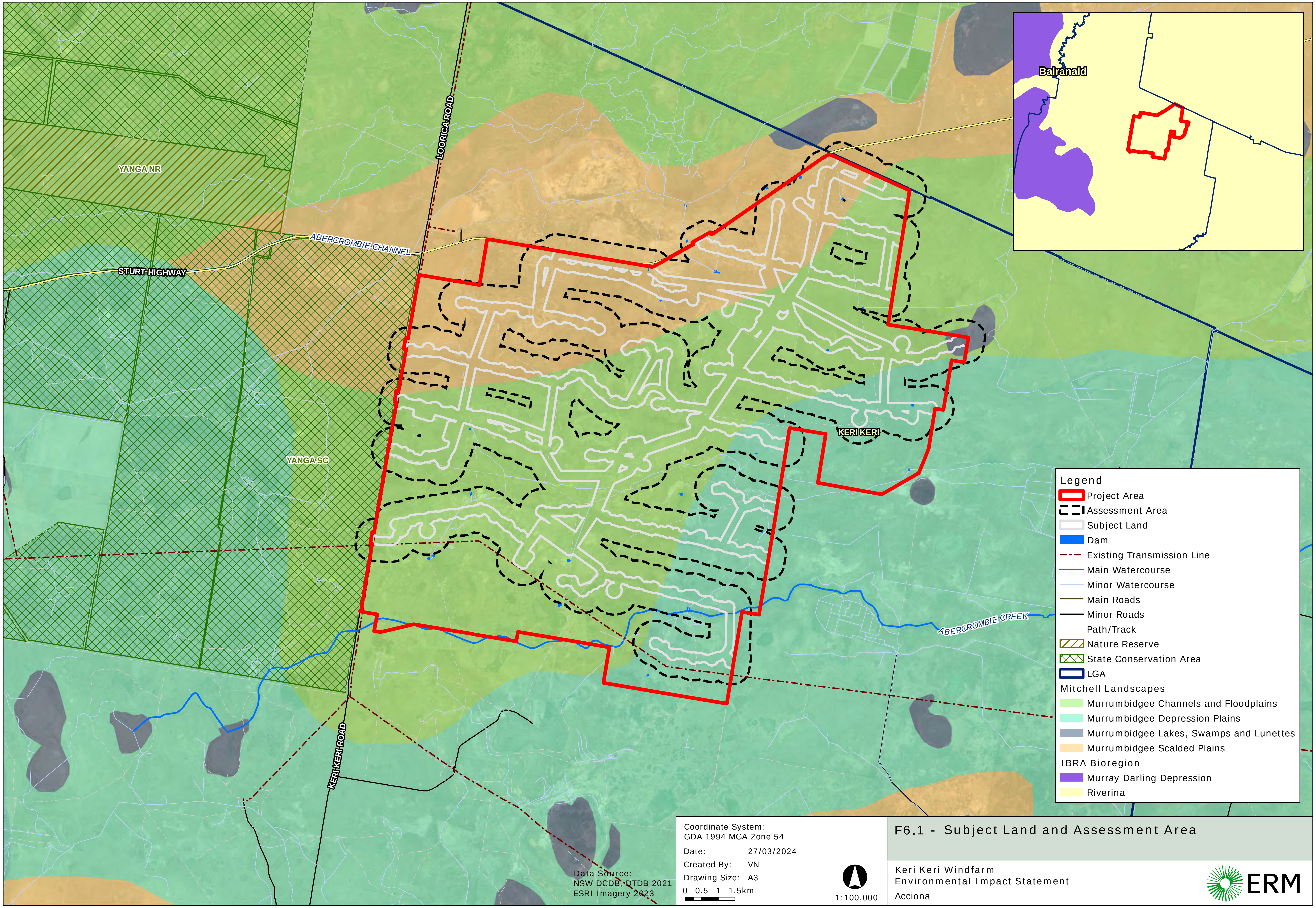
- Assessment of the site context by both desktop and field surveys to verify:
  - IBRA bioregions and subregions, NSW landscape region and area (ha);
  - Native vegetation extent and cleared areas within the buffer area;
  - Rivers and streams (classified according to stream order);

  - 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).
  - Desktop assessment of key maps, tools and field surveys;
- Assessment of native vegetation cover through both desktop sources and field surveys (to verify desktop-based regional data), including:
  - Protected matters search tool (PMST), State Vegetation Type Map (SVTM) (DPE, 2022a) and BioNet Vegetation Classification (BioNet VIS) system;
  - Land Surveys Aerial LiDAR Survey Imagery and Ground Control Survey 2023;
  - Historic imagery (Historical Imagery [nsw.gov.au]);
  - SEED (Geocortex Viewer for HTML5 [nsw.gov.au]);
  - Field surveys conducted between 2020 and 2023;
  - Bray-Curtis similarity index applied to statistically classify PCT identification by grouping plots into groups of similarity at the 5% significance level (SIMPROF groups); and
- Assessment of threatened species with the potential to occur within the Subject Land;
- Desktop assessment and preliminary habitat surveys along pinch points along the haulage route from the Port of Newcastle and Port of Adelaide to the Project Area.

Field surveys carried out from 2020 to 2023 involved the following methods:

- Rapid data points for Plant Community Types (PCTs) / TECs and vegetation zone mapping;
- Bird Utilisation Surveys (BUS) and Anabat monitoring;
- Nocturnal avian transects, nocturnal call playback and fauna spotlighting;
- Vegetation integrity plots (BAM plots);
- Targeted threatened flora surveys; and
- Habitat assessments.

Refer to **Appendix G** for complete methodologies.


YANGA NR
YANGA SC
LOORICA ROAD
ABERCROMBIE CHANNEL
STURT HIGHWAY
KERI KERI
KERI KERI ROAD
ABERCROMBIE CREEK
Balranald
Legend
Project Area
Assessment Area
Subject Land
Dam
Existing Transmission Line
Main Watercourse
Minor Watercourse
Main Roads
Minor Roads
Path/Track
Nature Reserve
State Conservation Area
LGA
Mitchell Landscapes
Murrumbidgee Channels and Floodplains
Murrumbidgee Depression Plains
Murrumbidgee Lakes, Swamps and Lunettes
Murrumbidgee Scalded Plains
IBRA Bioregion
Murray Darling Depression
Riverina
Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023
Coordinate System:
GDA 1994 MGA Zone 54
Date: 27/03/2024
Created By: VN
Drawing Size: A3
0 0.5 1 1.5km
1:100,000
F6.1 - Subject Land and Assessment Area
Keri Keri Windfarm
Environmental Impact Statement
Acciona
ERM
0617753_KKWF_EIS_G030_R0.mxd

6.1.3 EXISTING ENVIRONMENT

6.1.3.1 LANDSCAPE FEATURES

In accordance with the BAM, landscape features of the Subject Land were identified. These features may contain biodiversity values that are important to establish the context of the Subject Land in relation to the surrounding area and identify the likely habitat suitability for threatened species to assess the site context. **Table 6-1** summarises the existing landscape features within the Subject Land.

TABLE 6-1 SUBJECT LAND AND 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).
NSW Landscape Regions (Mitchell)	The Subject Land is situated across four NSW Landscape Regions: • 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 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 6.1.3.2** . 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 6-1** 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 6-1**). 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 6-2**).
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 EPA 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.

6.1.3.2 AQUATIC HABITAT

The Subject Land is located south of the Murrumbidgee River and Uara Creek, NSW. Abercrombie Creek, an ephemeral first order waterway, intersects the southern portion of the Subject Land (refer **Figure 6-1**). 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.

Aquatic Threatened Species

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.

Section 3.1.1.1 of **Appendix G** carried out 'likelihood of occurrence' assessments for these species and concluded that both species are unlikely to occur within the Subject Land and therefore not considered further.

Threatened Aquatic Ecological Communities

The creek lines across the Subject Land are within the distribution of the Lower Murray River Endangered Ecological Community (EEC) listed under the FM Act. However, these creek lines were observed to present as degraded, dried creek beds with a lack of native fish and aquatic invertebrates. If ephemeral creek lines are inundated post heavy rainfall, it remains unlikely that they 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 is discussed **Section 6.1.4.4**.

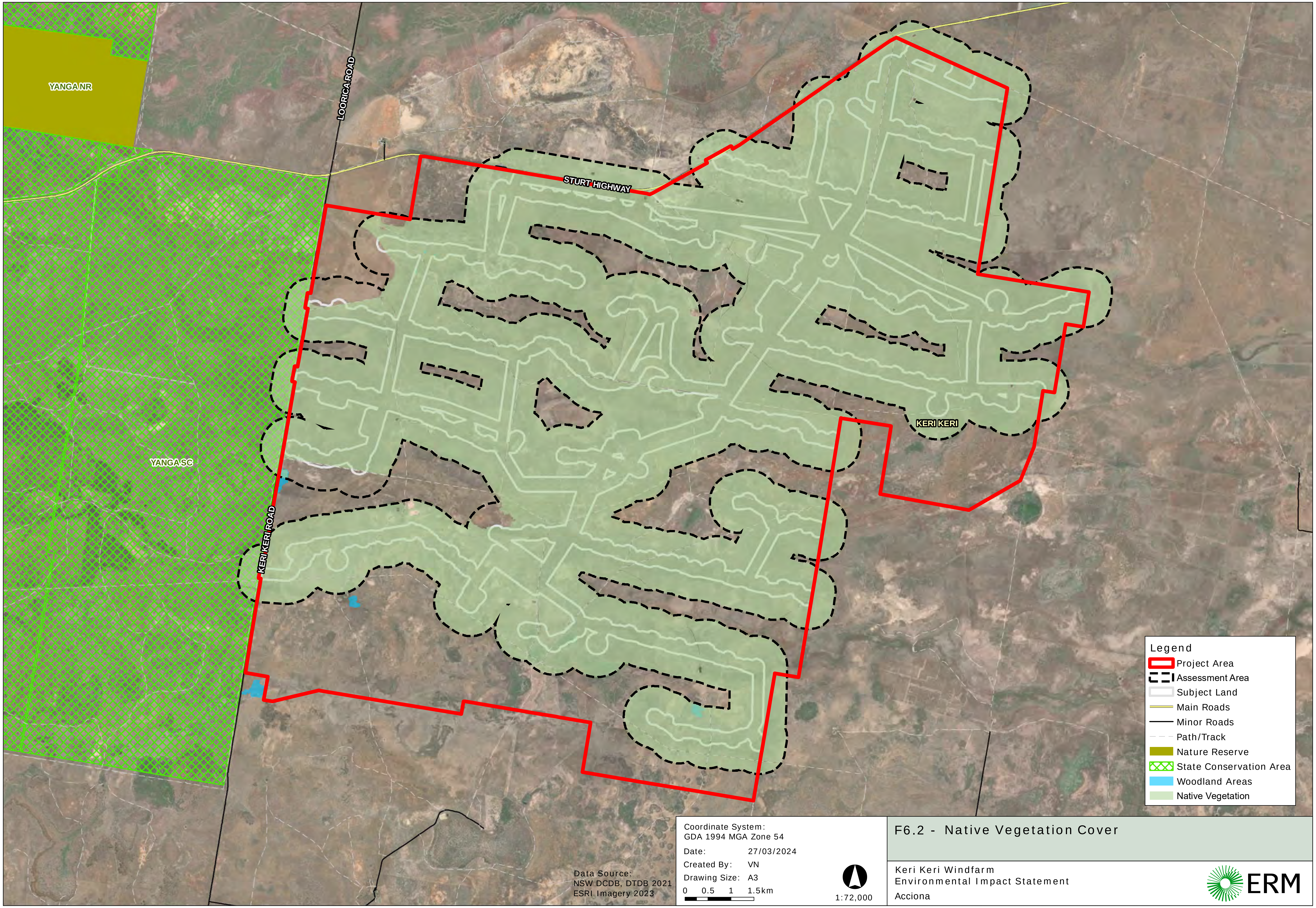
6.1.3.3 NATIVE VEGETATION

Native Vegetation Cover

The extent of native vegetation across the Subject Land is provided in **Figure 6-2** and summarised in **Table 6-2** which includes the parameters that were entered in the BAM Calculator (BAM-C).

TABLE 6-2 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%



Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F6.2 - Native Vegetation Cover

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

0617753_KKWF_EIS_G031_R0.mxd

Non-native Vegetation

According to landscape groups based on Keith (2004), the area of non-native vegetation mapped within the Project Area is 32.80 ha, with only 8.09 ha of non-native vegetation mapped within the Disturbance Footprint.

Following field verification of vegetation mapping, no addition areas of vegetation within the Subject Land re-allocated to non-native vegetation.

Vegetation Classification

BAM plots carried out during field surveys (Appendix B of **Appendix G**) were classified using the Bray-Curtis similarity index to produce a resemblance matrix to aid in PCT identification within the Subject Land. Section 4.1.3 of **Appendix G** describes the statistical analyses used to justify the robustness of this method. These analyses 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 (ANOSIM) to calculate the Global R Statistic and test for differences between unordered SIMPROF groups.

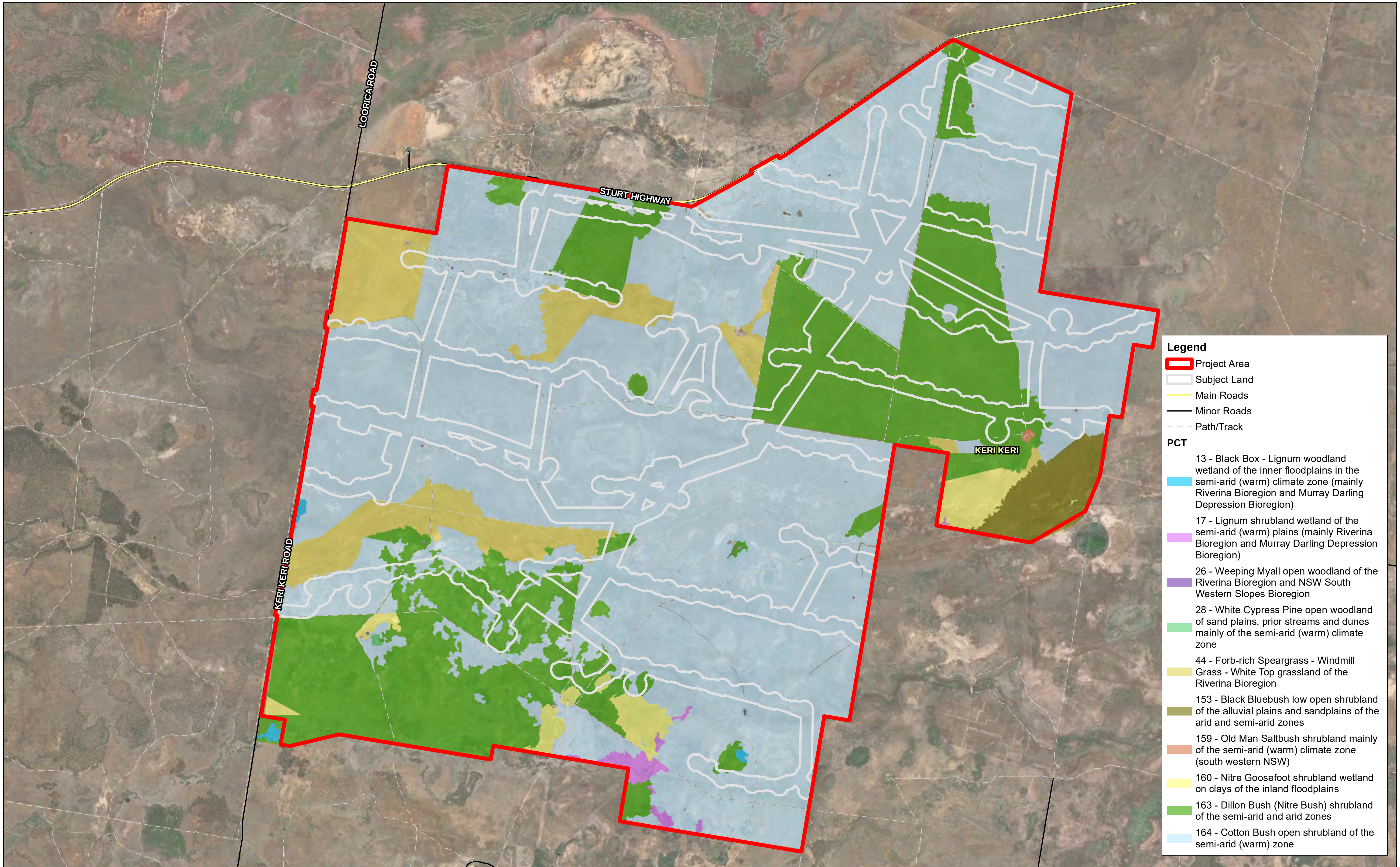
A similarity percentage (SIMPER) analysis of the SIMPROF groups was then performed to identify the characteristic species of those groups. Characteristic species were reported for each group and related to PCT descriptions to assign the best fit PCT.

Plant Community Types

PCTs across the Subject Land were determined based on the results of the SIMPER analysis. These are summarized in **Table 6-3** with extent shown in **Figure 6-3** and corresponding vegetation zones shown in **Figure 6-4**.

TABLE 6-3 PCTS IDENTIFIED IN THE SUBJECT AREA

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**



Coordinate System: GDA 1994 MGA Zone 54

Date: 27/03/2024

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Drawing Size: A3

F6.3 - Plant Community Types

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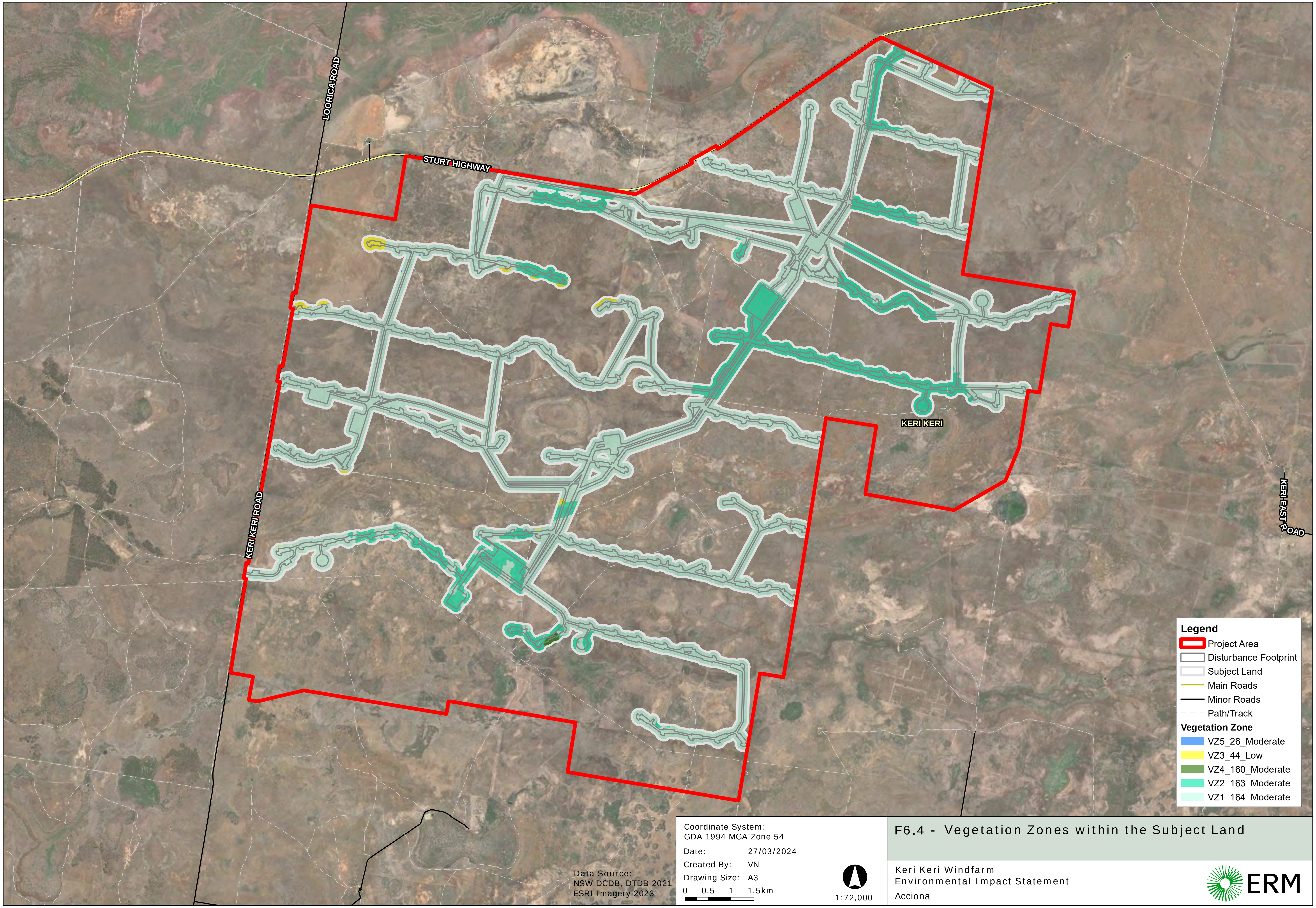

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F6.4 - Vegetation Zones within the Subject Land

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Threatened Ecological Communities

Desktop database searches (e.g., PMST, BioNET) identified three EPBC Act listed TECs with the potential to occur within the Subject Land. Two additional TECs listed under either the BC Act and/or EPBC Act were determined to be associated with PCTs verified as present within the Subject Land. Consideration of these TECs is provided in **Table 6-4**.

TABLE 6-4 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 acrocarpa*), recorded within the Subject Land.
Natural Grasslands of the Murray Valley Plains	-	Critically Endangered	PCT 44	No – Further discussed below.
Weeping Myall Woodlands Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Endangered	Endangered	PCT 26	Yes – patches of associated PCT 26 meet the criteria for the BC Act listed TEC. The criteria for the EPBC Act listed TEC is not met. Further discussed below.

Four of the TECs shown in Table 6-4 were discounted from being present within the Subject Land due to the Subject Land being outside of the TECs distribution or the absence of associated PCTs or lack of key diagnostic features within the Subject Land.

Exclusion of the Natural Grasslands of the Murray Valley Plains TEC from the Subject Land was justified as follows:

The Natural Grasslands of the Murray Valley Plains TEC is listed as 'Critically Endangered' under the EPBC Act and currently has no associated TEC under the BC Act. Regionally, a substantial part of the TEC lies within VIC, where it is listed under the Flora and Fauna Guarantee Act 1988 (FFG Act) as the threatened Northern Plains Grassland ecological community. However, this listing does not extend into the Murray-Darling Depression IBRA Bioregion; therefore, it is not considered to be relevant to the Subject Land.

Weeping Myall Woodland EEC has been confirmed to occur within the Subject Land. The Weeping Myall Woodlands TEC is listed as 'Endangered' under both the EPBC Act and the BC Act. 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 this TEC is not considered to be present under its EPBC Act listing. Regardless, all areas of PCT 26 within the Subject Land have been avoided.

Vegetation Zones

Vegetation zones are used to define the condition of PCTs mapped in a given location. For the Subject Land, vegetation zones were identified and delineated based on confirmed PCTs with similar levels of disturbance to growth form groups and/or extent of exotics, and then grouped. **Table 6-5** summarises the plot requirements based on the size and number of vegetation zones within the Disturbance Footprint. Four vegetation zones were identified within the Disturbance Footprint.

TABLE 6-5 VEGETATION ZONES AND 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

One vegetation zone, VZ5, is present in the micro-siting corridor only and it is not present within the Disturbance Footprint, and has therefore not been considered in the BAM-C.

Vegetation Integrity Scores

Vegetation integrity is a metric-based assessment used to measure the condition of native vegetation against a benchmark, based on survey data collected for a specific Project. Each of the vegetation zones identified (above) was assessed to obtain a quantitative measure of the composition, structure and function (i.e., BAM plot data) for identified PCTs. The vegetation integrity score (VIS) is then calculated in the BAM-C for each vegetation zone mapped within the Disturbance Footprint. The relevant vegetation integrity scores are summarised in **Table 6-6.**

TABLE 6-6 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

6.1.3.4 THREATENED SPECIES HABITAT AND SPECIES CREDITS

Habitat suitability for threatened species was determined by reviewing the DPE Threatened Biodiversity Data Collection (TBDC) with the BAM-C results. Existing vegetation and landscape features may be suitable habitat for a variety of threatened species for which the TBDC categories as three types of 'credit species':

- Ecosystem credit species – threatened species whose occurrence can generally be predicted by existing vegetation and/or landscape features;
- Species credit species (or candidate species) – threatened species named specifically by the TBDC to be associated with the existing vegetation and/or landscape features; and
- Dual credit species – threatened species identified as both ecosystem credit species and candidate species.

Table 6-7 summarises the predicted ecosystem credit species. **Table 6-8** and **Table 6-9** summarises the candidate flora and fauna species respectively where the latter includes whether fauna species are dual credit species. The sensitivity to gain classification for each species is provided, this is a ranking of either low, moderate, high or very high, and describes the level of effectiveness of management in controlling threats at a biodiversity stewardship site. For a species with very high sensitivity to gain class, the ability to control key threats at the site scale is negligible whereas a species with a low sensitivity to gain class has good capability to colonise improved habitat on a biodiversity stewardship site.

TABLE 6-7 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

TABLE 6-8 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 6-9 PREDICTED FAUNA CANDIDATE 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

Excluded Threatened Species

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 (breeding) (*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 (breeding) (*Phascolarctos cinereus*);
  - Pink-tailed Legless Lizard (*Aprasia parapulchella*);
  - Pink Cockatoo (breeding) (*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*).

Threatened Species Assumed Present

Although the following species were observed within across the Project Area, insufficient targeted survey resulted in assumed presence within the disturbance footprint within areas of associated PCT of suitable condition that were not adequately surveyed:

- 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).

These species are also considered to be candidate species (refer below for details).

Threatened Species Confirmed Present

Fourteen threatened species have been determined to occur within the Subject Land and one 'possible' microbat species (*Myotis macropus*). These species are detailed in **Table 6-10** and are categorised as ecosystem credit species, candidate species, and other listed species.

While two predicted fauna species were categorised as dual credit species (**Table 6-9**), these comprised of breeding populations which are not considered to be within the Subject Land. Therefore, dual credit species were not assessed further.

Species polygons are required to be prepared in accordance with the BAM for each candidate species present, or assumed to be present, within the Subject Land, and are based on the specifications outlined in the TBDC and relevant guidelines for each species.

Ecosystem Credit Species

Of the fourteen threatened species confirmed to be present in the Subject Land, seven are ecosystem credit species, namely:

- 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*).

These species do not require species polygons and are instead associated with the four vegetation zones and associated VIS described in **Table 6-5**.

Candidate Species

Four candidate species qualified for offset requirements for which species polygons were prepared:

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

Figure 6-5 to **Figure 6-8** show the extent of polygons for the above species.

Other Species

Three listed species not populated by the BAM-C were detected across the Subject Land:

- Fork-tailed Swifts (*Apus pacificus*), a migratory species listed under the EPBC Act;
- Southern Myotis (*Myotis macropus*) that had a possible detection by Anabat devices but has no associated PCTs within the Subject Land; and
- Blue-winged Parrot (*Neophema chrysostoma*) which became listed in NSW in late 2023 and is yet to be incorporated into the BAM-C, TBDC and BioNet Atlas.

None of the remaining candidate species nor their habitat components (e.g., hollow bearing trees) were detected within the Subject Land during targeted surveys.

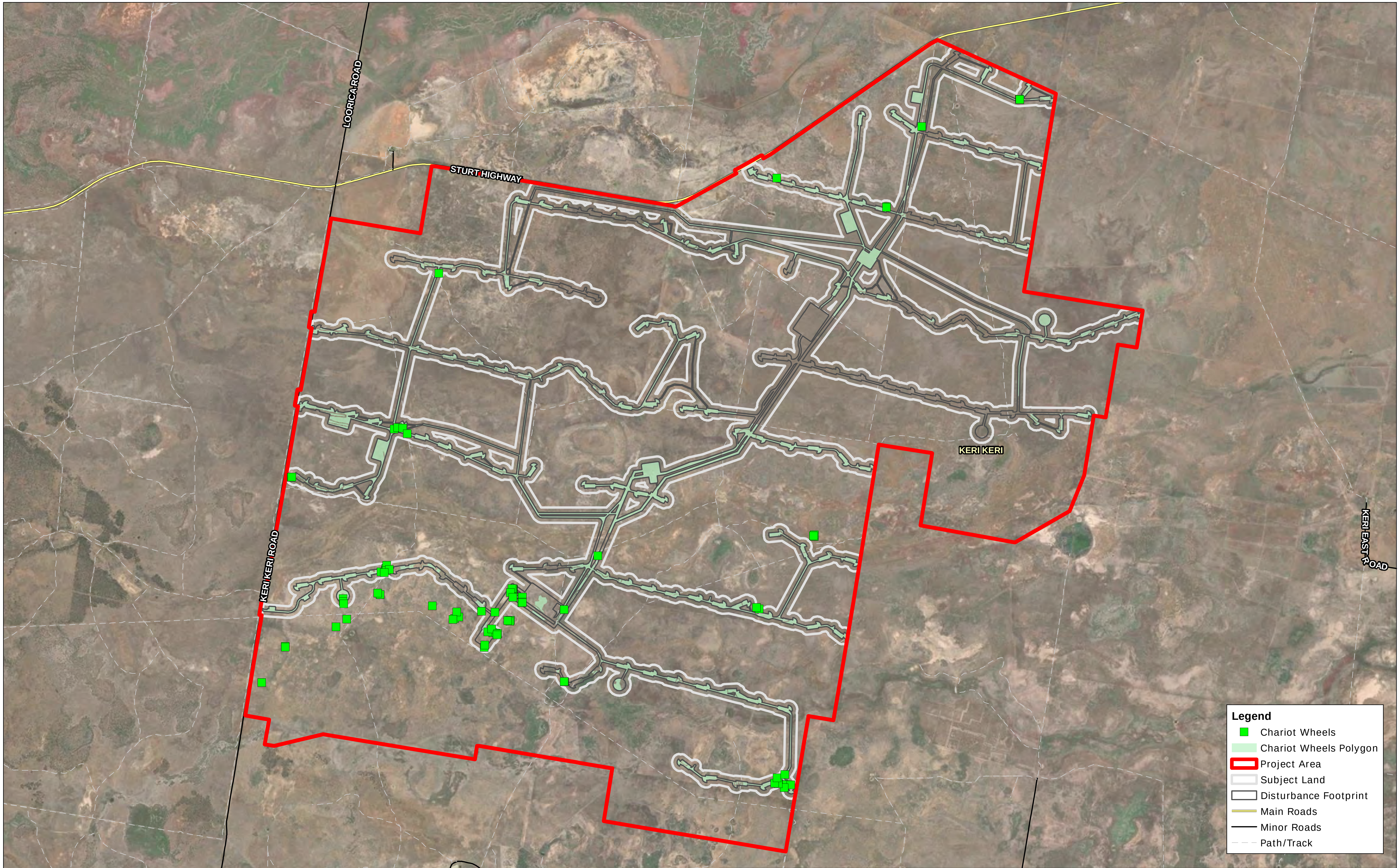
TABLE 6-10 PRESENT AND ASSUMED THREATENED SPECIES

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity?	Record Notes	Species Polygon
Candidate Species							
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.
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.

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
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*	V	-	N/A	No	Definite recording on 7 Anabat recorders in Summer 2022 (**Appendix D** of **APPENDIX G**).	N/A
White-fronted Chat	*Epthianura albifrons*	V	-	N/A	No	Recorded within open chenopod shrublands across the Subject Land during all survey events.	N/A

Common name	Scientific name	BC Act	EPBC Act	Biodiversity risk weighting	SAII entity?	Record Notes	Species Polygon
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** of **APPENDIX G**)	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.
Blue-winged Parrot	*Neophema chrysostoma*	V	V	N/A	No	One individual recorded in October 2023	No guidance for the assessment of this species has been released in NSW, in the interim we are assessing this species under the EPBC Act only.

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



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Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024
Created By: VN
Drawing Size: A3

0 0.5 1 1.5km

1:72,000

F6.5 - Species Polygon for Chariot Wheels (*Maireana cheelii*)

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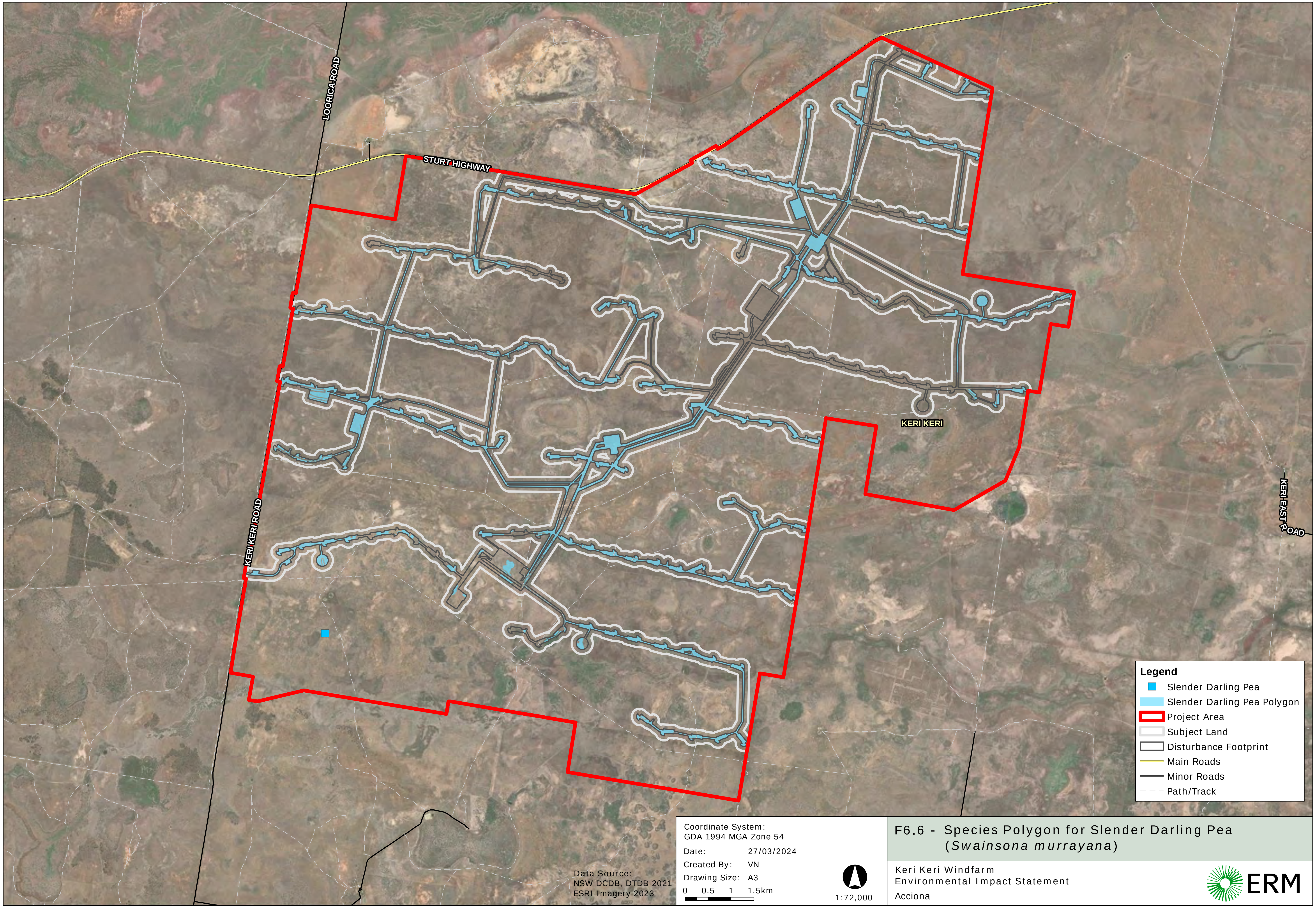

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GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F6.6 - Species Polygon for Slender Darling Pea (*Swainsona murrayana*)

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Acciona

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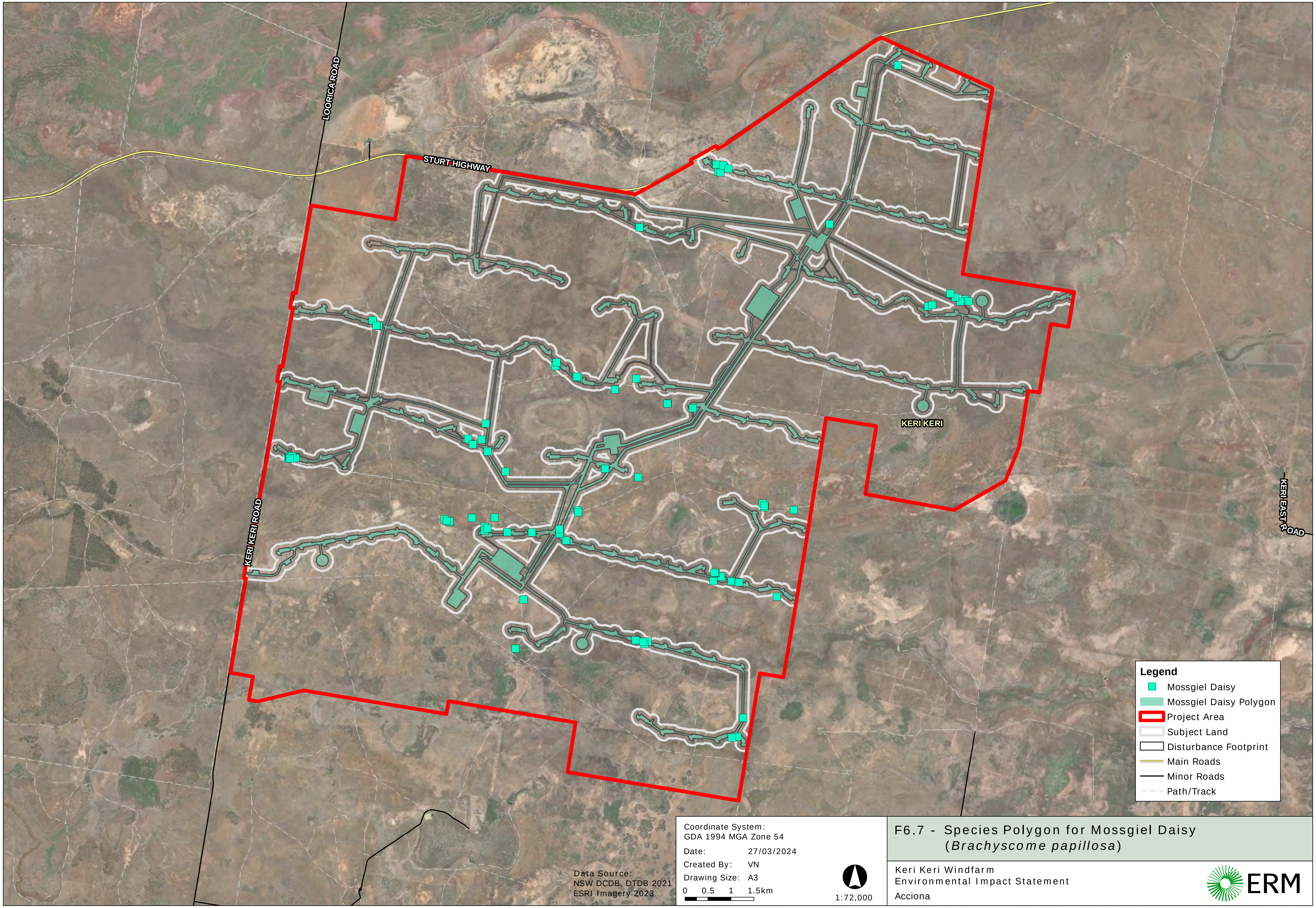

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F6.7 - Species Polygon for Mossgiel Daisy (*Brachyscome papillosa*)

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Acciona

ERM

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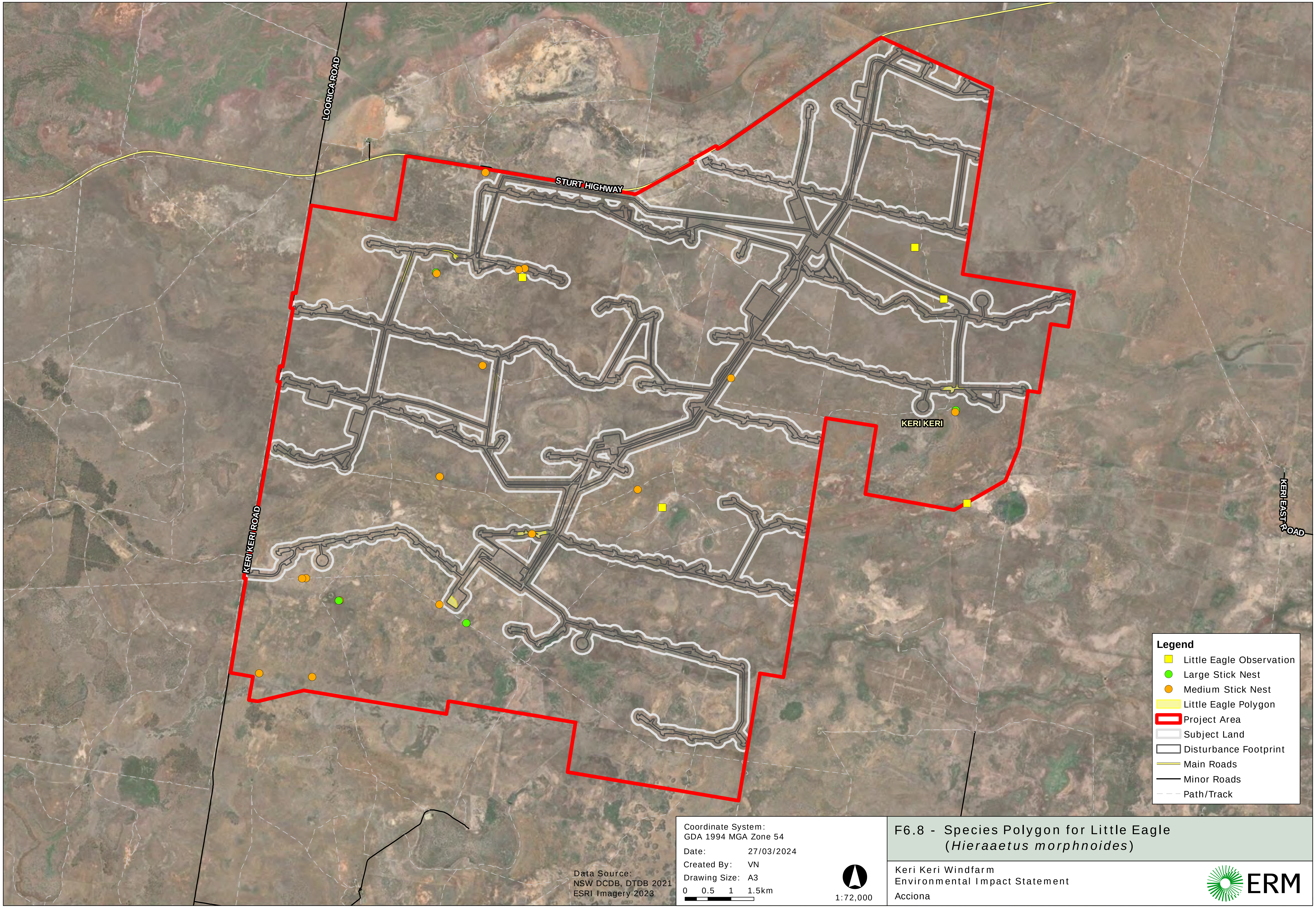

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F6.8 - Species Polygon for Little Eagle (*Hieraaetus morphnoides*)

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6.1.3.5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Supplementary SEARs provided by the Commonwealth identified MNES for consideration as a controlled action under Part 7 of the EPBC Act. **Table 6-11** presents those threatened species and communities listed by the supplementary SEARs and are assessed in **Section 6.1.5.4**.

TABLE 6-11 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

6.1.3.6 BIRDS AND BATS

Bird Community Composition

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.

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.

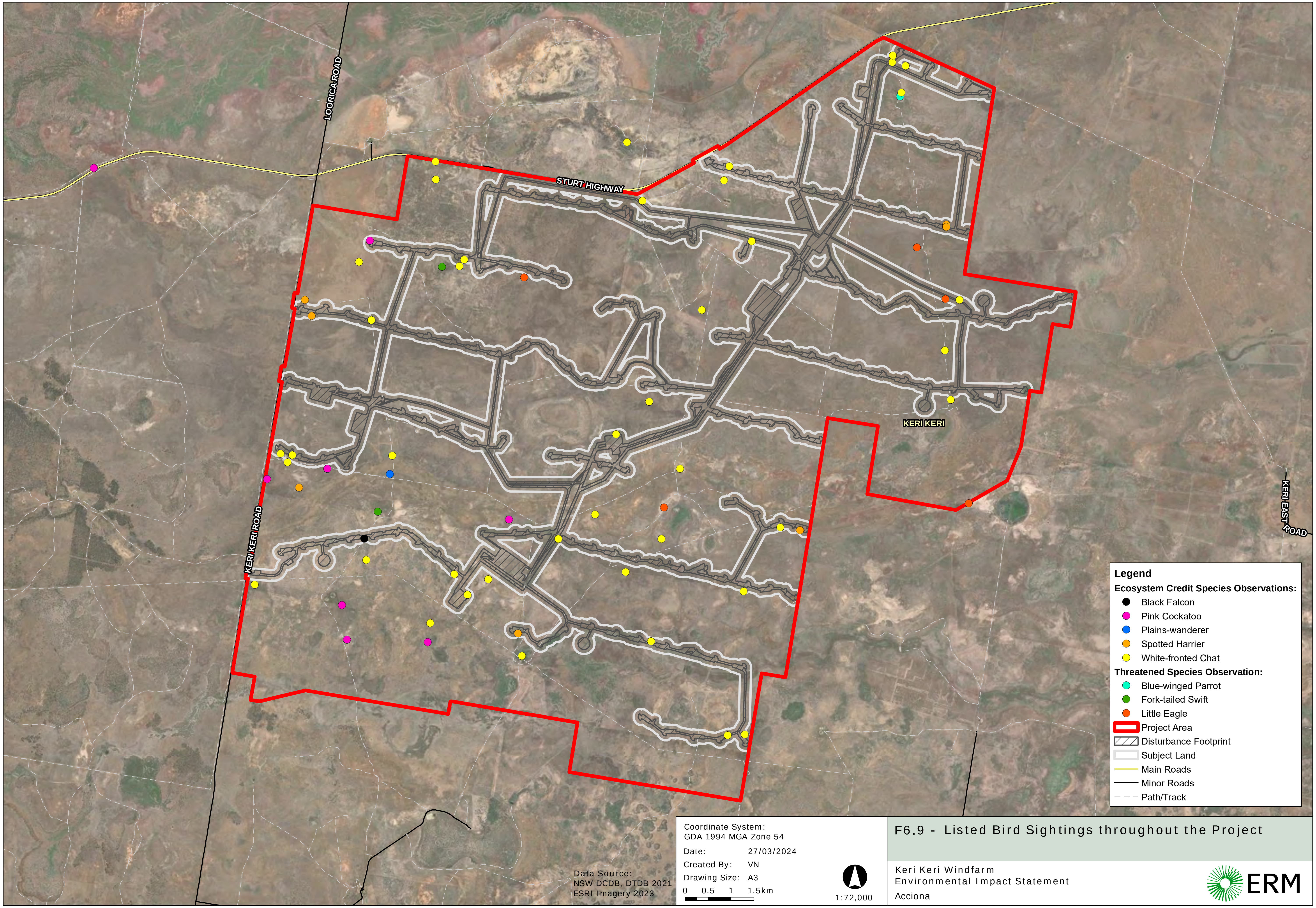
Raptor Habitat

As per Section 6.1.5 of the BAM, the likely habitat for resident raptor species has been determined within the Subject Land. This aligns with broad habitat types identified across the landscape and are grouped based on Keith (2004) vegetation classes as presented in **Table 6-12**. As all habitat across the Subject Land conforms with raptor habitat, resident raptors are anticipated to inhabit the entirety of the site.

TABLE 6-12 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
Total		**4,228.09**	**1,139.03**

A census of stick nest locations has also been collated and is shown in **Figure 6-9**.



Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

F6.9 - Listed Bird Sightings throughout the Project

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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Bat Community Composition

Anabat monitoring identified 14 species of microbat and is presented in **Table 6-13**.

TABLE 6-13 BAT CALL ANALYSIS RESULTS

Scientific Name	Common Name	BC Act Listing	EPBC Act Listing	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.

Bird and Bat Adaptive Management Plan (BBAMP)

The risk of collision between birds and bats and WTGs poses potential impacts to all species, not only those listed under the BC Act and EPBC Act. A BBAMP will be prepared for the Project and will be in line with the Onshore Wind Farm Guidance (DCCEEW, 2023) where specific objectives of individual species to achieve outcomes will be provided. 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.

Species Excluded from Collision Risk Modelling

BUS and Anabat monitoring results considered the following criteria on whether bird and bat species are not at risk of collision with WTGs:

- 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?
- 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 also discounted from WTG collision risk. These excluded species are described in **Table 6-14**.

TABLE 6-14 CANDIDATE AND ECOSYSTEM CREDIT SPECIES EXCLUDED FROM COLLISION RISK ASSESSMENT

Species	BC Act Listing	EPBC Act Listing	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.
Pyrrholaemus brunneus	V	-	The redthroat is a mostly ground dwelling bird occurring mostly in arid and semi-arid regions containing acacia

Species	BC Act Listing	EPBC Act Listing	Comments
Redthroat			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. 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.

Vagrant Species

Vagrant species with potential to occur within the Subject Land were ascertained by reviewing candidate and ecosystem credit species not listed as 'migratory' and not observed within the Project Area despite being associated with identified suitable habitat. While these species are not considered present upon survey efforts, there is potential for those species known to fly at RSA height and disperse over large distances during the Project's operational phase and are therefore considered as vagrant species to be included in. **Table 6-15** lists the vagrant species and their associated PCTs for which no bats were identified.

TABLE 6-15 VAGRANT SPECIES WITH POTENTIAL TO OCCUR

Species	BC Act Listing	EBPC Act Listing	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

Collision Risk Assessment

The collision risk assessment (CRA) used 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).

Further consideration is given to threatened species listed under the BC Act and/or EPBC Act.

The Blue-winged Parrot (Vulnerable under EPBC Act and BC Act), Pink Cockatoo (Endangered under the EBPC Act and Vulnerable under the BC Act), and Little Eagle (Vulnerable under BC Act) have been confirmed to occur within the Project Area. 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 with Project WTGs, and so mortality due to collision with WTGs is still possible. While collision risk modelling is not possible, the species were considered within the collision risk assessment and thresholds for impact triggers were dentified.

Three non-threatened species (White-necked Heron, Letter-winged Kite, And Black-shouldered Kite) were identified flying at heights within the RSA but with insufficient numbers for inclusion in the CRA. While these species may still be at risk of collision within the Subject Land, none are listed under either the EPBC Act or BC Act thus no CRA has been undertaken.

Twelve bird species were considered in the CRM. A summary of modelled outputs is presented in **Table 6-16**. Three different avoidance scenarios (95%, 98%, and 99%) have been included.

TABLE 6-16 CRA 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**

The CRM Model indicates that about 15 birds are expected to collide with the WTGs per year assuming the lowest avoidance rate of 95%. Under scenarios with avoidance rates of 98% and 99%, about 6 and 3 birds respectively may collide with WTGs per year. This is the worst-case scenario, based on the modelling approach as described. **Table 6-16** demonstrates that the overall collision risk is driven by the Straw-necked Ibis at 14.01 per year based on 95% avoidance. The collision risk for other species is significantly lower. The Straw-necked Ibis is not a listed threatened species; however, it is listed marine under the EPBC Act. This species is typically a waterbird, frequenting inundated areas. Periods of extended inundation occur infrequently in the Project Area, and all areas of wetland habitat have largely been avoided.

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.

6.1.3.7 HAULAGE ROUTE ASSESSMENT

Table 6-17 summarises the existing landscape features within the haulage routes from the Port of Newcastle and Port of Adelaide (within NSW land).

The haulage route was assessed for the presence of native vegetation that aligns with NSW PCTs via rapid vegetation assessments. No vegetation integrity surveys were undertaken in accordance with the BAM.

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 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 (PP11, 12 and 13) within PCT 164.

A small area of the haulage 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 Highway and Cobb Highway 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 of **Appendix G**.

TABLE 6-17 HAULAGE ROUTE LANDSCAPE FEATURES

Landscape feature	Description for each pinch point (PP)		
	PP09	**PP10**	**PP11, PP12 and PP13**
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, PP12 and PP13 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	PP11 and PP12 are situated across the Murrumbidgee Scalded Plains Mitchell Landscape. PP13 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	PP11, PP12 and PP13 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, PP12 and PP13 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

6.1.4 AVOIDANCE AND MINIMISATION THROUGH DESIGN

Since the conception of the Project, 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 EIS.

6.1.4.1 NATIVE VEGETATION

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 hollow bearing trees, 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 TEC 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.

6.1.4.2 RAPTOR HABITAT

The Project Area supports 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. Field surveys also recorded evidence of Little Eagle (*Hieraaetus morphnoides*) breeding 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.

6.1.4.3 PLAINS-WANDERER

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 is within the Disturbance Footprint.

6.1.4.4 WATERBODIES

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.

One ephemeral creek line intersects the Subject Land. As necessary, fish passage will be provided in the design of waterway crossings of this creek line, which was identified as associated with the FM Act listed Lower Murray River EEC.

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

6.1.4.5 SUMMARY

Table 6-18 summarises the evolution of the Project layout and the amendment responses to key environmental and other land use limitations identified.

TABLE 6-18 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

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 6.1.6**.

6.1.5 ASSESSMENT OF IMPACTS

6.1.5.1 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 Disturbance Footprint 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 6-19**); and
- Threatened species and threatened species habitat (outlined in **Table 6-20**).

TABLE 6-19 SUMMARY OF IMPACTS TO NATIVE VEGETATION

Vegetation Zone	BC Act Listing	EPBC Act Listing	SAII entity?	Project phase/ timing of impact	Extent (ha)
VZ1 (PCT 164 – Moderate)	-	-	No	Construction	855.73
VZ2 (PCT 163 – Moderate)	-	-	No	Construction	268.58
VZ3 (PCT 44 - Moderate)	-	-	No	Construction	4.78
VZ4 (PCT 160 – Moderate)	-	-	No	Construction	1.84
Total					1,130.93

TABLE 6-20 SUMMARY OF RESIDUAL IMPACTS TO THREATENED SPECIES AND THREATENED SPECIES HABITAT

Candidate Species	BC Act Listing	EPBC Act Listing	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.

Table 6-21 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 6-21 IMPACTS TO VEGETATION INTEGRITY SCORE

Vegetation zone	Management zone	Area (ha)	VI Score Before Development			Change in VI score
			Composition	Structure	Function	
VZ1 (PCT 164 – Moderate)	Complete clearance	855.38	98.5	96.7	-	-97.6
VZ2 (PCT 163 – Moderate)	Complete clearance	265.66	97.8	86.8	-	-92.2
VZ3 (PCT 44 - Moderate)	Complete clearance	5.14	98	18.7	-	-42.8
VZ4 (PCT 160 – Moderate)	Complete clearance	4.76	86	65.5	-	-75.1

6.1.5.2 INDIRECT IMPACTS

Without any measures to avoid, minimise or mitigate impacts, the Project could result in the following indirect impacts on biodiversity:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to edge effects;
- Transportation of weeds and pathogens from the subject site to adjacent vegetation;
- Trampling of threatened flora species;
- Increase in predators; and
- Increase in pest animal populations.

Mitigation measures are proposed, as described in **Section 6.1.6**, to minimise the potential for indirect impacts to occur.

6.1.5.3 PESCRIBED IMPACTS

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 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 occurred throughout the design reduction phase. However, two dams remain within the Disturbance Footprint. Given that the vegetation communities 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

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 occurred throughout the design reduction phase. However, two dams remain within the Disturbance Footprint. Given that the vegetation communities 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.

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 which will include the following details as a minimum:

- 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 and Science (BCS) Division, following approval of the Project.

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.

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 Construction Environmental Management Plan (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.

6.1.5.4 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Table 6-22 discusses the methods used to determine presence and impact of the Project to the identified threatened entities listed under the EPBC Act.

Field surveys concluded that three of the threatened flora species (Chariot Wheels, Slender Darling Pea and Mossgiel Daisy) are present and will be impacted by the Project. The remaining two threatened flora species (Winged Peppercress and *Austrostipa metatoris*) have been concluded to not occur within the Project Area.

One threatened fauna species (Plains-wanderer) 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 6-22 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.
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.
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.
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.
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.

6.1.5.5 SERIOUS AND IRREVERSIBLE IMPACTS

Section 7.16 of the BC Act outlines provisions relating to a SAII on a threatened entity that is likely to contribute significantly to its risk of extinction. A SAII is considered if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct if:

- 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.

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

No TECs are at risk of SAII as a result of the Project.

6.1.5.6 IMPACTS THAT REQUIRE OFFSET

Impacts requiring an offset are shown in **Figure 6-10**. 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 a TEC listed as 'endangered' or 'critically endangered';
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a TEC listed as 'vulnerable'; or
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

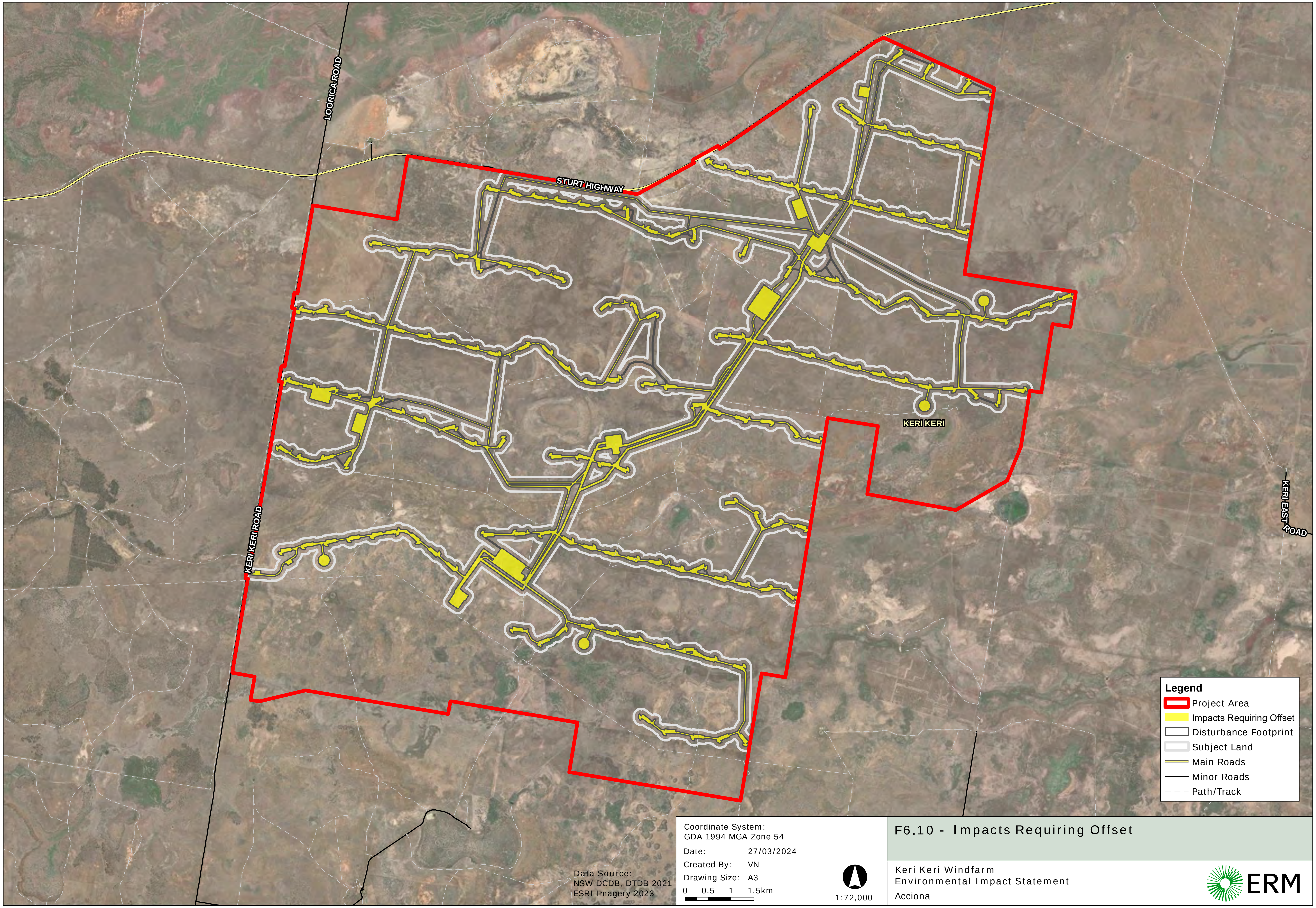
All PCTs mapped within the Subject Land that are to experience a permanent direct impact require offsetting as they meet the vegetation integrity score thresholds above.

Ecosystem Species Credits

Table 6-23 presents the number of credits required for ecosystem credit species associated with the vegetation zones.

TABLE 6-23 IMPACTS THAT REQUIRE OFFSET – ECOSYSTEM SPECIES CREDITS

Vegetation zone	Impact area (ha)	Change in VI score	Number of ecosystem credits required
VZ1 (PCT 164 – Moderate)	855.38	-97.6	31,315
VZ2 (PCT 163 – Moderate)	265.66	-92.2	9,282
VZ3 (PCT 44 - Moderate)	5.14	-42.8	102
VZ4 (PCT 160 – Moderate)	4.76	-75.1	52



F6.10 - Impacts Requiring Offset

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Candidate Species Credits

Candidate species requiring an offset are presented in **Table 6-24**.

TABLE 6-24 IMPACTS THAT REQUIRE OFFSET – CANDIDATE 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).

Offset Strategy

Reduction in Calculated Offset Liability

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. The assumed presence approach is for species that are not listed as SAII entities.

Prior to vegetation clearing commencing on site, the Applicant will undertake additional targeted surveys (as required by the BAM) 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 Disturbance Footprint.

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 6-25**.

TABLE 6-25 APPLICATION OF ANCILLARY RULES – PRESCRIBED BIODIVERSITY CONSERVATION ACTIONS

Common name	Scientific name	Prescribed Biodiversity Conservation Actions
Chariot Wheels	*Maireana cheelii*	Targeted 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.

6.1.6 MITIGATION MEASURES

Table 6-26 summarises the avoidance and minimisation measures to be implemented for direct, indirect and prescribed impacts.

TABLE 6-26 SUMMARY OF PROPOSED MITIGATION AND MANAGEMENT MEASURES FOR RESIDUAL IMPACTS (DIRECT, INDIRECT AND PRESCRIBED)

Mitigation measure	Method	Timing
Offsets	Residual impacts on habitat will be offset through the Biodiversity Offset Scheme. The residual impact of the Project is to be verified for the following species by way of completing seasonally appropriate targeted survey: • Chariot Wheels • Slender Darling Pea; and • Mossgiel Daisy. A revised offset liability is to be calculated for any reduction in the residual impact as calculated and stated in this report.	Detailed design
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

Mitigation measure	Method	Timing
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
Chemical Protocols	Protocols for the use of spraying exclusion zones around Plains-wanderers and their habitat to be implemented	Construction phase
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
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
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
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:	Construction and operations phase

Mitigation measure	Method	Timing
	• 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 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 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
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
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

Mitigation measure	Method	Timing
Bird and Bat Adaptive Management Plan	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

6.1.7 CONCLUSION

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; and
- PCT 164 Cotton Bush open shrubland of the semi-arid (warm) zone – 855.73 ha.

The following ecosystem credit species are associated with the above PCT areas:

- Spotted Harrier (*Circus assimil*is);
- 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 for the four candidate 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; and
- Little Eagle (*Hieraaetus morphnoides*) – 16.33 ha.

The impact areas of the candidate flora species (assumed present) are expected to be reduced by the completion of further targeted seasonal surveys.

The presence of one PCT subject to clearing has been confirmed across the haulage route:

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

6.2 ABORIGINAL CULTURAL HERITAGE

6.2.1 INTRODUCTION

An ACHAR has been prepared to assess the potential impacts of the Project on Aboriginal cultural heritage and identify mitigation and risk management measures to be implemented during construction and operation.

The ACHAR was prepared to address the requirements of the SEARs (**APPENDIX A**), in consideration of relevant stakeholder engagement (**Section 5**), targeted engagement (**Section 6.2.2**), relevant legislation, and in accordance with the following policies:

- 'Code of Practice for the Investigation of Aboriginal Objects in NSW' (DECCW, 2010c);
- 'Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW' (OEH, 2011);
- 'The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance' (Burra Charter) (Australia ICOMOS, 2013); and
- 'Aboriginal Cultural Heritage Consultation Requirements for Applicants 2010' (ACHCRs) (DECCW, 2010b).

The ACHAR is provided in **APPENDIX H**.

The scope of the ACHAR included:

- Consultation with Aboriginal communities in relation to the Project;
- Review of the landscape and natural resources of the Project Area to establish background parameters;
- Research of Aboriginal cultural heritage literature and archaeological records on a regional and local context, including review of the Aboriginal Heritage Information Management System (AHIMS) database and other relevant database;
- Archaeological surveys within the Project Area. The aims of the field survey were to:
  - Identify the presence or absence of Aboriginal cultural material within the Project Area;
  - Assess the likely extent and nature of any such cultural material;
  - Assess the archaeological significance of any cultural material;
  - Provide an opportunity for RAPs to assess the cultural significance of any material; and
  - Assess the management requirements for any cultural material.

6.2.2 ABORIGINAL COMMUNITY CONSULTATION

A key objective of the ACHAR was to identify any cultural values within the landscape in which the project is located so that those values can be recognised and incorporated into mitigation and management measures. Aboriginal community consultation was undertaken in accordance with ACHCRs (DECCW, 2010b). A log and copies of correspondence with Aboriginal community stakeholders is presented in Appendix C of the ACHAR (**APPENDIX H**). The ACHCRs include four main engagement stages:

- Stage 1: Identify RAPs who wish to be consulted about the Project;

- Stage 2 & 3: Provide information about the Project to the RAPs and acquire information regarding Aboriginal cultural values associated with the Project through RAP consultation and field work; and
- Stage 4: Produce a draft ACHAR to be issued to all RAPs for their consideration.

Consultation undertaken for each stage above is summarised in **Table 6-27**.

TABLE 6-27 ABORIGINAL COMMUNITY CONSULTATION PROCESS

ACHCR Stage	Actions	Outcome
1	An advertisement was placed in the 'Guardian Swan Hill' on 18 January 2022 to request expressions of interest. A letter seeking information from various agencies was sent on 15 October 2021. Letters were sent to individuals and groups whose contact details had been provided by the government agencies.	The following individuals/ groups registered to be consulted, and constitute the RAPs for the Project: • John Jackson – Individual; • Ian Woods – Nari Nari Tribal Council Ltd; • Vicki Atkinson – Banggerang Aboriginal Corporation; • Jason and Darryl Pappin – Pappin Family Aboriginal Corporation; • Ian Woods – Hay LALC; • Damien Aidon – Balranald LALC; and • Jeanette Crew – Yarkuwa LALC.
2 & 3	Detailed project information was provided in the assessment methodology issued to all RAPs for their consideration on 25 February 2022 with a 28-day review period. The document provided the archaeological context of the Project Area, a description of the proposed survey, and asked whether there were any cultural values that should be considered in the assessment. On 5 September 2022 and 15 February 2023, a project update letter was sent to all RAPs advising who would be engaged to complete the ACHAR.	Several RAPs showed interest in participating in the survey program. No comments were made on the methodology or cultural values during the required review period. Cultural values were discussed during the heritage survey, at a focus group field meeting held on 21 September 2022, and during a consultation workshop held with the Applicant on 23 February 2023.
4	The draft ACHAR was sent to RAPs on 9 February 2024 with a 28-day review period. A follow up reminder for feedback was sent to all RAPs on 10 March 2023. The letter attached to the draft ACHAR invited RAPs to review the ACHAR and provide any comments on the cultural values of the sites recorded and the broader Project Area.	One comment received on 16 February 2024 from Banggerang Aboriginal Corporation whom agreed with the report and had no further comments.

6.2.3 EXISTING ENVIRONMENT

6.2.3.1 LANDSCAPE AND NATURAL RESOURCES

Topography, geology, hydrology, vegetation and land use are critical considerations in understanding Aboriginal cultural heritage of an area. These are described in detail in Appendix G. The current main land use of the Project Area is associated with agricultural production, with historical activities such as vegetation clearing and sub-soil disturbance, potentially impacting Aboriginal sites. These activities may have led to the removal of some site types (e.g., culturally modified trees) and/or disturbance of other site types (e.g., artefact scatters through ploughing and/or stock trampling).

The Project Area is located within the Riverine Plain which is one of the world’s flattest places. Landforms in the region are identifiable on a micro level only with landform development associated directly with former and current distributary channels and the effect of flooding.

The rivers were central to the Aboriginal way of life, providing a rich concentration of food resources. Pardoe (1988) suggested that communities living along the rivers would have controlled access to the water and its resources, the rights to this occupation handed down from ancestors (Eardley 1999). For some eight months of the year, resources in the region were available in abundance; however, for the remaining four months of the year, it was substantially more difficult to forage for food.

For this reason, the Aboriginal communities participated in a semi-sedentary lifestyle, moving periodically based on the availability of local resources, setting up temporary villages along the way. During the Summer when the river systems were abundant, Aboriginal communities would remain in the vicinity for weeks or months (Beveridge 1884).

6.2.3.2 ABORIGINAL ARCHAEOLOGICAL CONTEXT

The Project Area is located approximately 126 km south-east of Lake Mungo, one of the most significant archaeological sites in Australia where AAR have been dated to 45,000 years before present (Hiscock 2000: 21-22). The Project Area is within the boundaries of the Kulin language group of the Western Murrumbidgee, encompassing the Mathi Mathi, Wathi Wathi, Nari Nari and Wemba Wemba language groups, the boundaries of which are difficult to define and often overlap (Pardoe & Martin 2001).

There is limited detail about how Aboriginal people lived on the Riverine Plains, more than 20 km from a main river channel. It is hypothesized that the Riverine Plains were predominantly used in winter when there was usually more surface water resulting from winter rainfall and/or floodwaters pushed out from the rivers along the normally dry creeks. The Aboriginal people within the plains to the west of the lower Murrumbidgee (encompassing the Project Area) were said to retire to the Murrumbidgee and Lachlan Rivers as soon as the water on the plains dried up (Pardoe & Martin 2001).

Large-scale reviews of archaeological site types were completed by Martin in her review of the Hay Plain (Martin 2007; Martin 2010). Prior to modern water control systems, it was noted that the western half of the Hay Plain would have acted as a sump which collected seasonal floodwater and excess rainfall and would have provided appropriate resources for the growth of several plant and animal resources. Mound sites in the area surrounding Gum Creek and the Abercrombie Creek System were noted to be focused on palaeaochannel features and around ephemeral lakes and swamps (Martin 2007: 199).

Much of the Project Area is comprised of predominantly flat landforms with small rises generally adjacent to clay pans, ephemeral lakes, and small ponds. Some of these rises are natural dunes formed along palaeochannels or lake lunettes, and others are culturally created earth mounds, or a combination of both. These rises were identified by Pardoe and Martin as having the potential to retain archaeological deposits as they were the focus of Aboriginal occupation to have easy access to the nearby retained water during dry seasons, and to stay dry when much of the surrounding area was underwater during wet seasons.

Further information and discussion on historical Aboriginal archaeology of the region is provided in **APPENDIX H**.

6.2.3.3 PREVIOUSLY RECORDED SITES

Table 6-28 summarises the results of desktop searches undertaken to identify previously recorded Aboriginal heritage within and adjacent the Project Area.

TABLE 6-28 ABORIGINAL HERITAGE DESKTOP SEARCH RESULTS

Name of Database Searched	Date of Search	Type of Search	Findings
Commonwealth and National Heritage Listings	10 January 2022	Project Area proximity	No places listed on either the National or Commonwealth heritage lists are located within the vicinity of the Project Area.
State Heritage Register (SHR) and s.170 Heritage Registers	10 January 2022	Project Area proximity	No places listed on either the SHR or s.170 heritage registers are located within the vicinity of the Project Area.
AHIMS	1 March 2023	1 km buffer of the Project Area	36 sites returned within the search area. Nine are located within the Project Area.
Local Environmental Plan	10 January 2022	Wakool LEP 2013	None of the Aboriginal places noted occur near the Project Area.

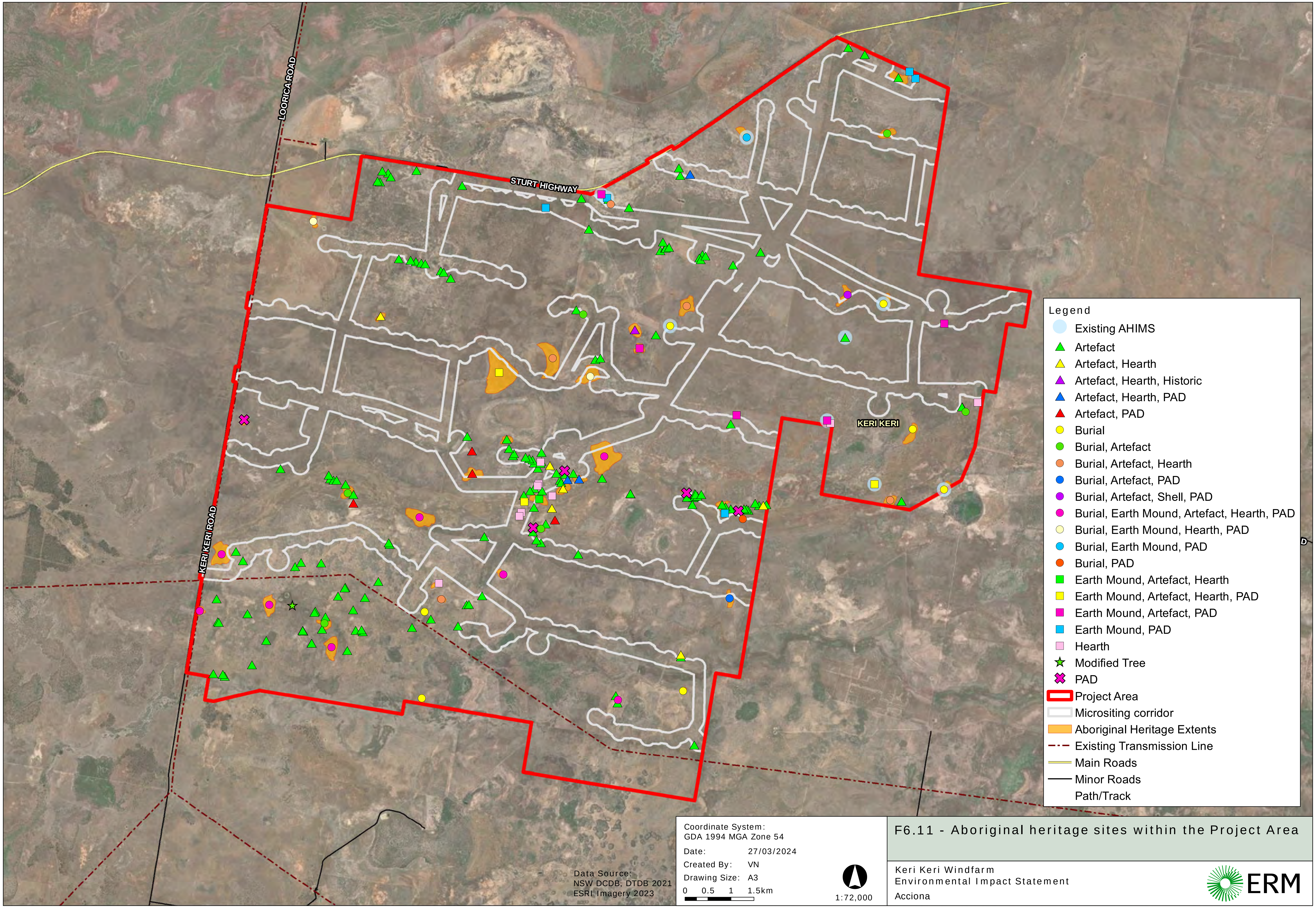
The search of the AHIMS database revealed 36 Aboriginal sites recorded within 1 km of the Project Area. Nine are located within the boundaries of the Project Area, and are varied in type, consisting of burials, earth mounds, PADs, hearths, and artefacts. Many of the registered sites contain multiple site types in one location (e.g., artefact and earth mound and PAD). **Table 6-29** summarises the AHIMS search result within 1 km of the Project Area and is shown in **Figure 6-11**. **Table 6-30** details these nine sites within the Project Area.

TABLE 6-29 AHIMS SEARCH RESULT WITHIN 1 KM OF THE PROJECT AREA

Site Type	Total Number of Site types	Site ID Within Project Boundary
Burial	4	47-6-0947, 48-4-0540, 48-4-0539
Burial, Earth Mound, Hearth	3	
Burial, Earth Mound, PAD	2	47-6-0759
Artefact	7	48-40182
Artefact, Hearth	1	
Artefact, Hearth, PAD	1	
Artefact, Earth Mound, PAD	4	47-6-0755, 48-4-0318
Artefact, Burial, Earth Mound, PAD	1	
Artefact, Earth Mound, Hearth, PAD	2	48-4-0317
Artefact, Hearth, PAD	1	
Earth Mound, PAD	1	47-6-0756
Hearth	5	
Hearth, PAD	2	
Modified Tree (Carved or Scarred)	2	
Total	36	

TABLE 6-30 AHIMS REGISTERED SITES WITHIN THE PROJECT AREA

Site ID	Name	Site Type
47-6-0755	WA-OS5 (West Abercrombie Open Site 5)	Artefact, Earth Mound, PAD
47-6-0756	WA-OS6 (West Abercrombie Open Site 6)	Earth Mount, PAD
47-6-0759	WA-OS7 (West Abercrombie Open Site 7)	Burial, Earth Mound, PAD
47-6-0947	Millicent Burials	Burial
48-4-0182	PTQ1	Artefact
48-4-0317	WA-OS24 (West Abercrombie Open Site 24)	Artefact, Earth Mound, Hearth, PAD
48-4-0318	WA-OS23 (West Abercrombie Open Site 23)	Artefact, Earth Mound, PAD
48-4-0539	Keri Keri Burial 1 2021	Burial
48-4-0540	Lyntot Swamp Burial	Burial



F6.11 - Aboriginal heritage sites within the Project Area

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6.2.4 ABORIGINAL SITES RECORDED IN THE PROJECT AREA

6.2.4.1 SURVEY TIMING

The first field survey of the Project Area was undertaken between 19 April and 29 April 2022. Poor site conditions following rain resulted in survey cancellation of several days, resulting in survey being undertaken across seven days of the 11-day program.

The second field survey season was undertaken between 19 September and 1 October 2022. Again, poor site conditions following rain resulted in survey cancellation of several days. Survey was undertaken across 7.5 days of the 13-day program.

The final field survey season was undertaken between 20 February and 24 February 2023. A forensic anthropology survey of the recorded AAR was undertaken concurrently.

Twenty different RAP site officers participated in the various survey seasons as well as one forensic anthropologist in the final season.

6.2.4.2 NEWLY IDENTIFIED SITES

A total of 209 new sites were recorded within the Project Area across the survey seasons. These are detailed in Appendix A of **APPENDIX H**, illustrated in **Figure 6-11**, and summarised in **Table 6-31** below.

TABLE 6-31 NEWLY IDENTIFIED SITES

Site Type	Number
Artefact	142
Artefact, Hearth	7
Artefact, Hearth, PAD	3
Artefact, PAD	4
Burial	4
Burial, Artefact	6
Burial, Artefact, Hearth	5
Burial, Artefact, PAD	1
Burial, Artefact, Shell, PAD	1
Burial, Earth Mound, Artefact, Hearth, PAD	8
Burial, Earth Mound, Hearth, PAD	2
Burial, PAD	1
Earth Mound, Artefact, Hearth	1
Earth Mound, Artefact, Hearth, PAD	2
Earth Mound, Artefact, PAD	3
Earth Mound, PAD	4
Hearth	9
Modified Tree	1

Site Type	Number
PAD	5
TOTAL	209

6.2.4.3 AREAS OF POTENTIAL ARCHAEOLOGICAL DEPOSITS (PAD)

A total of 34 new locations of PAD were recorded within the Project Area, 24 of which were associated with visible archaeological material such as AAR, hearths, or artefacts. The remaining 10 PADs were recorded as such due to the presence of dunes or earth mounds with similar characteristics to those with visible archaeological material present. Refer **Figure 6-11** for their locations within the Project Area.

6.2.5 SIGNIFICANCE ASSESSMENT

The ACHAR provides an assessment of significance for the cultural heritage sites located within the Project Area. The assessment of significance is a key step in the process of impact assessment for a proposed activity as the significance or value of an object, site or place will be reflected in resultant recommendations for conservation, management or mitigation.

The 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (DECCW, 2010a) requires significance assessment according to criteria established in the Australia Burra Charter (Australia ICOMOS, 2013). The Burra Charter and its accompanying guidelines are considered best practice standard for cultural heritage management, specifically conservation, in Australia. Guidelines to the Burra Charter set out four criteria for the assessment of cultural significance, being – Social or cultural value; Archaeological/ Scientific value; Aesthetic value; and Historic value.

6.2.5.1 SOCIAL OR CULTURAL VALUE

Consultation with the RAPs throughout the process identified that the Project Area demonstrates social significance as part of a wider cultural landscape. In particular, the significance of the Project Area has been identified to be associated with the use of the landscape as a residence and burial area for the Mutthi Mutthi people. These uses are noted particularly in the archaeological record through the prevalence of sites in the sandy earth mounds that are the remnants of embankments and lunettes along palaeochannels and small lakes. This landscape formed one component of a wider cultural landscape which extended towards the Murray River to the south and the Willandra Lakes district to the north.

The Project Area has been assessed to demonstrate high social significance as part of this wider cultural landscape.

No comments were received from the RAPs on the cultural significance of the PADs or broader Project Area other than the single comment in agreement with the assessment (refer **Table 6-27**). As such, the PADs recorded within the Project Area have been provisionally assessed as having high social and cultural values.

6.2.5.2 ARCHAEOLOGICAL/ SCIENTIFIC VALUE

A discussion of the defining characteristics of the sites assessed to demonstrate Low, Moderate and High scientific significance is provided in **Table 6-32** below.

TABLE 6-32 SCIENTIFIC SIGNIFICANCE ASSESSMENT OF ABORIGINAL SITES PRESENT

Site Type	Research potential	Rarity	Representativeness	Educational potential	Overall
Artefact	Low	Low	Low	Low	Low
Burial	High	High	High	High	High
Earth Mound	Moderate	Moderate	Moderate	Moderate	Moderate
Hearth	High	Moderate	Moderate	Moderate	Moderate
CMT	Moderate	Moderate	Low	Low	Low
PAD	Moderate	Unknown	Unknown	Unknown	Unknown
Shell	Moderate	High	Low	Low	Moderate

In summary:

- Isolated stone artefacts and CMTs within the Project Area have been assessed to demonstrate low archaeological significance;
- Sites of moderate scientific significance include earth mounds and hearth features which have research potential, are relatively rare across the national archaeological record but representative at the Project Area level;
- Burial sites within the Project Area have been assessed to demonstrate high scientific significance due to their research potential and rarity; and
- Area of PAD within the Project Area have been assessed to demonstrate unknown scientific significance. These sites would require further investigation through archaeological test excavation to adequately assess their significance.

6.2.5.3 AESTHETIC VALUE

Aesthetic values refer to the sensory, scenic, architectural and creative aspects of the place. These values may be related to the landscape and are often closely associated with social/cultural values.

While the Project Area has some aesthetic values associated with being part of one the flattest landscapes in Australia, it been assessed as having low aesthetic significance due to absence of landmark features within the landscape.

6.2.5.4 HISTORIC VALUE

The ethnographic record indicates significant overlap between the Mutthi Mutthi people and colonial settlers. Archaeologically this has been confirmed to extend in some capacity to the Project Area through the presence of a flaked glass artefact. Despite the evidence of this overlap, the current assessment has not identified a specific person or event of historic value associated with the Project Area.

The Project Area has been assessed to demonstrate low historic significance.

6.2.5.5 SIGNIFICANCE ASSESSMENT SUMMARY

Sites within the Project Area have been evaluated as being of low to moderate and high scientific significance. Sites with low scientific significance include isolated finds, low density artefact scatters, and CMTs. These sites are likely to represent movement through the landscape rather than continued or intensive occupation. Research potential of these sites is low, as they have a low likelihood of contributing to our understanding of past Aboriginal land use practices.

Sites with moderate to high scientific significance include earth mounds, hearth features, and burials. These sites may represent occupation or activity areas subject to repeated use and have research potential that is consistent with other sites in the nearby Willandra Lakes Region World Heritage Area.

Assessment of social/cultural significance can only be undertaken by the local Aboriginal community. No specific areas of social or cultural significance have been identified; however, it is understood that all Aboriginal heritage sites retain significance for the Aboriginal community and the cultural landscape of the Project Area, particularly manifest in the AAR, is highly significant to the Mutthi Mutthi.

6.2.6 LIKELY IMPACTS TO ABORIGINAL HERITAGE

The Project design was amended following each of the three heritage surveys conducted across the Project Area. In each instance, design refinements were made to avoid AAR and minimise impact to any other Aboriginal heritage sites, where possible. Sites identified as having high potential for impact due to their location within the development footprint may also be able to be further avoided by micro siting of turbines and infrastructure within the Disturbance Footprint.

6.2.6.1 DIRECT IMPACTS

A total of 209 new sites with similar features were identified within the Project Area as part of the development of this ACHAR. A summary of potential impacts to identified Aboriginal heritage values has been developed based on the proposed Disturbance Footprint of the Project and are summarised in **Table 6-33**. The area that has been identified as containing infrastructure and likely to require ground disturbance is described as the clearing corridor. The 100 m buffer is described as the micrositing corridor.

TABLE 6-33 POTENTIAL IMPACTS TO ABORIGINAL CULTURAL HERITAGE SITES ASSOCIATED WITH THE PROPOSED PROJECT LAYOUT

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-034	Artefact (isolated)	High- within Biosecurity Washdown	-
KK-035	Artefact (isolated)	High – within hardstand footprint	-
KK-044	Artefact (isolated)	-	Low- easy to avoid (approx. 15m outside micrositing corridor

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-045	Artefact (multiple)	High – within hardstand footprint	-
KK-046	Artefact (isolated)	-	Moderate - can avoid
KK-047	Artefact (isolated)	-	Moderate - can avoid
KK-048	Artefact (multiple)	High – within hardstand footprint	-
KK-049	Artefact (isolated)	Moderate to High – adjacent to hardstand	-
KK-050	Artefact (isolated)	-	Moderate - can avoid
KK-051	Artefact (isolated)	-	Moderate - can avoid
KK-052	Artefact (isolated)	-	Moderate - can avoid
KK-053	Artefact (isolated)	-	Moderate - can avoid
KK-054	Artefact (isolated)	-	Low – easy to avoid (outside corridor)
KK-059	Artefact (isolated)	-	Moderate – can avoid
KK-060	Artefact (isolated)	-	Low – easy to avoid
KK-074	Artefact (isolated)	-	Low – easy to avoid (approx. 60m outside micrositing corridor)
KK-075	Artefact (isolated)	-	Moderate – can avoid
KK-076	Artefact (isolated)	-	Moderate – can avoid
KK-077	Artefact (isolated)	-	Moderate – can avoid
KK-078	Artefact (isolated)	-	Low – easy to avoid (approx. 26m outside the micrositing corridor)
KK-084	Artefact (multiple)	-	Moderate – can avoid
KK-089	Artefact (isolated)	-	Moderate – can avoid
KK-090	Artefact (isolated)	-	Moderate – can avoid
KK-092	Artefact (isolated)	-	Moderate – can avoid
KK-093	Artefact (isolated)	-	Moderate – can avoid
KK-094	Artefact (isolated)	-	Moderate – can avoid
KK-095	Artefact (isolated)	-	Moderate – can avoid
KK-096	Artefact (isolated)	High – within corridor	-
KK-097	Artefact (isolated)	-	Moderate – can avoid
KK-101	Artefact (isolated)	-	Moderate – can avoid
KK-102	Artefact (isolated)	-	Moderate – can avoid
KK-103	Artefact (isolated)	-	Moderate – can avoid

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-105	Artefact (isolated)	-	Moderate – can avoid
KK-106	Artefact (isolated)	-	High – can avoid
KK-107	Artefact (isolated)	-	High – can avoid
KK-108	Artefact (isolated)	-	Moderate to High – can avoid
KK-109	Artefact (isolated)	-	Moderate – can avoid
KK-112	Hearth	-	Low – easy to avoid (approx. 90m outside micrositing corridor)
kk-113	Hearth	-	Low – easy to avoid (approx. 130m outside micrositing corridor)
KK-114	Artefact (isolated)	-	Moderate – can avoid
KK-116	Artefact (isolated)	-	Low – easy to avoid (approx. 30m outside micrositing corridor)
KK-117	Artefact (multiple)	-	Moderate – can avoid
KK-118	Artefact (isolated)	-	Moderate – can avoid
KK-120	Artefact (isolated)	-	Moderate to High – can avoid
KK-121	Artefact (isolated)	-	Moderate – can avoid
KK-122	Artefact (isolated)	-	Moderate – can avoid
KK-126	Artefact (isolated)	-	Moderate to High – can avoid
KK-132	Artefact (isolated)	High – within corridor	-
KK-133	Artefact (isolated)	-	Moderate to High – can avoid
KK-134	Artefact (isolated)	-	Low – easy to avoid (approx. 7 m outside micrositing corridor)
KK-135	Artefact (isolated)	-	Low – easy to avoid (approx. 17 m outside micrositing corridor)
KK-136	Artefact (isolated)	-	Moderate to High – can avoid
KK-137	Artefact (isolated)	-	Moderate- can avoid
KK-138	Artefact (isolated)	-	Moderate – can avoid
KK-139	Artefact (isolated)	-	Moderate – can avoid
KK-140	Hearth	-	Moderate – can avoid
KK-141	Artefact (isolated)	-	Moderate – can avoid
KK-142	Hearth	-	Low – easy to avoid (approx. 15m outside micrositing corridor)

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-143	Hearth	-	Low – easy to avoid (approx. 15m outside micrositing corridor)
KK-144	Artefact (isolated)	-	Moderate – can avoid
KK-145	Hearth	-	Moderate – can avoid
KK-146	Hearth	-	Moderate – can avoid
KK-147	Artefact (isolated)	-	Low – can avoid (outside micrositing corridor)
KK-148	Artefact (isolated)	-	Low – easy to avoid (outside micrositing corridor)
KK-149	Artefact (isolated)	-	Low – can avoid (outside micrositing corridor)
KK-150	Artefact (isolated)	High – within corridor	High – within micrositing corridor
KK-151	Earth Mound, PAD	Moderate- can avoid (approx. 20m from hardstand)	High – partially within micrositing corridor
KK-152	Artefact scatter	Low – can avoid (approx. 77m from clearing corridor)	Moderate to High – partially within micrositing corridor
KK-154	Burial, Artefact	Moderate to High- can avoid (approx. 15m from hardstand boundary)	High – partially within micrositing corridor
KK-155	Artefact, Hearth, PAD	Moderate -can avoid (approx. 6m from hardstand)	High – within micrositing corridor
KK-158	Earth Mound, PAD	Moderate -can avoid (approx. 6m from clearing corridor)	High – within micrositing corridor
KK-159	Burial, Artefact, Hearth	-	Low to Moderate – can avoid (approx. 8m outside micrositing corridor)
KK-160	Burial, Artefact, Hearth	-	Low - adjacent to micrositing corridor (approx. 40m) but can avoid
KK-163	Burial, Artefact	Low to Moderate – approx. 50m from hardstand	High – within micrositing corridor
KK-164	Burial, Artefact, Shell, PAD	Moderate to High- adjacent to clearing corridor	High – within micrositing corridor
KK-165	Earth Mound, Artefact, PAD	Moderate -can avoid (approx. 36m from clearing corridor)	High – within micrositing corridor
KK-166	Burial	-	Low- easy to avoid (approx. 500m from micrositing corridor)

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-167	Burial, Artefact	-	Low – easy to avoid (approx. 120m from micrositing corridor)
KK-169	Earth Mound, Artefact, PAD	Low to Moderate (approx. 60m from clearing corridor)	Moderate to High – partially within micrositing corridor
KK-171	Artefact Scatter	-	Low – easy to avoid (approx. 120m from micrositing corridor)
kk-172	PAD	Low (approx. 125m from hardstand)	Low- can avoid (approx. 30m outside micrositing corridor boundary)
KK-173	Burial, PAD	Moderate to High- can avoid (14m from clearing corridor)	High – majority of site extent within micrositing corridor
KK-174	Artefact Scatter	-	Low - can avoid (approx. 30m outside micrositing corridor boundary)
KK-175	PAD	Moderate- can avoid (15m from hardstand)	High – within micrositing corridor
KK-176	Burial, Earth Mound, Artefact, Hearth, PAD	High – within transmission line corridor	High – within micrositing corridor
KK-177	Artefact, Hearth	Moderate – approx. 50m from hardstand	High – partially within micrositing corridor
KK-178	Artefact Scatter	Moderate – approx. 40m from hardstand	Moderate – entirely within micrositing corridor
KK-179	Artefact, Hearth, PAD	Low- approx. 80m from overhead transmission line clearing corridor	Moderate to High – partially within micrositing corridor
KK-180	PAD	High – within overhead transmission line clearing corridor	High – within micrositing corridor
KK-181	Artefact, PAD	-	Low – easy to avoid (approx. 210m outside micrositing corridor)
KK-182	Artefact Scatter	-	Low – easy to avoid (approx. 75m outside micrositing corridor)
KK-183	Artefact, PAD	Moderate – adjacent to clearing corridor (approx. 8m)	Moderate – partially within micrositing corridor
KK-184	Artefact, Hearth	Moderate – approx. 20m from hardstand	Moderate to High – entirely within micrositing corridor
KK-185	Artefact, Hearth	-	Low to Moderate - can avoid (approx. 10m outside micrositing corridor)

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-186	Earth Mound, Artefact, Hearth, PAD	High – partially within corridor within overhead transmission line clearing corridor	High – entirely within micrositing corridor
KK-187	Earth Mound, Artefact, Hearth	High – partially within overhead transmission line clearing corridor	High – large portion of the site within the micrositing corridor
KK-188	Artefact, Hearth	-	Low – easy to avoid (outside micrositing corridor)
KK-190	PAD	-	Low – easy to avoid (outside micrositing corridor)
KK-191	Burial, Artefact	-	Low - can avoid (outside micrositing corridor)
KK-192	Hearth	-	Low - can avoid (outside micrositing corridor)
KK-193	Burial, Artefact, Hearth		Low - can avoid (outside micrositing corridor)
KK-195	Burial (unverified)		Low – can avoid (outside micrositing corridor)
KK-201	Burial, Earth Mound, Artefact, Hearth, PAD	Moderate – approx. 40m from hardstand	Moderate to High – partially within micrositing corridor
KK-202	Burial, Earth Mound, Artefact, Hearth, PAD	-	Low to Moderate – can avoid (approx. 65m outside micrositing corridor)
KK-206	Earth Mound, Hearth, PAD	-	Low – easy to avoid (approx. 140m outside micrositing corridor)
KK-207	Burial, Earth Mound, Hearth, PAD	Moderate to High – site extent adjacent to two hardstand locations	High – Three portions of the site lie within the micrositing corridor
KK-208	Earth Mound, Artefact, Hearth, PAD	Moderate – approx. 28m from hardstand	Moderate to High – partially within micrositing corridor
KK-209	Artefact, Hearth	-	Low – can avoid (approx. 40m outside micrositing corridor)
KK-211	Burial, Earth Mound, Hearth, PAD	-	Low – easy to avoid (outside micrositing corridor)
KK-212	Burial, Artefact, PAD	Moderate to High – adjacent to clearing corridor	High – partially within the micrositing corridor
KK-213	Burial	-	Low – can avoid (approx. 150m outside micrositing corridor)
KK-214	Burial, Artefact, Hearth	High – partially within hardstand	High – partially within corridor

Aboriginal heritage site	Site type	Potential for impact based on clearing corridor	Potential for impact based on micrositing corridor
KK-215	Burial, Earth Mound, Artefact, Hearth, PAD	Low – approx. 115m outside overhead transmission line clearing corridor	Low to Moderate – can avoid (approx. 23m outside micrositing corridor)
kk-216	Earth Mound, PAD	-	Low – easy to avoid (approx. 70m outside micrositing corridor)
WA-OS5 (47-6-0755)	Artefact, Earth Mound, PAD	-	Low – easy to avoid (approx. 35m outside micrositing corridor)
WA-OS6 (47-6-0756)	Earth Mound, PAD	-	Low – easy to avoid (approx. 135m outside micrositing corridor)
KK Burial	Burial	Moderate- can avoid (approx. 23m from hardstand boundary)	High – partially within micrositing corridors
Millicent Burials (47-6-0947)	Burial	Moderate- can avoid (approx. 42m from hardstand boundary)	High– partially within micrositing corridor

Based on the current Disturbance Footprint, direct harm to the 9 sites have been identified associated with the infrastructure layout (**Table 6-33**). A further 74 sites have been assessed to be subject to potential impact associated with the proposed works within the micro-siting corridor. However, where possible the Applicant intend to avoid these sites.

6.2.7 MITIGATION MEASURES

The following measures to minimise and manage impacts to Aboriginal cultural heritage are recommended:

- Micro-siting of project elements should be used as a mitigation measure to avoid disturbing Aboriginal cultural heritage sites. If micro-siting was to occur within any areas that have not been previously surveyed, additional archaeological survey should be undertaken;
- An Aboriginal Cultural Heritage Management Plan (ACHMP) should be developed to describe the processes and procedures required to be implemented during the construction and operational phases of the Project. This should be developed in partnership with the Traditional Owners and should at a minimum include:
  - Areas of the earth mounds, hearths, burials or PADs which may be subject to harm as part of disturbance within the clearing and /or micro-siting corridor should be subject to archaeological test or salvage excavation if harm is unavoidable. This assessment has found that there are 39 sites, and their extents, (containing features such as hearths, burials, earth mounds or PADs) within or immediately adjacent to the current proposed Disturbance Footprint that may be subject to varying levels of impact;
  - There are 56 artefact sites that may be subject to harm as part of disturbance within the clearing and /or micro-siting corridor. Mitigation measures of surface collection, due to potential impacts, are recommended for these sites;

- The Applicant should liaise with landholders and Traditional Owners to develop appropriate stock management strategies to limit the further disturbance and damage to Aboriginal cultural heritage sites;
- The Applicant should consider the appointment and training of a Traditional Owner liaison/s to coordinate appropriately informed access for staff and contractors to culturally sensitive areas and provide cultural awareness training; and
- The Applicant should consider working with the Traditional Owners to develop and implement an additional research project that would extend the understanding of the Aboriginal cultural heritage values within the Project Area beyond the development footprint and place them in context of the broader cultural landscape of the region, and the internationally significant story of this area and its connection to the Willandra Lakes and Lake Mungo.

6.2.7.1 GENERAL MANAGEMENT PRINCIPLES

The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance:

- Avoid impact by altering the Project, or in this case, by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed; and
- If impact is unavoidable, then approval to disturb sites under the authority of an ACHMP must be sought from DPE. Normally the management recommendations contained in the ACHAR become policies of the ACHMP. As the Aboriginal community have been provided the opportunity to view the draft ACHAR, the ACHAR must make it clear that a future ACHMP will manage Aboriginal cultural heritage within the Project Area so that the Aboriginal community can assess the management recommendations with this knowledge. The ACHMP policies will often stipulate that the Aboriginal community should be involved in any salvage activities and will dictate what the fate of any salvaged Aboriginal objects will be.

6.2.8 CONCLUSION

Aboriginal cultural heritage sites have been recorded across the Project Area, comprising a total of 209 newly recorded sites, of which nine sites have been assessed to be subject to direct impact associated with Project infrastructure. A further 74 sites have been assessed with potential to impact as they are within the micro-siting corridor.

As the Project is assessed as a SSD, under Part 4.7 clause 4.41 (1)(d) of the EP&A Act, an ACHMP should be developed to record and describe the processes and procedures required to be implemented regarding Aboriginal cultural heritage prior to and during the construction and operational phases of the Project.

6.3 HISTORIC HERITAGE

6.3.1 INTRODUCTION

A historic heritage assessment has been prepared as part of the ACHAR (**APPENDIX H**) to assess the potential impacts of the Project on historic heritage and is summarised within this section of the EIS.

As per the SEARs, no standalone Statement of Heritage Impact (SOHI) was deemed necessary and "an assessment of the impacts to historic heritage having regard to the *NSW Heritage Manual*" (refer **APPENDIX A**) has been carried out. The assessment also identifies mitigation and risk management measures to be implemented during construction and operation.

6.3.2 EXISTING ENVIRONMENT

6.3.2.1 HISTORICAL OVERVIEW

Early colonial exploration of the Murrumbidgee Region occurred from the 1820s with expeditions originally focused along the Murrumbidgee River. From his explorations of the Murrumbidgee and lower Murray Rivers between 1828-31, Charles Sturt described treeless plains and good water sources, which lured graziers to the region. Pastoral stations focusing on cattle grazing were established in the lower Murrumbidgee region from the 1820s and by 1841 the Murrumbidgee District contained 147 stations. By 1845 an average pastoral property in the Murrumbidgee-Murray junction region comprised eighty thousand ha (Eardley 1999).

Development of towns within the region soon followed. Balranald (to the west of the Project Area) was first investigated as the site of a township in c.1847, when George James MacDonald, Commissioner for Crown Lands for the Lower Darling District arrived in the region. In 1849 surveyor Francis McCabe laid out large reserves in the region of the Lower Murrumbidgee/Murray-Darling junction and included a site 'for a Township at the North End of Caiera, otherwise Balranald Reserve' (Heritage Archaeology 2007). It was in 1849 that Leighton Robinson and Thomas Duggan established a general store at Balranald and in the same year a public-house, the Balranald Inn, was erected by a Mr Robertson (Feldtmann 1976). The township of Balranald was gazetted on 4 April 1851 and the first land sale held on 14 January 1852, with thirty-five lots submitted to public auction (Heritage Archaeology 2007). To the south-east of the Project Area, the township of Moulamein was established in the late 1840s and was gazetted in 1851 (Heritage Archaeology 2007).

To the immediate west of the Project Area pioneer and explorer William Charles Wentworth established 'Tala' Station in 1835 (part of which is now Yanga Station). At its largest (in 1887) Yanga Station totalled 168,000 ha and carried some 151,000 sheep and 2,000 cattle (Heritage Archaeology 2007).

The Project Area is within the extents of the historical Keri Keri Pastoral Holding No. 29. The Keri Keri Pastoral Holding encompassed the historic parishes The Willows, Kerkeri, Bluff, Winter, Yanga as well as the eastern portion of Merwin Parish. The Project Area is largely within the historic parishes of The Willows of Caira County and Kerkeri of Wakool County. The resumed area of the pastoral run was 39,782 acres (16,099 ha) and the total leasehold area was 37,575 acres (15,206 ha). The run encompassed the Crown lands within the boundaries of those parts of Moulamein Block A and Moulamein Block B Runs lying to the north and south of the dividing line, as notified in Gazette, 11 July 1885 (Hanson 1889). The run was held originally by John Cummings who predominantly focused on sheep farming.

Available pastoral run maps indicate that several pastoral improvements and structures were constructed across the Keri Keri Run over time. Noted structures across the property include several wells, tanks, dams, sheering sheds, shearers' huts, and cottages (Historic Land Record Viewer, accessed 9 February 2022). The south-western portion of the Keri Keri Run is shown to have included a relatively high density of structures including a homestead feature. These maps indicate that the main homestead structure was located to the south of the Project Area in proximity to the southern boundary of the Keri Keri Parish. Structures noted within the boundaries of the Project Area are limited to a series of tanks, dams and fence lines. The Sturt Highway (delineating the northern boundary of the Project Area) was gazetted in 1933. Recent historical aerials indicate that the Project Area continues to be used primarily as grazing lands.

Figure 6-12 to **Figure 6-15** presents historical maps and holdings relative to the Project Area.

FIGURE 6-12 HISTORICAL MAP OF THE REGION SHOWING THE PROJECT AREA – MOULAMEIN A AND B (ARROWED; C.1860) (SLNSW, HTTPS://NLA.GOV.AU/NLA.OBJ-230694679/VIEW)

FIGURE 6-13 MURRUMBIDGEE RIVER DISTRICT SHOWING KERI KERI PASTORAL HOLDING (OUTLINED RED) IN RELATION TO BALRANALD TO WEST (ARROWED; 1901) (SLNSW, Z/M3814/1901/1)

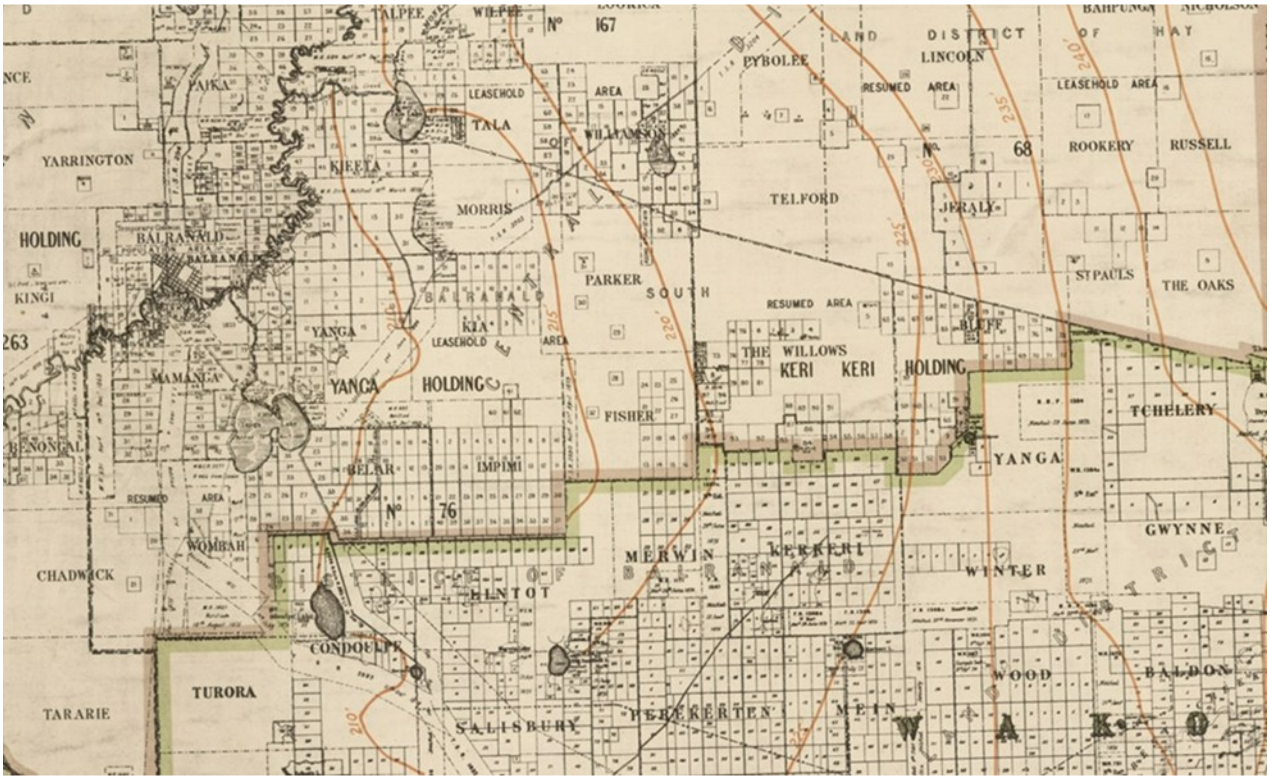
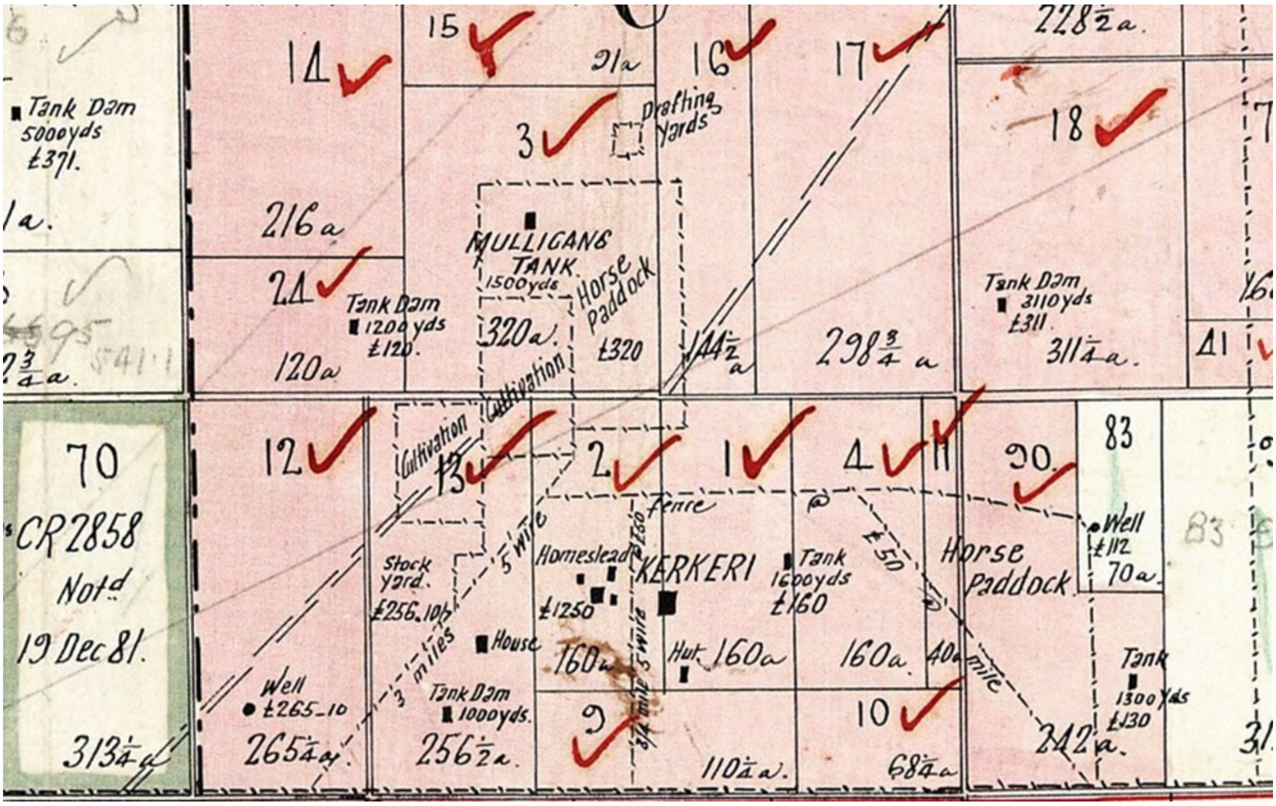


FIGURE 6-14 KERI KERI PASTORAL HOLDING, WITH PROJECT AREA IN RED (ND) (AUSTRALIAN NATIONAL UNIVERSITY, OPEN RESEARCH LIBRARY: E0058.PDF (ANU.EDU.AU))

FIGURE 6-15 KERI KERI HOMESTEAD LOCATED TO THE SOUTH OF THE PROJECT AREA (HLRV MAP 572526)



6.3.2.2 DATABASE SEARCHES

The following databases were searched to determine whether known historic (non-Aboriginal) heritage sites are located within the Project Area:

- Australian Heritage Database including the following heritage lists:
  - World Heritage List;
  - National Heritage List;
  - Commonwealth Heritage List;
  - Register of the National Estate (non-statutory);
- NSW State Heritage Inventory including the following heritage lists:
  - SHR;
  - Selected s.170 heritage registers; and
- Wakool LEP.

A search of heritage databases was undertaken on 10 January 2022 to determine whether any historic heritage items have previously been registered within the Project Area or within the immediate vicinity. For the purposes of this assessment, heritage items within 5 km of the Project Area were considered to be in the vicinity of the Project Area.

No items of heritage significance were identified within the vicinity of the Project Area. The nearest site is 30 km west of the Project Area being 'The Old Court House and Footbridge' (item no. I5; Wakool LEP).

6.3.2.3 FIELD SURVEY RESULTS

Items of potential historical heritage significance were surveyed in tandem with Aboriginal cultural heritage survey seasons (refer **APPENDIX H**).

One newly identified Aboriginal heritage site located 200-300 m from one of the Keri Keri property buildings also included some accumulated historic material, in the form of a bottle dump (Photograph 6.1) and some coins (Photograph 6.2). The location of these features within the site boundary is illustrated in **Figure 6-16**.

PHOTOGRAPH 6.1 BOTTLE DUMP WITHIN KK-161 (ERM 2022)

PHOTOGRAPH 6.2 COIN FOUND WITHIN KK-161 (ERM 2022)

Coordinate System: GDA 1994 MGA Zone 54
Date: 27/03/2024
Created By: VN
Drawing Size: A3

F6.16 - Historic features within site boundary of KK-161

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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6.3.3 LIKELY IMPACTS TO HISTORIC HERITAGE

No registered historic heritage items are located within 5 km the Project Area. With the nearest registered item 30 km away (item no. I5; Wakool LEP), potential impacts to this item would be nil to low.

Review of the potential for Historical Archaeological Resource to be present within the Project Area is based on a consideration of current ground conditions and analysis of historic development within the Project Area. Built structures noted within the boundaries of the Project Area are limited to a series of tanks, dams and fence lines.

Gradings of archaeological potential used for this assessment is detailed in **Table 6-34**.

TABLE 6-34 GRADING OF ARCHAEOLOGICAL POTENTIAL

Grading	Justification
Nil	No evidence of historical development or use, or where previous impacts would have removed all archaeological potential
Low	Research indicates little or low intensity historical development, or substantial previous impacts. Expected that deep subsurface archaeological features may survive
Moderate	Known historical development with some evidence of previous impact. Likely that archaeological remains survive with some localised truncation and disturbance
High	Evidence of multiple phases of historical development and structures with minimal or localised twentieth century development impacts. Archaeological remains likely to be largely intact

Due to the deflating nature of the landscape, the scarce and unsubstantial built structures, the long-term use of the Project Area for grazing, and the limited historical material observed during survey, the historical archaeological potential of the Project Area is considered nil to low.

One newly identified Aboriginal heritage site (KK-161) was identified as also including historic heritage features, namely a bottle dump and some coins. As the location of the historic features is outside the proposed development footprint, no further recommendations regarding their management are made at this time.

6.3.4 MITIGATION MEASURES

No specific measures to mitigate historic heritage are recommended.

A Chance Finds Procedure will be in place for any unexpected finds with potential historic heritage significance during construction and operation of the Project.

6.3.5 CONCLUSION

Due to the limited existing heritage features and archaeological potential, the likelihood of the Project impacting historic heritage is considered nil to low.

6.4 NOISE AND VIBRATION

6.4.1 INTRODUCTION

A Noise and Vibration Impact Assessment (NVIA) was prepared to assess potential noise and vibration impacts associated with the construction and operation of the Project, and to recommend feasible and reasonable mitigation and management measures. These recommendations are designed to ensure that the construction and operation of the Project are carried out within the noise limits established in the NVIA.

The NVIA is provided in **APPENDIX I**.

The NVIA address the project-specific SEARs (**APPENDIX A**) and considers all relevant stakeholder engagement described in Section 5. Potential social amenity impacts associated with noise and vibration were raised by the community during the stakeholder engagement process. The NVIA addresses potential noise impacts associated with the construction and operation of the Project with particular focus on potential noise impacts to non-associated dwellings surrounding the Project Area. Refer to **Section 6.13** for further details regarding the social context.

The NVIA was prepared in accordance with the following guidelines and regulations:

- Wind Energy: Noise Assessment Bulletin for State Significant Wind Energy Development (DPE/ EPA, 2016) (Noise Bulletin);
  - Based on the 2009 South Australian document- Wind Farms Environmental Noise Guidelines (EPA SA, 2009) (SA Noise Guidelines);
- Interim Construction Noise Guideline 2009 (NSW ICNG, 2009) (ICNG);
- Noise Policy for Industry 2017 (NSW NPI, 2017) (NPI);
- Road Noise Policy 2011 (NSW RNP, 2011) (RNP); and
- Assessing Vibration: A Technical Guideline (DECC, 2006) (Vibration Guideline).

Refer to Section 4 of **APPENDIX I** for details of the above.

The scope of the NVIA included:

- Evaluation of the existing noise environment and identification of noise-sensitive receivers;
- Establishment of project-specific noise criterion at receiver locations to comply with relevant noise guidelines;
- Determining the extent of noise impacts (if any) associated with the construction of the Project;
- Determining the extent of noise impacts (if any) associated with the operation of the Project;
- Determining the extent of traffic noise impacts (if any) associated with the construction and operation of the Project;
- Assessment of the cumulative noise impacts (considering other developments in the area); and
- Recommendation of mitigation measures to be implemented on site to ensure compliance with the noise limits.

6.4.2 EXISTING ENVIRONMENT

6.4.2.1 SENSITIVE RECEIVERS

Dwellings

With respect to sensitive receivers assessed in the NVIA, dwellings whose owners are hosting Project infrastructure or have entered into an agreement in relation to the Project are referred to as 'Associated' dwellings. All other dwellings are referred to as 'non-associated' dwellings.

Table 6-35 lists the associated and non-associated dwellings within the relevant assessment area and provides their respective distances to the nearest WTG. **Figure 3-5** shows the location context.

TABLE 6-35 DWELLINGS

Dwelling	Dwelling Type	Distance to Nearest WTG (m)	Nearest WTG	Dwelling Coordinates (GDA94 Zone 56)	
				X(m)	Y(m)
19	Non-associated	2,227	184	765553	6154292
99	Non-associated	2,235	184	765521	6154300
42	Non-associated	5,924	75	785449	6147202
12	Non-associated	6,420	5	783072	6160304
90	Non-associated	6,487	5	783112	6160359
93	Associated	6,493	181	765421	6138049
89	Non-associated	6,519	184	783101	6160405
62	Associated	6,568	181	765409	6137970
71	Non-associated	7,525	1	779424	6163383
107	Non-associated	7,529	1	779289	6163430
70	Non-associated	7,614	1	779341	6163502
77	Non-associated	7,714	1	779326	6163612
80	Non-associated	7,987	1	779121	6163954
81	Non-associated	8,002	1	779099	6163975
45	Non-associated	8,026	1	779190	6163976
105	Non-associated	9,624	153	758901	6136987
106	Non-associated	11,122	75	789535	6143558
108	Non-associated	11,879	128	751755	6146361

The Noise Bulletin does not specify noise criteria for associated dwellings. Therefore, the following criteria were nominated for associated dwellings for this Project, based on guidance from the SA Noise Guidelines and the World Health Organisation Guidelines for Community Noise (World Health Organisation, 1999) (WHO Guidelines):

The predicted equivalent noise level (LAeq,10 minute), adjusted for tonality and low frequency noise in accordance with these guidelines, should not exceed 45 dB(A) or the background noise (LA90, 10 minute) by more than 5 dB(A), whichever is the greater, at all relevant receivers for wind speed from cut-in to rated power of the wind turbine generator and each integer wind speed in between.

The criteria were used to objectively understand if a reasonable level of acoustic amenity is achieved and if any adverse health effects are likely at associated dwellings due to noise produced by the Project. It should be noted that noise levels at associated dwellings shall be managed in accordance with agreements established between Acciona and the associated dwelling landowners. The Yanga State Conservation Area (SCA) is situated to the west of the Project and has a total area of about 34,557 ha. Within the Yanga SCA, the closest sensitive receptor to the Project is the Willow Campground and Picnic Area (X/Y - 752658, 6149983) which is about 11.2 km from the nearest WTG (WTG #128) (refer to **Figure 3-5**).

6.4.2.2 BACKGROUND NOISE

Noise Monitoring

Preliminary noise modelling was included in the Scoping Report (ERM, 2022). This modelling considered worst-case WTG noise parameters and a preliminary WTG layout.

Background noise levels (LA90, 10min) were measured for a range of hub-height wind speeds to allow WTG noise criteria at the noise monitoring locations to be determined. Noise monitoring was undertaken between 18 December 2022 and 20 February 2023. As recommended in the Noise Bulletin, this monitoring period provided sufficient noise data (at least 2000 valid data points) for regression analysis.

The noise monitoring locations (NMLs) were selected based on the considerations provided in **Table 6-36**. Photographs of the NMLs are provided in Appendix D and the NMLs are shown graphically in **Appendix I**.

Table 6-37 presents the findings of the background noise monitoring for a range of wind speeds within the operating range of the Project. The operational noise limits at NMLs were determined using best fit third order regression analysis of the measured background noise levels and the commensurate time period Sonic Detection and Ranging (SODAR) data representing hub height wind speed. The measured noise data at the noise loggers used for regression analysis was filtered to exclude data affected by wind speeds greater than 5 m/s and rainfall present at the noise loggers.

The applicable project operational noise criteria for the NMLs are provided in **Table 6-38**.

TABLE 6-36 NML SELECTION CONSIDERATIONS

Noise Monitoring Location (NML)	Dwelling	Dwelling Type	Selection Considerations based on the Preliminary Noise Modelling in the Scoping Report (ERM, 2022)
1	19	Non-associated	• Exceeded the 35 dB(A) non-associated dwelling base noise criterion by 5 dB in the Scoping Report. • Closest dwelling to the Project Area.
2	90	Non-associated	• Complied with the 35 dB(A) non-associated dwelling base noise criterion marginally by 2 dB in the Scoping Report. • Representative dwelling in the closest cluster of dwellings to the north of the Project Area.
3	42	Non-associated	• Complied with the 35 dB(A) Non-associated dwelling base noise criterion marginally by less than 1 dB in the Scoping Report. • Closest dwelling to the east of the Project Area.
4	62	Associated	• Exceeded the 35 dB(A) non-associated dwelling base noise criterion marginally by less than 1 dB in the Scoping Report. • Complied with the nominated 45 dB(A) Non-associated dwelling base noise criteria. • Closest dwelling to the south of the Project Area. • Selected to enable a more detailed assessment of the closest associated dwelling. • Selected to address any change to the Dwelling Type status in the future.

TABLE 6-37 BACKGROUND NOISE LEVELS (DB(A))

Noise Monitoring Location (NML)	Dwelling	Dwelling Type	Background Noise Level (dB(A)) for Integer Hub Height (200 m AGL) versus Wind Speed											
			3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10 m/s	11 m/s	12 /m/s	13 m/s	14 m/s
1	19	Non-associated	35	37	38	38	38	37	37	36	35	35	35	36
2	90	Non-associated	35	36	36	36	37	37	37	37	37	38	39	41
3	42	Non-associated	32	33	34	35	35	35	35	35	35	34	34	35
4	62	Associated	30	30	31	32	34	35	36	38	39	39	39	39

TABLE 6-38 PROJECT WTG NOISE CRITERIA

Noise Monitoring Location (NML)	Dwelling	Dwelling Type	Projected Noise Criteria (dB(A)) for Integer Hub Height (200 m AGL) versus Wind Speed											
			3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10 m/s	11 m/s	12 /m/s	13 m/s	14 m/s
1	19	Non-associated	40	42	43	43	43	42	42	41	40	40	40	41
2	90	Non-associated	40	41	41	41	42	42	42	42	42	43	44	46
3	42	Non-associated	37	38	39	40	40	40	40	40	40	39	39	40
4	62	Associated	45	45	45	45	45	45	45	45	45	45	45	45

Project Noise Trigger levels

The NPI considers the lowest of the intrusive or amenity residential receptor criteria so that the most stringent threshold is set concerning existing industrial noise in the area, known as project noise trigger levels (PNTLs). PNTLs have been established for the Project with due regard to the requirements of the NPI by applying the following factors for all identified residential (dwelling) and other sensitive (industrial) receptors:

- Rating background noise levels (RBLs);
- Intrusiveness noise levels;
- Amenity noise levels and hence, project amenity noise levels; and
- Maximum noise level events (sleep disturbance).

RBLs are representative of an existing noise environment during day/evening/night periods where the NPI sets minimum levels. The intrusiveness of an industrial noise source is determined as follows:

$$L_{Aeq,\ 15min} \leq \text{Rating Background Noise Level} + 5\ dB$$

The Project intrusiveness noise levels are shown in **Table 6-39**.

TABLE 6-39 MINIMUM ASSUMED RBLS AND PROJECT INTRUSIVENESS NOISE LEVELS

Time of day	Minimum assumed RBL, in dB(A)	Minimum project intrusiveness noise levels, in $L_{Aeq,15min}$ dB(A)
Day	35	40
Evening	30	35
Night	30	35

The NPI describes amenity noise levels as determined by categorical noise environments. In this case "residential rural" describes the Project locality. The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To extrapolate the amenity noise levels to A-weighted dB, the project amenity noise levels have been converted to LAeq, 15min using the following formula as per as per Section 2.2 of the NPI: LAeq, 15min = Leq, period + 3 dB. To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = Recommended amenity noise level minus 5 dB(A)

The relevant noise amenity levels and subsequent project amenity noise levels are given in **Table 6-40**.

TABLE 6-40 AMENITY NOISE LEVELS

Receiver/ Noise Amenity Area	Assessment Period	Recommended Amenity Noise Level, L_{eq} dB	Project Amenity Noise Level, $L_{Aeq,15min}$ dB(A)
Residential Rural	Day	50	48
	Evening	45	43
	Night	40	38

Note:
- Day-time period is from 07:00 to 18:00 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays)
- Evening period is from 18:00 to 22:00
- Night-time period is from 22:00 to 07:00 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays).

The potential for sleep disturbance from maximum noise level events from the Project during the night-time period should typically be considered. Sleep disturbance relates to both awakenings and disturbance to sleep stages. A detailed maximum noise level event assessment should be undertaken where the Project night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater; and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

The night-time noise levels subject to a detailed maximum noise level event assessment are therefore LAeq,15min 40 dB(A) and/or LAFmax 52 dB(A).

The assessment should cover both the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that are important in assessing the extent of impacts on sleep include:

- How often high noise events will occur;
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development;
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods); and
- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

However, given that there are no impulsive noise events from ancillary noise sources, and relevant thresholds were not exceeded, a sleep disturbance noise assessment was not undertaken for this Project.

Considering all the above, the PNTLs were determined and are detailed in **Table 6-41**. PTNLs correspond to the most stringent of the aforementioned noise criteria; project intrusiveness noise levels. These PNTLs were applied for all assessment periods and are applicable to the operational noise assessment. By meeting the PNTLs at the identified sensitive receivers, the noise levels at all other receivers located further away from the Project are expected to comply with the noise limits of the NPI.

TABLE 6-41 PROJECT NOISE TRIGGER LEVELS

Receiver	Assessment period	Project Intrusiveness Noise Level[1] $L_{Aeq,15min}$ dB(A)	NPI Amenity Noise Level $L_{Aeq, period}$ dB(A)	Project Amenity Noise Level $L_{Aeq,15min}$ dB(A) [2,3]	Project Noise Trigger Level $L_{Aeq,15min}$ dB(A)	Sleep Disturbance LAmax
Residential	Day	40	50	48	40	-
	Evening	35	45	43	35	-
	Night	35	40	38	35	52

Notes:
1. Based on RBL as noted in **Table 6-39.**
2. These levels have been converted to $L_{Aeq,\ 15\ minute}$ using the following: $L_{Aeq,\ 15\ minute}$ = $L_{Aeq,\ period}$ + 3 dB (NSW Noise Policy for Industry Section 2.2.
3. To account for the existing industrial noise sources, -5dB was applied to the Project Amenity Noise Level (NSW Noise Policy for Industry Section 2.4)
4. Assumed 10 dB noise reduction for inside to outside noise levels and when the school classroom is in use.
5. This value has been conservatively assumed that $L_{Aeq,\ 15\ minute}$ is equivalent to $L_{Aeq,\ 1hr}$.
6. Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays; Evening period is from 1800 to 2200 and Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays).

6.4.2.3 ROAD TRAFFIC NOISE

The Project is bordered by the Sturt Highway to the north and Keri Keri Road to the west. The Sturt Highway (A20) is a state road which runs east-west direction between Northern Expressway (Reid, South Australia) and Hume Highway (north of Tarcutta). Keri Keri Road is a local road with a north-south alignment between Sturt Highway and Berrambong Railway Road. Keri Keri Road is an unsealed road running along the Project Area's western boundary.

Existing road traffic data for the Sturt Highway near the Project site was obtained from the Keri Keri Wind Farm Traffic & Transport Impact Assessment (TTPP, 2023). The average daily traffic volume (weekday) is in the order of 535 vehicles in the eastbound direction and 970 vehicles in the westbound direction. Heavy vehicles comprise around 47% of the daily traffic volume. The posted traffic speed of 110 km/h on Sturt Highway was considered representative of the average vehicular speed. It is assumed that 20% of the daily traffic will occur during night periods (10pm to 7am).

Along Keri Keri Road, the Project would only use the northernmost end where the nearest resident along this road is over 5 km away.

6.4.3 METHODOLOGY

6.4.3.1 WTG OPERATION

Noise Emissions

Operational noise modelling of WTGs was based on the candidate WTG model (**Table 6-42**), quantity (n=155) and conservative parameters (**Table 6-43**) as recommended by the Noise Bulletin.

TABLE 6-42 CANDIDATE WTG DETAILS

Feature	Parameter used
Wind Turbine Model	Nordex N163-5.X - 5.7 MW operating in Mode 0 (highest rated power of 5.7 MW)
Hub Height, m	200
Rotor Diameter, m	183
Cut-in wind speed, m/s	3
Cut-out wind speed, m/s	26
Maximum Sound Power Level, dB(A)	109.2
Serrated Trailed Edge (STE) technology	No

TABLE 6-43 MODELLING PARAMETERS

Modelling aspect	Parameter
Noise Modelling Software	SoundPLAN 8.2
Algorithm	International Standard ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO 9613-2) (Standards Australia, 1996)
Ground Absorption Factor	0.5 (50% acoustically hard ground and 50% acoustically soft ground)
Humidity	80%
Temperature	10°C
Topographical contours	2m intervals
Receiver height	1.5m
Wind direction	Downwind – noise level at each receiver is predicted based on being simultaneously downwind of every wind turbine at the site.

Note: Corrections for a concave ground profile and barrier attenuation being no greater 2 dB have been incorporated into the noise model.

Noise emissions from WTGs were quantified by the 1/3 octave band sound power level (SWL) per hub-height wind speed for the candidate WTG model are provided in **Table 6-44**.

TABLE 6-44 WIND TURBINE SOUND POWER LEVEL PER WIND SPEED AT HUB HEIGHT

Wind Speed at Hub Height (m/s)	SWL at Hub Height, L_{eq}, dB(A)
3	97.5
4	100.8
5	105.7
6	109.2
7	109.2
8	109.2
9	109.2
10	109.2
11	109.2
12	109.2

Tonality

Tonality from wind turbines is generally related to rotational equipment in the turbine nacelle and can have a specific pitch dependent on the speed of rotation (DPE/ EPA, 2016). This can cause the noise to be more annoying or noticeable. It should be noted that tonal characteristics typically do not occur in well-designed and well-maintained WTGs and if present, they are usually caused by maintenance issues.

The presence of excessive tonality is assessed using the methodology described in ISO 1996.2: 2007 Acoustics - Description, measurement and assessment of environmental noise – Determination of environmental noise levels.

Tonality is defined as when the SWL of 1/3 octave band centre frequency exceeds the level of the adjacent bands on both sides by:

- 5 dB or more if the centre frequency of the band containing the tone is in the range 500 Hz to 10,000 Hz;
- 8 dB or more if the centre frequency of the band containing the tone is in the range 160 Hz to 400 Hz; and/or
- 15 dB or more if the centre frequency of the band containing the tone is in the range 25 Hz to 125 Hz.

The above criteria were applied to the nearest non-associated dwelling (dwelling 19) located 2,227 m from the nearest WTG (WTG#184) for 1/3 octave band centre frequencies between 10 Hz and 8000 Hz to produce an A-weighted dB noise level.

Low Frequency Noise

The Noise Bulletin notes analysis of wind turbine spectra shows that low frequency noise is typically not a significant feature of modern wind turbine noise when it complies with the A-weighted criteria. The Noise Bulletin also notes that noise assessments for proposed wind energy projects shall assess the potential for non-associated residential receiver locations to experience low frequency noise levels (C-weighted) exceeding 60 dB(C).

The assessment of low frequency noise from WTG components was therefore adopted from the C-weighting of 1/3 octave band centre frequencies between 10 Hz and 8000 Hz with respect to Dwelling 19 and WTG 184.

6.4.3.2 ANCILLARY ELECTRICAL INFRASTRUCTURE

BESS

PNTLs in **Table 6-41** were applied to the 800 MWh BESS with the following parameters:

- Inverters (102 Units - SWL of 95 dB(A) per unit is conservatively assumed based on Applicant's advice); and
- Battery Storage (364 Units - SWL of 102 dB(A) per unit is conservatively assumed based on Applicant's advice).

These parameters were then modelled at each dwelling (associated and non-associated) to predict the noise impact of the BESS and whether they exceed PNTLs.

Transmission Lines

Corona noise is the most common noise associated with transmission lines and is heard as a crackling or hissing sound. Corona is the breakdown of air into charged particles caused by the electrical field at the surface of conductors. This type of noise varies with both weather and voltage of the line, and most often occurs in conditions of heavy rain and high humidity (typically >80%). An electric field surrounds power lines and causes implosion of ionized water droplets in the air, which produces the sound (Aspen Environmental Group, 2016).

Aeolian noise is caused by wind blowing through the conductors and/or structures. This type of noise is usually infrequent and depends on wind velocity and direction. Wind must blow steadily and perpendicular to the lines to set up an Aeolian vibration, which can produce resonance if the frequency of the vibration matches the natural frequency of the line (Aspen Environmental Group, 2016).

Corona noise and Aeolian noise have the potential to create an impact at dwellings (with respect to exceeding NPI PNTLs) at a separation distance of less than 200 m. Given that the separation distance between the transmission lines and the nearest non-associated dwelling along the transmission line route is more than 1 km, any potential noise impacts at dwellings from Corona and Aeolian noise generation from transmission lines are insignificant. Assessment of such noise is not considered further.

6.4.3.3 CONSTRUCTION NOISE

Conservative predictions of construction noise have been undertaken through the calculation of the geometrical dispersion of noise with the assumption of flat topography, no acoustic shielding and no ground absorption effects.

The predictions take into consideration the equipment SWLs operating continuously for a 15-minute period. The construction noise levels at any receiver depend on the type and duration of construction activity being undertaken and are expected to be highly variable over the total construction program.

Typical construction noise sources and their SWLs were assessed for the Project (**Table 6-45**). The activities and equipment SWLs provided were verified by the Applicant and are based on AS 2436:2010 (Standards Australia, 2010).

TABLE 6-45 CONSTRUCTION NOISE SOURCES

Stage	Activity	Equipment Item	SWL, L_{eq}, dB(A)	Quantity	Duty Factor (% of time equipment item is operational during a 15 minute period), %
Early Works	Civil Construction involving: • Clearing • Slight Excavations • Road Construction and Upgrade • Certain early Bench Construction – site compound, laydown, batching plant etc. • Early Access Drainage Construction	Excavator	107	5	75
		Concrete agitator truck	109	2	50
		Generator (diesel)	99	2	100
		Truck (water cart)	107	3	75
		Concrete pump truck	108	2	50
		Roller (vibratory)	108	3	100
		Grader	110	2	75
		Jackhammer	105	1	100
		Vehicle (light commercial e.g., 4WD)	106	10	75
		Truck (> 20 tonne)	107	4	50
		Forklift	106	2	50
		Dozer	108	2	100
Construction, Installation and Commission	Civil Construction involving: • Clearing • Excavations • Road Construction • Bench Construction – Permanent and Temporary • Borrow pit / Quarry Construction • Fencing & Security • Meteorological Mast Construction • Blasting (Assessed separately)	Excavator	107	10	100
		Concrete agitator truck	109	8	100
		Generator (diesel)	99	6	100
		Truck (water cart)	107	6	50
		Concrete pump truck	108	2	100
		Roller (vibratory)	108	4	100

Stage	Activity	Equipment Item	SWL, L_{eq}, dB(A)	Quantity	Duty Factor (% of time equipment item is operational during a 15 minute period), %
	• Drainage Construction • WTG Concrete Work • WTG Reinforcing Fabric and Shutters & Inner Works • WTG Civil Works • General Building Activities • Civil Reinstatements • Civil Major • Demobilisation WTG Construction involving: WTG Component Logistics – Truck movement of components from port to wind farm & vice versa, including truck movement inside farm. WTG preparation on Hardstands/laydown area for erection. WTG Installation of Components WTG Major De-mobilisation of tools, sheds, ship containers, crew, accommodation, and cranes etc.	Grader	110	4	75
		Jack hammers	105	2	100
		Vehicle (light commercial e.g., 4WD)	106	40	100
		Truck (> 20 tonne)	107	8	75
		Forklift	106	2	50
		Piling (bored)	111	6	50
		Telehandler	107	3	75
		Crane (mobile)	104	4	75
		Crane (tower)	105	1	75
		Dozer	108	2	100
		Scraper	116	8	100
Demobilisation	Removal of all temporary items from site, namely: Compound Office Units Shipping containers • Civil Works: Minor demobilisation	Crane (mobile)	104	2	50
		Truck (> 20 tonne)	107	4	50
		Vehicle (light commercial e.g., 4WD)	106	6	50

In addition to the noise sources listed in **Table 6-45** operating concurrently and dynamically over the entire Project Area for each stage, the following worst-case construction noise scenarios were also assessed at the nearest receiver (Dwelling 19, 870m from the Project Area boundary).

- Early Works - A Grader and a Concrete agitator truck at the Project Area fronting Dwelling 19 and operating continuously for 15 minutes;
- Construction, Installation and Commission - A Grader and Piling (bored) (at the nearest WTG) at the Project Area fronting Dwelling 19 and operating continuously for 15 minutes; and
- Demobilisation – A Truck (>20 tonne) and a Vehicle (light commercial e.g., 4WD) at the Project Area fronting Dwelling 19 and operating continuously for 15 minutes.

6.4.3.4 VIBRATION AND BLASTING

Vibration

For construction activities occurring during the daytime, the Vibration Guideline can be interpreted to provide the minimum vibration criteria at dwellings based on human response.

Vibration from plant and equipment were considered using safe working distances for vibration intensive equipment provided in **Table 6-46**. They are referenced from the Transport for NSW's Construction Noise and Vibration Strategy (TfNSW, 2016).

TABLE 6-46 SAFE WORKING DISTANCES FOR VIBRATION INTENSIVE EQUIPMENT (TFNSW, 2016)

Plant Item	Rating/Description	Minimum Distance for Compliance with Assessing Vibration: A Technical Guideline (DECC, 2006)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	20 m
	< 200 kN (Typically 4-6 tonnes)	40 m
	< 300 kN (Typically 7-13 tonnes)	100 m
	> 300 kN (Typically 13-18 tonnes)	100 m
	> 300 kN (> 18 tonnes)	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	73 m
Vibratory Pile Driver	Sheet piles	20 m
Pile Boring	≤ 800 mm	N/A

Plant Item	Rating/Description	Minimum Distance for Compliance with Assessing Vibration: A Technical Guideline (DECC, 2006)
Jackhammer	Hand held	Avoid contact with structure

Blasting

The Vibration Guideline does not specifically address blasting-induced vibration effects. Blasting overpressure and ground vibration should be addressed using the document *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Over Pressure and Ground Vibration* (ANZEC, 1990). This document provides criteria intended to minimise annoyance and discomfort to dwelling occupants.

The recommended maximum levels for blasting are as follows:

- Airblast overpressure – 115 dB (Lin Peak) for 95 % of all blasts over a period of 12 months and 120 dB (Lin Peak) at all times; and
- Ground vibration: – 5 mm/s (PPV) for 95 % of all blasts over a period of 12 months and 10 mm/s (PPV) at all times.

Low-level blasting may be required when hard material is encountered during excavation for the WTG foundations during the construction phase of the Project. However, ground vibration and overpressure impacts can only be assessed against the ANZEC (1990) when the locations, depths and explosive charge masses are known. This assessment therefore only considers the distance between the nearest WTG and dwelling in a preliminary scope only.

If the need for blasting has been identified and once the above-mentioned information is known, it is recommended that a screening assessment be conducted as part of a Blasting Plan to identify all sensitive receivers located within a buffer distance based on the proposed blast charge mass and local ground properties.

6.4.3.5 TRAFFIC AND TRANSPORT NOISE

Based on the construction traffic volume predictions provided in the Project's Traffic Impact Statement (TTPP, 2024), there will be 636 heavy vehicle movements (general construction and wind turbine delivery) and 140 light vehicle movements (construction workers) in a typical day. The following inputs were used to predict the traffic noise:

- 15-hour Day period (7am to 10pm) – 70 light vehicle movements and 596 heavy vehicle movements; and
- 9-hour Night period (10pm to 7am) – 70 light vehicle movements and 40 heavy vehicles movements.
- It is assumed that all vehicle movements will occur between 6am to 7pm. Light vehicles will enter the Site between 6am and 7am and leave the Site in a staggered manner between 7am to 7pm. Heavy vehicle movements will be distributed evenly between 6am to 7pm.

From the Keri Keri Wind Farm Traffic & Transport Impact Assessment, potential construction traffic arrives from Balranald and Hay. Along this route, the most affected Sensitive Receiver was identified to be 441 Moama St, Hay South NSW 2711 and it was selected to be the assessment location given that the dwelling is separated from the edge of Sturt Highway by 35 m. Among all the Sensitive Receivers, it has the highest potential to be affected by construction traffic noise give the nearest distance to the route.

The predicted construction traffic noise levels at Sensitive Receptor 441 Moama St are shown in **Table 6-47**.

TABLE 6-47 RNP RESIDENTIAL ROAD TRAFFIC NOISE CRITERIA

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7am to 10pm	Night 10pm to 7am
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)

Note: The assessment criteria for external noise levels apply at 1 m from the façade of any affected residential receiver

The predicted road traffic noise levels at Sensitive Receptor 441 Moama St comply with the RNP criteria during the day period. There is a 0.7 dB exceedance of the RNP criteria during the night period. However, existing night-time traffic noise is expected to increase by only 0.3 dB. As per the RNP, if road traffic noise level increase during Project construction is within 2 dB(A) of current levels, then the objectives of the RNP are met and no specific mitigation measures are required. Construction road traffic noise is, therefore, not expected to generate a noise impact the Sensitive Receptors.

6.4.3.6 NATIONAL PARK AMENITY

In the absence of any tailored legislative objective requirements for National Parks and based on campgrounds being more aligned with the amenity expected at permanent dwellings, the noise level at the closest campgrounds have been considered against wind farm assessment criteria which would otherwise apply at dwellings. That is, a baseline noise criterion of 35 dB(A) has been considered at the campgrounds to satisfy the SEARs.

For Yanga SCA, ‘The Willows Campground’ was considered as a non-associated dwelling for a conservative assessment of noise emissions from the nearest WTG (#128) approximately 11 km away.

6.4.4 ASSESSMENT OF IMPACTS

6.4.4.1 WTG OPERATION

Noise Emissions

The resultant worst-case noise levels presented against the base noise limits at associated and non-associated dwellings are presented in **Table 6-48** . A noise contour map displaying the noise propagation from the wind turbines during operation has been provided in **Figure 6-17**.

TABLE 6-48 PREDICTED NOISE LEVELS AT SENSITIVE RECEPTORS

Dwelling	Dwelling Type	GDA94 / MGA zone 56		Nearest WTG	Distance to Nearest WTG, m	Predicted Worst-case WTG Noise Level, L_{eq}, dB(A)	Base Noise Limit, L_{eq}, dB(A)
		Easting	Northing				
19	Non-associated	765553	6154292	184	2,227	33.7	35
99	Non-associated	779424	6163383	184	2,235	33.6	35
42	Non-associated	765553	6154292	75	5,924	30.4	35
12	Non-associated	783072	6160304	5	6,420	25.7	35
90	Non-associated	783112	6160359	5	6,487	25.6	35
93	Associated	779424	6163383	181	6,493	24.3	45
89	Non-associated	765553	6154292	184	6,519	22.9	35
62	Associated	765409	6154292	181	6,568	22.9	45
71	Non-associated	765553	6154292	1	7,525	22.9	35
107	Non-associated	779289	6163430	1	7,529	22.9	35
70	Non-associated	765553	6154292	1	7,614	22.8	35
77	Non-associated	765553	6154292	1	7,714	22.8	35
80	Non-associated	765553	6154292	1	7,987	22.8	35
81	Non-associated	765553	6154292	1	8,002	22.5	35
45	Non-associated	779190	6163976	1	8,026	22.5	35
105	Non-associated	758901	6163383	153	9,624	19.8	35
106	Non-associated	779424	6163383	75	11,122	18.8	35
109	Yanga CA	752659	6149983	128	11,160	20.2	
108	Non-associated	751755	6146361	128	11,879	19.5	35

The noise modelling results indicate no exceedances of the base noise limits.

Compliance with the operational noise criteria of the Noise Bulletin was assessed at non-associated Dwellings 19 and 99 (the two nearest dwellings to the Project) based on the background plus 5 dB(A) criteria being met at each hub-height integer wind, as detailed below.

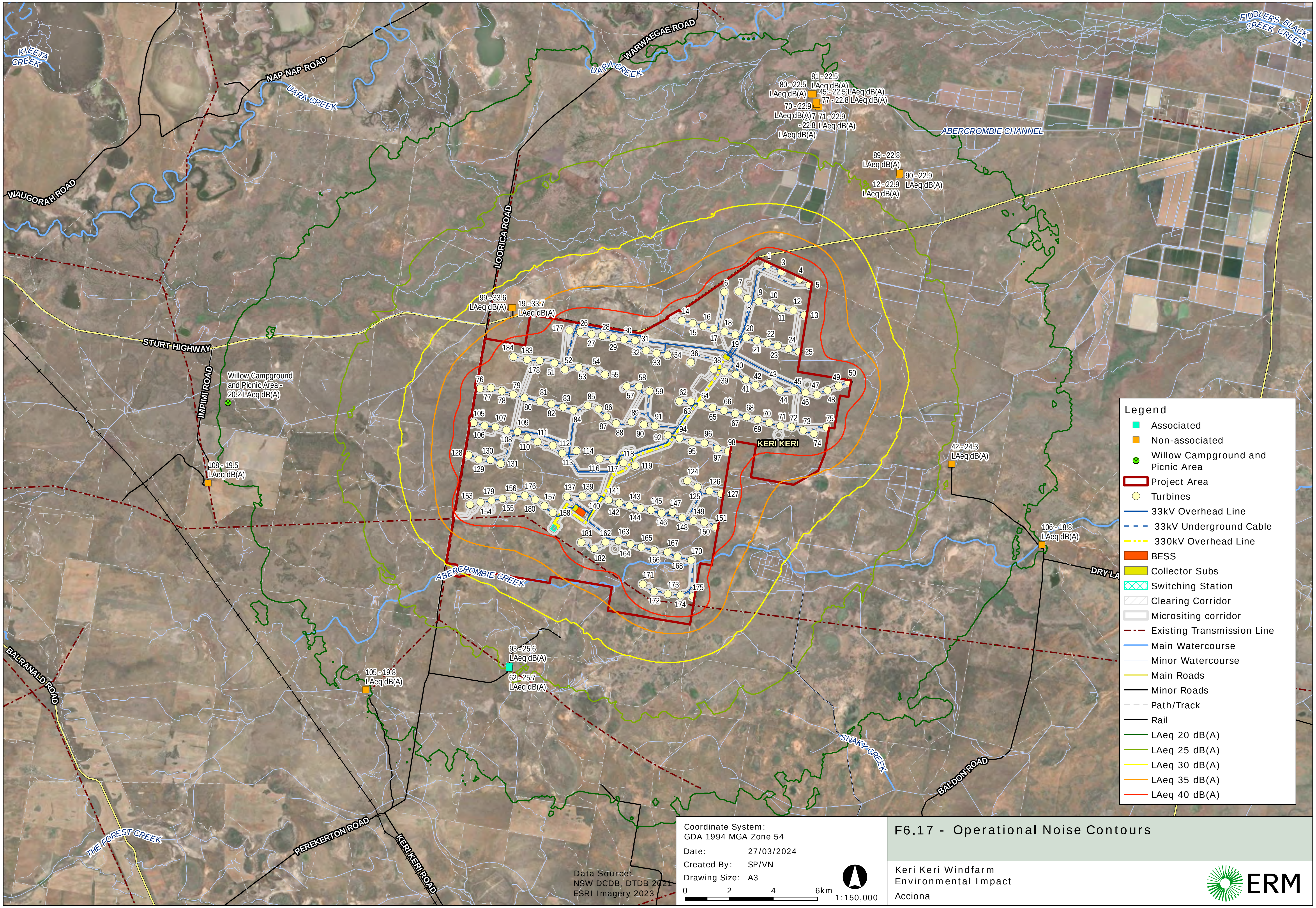
Non-associated Dwellings 19 and 99

The predicted noise levels at various hub-height wind speeds are plotted against the project criteria for Dwellings 19 and 99 in **Figure 6-18** and **Figure 6-19** respectively.

As per the Noise Bulletin:

The predicted equivalent noise level (LAeq,10 minute), adjusted for tonality and low frequency noise in accordance with these guidelines, should not exceed 35 dB(A) or the background noise (LA90, 10 minute) by more than 5 dB(A), whichever is the greater, at all relevant receivers for wind speed from cut-in to rated power of the wind turbine generator and each integer wind speed in between.

The RBL plus 5 dB(A) criteria is not exceeded. Therefore, Dwellings 19 and 99 fully comply with the operational noise criteria in the Noise Bulletin.



Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024
Created By: SP/VN
Drawing Size: A3

F6.17 - Operational Noise Contours

Keri Keri Windfarm
Environmental Impact
Acciona

ERM

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FIGURE 6-18 PREDICTED WIND FARM NOISE VS WIND SPEED – DWELLING 19

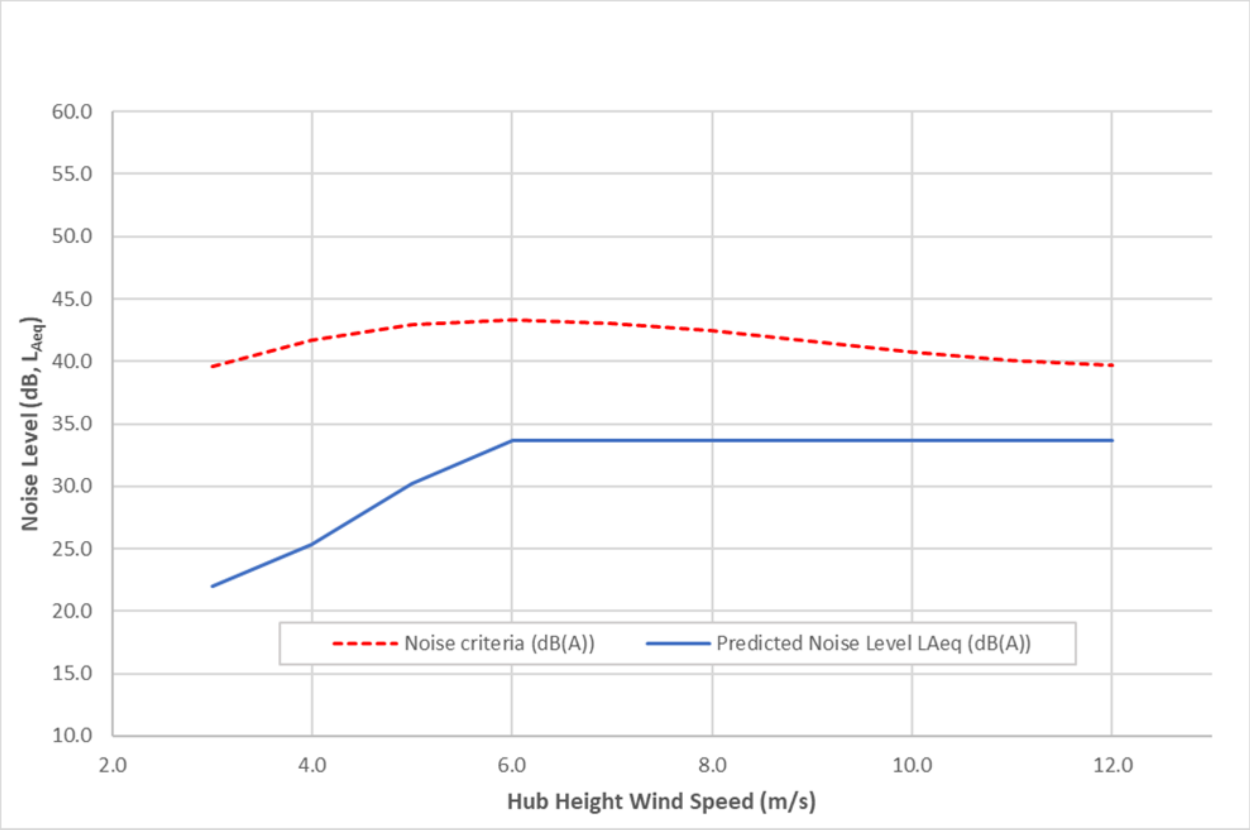
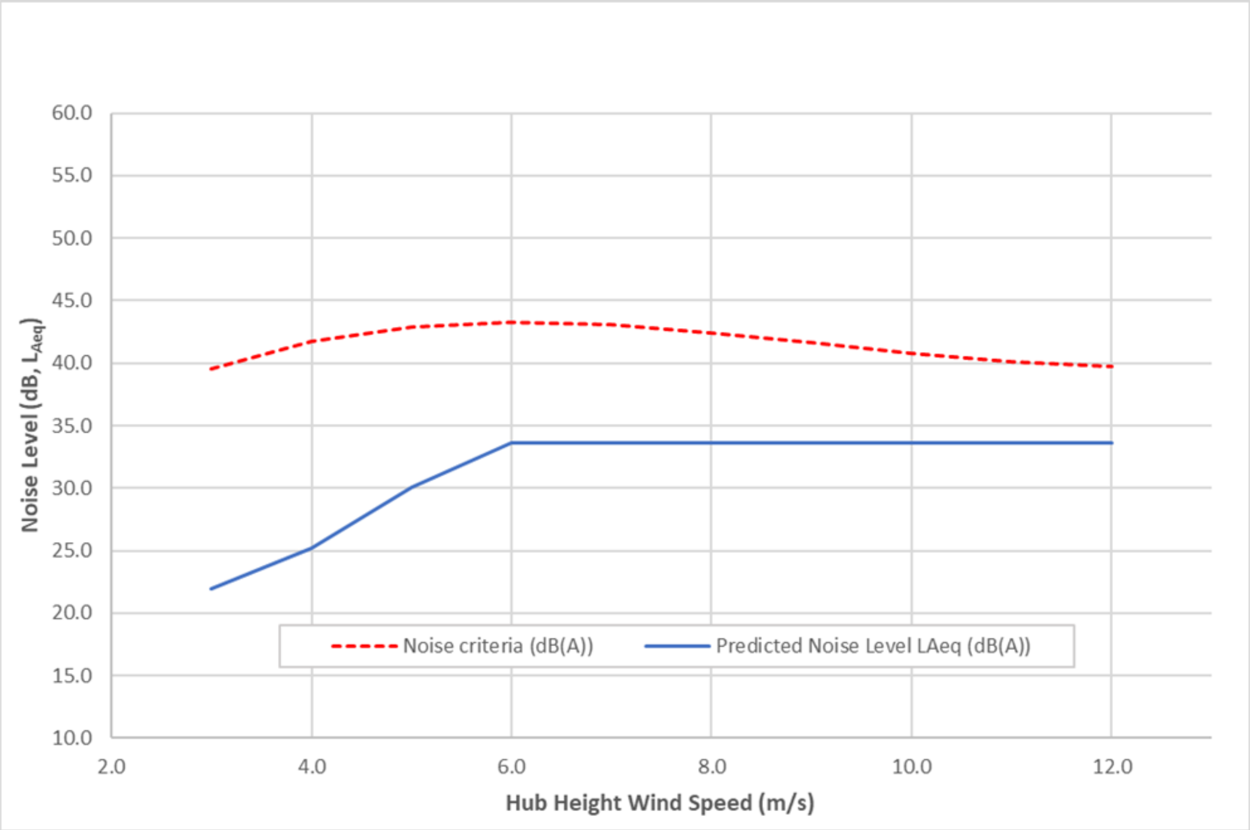


FIGURE 6-19 PREDICTED WIND FARM NOISE VS WIND SPEED – DWELLING 99



Tonality

Third octave band centre frequency noise predictions at the nearest non-associated dwelling 19 which is 2,227 m from WTG #184 are provided in **Table 6-49**. Based on an analysis of the spectra, no tonal characteristics are present at dwelling 19 as shown by the overall A-weighted value of 33.7 dB(A).

TABLE 6-49 PREDICTED 1/3 OCTAVE BAND CENTRE FREQUENCY NOISE LEVELS AT DWELLING 19

1/3 Octave Band Centre Frequency	Predicted Noise Level at Dwelling 19, L_{eq} dB
10 Hz	58.3
12.5 Hz	56.1
16 Hz	53.9
20 Hz	52.1
25 Hz	50.3
31.5 Hz	50.6
40 Hz	49.1
50 Hz	49.7
63 Hz	46.7
80 Hz	45.5
100 Hz	42.1
125 Hz	36.9
160 Hz	34.6
200 Hz	32.0
250 Hz	29.6
315 Hz	29.9
400 Hz	27.6
500 Hz	25.3
630 Hz	25.0
800 Hz	23.7
1000 Hz	21.7
1250 Hz	17.4
1600 Hz	12.2
2000 Hz	3.8
2500 Hz	-8.3
3150 Hz	-26.4
4000 Hz	-53.2
5000 Hz	-92.3

1/3 Octave Band Centre Frequency	Predicted Noise Level at Dwelling 19, L_{eq} dB
6300 Hz	<-92.3
8000 Hz	<-92.3
Overall A-weighted value	**33.7**

Low Frequency Noise

Based on C-weighting the predicted un-weighted noise levels in **Table 6-49** at the nearest non-associated dwelling (Dwelling 19), the overall C-weighted noise level was shown to be 55.9 dB(C). Based on compliance with the 60 dB(C) criterion, no low frequency characteristics are expected at the nearest dwelling.

6.4.4.2 ANCILLARY ELECTRICAL INFRASTRUCTURE

The predicted noise levels from the BESS are provided in **Table 6-50**. The predicted noise levels from the BESS comply with the NPI PNTLs at all dwellings (associated and non-associated).

TABLE 6-50 PREDICTED BESS NOISE LEVELS AT SENSITIVE RECEPTORS

Dwelling	**Dwelling Type**	**GDA94 / MGA zone 56**		**Predicted BESS Noise Level, L_{eq}, dB(A)**	**Day PNTL $L_{Aeq,15min}$ dB(A)**	**Evening PNTL $L_{Aeq,15min}$ dB(A)**	**Night PNTL $L_{Aeq,15min}$ dB(A)**
		Easting	Northing				
19	Non-associated	765553	6154292	18	40	35	35
99	Non-associated	779424	6163383	18	40	35	35
42	Non-associated	765553	6154292	-	40	35	35
12	Non-associated	783072	6160304	-	40	35	35
90	Non-associated	783112	6160359	-	40	35	35
93	Associated	779424	6163383	26	40	35	35
89	Non-associated	765553	6154292	-	40	35	35
62	Associated	765409	6154292	25	40	35	35
71	Non-associated	765553	6154292	-	40	35	35
107	Non-associated	779289	6163430	-	40	35	35
70	Non-associated	765553	6154292	-	40	35	35
77	Non-associated	765553	6154292	-	40	35	35
80	Non-associated	765553	6154292	-	40	35	35

Dwelling	Dwelling Type	GDA94 / MGA zone 56		Predicted BESS Noise Level, L_{eq}, dB(A)	Day PNTL $L_{Aeq,15min}$ dB(A)	Evening PNTL $L_{Aeq,15min}$ dB(A)	Night PNTL $L_{Aeq,15min}$ dB(A)
		Easting	Northing				
81	Non-associated	765553	6154292	-	40	35	35
45	Non-associated	779190	6163976	-	40	35	35
105	Non-associated	758901	6163383	8	40	35	35
106	Non-associated	779424	6163383	-	40	35	35
109	Yanga CA	752659	6149983	-	40	35	35
108	Non-associated	751755	6146361	-	40	35	35

6.4.4.3 CONSTRUCTION NOISE

Predicted worst-case and unmitigated LAeq, 15min noise levels for all construction equipment and construction scenarios at the nearest receiver (dwelling 19) have been presented in **Table 6-51**.

ICNG Management Level exceedances are not predicted at any associated or non-associated dwelling.

It should be noted that the predicted noise levels and the duration of any exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and dwellings. A Construction Noise and Vibration Management Plan (CNVMP) is required as per standard practice for construction in NSW and in-principle noise and vibration mitigation measures are discussed in **Section 6.4.5**.

TABLE 6-51 PREDICTED CONSTRUCTION NOISE LEVELS AT THE NEAREST SENSITIVE RECEPTOR

Stage and Situation	ICNG Management Level, $L_{Aeq(15\ min)}$ dB(A)			Predicted Noise Level at Nearest Sensitive Receiver (Dwelling 19), dB(A)	Compliance?
	Standard Hours, Noise Affected	Standard Hours, Highly Noise Affected	Outside recommended standard hours (OOH), Noise Affected		
Early works – All equipment for the stage concurrently and dynamically operating over the entire Project Area as per the quantity and duty factor specified in **Figure 3-3**.	45	75	40	25	Yes
Early Works - A Grader and a Concrete agitator truck at the Site boundary fronting Dwelling 19 and operating continuously for 15 minutes				40	Yes
Construction, Installation and Commission - All equipment for the stage concurrently and dynamically operating over the entire Project Area as per the quantity and duty factor specified in **Figure 3-3.**				31	Yes
Construction, Installation and Commission - A Grader and Piling (bored) (at the nearest turbine) at the Site boundary fronting Dwelling 19 and operating continuously for 15 minutes				40	Yes
Demobilisation – All equipment for the stage concurrently and dynamically operating over the entire Project Area as per the quantity and duty factor specified in **Figure 3-3.**				23	Yes
Demobilisation – A Truck (>20 tonne) and a Vehicle (light commercial e.g., 4WD) at the Site boundary fronting Dwelling 19 and operating continuously for 15 minutes.				37	Yes

6.4.4.4 VIBRATION AND BLASTING

Vibration

The assessment concluded that vibration impacts associated with human response at dwellings is only likely if construction equipment is in proximity (<100m).

Based on a separation distance of 870 m between the nearest receiver (Dwelling 19) and the Project Area, construction vibration impacts are not expected at any associated or non-associated dwelling.

Blasting

The Vibration Guideline does not specifically address blasting-induced vibration effects. Blasting overpressure and ground vibration should be addressed using the document *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Over Pressure and Ground Vibration* (ANZEC, 1990). This document provides criteria intended to minimise annoyance and discomfort to dwelling occupants.

The recommended maximum levels for blasting are as follows:

- Airblast overpressure – 115 dB (Lin Peak) for 95 % of all blasts over a period of 12 months and 120 dB (Lin Peak) at all times; and
- Ground vibration: – 5 mm/s (PPV) for 95 % of all blasts over a period of 12 months and 10 mm/s (PPV) at all times.

Low-level blasting may be required when hard material is encountered during excavation for the WTG foundations during the construction phase of the Project. However, ground vibration and overpressure impacts can only be assessed against the ANZEC (1990) when the locations, depths and explosive charge masses are known. This assessment therefore only considers the distance between the nearest WTG and dwelling in a preliminary scope only.

If the need for blasting has been identified and once the above-mentioned information is known, it is recommended that a screening assessment be conducted as part of a Blasting Plan to identify all sensitive receivers located within a buffer distance based on the proposed blast charge mass and local ground properties.

6.4.4.5 TRAFFIC AND TRANSPORT NOISE

Construction

The predicted construction traffic noise levels at Sensitive Receptor 441 Moama St are shown in **Table 6-52.** The predicted construction traffic noise levels at Sensitive Receptor marginally exceed the RNP criteria during the day and night periods. There is a 0.4 dB and 1.5 dB exceedance of the RNP criteria during the day and night periods respectively.

There is a 2.9 dB and 1.1 dB noise level increase of existing traffic noise levels during the day and night periods respectively. As per the RNP, if road traffic noise level increase during Project construction is within 2 dB(A) of current levels, then the objectives of the RNP are met and no specific mitigation measures are required. Traffic noise levels are increased by 2.9 dB (marginal RNP objective exceedance of 0.9 dB) due to the Project during the day period. This assessment is considered to be a worst-case scenario assessment and would not occur throughout the peak construction period. Construction road traffic noise is, therefore, not expected to generate a noise impact the Sensitive Receptors.

TABLE 6-52 PREDICTED CONSTRUCTION TRAFFIC NOISE LEVELS AT SENSITIVE RECEPTOR 441 MOAMA ST

Period	Existing Traffic			Existing + Project Traffic			RNP Criteria, dB(A)	Noise Level Increase, dB
	Traffic Volume (vehicles/period)		Predicted Traffic Noise Level, dB(A)	Traffic Volume (vehicles/period)		Predicted Traffic Noise Level, dB(A)		
	Light Vehicles	Heavy Vehicles		Light Vehicles	Heavy Vehicles			
Day (7 a.m.– 10 p.m.)	638	566	$L_{Aeq,15hr}$ 57.3	708	1162	$L_{Aeq,15hr}$ 60.4	$L_{Aeq,15hr}$ 60	2.9
Night (10 p.m.–7 a.m.)	160	141	$L_{Aeq,9hr}$ 55.4	230	181	$L_{Aeq,9hr}$ 56.5	$L_{Aeq,9hr}$ 55	1.1

Note: A façade reflection of 2.5 dB has been applied to all calculated results as per the RNP.

Operation

Traffic noise impacts on sensitive receivers during the operational stage of the Project are expected to be insignificant.

6.4.4.6 NATIONAL PARK AMENITY

Table 6-53 presents the predicted worst-case WTG noise level for 'The Willows Campground' within Yanga SCA which does not exceed the 35 dB(A) noise level. It is considered that the Project will not impact on amenity/recreational uses within of Yanga SCA.

TABLE 6-53 PREDICTED NOISE LEVEL FOR YANGA SCA

Yanga SCA	GDA94 / MGA zone 56		Nearest WTG #	Distance to Nearest WTG, m	Predicted Worst-case WTG Noise Level, L_{eq}, dB(A)	Baseline Limit, L_{eq}, dB(A)
	Easting	Northing				
The Willows Campground	752659	6149983	128	11160	20	35 [1]

Note:
1. Non-associated dwelling criterion has been used as a suitable criterion for assessment of the campground.

6.4.5 MITIGATION MEASURES

6.4.5.1 CONSTRUCTION

Based on the findings presented above, the ICNG Management Levels are not exceeded at any associated or non-associated dwelling. Notwithstanding this, during construction of the Project, good-practice construction noise mitigation and management measures should be implemented to reduce noise levels and minimise any impacts as far as practicable. A range of mitigation and management measures are available and those that are considered feasible, reasonable and practical to implement the specific tasks should be considered, for example:

- Avoid unnecessary noise due to idling diesel engines and fast engine speeds when lower speeds are sufficient;
- Ensure all machines used on the site are in good condition, with particular emphasis on exhaust silencers, covers on engines and transmissions and squeaking or rattling components. Excessively noisy machines should be repaired or removed from the site;
- Ensure that all plant, equipment and vehicles movements are optimised in a forward direction to avoid triggering motion alarms that are typically required when these items are used in reverse; and
- During the construction design, choose appropriate machines for each task and adopt efficient work practices to minimise the total construction period and the number of noise sources on the site. Select the quietest item of plant available where options that suit the design permit.

Works associated with transmission line and access road construction often require activities in closer proximity to receivers that are not affected by construction works at WTGs or permanent facilities. In these circumstances task-specific noise mitigation and management measures should be implemented (when works are close to receivers) to reduce noise impacts to acceptable levels.

Construction road traffic and heavy vehicle movements have the potential to generate “peak” or “maximum” noise level events, and these should be limited during the night period, and avoided if possible. Where it is not possible for this to occur, heavy vehicle drivers should be instructed to arrive and depart as quietly as possible. Whilst on-site and near receivers, heavy vehicle drivers should be instructed to implement good-practice noise management measures to reduce peak noise levels and minimise any impacts as far as practicable. During the works, heavy vehicle drivers should be instructed to travel directly to site and avoid any extended periods of engine idling at or near residential areas, especially at night.

To minimise impacts during construction it is recommended that a CNVMP be developed for management of the works. The CNVMP would have the following objectives:

- Provide a management framework and mitigation measures to minimise impacts where possible;
- Establish approved hours for works;
- Ensure workers are aware of noise and vibration generating activities and any required control methods to minimise impacts;
- Establish roles and responsibility for managing noise and vibration impacts; and
- Establish a noise and vibration complaints management system.

6.4.5.2 OPERATION

No noise mitigation measures are deemed necessary during operational of the Project.

It should be noted that opportunities for mitigation strategies through technology selection, localised equipment noise control among other options with equivalent or improved noise impact mitigation performance shall be considered in the detailed design phase.

6.4.5.3 ROAD TRAFFIC

Construction and operational traffic noise management should be included in the CNVMP for the Project.

It is anticipated that this may include site awareness training and environmental inductions for construction and operation staff, highlighting driving practices to minimise traffic noise impacts on the sensitive receivers.

6.4.6 CONCLUSION

Based on the parameters assessed and compliance with guidelines and regulations, the worst-case predicted noise levels at the nearest dwellings (associated and non-associated) were assessed and showed no exceedances as per the following:

- The predicted noise levels from the BESS comply with NPI criteria;
- Construction noise has been assessed and compliance with ICNG criteria is expected at all sensitive receivers. Construction noise and vibration control measures have been provided as best practice measures during the construction stage;
- Construction traffic noise levels at the sensitive receivers meet the RNP noise objectives. Operational road traffic noise impacts are expected to be insignificant;
- No noise impacts due to the project are expected at the Willows Campground in the Yanga Conservation Area; and

- Nearby Willan Wind Farm is not expected to generate a cumulative noise impact to the Project's sensitive receivers.

6.5 TRAFFIC AND TRANSPORT

6.5.1 INTRODUCTION

A Traffic and Transport Impact Assessment (TTIA) was prepared to determine the level of potential impacts of the construction, operations and decommissioning phases of the Project on the operation of the surrounding road network (TTPP, 2024; **APPENDIX J**). Feasible and reasonable mitigation measures are proposed to ensure that the construction and operation of the Project can be carried out with minimal impact on the surrounding road network and users.

The TTIA addresses the project-Specific SEARs (**APPENDIX A**), with consideration of relevant stakeholder engagement (**Section 5**), and relevant guidelines. The TTIA incorporates the proposed OSOM transport route assessment (Rex J Andrews, 2024).

6.5.2 EXISTING ENVIRONMENT

6.5.2.1 ROAD NETWORK

State roads are the major arterial links throughout NSW and within major urban areas. Within regional areas, these roads provide the main connections to and between regional centres and smaller towns and districts.

The Project Area adjoins the Sturt Highway (A20) to the north, which is a state road that runs in an east-west direction between the Northern Expressway (Reid, South Australia) and the Hume Highway NSW (north of Tarcutta). Adjacent to the Project Area, the Sturt Highway is a two-lane road providing a single travel lane in each direction. Each travel lane is approximately 3.5 m wide with sealed road shoulders and gravel verge provided on both sides of the road. The alignment of the Sturt Highway is flat with extensive straight sections of road providing lengthy sight distances to approaching vehicles and for those vehicles accessing the highway.

Designated local roads are typically narrower and accommodate lower traffic volumes. They may be sealed or unsealed. The key local road relevant to the Project Area is Keri Keri Road, which has a north-south alignment between Sturt Highway and Berrambong Railway Road. Keri Keri Road is an unsealed road running along the Project Areas western boundary, with no speed limit signage. The road is flat with a straight alignment offering extensive sight distances to approaching vehicle and has a width of approximately 5 m with unsealed shoulders.

Sturt Highway and Keri-Keri Road converge at a four-way priority-controlled intersection (give way) to the north-west of the site.

6.5.2.2 TRAFFIC VOLUMES

Traffic volumes for the road network proximate to the Project were measured at the intersection of Sturt Highway and Keri Keri Road, with traffic movement counts conducted in the AM and PM peak periods (9:30 am-10:30 am and 3:30 pm-4:30 pm respectively) on Sunday 18 September 2022 to Wednesday 21 September 2022.

The results of these traffic counts are summarised within **Table 6-54**.

TABLE 6-54 TRAFFIC VOLUMES - STUART HIGHWAY/KERI KERI ROAD

Road and Direction	AM Peak (9:30 am – 10:30 am)			PM Peak (3:30 pm – 4:30 pm)		
	Light Vehicles	Heavy Vehicles	Combined	Light Vehicles	Heavy Vehicles	Combined
Sturt Highway (A20)						
Eastbound	37	15	**52**	30	15	**45**
Westbound	36	21	**57**	36	14	**50**
Two-way Flow	73	36	**109**	66	29	**95**
Keri Keri Road						
Eastbound	0	0	**0**	1	0	**1**
Westbound	0	0	**0**	0	0	**0**
Two-way Flow	0	0	**0**	0	0	**1**

The average daily traffic volume for a typical weekday was therefore calculated to be in the order of 535 vehicles in the eastbound direction and 970 vehicles in the westbound direction, with heavy vehicles comprising around 47% of the daily traffic volume.

6.5.2.3 CRASH HISTORY

Historic crash data in the vicinity of the Project was sourced from Transport for NSW (TfNSW) Centre for Road Safety for the five-year period from 2017 to 2021. This data shows that there have been six crashes recorded within a five-year period within proximity to the Project site's frontage to the Sturt Highway. However, none of the six recorded crashes were located within 1 km of the proposed Project vehicle site access points on the Sturt Highway or the intersection of Sturt Highway and Keri Keri Road.

Of the six recorded crashes, four were non-injury tow away crashes, while the other two crashes resulted in a minor injury. All crashes along the Project site frontage with the Sturt Highway were single vehicle crashes and were recorded as 'vehicle leaving road' on a straight section or bend in the roadway. There have been no fatalities recorded.

6.5.2.4 OTHER TRANSPORT

There are no nearby public transport services within the vicinity of the Project.

Balranald Coach Stop in Market Street, Balranald is nearest bus stop and is located approximately 45 km from the site. Pre-paid bus routes 725 and 726 run between Mildura and Cootamundra using Sturt Highway. There are two services per day, typically one in the early morning and one in the evening.

Griffith Station is located 200 km from the site and is served by the NSW TrainLink Regional train and coach service. The coach link between Balranald and Hay travels along the Sturt Highway past the site's frontage.

6.5.3 ASSESSMENT OF IMPACTS

6.5.3.1 TRAFFIC GENERATION AND DISTRIBUTION METHODOLOGY

For assessment purposes, the potential for traffic generation for the Project is considered in three separate stages:

- **General Construction Traffic (Non OSOM vehicles)** – based on a 24-month period, noting that the volume of construction vehicle generation will vary significantly over this period as the Project moves through the various stages of construction. General construction traffic includes (but is not limited to):
  - Transportation of construction workers, with an estimated workforce of up to 650 people at the peak construction stage;
  - Delivery of plant, equipment and materials; and
  - Removal of waste
- **Construction Traffic – OSOM vehicles** – OSOM vehicles would be used for the transportation of the various component of the WTGs including blades, tower and turbine components between the port and the Project area. OSOM vehicles will also be used to transport components associated with BESS including transformers and batteries.
- **Operational Traffic** – Transportation of up to 12 people (typical operational phase workforce), who would access the site via private transport.

Generation of traffic within the peak construction period is summarised in **Table 6-55** and **Table 6-56** below, (noting that a vehicle trip is defined in accordance with the RTA Guide to Traffic Generating Developments (2002) as a movement to or from the Project Area).

TABLE 6-55 PEAK CONSTRUCTION PERIOD DAILY PROJECT TRAFFIC GENERATION

Stage	Peak Daily Trips (in and out)
General construction	598
WTG – OSOM	38
Construction Workers	140
Total	776

TABLE 6-56 PEAK CONSTRUCTION PERIOD – HOURLY PROJECT TRAFFIC GENERATION

Stage	Peak Hour Trips (in and out)
Morning Peak Hour	93
Midday Peak Hour	57
Evening Peak Hour	93

For the purpose of the assessment, it was assumed:

- Project generated traffic would be distributed evenly from both the east and the west along the Sturt Highway.
- Importation of quarried materials including gravel, aggregate and sand (where required) is assumed to be sourced externally from existing quarries (in the worst-case scenario) via the Sturt Highway; and
- On-site construction worker accommodation will be provided.

6.5.3.2 ROAD NETWORK CAPACITY

The Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis specifies the capacity for a two-lane highway to be 1,700 passenger car units per hour (pcu/h) for each direction of travel. The 1,700 pcu/h capacity has been adopted for the assessment of the Sturt Highway (A20).

Local unsealed roads have reduced capacity resulting from lower vehicle operating speeds (due to factors such as reduced vehicle control) and increased headways between vehicles (due to factors such as dust). As such, a capacity of 1,000 pcu/h for each direction of travel has been conservatively assumed for the unsealed Keri Keri Road.

The criteria for evaluating road performance used in this study is Level of Service (LoS). LoS is a qualitative measure that describes the operational conditions within a traffic stream and the perception of these by road users. The LoS ranges from A (best rating) to F (worst rating).

In rural areas, LoS rating C can be considered a minimum desirable standard, and any deterioration of the LoS below this level would imply that remedial measures to maintain the existing LoS should be sought.

Table 6-57 outlines the LoS categories and definitions provided within the Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* (Austroads, 2017).

TABLE 6-57 LEVEL OF SERVICE DEFINITIONS AND CRITERIA FOR MID-BLOCK SECTIONS

Level of Service	Description	Volume to Capacity threshold*
A	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.	0.32
B	In the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is little less than that of the Level of Service A.	0.50
C	In the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	0.71

Level of Service	Description	Volume to Capacity threshold*
D	Close to the limit of stable flow but is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.	0.91
E	Occurs when traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause a traffic-jam.	1.00
F	Describes unstable flow. Such conditions exist within queues forming behind bottlenecks. The projected flow rate can exceed the estimated capacity of a given location. Flow break-down occurs and queuing and delays result.	>1.00

*based on free-flow speed of 100 km/h

The results of the Volume to Capacity (V/C) ratio assessment for the peak period construction activities of the Project were assessed and are shown in **Table 6-58**.

For the forecasted construction traffic volumes, it is assumed that all construction traffic associated with the Project arrives and departs in the same direction and all traffic utilises the Sturt Highway site access, which would represent the worst-case scenario with regard to the V/C ratios.

TABLE 6-58 PEAK CONSTRUCTION PERIOD GENERATION AND V/C RATIO

Road	Period	Direction	Existing Volumes		With Peak Construction Volumes		
			Volume (vph)	V/C	Project Generated Traffic (vph)	Total Volume (vph)	V/C
Sturt Highway	Morning Peak	Eastbound (towards Hay)	37	0.021	93	130	0.076
		Westbound (towards Balranald)	36	0.21	93	129	0.076
	Evening Peak	Eastbound (towards Hay)	30	0.018	93	123	0.072
		Westbound (towards Balranald)	36	0.021	93	129	0.076

The assessment shows that the Sturt Highway would always operate at LoS A during the peak of construction, indicating that the capacity of the Sturt Highway would not be adversely impacted by the Project.

Additionally, is noted that traffic flows along Keri Keri Road are extremely low with 0 - 1 vehicles per hour surveyed in peak periods. The use of Keri Keri Road for construction access of up to 93 vehicles per hour in a peak period would also represent a V/C ratio of 0.1, comfortably within the LoS A rating, indicating that the operations of Keri Keri Road would also not be adversely impacted by Project.

The assessment of the road network operation demonstrates that the road network on the proposed transport routes has sufficient capacity to accommodate the peak construction traffic generation of the Project.

6.5.3.3 OSOM TRANSPORT ASSESSMENT

OSOM vehicles will be used to deliver WTG components and associated electrical equipment between the relevant port and the site. The movement of OSOM vehicles for WTG components is a specialised logistics exercise and deliveries are undertaken with extensive traffic control and (potentially) enabling works, sometimes including temporary removal of street furniture and removal of vegetation.

An investigation was undertaken to determine the feasibility and implications associated with the transport of WTG components to the site with port origins at:

- Port of Newcastle; and
- Port of Adelaide (noting the OSOM movements are considered from the Victorian border to the site).

The assessment found that:

- The transport of WTG components with OSOM from the Port of Adelaide (via Victoria) would require a 'moderate' or greater amount of enabling works; and
- The transport of WTG components with OSOM from the Port of Newcastle require a 'some – moderate' amount of enabling works.

While the Port of Newcastle is considered to be the preferred port for the transportation of WTG OSOM vehicles to the site based on the lesser amount of enabling works (which includes operational, construction and environmental impacts to the existing road network), the assessment concludes that both options are feasible port locations with regard to the transportation of WTG components using OSOM vehicles.

Mitigation measures specific to the OSOM enabling works are contained within this chapter, and any identified or potential impacts as a result of these enabling works (for example, biodiversity and heritage impacts that have been identified) are contained within the relevant chapters of the EIS.

The geometric assessment of the transport route alternatives demonstrates that either route can satisfactorily accommodate the swept path movements of the proposed OSOM vehicle types, albeit with the need to adjust road infrastructure and intersection layouts and street furniture.

6.5.3.4 SITE ACCESS ASSESSMENT

Intersection Capacity

Throughout the construction and operational phase of the Project, it is proposed that the site will be accessed via the below four site access points:

- One new access point to Sturt Highway (northern boundary) – direct access off Sturt Highway to the site; and
- Three new access points to Keri Keri Road (western boundary) – accessed via the Sturt Highway and Keri Keri Road intersection.

The above access points are in addition to new internal site access tracks that are to be constructed to connect the various on-site facilities to the site access points.

In assessing access to the site at the intersection along the Sturt Highway and its ability to accommodate the estimated traffic generation potential of peak period construction activity of the Project, a SIDRA intersection analysis was undertaken, where it was assumed that all Project related construction traffic would utilise a single access point.

The LoS performance measure was utilised to determine the efficiency of the intersection/ network under the prevailing traffic conditions. LoS is directly related to the delays experienced by traffic travelling through the intersection, and ranges from LoS A (spare capacity) to LoS F (over capacity) on a sliding scale.

For the peak construction periods the delay and LoS for the worst performing movement is presented as the intersection result in accordance with standard practice stipulated in the *RTA Guide to Traffic Generating Developments (2002)* for priority and roundabout intersections.

The LoS criteria and corresponding modelling results are shown in **Table 6-59** and **Table 6-60**.

TABLE 6-59 LEVEL OF SERVICE CRITERIA – INTERSECTION CAPACITY

Level of Service	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 – 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 – 42	Satisfactory	Satisfactory, but accident study required
D	43 – 56	Near Capacity	Near capacity, accident study required
E	57 – 70	At capacity; at signals incidents would cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	Greater than 70	Unsatisfactory, requires additional capacity	Unsatisfactory, requires other control mode or major treatment

TABLE 6-60 SIDRA MODEL RESULTS

Intersection	Period	Existing		Existing + Construction Traffic	
		Ave delay (seconds)	Level of Service	Ave delay (seconds)	Level of Service
Sturt Highway / Keri Keri Road	Morning peak	-	-	8	A
	Midday peak	-	-	11	A
	Evening peak	-	-	11	A

The modelling shows that a site access intersection would perform acceptably with increased traffic resulting from the construction phase of the project.

Sight Distance and Turn Warrants Assessment

A review of driver sight distance was undertaken in accordance with *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersection (2021).*

The Safe Intersection Sight Distance (SISD) criteria as defined by Austroads was applied in the assessment of the available sight distances at the proposed site access points, noting that SISD is the minimum sight distance which should be provided on the major road at any intersection.

The required sight distances are as follows:

- Sturt Highway access – the appropriate design speed is 120 km/h which is +10 km/h on the posted speed limit. Based on the Austroad requirements, the SISD for vehicles travelling along the Sturt Highway approaching the proposed site access and the Keri Keri Road intersection is 324 m. Given that the available sight distances for vehicles entering the Sturt Highway at the Project site is over 500 m in both directions, the available sight distances at the access points to the Sturt Highway comply with the minimum Austroad SISD requirements.
- Keri Keri Road access – the road conditions are such that the design speed is considered to be 80 km/h, resulting in a SISD of 181 m. Similar to the Sturt Highway access point, the available sight distance of over 500 m from the proposed Keri Keri access points comfortably exceeds the minimum Austroad SISD requirements.

Therefore, all four access points (one to the Sturt Highway and three to Keri Keri Road) as proposed will be located and constructed to ensure that there is adequate sight distance to traffic entering the road network.

An assessment of the turn treatments required for a potential site access point at the Sturt Highway was also undertaken in accordance with *Austroads Guide to Road Design (AGRD) Part 4 (2017 and 2021)* and *Austroads Guide to Traffic Management (AGTM) Part 6 (2020),* with the underlying assumption of the assessment that all construction related traffic will enter and exit the site utilising the site access intersection along the Sturt Highway.

Based on this assessment, the turn treatments required at a Project site access at the Sturt Highway are:

- A basic left-turn (BAL); and
- Basic right-turn (BAR).

The warrants are such that upgrades would be required at the Sturt Highway site access and at the intersection of the Sturt Highway and Keri Keri Road.

6.5.4 MITIGATION MEASURES

Several mitigation measures are recommended to alleviate the potential traffic and transport related impacts associated with the Project, including:

- Provision of a detailed traffic management plan in respect of OSOM enabling works, which is to include:
  - Procedures for escorts of oversized and over mass vehicles.
  - Traffic control plans for temporary road closures to allow vehicles to cross to carriageway.
  - Safe work methods and strategies for working on roadways.
  - Dates and times for transporting loads.
  - Location and use of rest stops and layovers along the journey.
  - Communication strategy to affected communities and other stakeholders (for example, police and emergency services, local councils and public and school bus operators).
  - Contact details of foreman or project manager throughout operations to be shared with emergency services and road authorities.
  - Timing of operations and measures to avoid commuter peaks and school peaks through populated areas where practicable.
  - Consideration of cumulative impacts of other projects along the route.
  - Identification of layby areas for driver breaks and co-ordination of OSOM on site arrivals.
- Obtaining the required permits from the National Heavy Vehicle Regulator (NHVR);
- Reducing the amount of traffic generation with the use of shuttle bus services to transport workers who are residing off-site;
- Conducting dilapidation surveys (in consultation with the relevant local Councils and TfNSW) for the proposed transport routes prior to and after construction, with an expectation that any damage incurred to these routes (beyond the usual wear and tear) would be repaired; and

- Implementation of the Safe Systems Approach, which comprises measures related to:
  - Safe people – the education of workers and others present on the site.
  - Safe vehicles – the notion that all vehicles on the site are road worthy, safe and in good working order.
  - Safe speeds – the requirement for all workers and others present on the site to drive to the local conditions and to not exceed the speed limit.
  - Sensitive land uses – the awareness that the project may have an impact on sensitive and uses such as residential precincts and education facilities, both within the construction period and during the OSOM enabling phase. Temporary road closures should be coordinated as to not impact on these sensitive uses, and vehicle layovers should be identified so that heavy vehicles can remain stationary if it is inappropriate to travel at any given time.

In accommodating the Project, the following measures are recommended:

- Site access intersection improvement works at the proposed Sturt Highway site access;
- Intersection improvements works at the Sturt Highway / Keri Keri Road intersection to accommodate the turning path requirements of OSOM vehicles;
- Implementation of appropriate traffic control measures and plans for OSOM vehicle movements;
- Implementation of the Drivers Code of Conduct detailing expectations for driver behaviour for travel to and from the Project site; and
- Preparation and implementation of a detailed Construction Traffic Management Plan (CTMP) detailing how works to the site access and ongoing construction works will be undertaken. The CTMP shall be prepared by the Applicant with the works contractor in consultation with TfNSW / Council.

6.5.5 CONCLUSION

With consideration and implementation of the key mitigation measures outlined, it is considered that the construction and operation of the Project can be undertaken without significant adverse impacts to the operation, capacity or safety of the surrounding road network.

6.6 LANDSCAPE AND VISUAL

6.6.1 INTRODUCTION

A Landscape and Visual Impact Assessment (LVIA) was prepared to identify and assess potential visual impacts associated with the Project. The assessment considered impacts relating to changes in landscape character, landscape values, landscape amenity and scenic vistas that may result from the Project. Where necessary, the LVIA specifies proposed mitigation measures to minimise potential impacts.

The LVIA (Moir, 2024) is provided in **APPENDIX K**.

The LVIA was prepared in accordance with the relevant SEARs, the 'Wind Energy: Visual Bulletin' (DPE, 2016), and with consideration of the following literature:

- 'Scottish Natural Heritage, Visual Representation of Wind Farms - Good Practice Guidance' (Scottish Natural Heritage, 2017);
- 'Environment Protection and Heritage Council, Draft National Wind Farm Development Guidelines' (EPHC, 2010);
- 'Landscape Institute and Institute of Environmental Management & Assessment, Guidelines for Landscape and Visual Impact Assessment Third edition' (Landscape Institute and IEMA, 2013); and
- 'Clean Energy Council, Best Practice Guidelines for Wind Energy Development' (CEC, 2018).

The Visual Bulletin specifies the assessment requirements, which comprise:

- A baseline study that includes analysis of the landscape character, scenic quality and visibility from viewpoints of different sensitivity levels;
- Establishing the visual influence zones from viewpoints using data collected in the baseline study;
- Assessment of the proposed layout against visual performance objectives;
- A glint and glare assessment to demonstrate whether the Project posed a significant risk to motorists or pilots; and
- Justification for the final proposed layout and identification of mitigation and management measures.

Extensive field and photographic survey work to inform the LVIA was undertaken in March 2023 from both public and private properties.

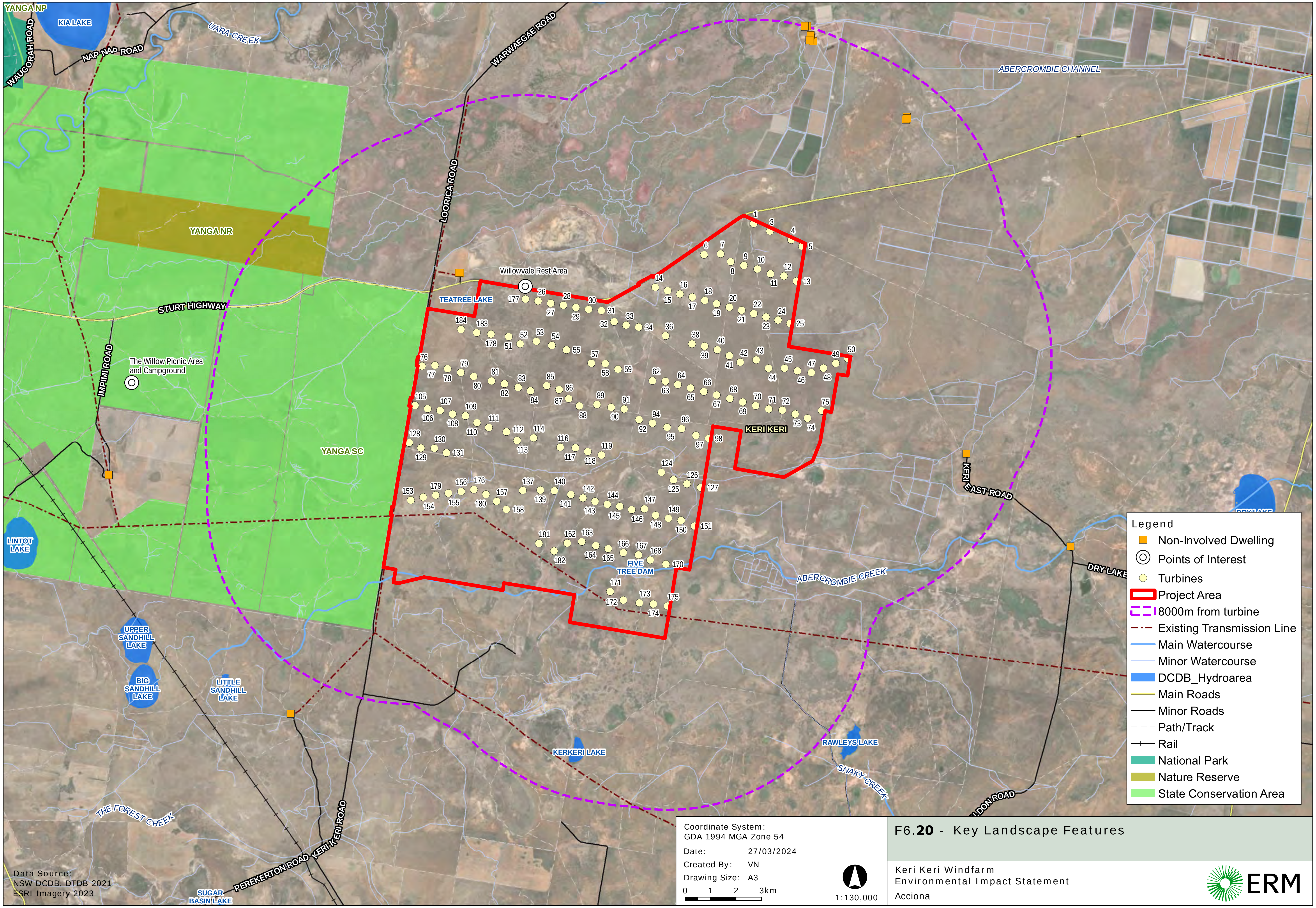
Assessment of the potential for visual impact on Yanga SCA and Yanga National Park was also undertaken.

6.6.2 COMMUNITY LANDSCAPE VALUES

Community engagement was undertaken by the Applicant to establish an understanding of the landscape values held by the local and broader community. Engagement activities have included face-to-face meetings; on-line presentations; public information sessions; provision of printed material including Factsheets, Flyers; a website; an On-Line Engagement Hub; emails, phone calls and a questionnaire. **Figure 6-20** shows key landscape features in relation to the Project Area

A specific questionnaire relating to landscape values was distributed to the Projects stakeholder list. Responses to the questions: "*What are the key landscape features of importance to you in the area? Which of these features do you value most highly?*" included:

- River environs;
- Big tree on the river;
- Heritage Village;
- Cultural Heritage; and
- Flat Plains.



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6.6.3 EXISTING ENVIRONMENT

The Visual Bulletin requires that a 'visual baseline study' is undertaken to establish the existing landscape and visual conditions. This is summarized in **Table 6-61**.

TABLE 6-61 VISUAL BASELINE STUDY INPUTS

Visual Baseline	Investigation Summary
Bioregion	The Project sits within the Riverina IBRA Bioregion in southwest NSW. The Yanga SCA exhibits characteristics of the Riverina IBRA Bioregion and Murrumbidgee subregion. The area is characterised by extensive saltbush plains with small depressions and isolated low rises.
Sensitive Land Use	Yanga National Park, Nature Reserve and SCA - land category C1- National Parks and Nature Reserves - are located to the west of the Project, with the Yanga SCA directly adjacent to the Project's western boundary. Yanga SCA and Nature Reserve are classified as lands under minimal use due to their significant natural, landscape, cultural and educational values. Areas surrounding the SCA and the Reserve consist of natural and improved pastures, dryland and irrigated cropping.
Land Use	The Project Area and most of the surrounding land are zoned RU1 – Primary Production. Land use within and around the Project Area is predominately comprised of agricultural production activities including grazing over native vegetation pastures.
Geology and Landform	The landform of the Project Area and surrounds is generally flat with dry distributary channels and floodplains, which are made up of quaternary alluvial sediments with shallow and small depressions.
Vegetation Character	The Project Area and surrounds is characterised by low-lying saltbush with typically sparse (or non-existent) tall canopy tree species. This vegetation character yields clear, open views of the expanse. The lack of tall canopy species allows higher wind speeds with continual wind action on the landscape. Some taller canopy tree cover is present within the extents of the Yanga National Park, Nature Reserve and the central and western parts of Yanga SCA.
Creeks, Swamps and Floodplains	Dry creeks and lakes within and surrounding the Project Area include Abercrombie Creek (running east to west on the southern side of the Project Area), Forest Creek, Dry Lake and Gunyah Swamp. These are all associated with the Murrumbidgee River catchment. In the broader landscape (i.e., not within the Project Area) lakes or depressions are generally shallow and defined by low-storey, scrubby vegetation such as saltbush and canegrass species. Creek floodplains, generally to the north and south of the Project Area are defined by scattered clumps of blackbox trees, belah trees, saltbush, bluebush, speargrass and forbs.
Nature Reserves	Yanga National Park, Nature Reserve and SCA are located to the west of the Project Area. These conservation areas are an example of undisturbed patches of dense belah, mallee, rosewood and sugarwood communities with abundant grasses and dillon bush. This area also has significant historic and cultural associations, including Aboriginal burial sites, middens, spiritual sites, woolsheds and other structures established during colonial settlement

Visual Baseline	Investigation Summary
Campgrounds and Points of Interest	Points of interest nearby the Project Area that are used by the community include: • The Willows Picnic Area and Campground and Willows Visitor Access Trail recreational areas, which are located within the Yanga SCA and offer opportunities for short bushwalks, birdwatching, camping and rest /picnic areas; and • The Willowvale Rest Area, located on the northern side of the Project Area along the Sturt Highway, which serves as a rest spot for commuters travelling between the towns of Hay and Balranald.
Access Roads	The key roads located in proximity to the Project include: • Sturt Highway, located to the north of the Project, which runs east to west and is the main road connecting Hay and Balranald townships; • Dry Lake Road, located to the east of the Project Area, which is a minor road that runs north to south between Sturt Highway and Moulmein; • Keri Keri Road, located to the west of the Project, which runs north to south and provides access to dwellings on the southern side of the Project Area; and • Loorica Road, located to the north of the Project Area, which is a low use road that runs generally north – south.

The existing landscape features and condition were used to define landscape character units (LCUs) relevant to the Project Area and surrounds. A scenic quality rating frame of reference (adapted from DPE, 2016 and Tudor, 2019) was used to rate the scenic quality of each of these LCUs as follows:

- LCU01 - Yanga Parks - Moderate;
- LCU02 - Creek Corridors - Moderate;
- LC03 - Dry Lakes and Swamps – Low; and
- LCU04 – Farmlands - Low.

6.6.4 ASSESSMENT OF IMPACTS

6.6.4.1 PRELIMINARY ASSESSMENT

In accordance with the Visual Bulletin, two preliminary assessment tools were used to define the visual catchment:

1. Visual magnitude; and
2. Multiple Wind Turbine Tool.

These tools provide an early indication of where turbines require careful consideration because of potential visual impacts and are applied to both dwellings and public viewpoints. The preliminary assessment tools identified dwellings which required further detailed assessment.

Visual Magnitude

Visual magnitude is based on a 2D assessment of the Project, and does not consider topography, vegetation or other screening factors which may reduce the potential for viewing turbines. The Visual Magnitude Threshold is based on the height of the proposed WTGs to the tip of the vertical blade and distance from dwellings or key public viewpoints. The proposed WTGs have a maximum tip height of 291.5 m. Based on these dimensions, the 'black line' intersects at 3,900 m and the 'blue line' intersects at 5,700 m. Non-associated dwellings identified within 3,900 m (black line of visual magnitude) and between 3,900 – 5,700 m (blue line of visual magnitude) of the nearest proposed turbine are shown on **Figure 6-21**. The 'purple line' of visual magnitude is in between 5,700 m and 8,000 m to the nearest proposed turbine.

Thirteen non-associated dwellings were identified within 8 km of a WTG. Of these:

- Two non-associated dwellings within 3,900 m of a wind turbine (within the black line);
- No non-associated dwellings within 3,900 – 5,700 m of a wind turbine (within the blue line); and
- 11 non-associated dwellings within 5,700 m – 8,000 m of a wind turbine.

Multiple Wind Turbine Tool

The *Multiple Wind Turbine Tool* provides a preliminary indication of potential cumulative impacts arising from the Project. To establish the degree to which dwellings or key public viewpoints may be impacted by multiple WTG, the Applicant must map into six sectors of 60° any proposed turbines and any existing or approved turbines within 8 km of each dwelling or key public viewpoint.

The Project is located in proximity to the Wilan Wind Farm (WWF) and Baldon Wind Farm (BWF), and Tchelery Wind Farm (TWF). Potential locations of turbines associated with these projects were obtained from information available on the NSW Government Major Projects Portal.

The 2D Multiple Wind Turbine Tool was applied to public viewpoints identified in the visual baseline study, namely Willowvale Rest Area and Willows Picnic Area and Campground. This assessment concluded that views of turbines associated with the Project, WWF and BWF will be available in up to six 60º sectors (up to 180º) at Willowvale Rest Area.

When applied to the 13 non-associated dwellings within 8 km of the Project:

- One non-associated dwelling (dwelling 108) will have turbines potentially visible in up to three 60º sectors. This dwelling is not located within 8 km of the Project, but will have views associated with BWF;
- 10 non-associated dwellings within 8 km of the project had turbines potentially visible in up to four 60º sectors. Of these, seven non-associated dwellings have views of turbines associated with WWF, BWF and the Project, and three have views associated with BWF and the Project;
- One non-associated dwelling (dwelling 42) will have turbines potentially visible in up to five 60º sectors. This dwelling is not located within the blue line of visual magnitude, and is associated with BWF; and

- Two non-associated dwellings (dwellings 19 and 99) will have turbines potentially visible in up to six 60º sectors. These dwellings are located within the black line of visual magnitude and will have views associated with WWF and the Project. These dwellings are associated with the WWF.

Figure 6-22 provides an overview of the number of 60º sectors visible from each of the dwellings that are identified within 8,000 m of a dwelling.

6.6.4.2 ZONE OF VISUAL INFLUENCE

Two Zone of Visual Influence (ZVI) diagrams were prepared to illustrate the theoretical visibility of the Project from hub and blade tip heights. The ZVI presents a bare-ground scenario, and it does not consider the potential screening effect of structures or vegetation which may screen views to the Project. The ZVI has been assessed to approximately 10 km from the centre of the Project Area.

Figure 6-23 shows the areas of land from which the Project may be visible at a blade tip of 291.5 m and provides an indicative number of visible WTGs. **Figure 6-24** shows the areas of land that may which the Project Area may be theoretically visible at a hub height (200 m). The ZVI prepared for the Project indicates that:

- Due to the generally flat topography, turbines associated with the Project are likely to be visible from most areas around the Project;
- Some views are limited by topography such as the dry lake systems that form a part of the Yanga Parks and parts of the Murrumbidgee Valley that are located generally northwest/west of the Project Area;
- Views to most turbines associated with the Project are likely to be available for all dwellings within 8 km of the wind turbines; and
- Existing intervening vegetation that surrounds non-associated dwellings is likely to reduce views of turbines from several locations.

Further detailed assessment has been undertaken to 'ground truth' the findings of the ZVI assessment and is discussed further in **Section 6.6.4.4**.

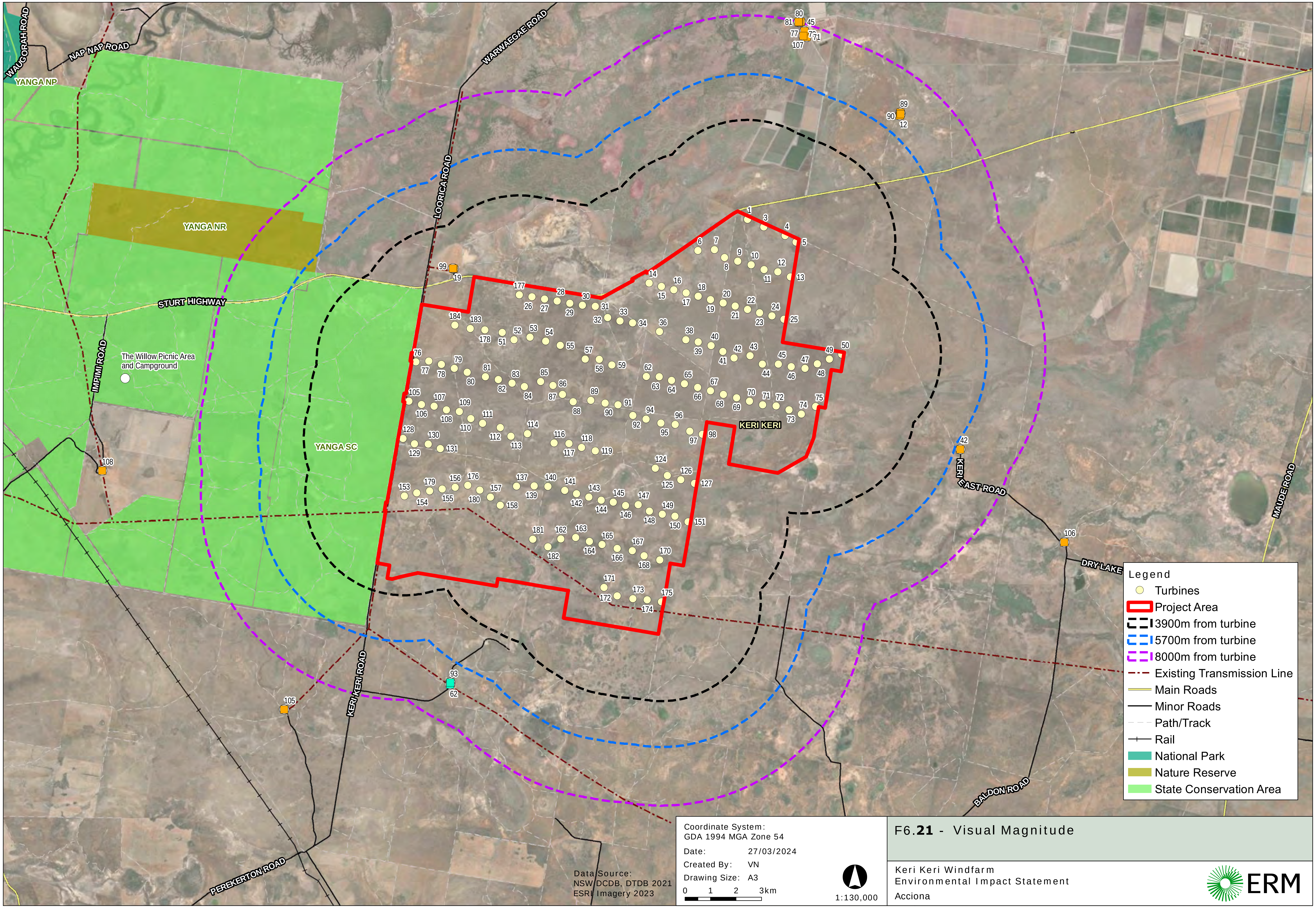
6.6.4.3 VIEWPOINT ANALYSIS

Public viewpoints were taken predominantly on accessible public land (typically walking tracks, roads, and lookouts), while private viewpoints were taken only with consent from landowners. The visual impact of the viewpoint was assessed both on site and through a desktop assessment using topographic and aerial information.

A total of 13 public viewpoints were assessed from varying distances and locations surrounding the Project Area. The locations of viewpoints are shown in **Figure 6-25**. Each viewpoint was assessed against the objectives for the identified Visual Influence Zone (VIZ). VIZ were established using viewer sensitivity level, visibility distance (refer to Appendix A of **APPENDIX K** for tables presenting these) and the scenic quality class (section 5.5 of **APPENDIX K**).

The following provides a summary of the viewpoint analysis:

- Visual Influence Zone 1 (High) (VIZ2): None of the public viewpoints have the potential for a high visual impact;
- Visual Influence Zone 2 (Medium) (VIZ2): Four viewpoints were rated as VIZ2. The Project was assessed as having a visible element in the landscape from three (3) public viewpoint locations, while the fourth public viewpoint location (Willowvale Campground) was considered applicable due to its proximity to the location (refer photomontages VP01, VP02, VP07 and VP08 in Appendix D of **APPENDIX K**); and
- Visual Influence Zone 3 (Low) (VIZ3): A total of nine (9) public viewpoints were rated as VIZ3. In accordance with the methodology in the Visual Bulletin no performance objectives have been noted for VIZ3.



Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 1 2 3km

1:130,000

F6.**21** - Visual Magnitude

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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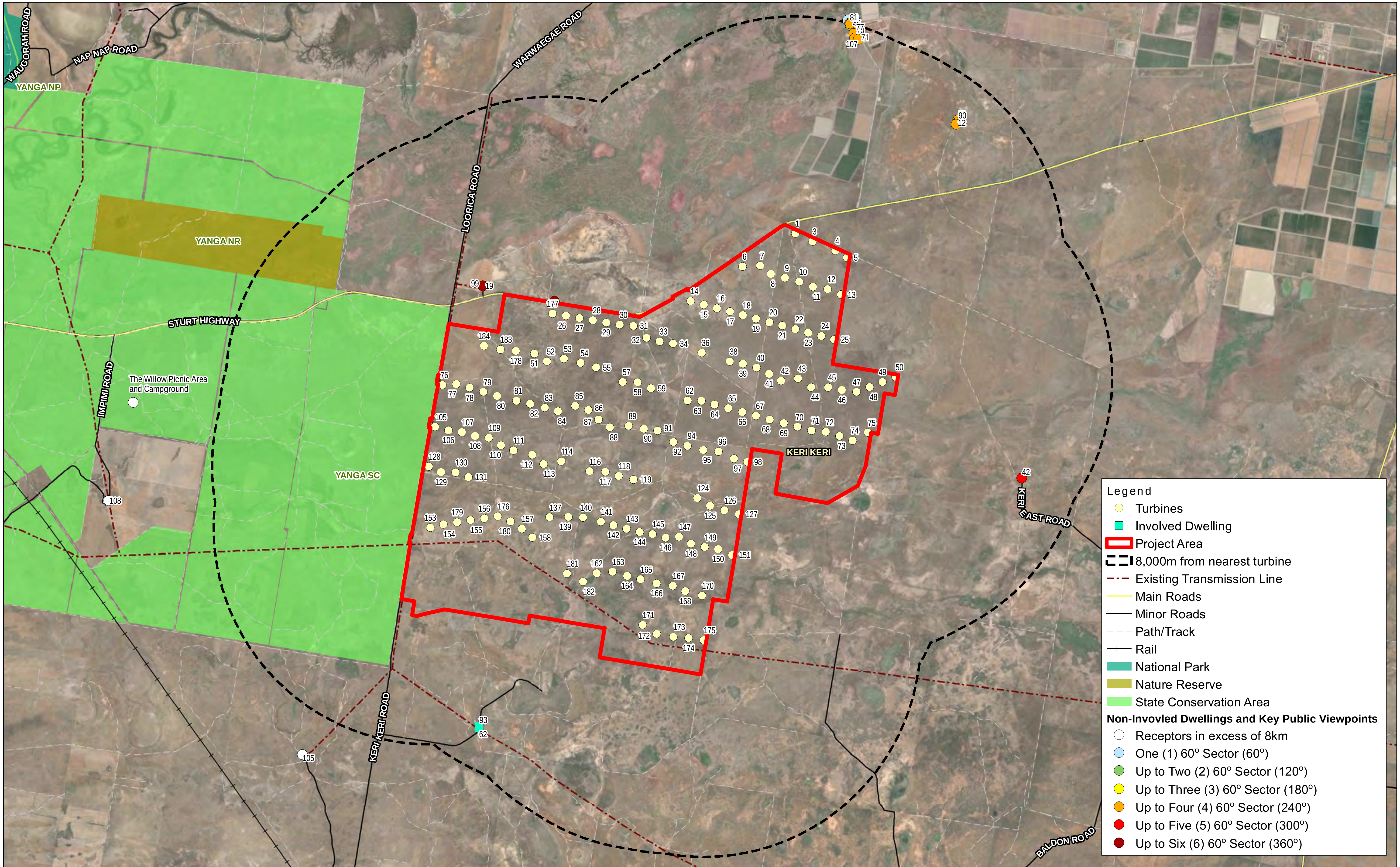

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024
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0 1 2 3km

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F6.22 - Multiple Wind Turbine Tool

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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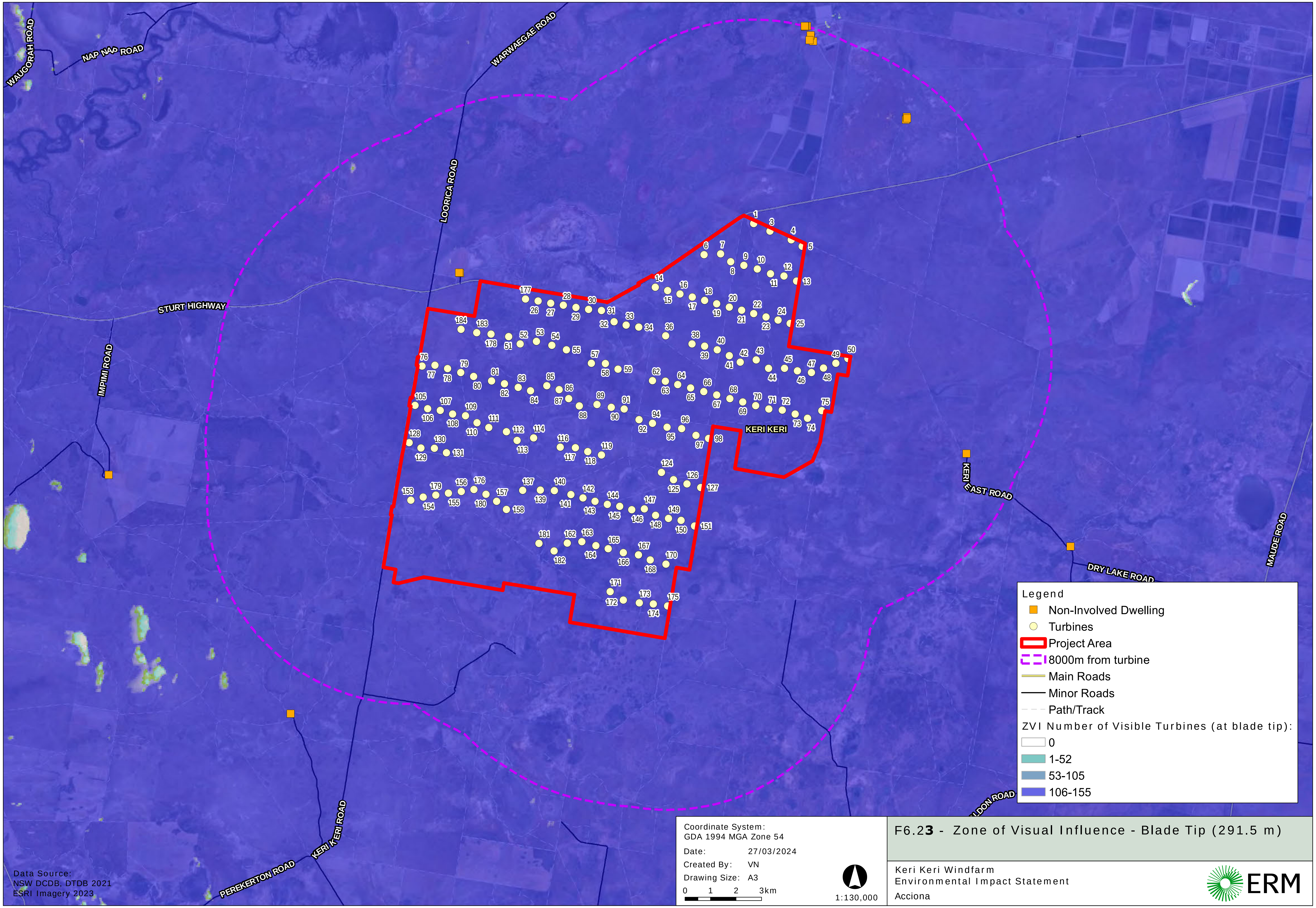

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 1 2 3km

1:130,000

F6.23 - Zone of Visual Influence - Blade Tip (291.5 m)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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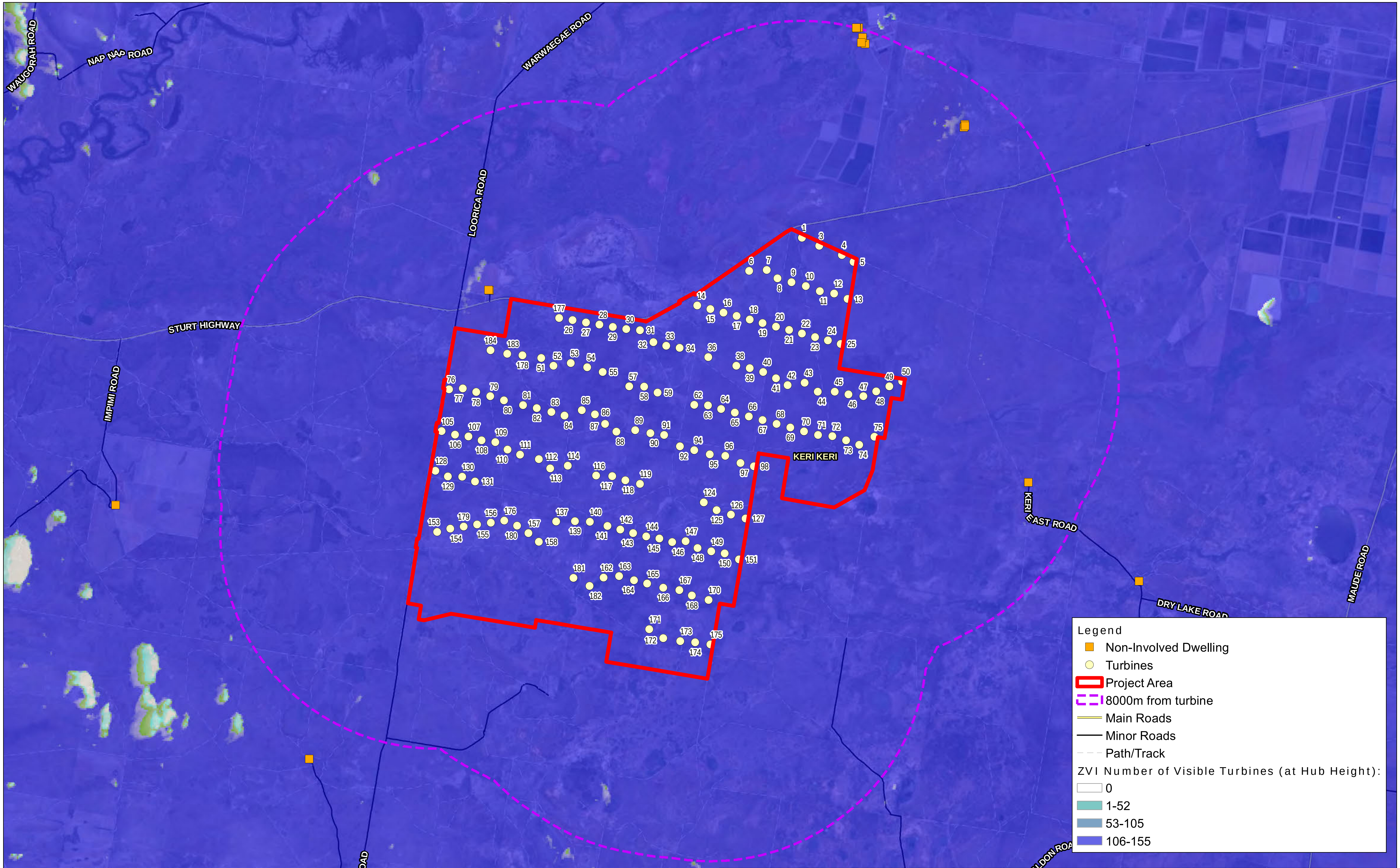

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 1 2 3km

1:130,000

F6.24 - Zone of Visual Influence - Hub Height (200 m)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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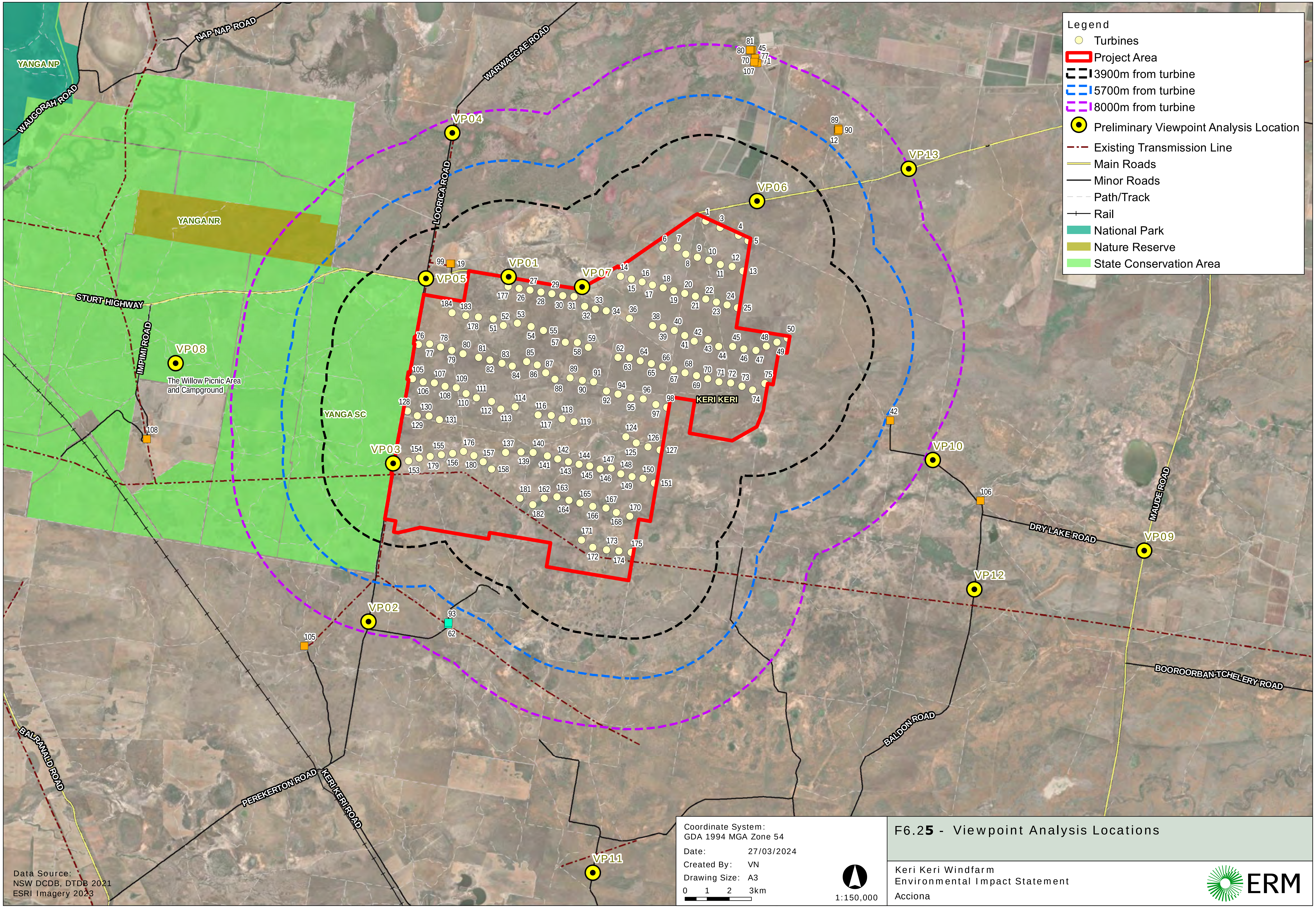


Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 1 2 3km

1:150,000

F6.25 - Viewpoint Analysis Locations

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

0617753_KKWF_EIS_G029_R0.mxd

6.6.4.4 DWELLINGS ASSESSMENT

The preliminary assessment tools defined the visual catchment and identified non-associated residences within surrounding the Project Area which require further assessment. These included:

- Two non-associated dwellings (dwellings 99 and 19) within 3,900 m of the nearest Project-related turbine (black line of visual magnitude); and
- 11 non-associated dwellings were identified within 5,700 and 8,000 m of the nearest Project-related turbine.

Detailed assessments have been included for three additional dwellings (dwellings 105, 106 and 108) that were identified in the broader Study Area.

As of March 2024, a total of eight lots with dwelling entitlements were identified within 5.7 km of the nearest wind turbine in the Murray River and Hay Shire Council LGAs. A ZVI assessment based on the topography alone suggests that all lots have the potential for views to most of the Project. The LVIA recommends that dwellings are sited and orientated away from the Project. The introduction of screen planting around any future dwellings will also help limit visual impacts of the Project.

Sensitive receptors (non-associated dwellings) identified using the preliminary assessment tools were subject to detailed assessment. This assessment included 3D assessment based on topography alone, assessment of aerial imagery, site inspection, preparation of photomontages and wireframe diagrams, evaluation of VIZ objectives, determination of visual impact rating and consideration of mitigation measures.

The Applicant offered on site dwelling assessments to be undertaken for all non-associated dwellings within 12,000 m of the nearest turbine. The results of the dwelling assessments are presented in **Table 6-62**.

TABLE 6-62 DWELLINGS ASSESSMENT SUMMARY

Dwelling Status	Assessment Findings
Dwellings within 3,900 m of nearest turbine	• Dwelling 99 and 19 have a **moderate** visual impact rating.
Dwellings 5,700 m to 8,000 m of the nearest turbine	• Four dwellings were assessed as having a negligible visual impact rating. • Seven dwellings were assessed as having a low visual impact rating.

Lots with Dwellings Entitlements	• No approved Development Applications were identified within the overall Study Area.
	• An assessment based on topography alone suggests that the majority of the Project will be visible on all lots with dwelling entitlements.
	• The highest impacts are likely to be associated at the following lots:
	  ◦ HS02 (Lot 06 / DP751229);
	  ◦ HS04 (Lot 01 / DP235870);
	  ◦ MR01 (Lot 08 / DP751215);
	  ◦ MR03 (Lot 29 / DP756595); and
	  ◦ MR04 (Lot 73 / DP756601).

6.6.4.5 PHOTOMONTAGES AND WIREFRAME DIAGRAMS

Photomontages are used to illustrate the likely view of a proposed development as it would be seen in a photograph. The photomontages are based on a maximum turbine height of 291.5 m with a hub height of 200 m, without the inclusion of the proposed mitigation methods.

Wire frame diagrams indicate the 3D shape of the landscape in combination with additional elements. Wire frame images can be seen as a worst-case scenario as they do not consider factors such as vegetation, building structures. Wire frame diagrams were used in the LVIA to assist in the assessment of the Project from inaccessible locations. In instances where access to a private property was not granted, wire frame diagrams have been used as an assessment tool to provide a worst-case scenario view of the proposal.

Photomontages and wireframes were prepared for eight public and seven private viewpoints to best illustrate the potential appearance of the Project from varying distances and locations with differing views. These locations were selected based on feedback received from the community. Exact photomontage locations were selected on site to represent a worst-case scenario for the viewpoint location. Localised screening factors (such as vegetation) were avoided (where possible) to ensure maximum exposure to the Project.

Photomontages and wireframes are included in Appendix D of **APPENDIX K**.

6.6.4.6 NIGHT LIGHTING

Potential visual impacts associated with night lighting on Project infrastructure was assessed. Night lighting was recommended in the Aviation Impact Assessment undertaken for the Project (**Section 6.7.1** and **APPENDIX L**) on temporary and permanent met masts that are not in proximity to a turbine. No aviation hazard lighting is proposed for the turbines. Security lighting is also proposed on ancillary infrastructure such as the substation, within the O&M compounds, and flood lights at the workers accommodation (only during construction) which will be installed to comply with relevant standards and guidelines. Existing sources of light include homesteads and motor vehicles. These sources are considered limited due to the isolated location of the Project. The light sources are limited to low-level lighting for security, nighttime maintenance and emergency purposes.

Given limited number of receptors within the broader Study Area (up to 8 km from a Project turbine), and the limited requirement for night lighting, it is unlikely to be experienced from inside of a dwelling as internal lights will limit views to the exterior at night.

There will be no permanently illuminated lighting installed. Ancillary infrastructure has been carefully sited to minimise visibility from existing residences and publicly accessible viewpoints. Further, the Project will consider principles outlined in relevant best practice guidelines for lighting design that support the maintenance of a dark sky and improve lighting practice. Therefore, it is likely there will be limited or no visual impacts resulting from night lighting of ancillary structures for the Project.

The highest visual impact is likely to be where people experience the night landscape outdoors. Dark sky is a valued quality of the rural landscape, due to the lack of light pollution. Aviation lighting has the potential to impact on receptors who view the landscape at night, in particular night-sky enthusiasts, photographers, star gazers, campers and some landowners with potential visibility of a turbine’s hub.

6.6.4.7 SHADOW FLICKER AND BLADE GLINT

Shadow flicker refers to the visual effect that occurs when rotating turbines cause moving shadows as the blades pass in front of the sun. The shadow flicker assessment for the Project based on a maximum tip height of 291.5 m, identified that:

- There will be no shadow flicker affect on non-associated dwellings;
- Willowvale Rest Area is likely to experience 30 - <100 hours of shadow flicker per year. No limitations have been identified for public areas that are likely to experience shadow flicker for over 30 hours per year; and
- The shadow flicker assessment identified extents of Sturt Highway, Keri Keri Road and a small section of Loorica Road which have the potential to experience temporary shadow flicker.

6.6.4.8 ASSOCIATED INFRASTRUCTURE

In addition to the proposed WTGs, the ancillary infrastructure is likely to contrast with the existing visual landscape. Due to the large scale and elevated siting of the Project, access roads, transmission lines and other ancillary structures have been assessed for a potential to alter the existing visual landscape. The results of these assessments are summarised in **Table 6-63**.

TABLE 6-63 ASSOCIATED INFRASTRUCTURE ASSESSMENT SUMMARY

Infrastructure	Impact
HV Transmission Lines	• The proposed transmission line design is in keeping with the scale and appearance of existing 220 kV transmission line which is located south of the Project Area and is therefore considered an existing element visible in the landscape. • Since the existing transmission line is proposed to be upgraded to 330 kV under Project EnergyConnect, the proposed 330kV transmission line will visually form part of the overall infrastructure.
MV Transmission Lines	• The turbines will be connected via a system comprising a network of approximately 64.5 km of 33 kV overhead electrical cables, reticulating power from each WTG to the onsite substations. • Where ground conditions are not suitable for underground cabling, overhead single circuit electricity lines will be installed using concrete poles. • Mitigation measures that would assist in reducing any residual visual impacts are discussed in Section X.
Internal Access Roads	• Generally, the internal roads have been sited to reduce potential vegetation loss and limit earth work requirements. It is proposed that the internal access track network will connect to existing Council roads. Due to the existing agricultural land use of the Study Area, farm roads traversing the landscape form a significant part of the existing landscape character. • The proposed access roads are likely to be viewed as part of the existing character of the landscape. Mitigation measures that would assist in reducing any residual visual impacts are discussed in Section X.
On-site Substations	• Although the substation compound will be visible from the Sturt Highway, the existing character around the proposed substation site is currently defined by flat, treeless land which is used for grazing and cropping. The landscape character is highly modified and the existing visual quality is poor and no scenic views will be obliterated by the proposed infrastructure.

Infrastructure	Impact
Switchyard	• The switchyard is proposed to be located approximately 4.6 km east of Keri Keri Road and 9 km south of the Sturt Highway. It is likely that the switching station will not be discernible from the Sturt Highway. Although the switchyard will be visible from Keri Keri Road, it should be noted that the road is currently used for farm access and once the Project is operational, the road will be used for infrastructure access. No other receptors will be impacted by the switchyard. No key views will be impacted by the switchyard.
Meteorological monitoring masts	• Meteorological masts are generally difficult to discern due to their form. The proposed temporary and permanent meteorological masts have been set back from nearby residences and public viewing locations. The northern masts are sited approximately 6 km south of the Sturt Highway and the southern met masts are located approximately 2 km east of Keri Keri Road.
O&M Facility	• The smaller scale of ancillary structures including the proposed construction control room can be screened by topography, existing vegetation or proposed screening vegetation. • Mitigation measures that would assist in reducing any residual visual impacts are discussed in **Section 6.6.5**.
BESS	• The BESS is proposed to be located approximately 5.5 km east of Keri Keri Road and 8.5 km south of the Sturt Highway. It is likely that the BESS will not be discernible from the Sturt Highway. Views of the BESS are likely to be available along Keri Keri Road and no other receptors in the area. No key scenic views will be impacted by the BESS.
Other Temporary Infrastructure	• Up to two concrete batching plants, three laydown areas, borrow pit and rock crushing facilities, two construction compounds, four temporary met masts and a workers accommodation compound and carpark will be temporarily located at the Project Area during the construction period. • The visual impacts associated with these facilities will be temporary and will occur during the construction phase. No scenic views will be impacted by the construction activity.

6.6.4.9 IMPACT ON LANDSCAPE CHARACTER

The proposed development is to be located within a predominantly rural landscape that has not been identified as significant or rare. The broad landscape character is dominated by established rural land which consists of modified vast plains with little topographical variation. Generally, the Scenic Quality Classes of the LCU within the Study Area have been rated as moderate or low.

The assessment has determined that the proposed wind farm would become a feature of the visual landscape due to the addition of vertical turbines in a landscape offering unencumbered views across large expanses. Areas such as Yanga SCA and Nature Reserve, which are valued for their ecological, recreation and tourism functions will remain intact.

Of the four LCU's identified and assessed, the Project is likely to be visible from all character areas to varying degrees. Due to the flat topography surrounding the Project Area, low vegetation typical of the region and the lack of built structures, there is little in the current landscape to impede views of the Project Area. **Table 6-64** provides a summary of these findings.

TABLE 6-64 SUMMARY OF VISUAL IMPACT ON LCUS

LCU	Scenic Quality Rating	Key Landscape Integrity	Overview of Impact on Landscape Character
LCU01: Yanga Parks	Moderate	Views from this LCU are often contained by the unique vegetation that defines this LCU. Despite the flat topography, dense woodlands will help reduce and mitigate views towards the Project. Recreational camp sites such as the Willows Picnic Area and Campground will have minor or no visual impact due to vegetation in the foreground. The landscape scenic integrity is likely to remain intact since the Project will not be visible from within the LCU.	The LCU is characterised by expanses of flat terrain and dense woodlands that are unique to this region. Views on the Project are likely to be limited from locations within the LCU due to the dense vegetation. The Project is not likely to change the existing character of the LCU. The Project will not disrupt views to any key landscape features or viewpoints located within the LCU. An assessment of potential impacts on recreational sites such as the Willows Picnic Area and Campground states that the potential visual impact on the existing landscape character is likely to be low to nil.
LCU02: Creek Corridors	Moderate	Views towards the Project will be partially available within this LCU because of the relatively flat topographic character. Patches of vegetation along creek corridors, however, may help screen views in certain areas. Vegetation is generally different by clumps of mid-height canopy cover and saltbush. No key viewpoints were identified within the Creek Corridors LCU. It is likely that the Project will have a moderate impact on the landscape scenic integrity of this LCU because the Project contrasts to the character of this LCU.	The LCU is characterised by very gentle undulations within the creek corridor. Patchy tree/shrub cover is prominent. The vegetation acts as a landmark in an otherwise flat, open landscape. Views on the Project are likely to be partially screened from locations within the LCU due to the patchy vegetation. The Project is likely to have a moderate impact on the existing character of the LCU.
LCU03 Dry Lakes and Swamps	Low	Views of the Project from the Dry Lakes & Swamps LCU will be available from most locations. The flat, low-lying character allows open views. Existing shrubs may help reduce the visual impact in certain areas. It is likely that the Project will have a moderate to low impact on the landscape scenic integrity of this LCU.	The LCU is characterised by flat, semi-circular, gentle depressions covered in saltbush and grasses. Views of the Project are likely to be available from most locations within the LCU. The Project is likely to have a moderate to low impact on the existing character of the LCU.
LCU04 Farmlands	Low	The Project is located within the Farmlands LCU which is also the most prominent character of the region. Views are generally open with minimal obtrusive elements. Although the Project will be visually prominent in the LCU, the Project will have a low impact on the scenic integrity of this LCU.	The LCU is characterised by flat, expansive, treeless lands. Views of the Project will be available from most locations within the LCU. The LCU has low scenic quality and does not offer any key visual features.

6.6.5 MITIGATION MEASURES

Mitigation measures are proposed for the 2 non-associated dwellings deemed to have potential for moderate visual impact - dwellings 19 and 99. These dwellings are located within the black line of visual magnitude. Mitigation measures proposed for these dwellings are presented in **Table 6-65** and Appendix E of **APPENDIX K**.

The Applicant has attempted to engage with the landowner of dwellings 19 and 99 to discuss potential visual impacts and establishing an agreement between the Applicant and the landowner relating to these. The landowner has, to date, stated they are not interested in signing an agreement. The Applicant is willing to engage with the landowner of dwelling 19 and 99 to discuss the mitigation measures proposed.

The landowner associated with dwellings 19 and 99 is associated with the Wilan Wind Farm. Based on the Wilan Wind Farm Scoping Report, the Wilan Wind Farm BESS, substation, O&M facility and construction compound and laydown area are proposed at or near the location of dwellings 19 and 99. Based on the turbine layout proposed in the Wilan Wind Farm Scoping Report, these dwellings are within 1 km of a Wiland Wind Farm turbine.

Nevertheless, the Applicant will continue to engage with the landholder regarding the implementation of the recommended mitigation measures.

The Applicant has committed to implementing design principles to significantly reduce the visual impacts of the Project and associated infrastructure. These include the siting principles, access, layout and other aspects of the design which directly influence the appearance of the proposed development.

Table 6-65 outlines the design considerations that have been developed in response to the associated infrastructure.

TABLE 6-65 LANDSCAPE AND VISUAL MITIGATION MANAGEMENT MEASURES

ID	Mitigation and Management Measures
LV1	The following principles have been and will continue to be considered in the design process of the Project (as applicable): • The lines of WTGs will reflect the contours of the natural landscape as best as possible; • Where possible, the location of turbine types, densities, and layout geometry will be considered to minimise the visual impacts; and • Where possible, turbines will be evenly spaced to give a regular pattern creating a better balance within the landscape.
LV2	The turbines will have a matte white finish and consist of three blades. The following factors will also be considered in the Project design to achieve a visual consistency through the landscape: • Uniformity in the colour, design, height, and rotor diameter; • The use of simple muted colours and non-reflective materials to reduce distant visibility and avoid drawing the eye; • Blades, nacelle, and tower to appear as the same colour; and • Avoidance of unnecessary lighting, signage, logos.
LV3	Landowners of non-associated dwellings rated with the potential for moderate or higher visual impact will be offered tree planting to ensure that desirable views are not inadvertently eroded or lost and in the effort to mitigate views of the turbines (refer Appendix E of **APPENDIX K**). These include: • Recommendation for screen planting, if accepted by the landowner associated with dwellings 19 and 99.

ID	Mitigation and Management Measures
LV4	When planning for landscaping and visual screening the following will be adhered to by the Project: • Planting will occur post construction, where possible; • Planting will remain in keeping with existing landscape character; • Species selection will be typical of the area; • Planting layout will avoid screening views of the broader landscape, where possible; • Clearing of existing vegetation will be avoided; • Where appropriate, any lost vegetation will be reinstated; and • Where possible, over any areas of disturbance, natural vegetation will be allowed to regrow.
LV5	During detailed design of overhead MV transmission lines the following will be considered: • Where possible, utilize existing transmission lines; • The route for overhead transmission lines will be selected with the aim to reduce visibility from surrounding areas and minimise vegetation loss; • Where possible, non-reflective materials for overhead electrical cabling will be used; • Visual identification elements will be non-reflective to avoid visual interference; and • Subtle colours and a low reflectivity surface treatment on power poles will be used to ensure that glint is minimised.
LV6	To reduce the residual visual impact resulting from the construction of access roads the following will be adopted by the Project: • Where possible, existing roads, trails or tracks will be utilised or upgraded to reduce the need for new roads; • Where possible, following construction roads will be downsized or restored to existing condition; • Cut and fill will be minimised in the construction of new roads and loss of vegetation will be avoided; and • Local materials will be utilised where possible and practical.
LV7	To reduce any residual visual impacts from temporary infrastructures the following measures will be considered: • Siting of infrastructure will minimise vegetation loss; • Buildings will be sympathetic to existing architectural elements in the landscape; • Building materials will use type and colours that blends into the existing landscape; • Unnecessary lighting, signage on fences, logos etc. will be avoided; • Cut and fill and loss of existing vegetation will be minimised throughout the construction process; and • Boundary screen planting will be considered to ameliorate potential visual impacts resulting from the construction of ancillary structures with a small vertical scale such as collector substations, switching stations and the operations facilities building.
LV8	To assist in the amelioration of the effect of aviation hazards lighting on met masts, and associated infrastructure the following will be applied: • Candela intensity will be the lowest as allowed by CASA; • Shielding will be provided (as per CASA requirements and if needed) and ensure that no more than 5% of the nominal light intensity is emitted at or below 5° below horizontal; and • No light will be emitted at or below 10° below horizontal.
LV9	To assist in the amelioration of the effect of night lighting on ancillary structures, the following mitigation measures will be applied where necessary: • Security lighting throughout the wind farm, switching station and the substation will be minimised to decrease the contrast between the wind farm and the night-time landscape of the area; • Motion detectors will be used to activate night-time security lighting when required; and • Lighting will be designed to ensure it does not spill onto nearby roads or residences.

6.6.6 CONCLUSION

The LVIA concluded that there are limited opportunities to view the Project from non-associated dwellings within 8 km. The greatest visual effect is likely to be felt by residents in the immediate vicinity of the Project. Of the 13 non-associated dwellings within 8 km of the Project, 11 are likely to have a negligible – low visual impact. Two non-associated dwellings are likely to have a moderate visual impact rating. Mitigation measures incorporated into the design process, as well as landscape and visual screening, can reduce visual impacts to non-associated dwellings identified as having a moderate visual impact (in further consultation with relevant land owner).

Overall, the LVIA assessed that, with the implementation of the recommended mitigation measures, the Project is compliant with the performance objectives of the Bulletin.

6.7 HAZARDS AND RISKS

6.7.1 AVIATION SAFETY

6.7.1.1 INTRODUCTION

An Aviation Impact Assessment (AIA) for the Project was prepared by Aviation Projects Pty Ltd (Aviation Projects). The AIA assesses the potential aviation safety impacts, provides aviation safety advice in respect of the relevant requirements of air safety and procedures, and documents consultation with the relevant aviation agencies and stakeholders.

The AIA includes an Aviation Impact Statement (AIS) that addresses the requirements of Airservices Australia, and a qualitative risk assessment to determine any required treatments to mitigate the level of risk, such as the need for obstacle lighting on wind turbines or meteorological masts.

The AIA specifically responds to the requirements of:

- The Project SEARs (**APPENDIX A**);
- Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR);
- *Airports Act 1996* (*Cth*);
- Civil Aviation Safety Authority, Advisory Circular (AC) 139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome*;
- *National Airports Safeguarding Framework Guideline D: Managing the Risk to aviation safety of wind turbine installations (wind farms)/Wind Monitoring Towers*; and
- Other requirements as advised by Airservices Australia.

6.7.1.2 METHODOLOGY

Aviation Projects undertook the following in preparation of the AIA:

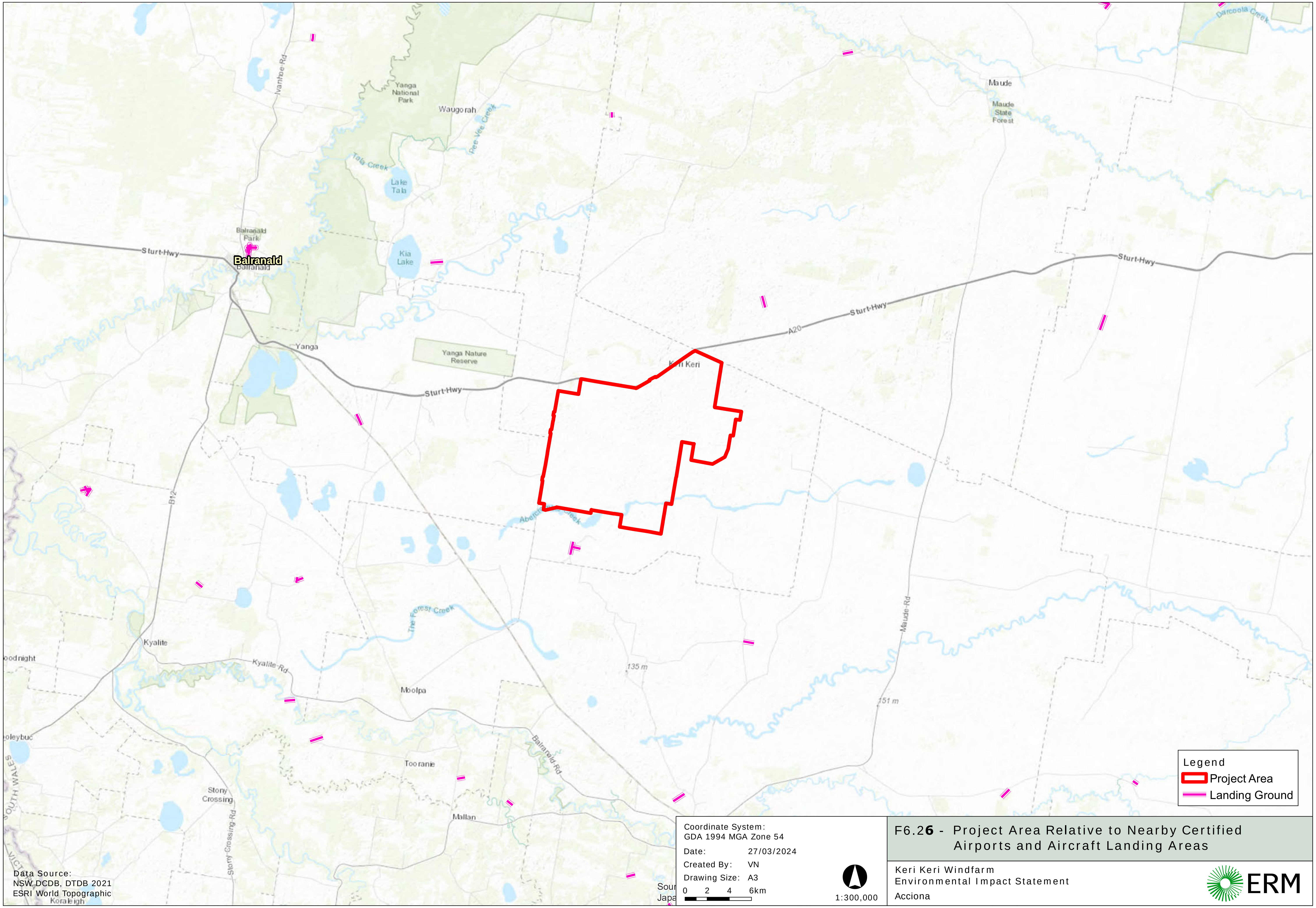
- Review of relevant regulatory requirements and information sources;
- Review of relevant information provided by the Applicant;
- Identification of risk mitigation strategies that provides an acceptable alternative to night lighting in accordance with ISO 31000:2018 Risk Management – Guidelines;
- Consultation with Murry River Council, Balranald Shire Council, Part 173 procedure designers (Airservices Australia), and other stakeholders including operators of nearby relevant aerodromes and the Commonwealth Department of Defence (DoD); and
- Engagement with other relevant stakeholders;
- Review of aviation and aircraft landing facilities in the vicinity of the Project;
- Review of controlled airspace and grid air route lowest safe altitude (LSALTs);
- Review of radar facilities in the vicinity of the Project;
- Review of aerial firefighting and aerial application operations in the vicinity of the Project; and
- Preparation of an AIA and supporting technical data to provide evidence and analysis for the planning application and identification of appropriate risk mitigation strategies, including the need for obstacle marking and lighting.

The AIA report is included in **APPENDIX L**.

6.7.1.3 EXISTING ENVIRONMENT

The AIA identified the following aviation relevant facilities and activities in proximity to the Project Area:

- Certified Aerodromes:
  - Balranald Airport (YBRN) – the Project Area is located approximately 17 nautical miles (nm) south-east of Balranald Airport. This airport is a Code 1, non-instrument certified aerodrome that is operated by the Balranald Shire Council. The Project Area is located beyond the horizontal extent of the Balranald Obstacle Limitation Surface (OLS);
- Aircraft Landing Areas (ALA):
  - Two ALAs were identified within 3 nm of a Project WTG, depicted on **Figure 6-26** and include Keri-Keri ALA and Jeraly Station ALA;
  - Tow ALAs and one landing ground were identified in the vicinity of the Project; however, outside of the 3 nm reference limit;
- Airspace:
  - The Project area is located outside of controlled airspace (the area is wholly within Class G airspace) and is not located in any Prohibited, Restricted and Danger areas;
- Grid and Air routes Lowest Safe Altitude:
  - The Project Area is located within two airspace grids with LSALT of:
    - 1700 feet (ft) AMSL and 1800 ft AMSL which provide clearance above obstacles with heights up to 700 ft AMSL and 800 ft AMSL, respectively;
  - The Project Area is located within 7 nm of two air routes (W762 and H247) with LSALT of:
    - 2,100 ft AMSL with an obstacle height limit of 1,100 ft AMSL (W762);
    - 2,000 ft AMSL with an obstacle height limit of 1,000 ft AMSL (H247);
- Radar:
  - The closest radar facility is the Mt Macedon Secondary Surveillance Radar (SSR), which is located approximately 296 km to the south of the Project Area;
- Aerial Firefighting:
  - Aerial firefighting operations (firebombing in particular) are conducted under Day VFR, sometimes below 500 ft AGL; and
- Aerial application operations:
  - Aerial application operations including activities such as fertiliser, pest and crop spraying are generally conducted under day Visual Flight Rules Guide (VFR) below 500 ft AGL, usually between 6.5 ft (2 m) and 100 ft (30.5 m) AGL. Aerial application operations are conducted within the area.



Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 2 4 6km

1:300,000

F6.2**6** - Project Area Relative to Nearby Certified Airports and Aircraft Landing Areas

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

0617753_KKWF_EIS_G045_R0.mxd

6.7.1.4 AVIATION IMPACT STATEMENT

Certified Airports

Airservices Australia requires that all aerodromes within 30 nm of the Project are identified. This is due to tall structures associated with the Project that are located within 30 nm from an Aerodrome Reference Point (ARP) potentially presenting a risk to air space safety. The Project Area is within 30 nm of Balranald Airport (17 nm northwest of the Project Area).

Balranald Airport (YBRN) is a Code 1, non-instrument certified aerodrome, which is operated by the Balranald Shire Council, and is not serviced by any instrument approach procedures. The maximum lateral extent of the OLS for a Code 1 non-instrumental runway such as YBRN is up to 2.7 km for the conical surface and 1.6 km for the take-off and approach surfaces. As the Project Area is located beyond the horizontal extent of the OLS, it was determined that there will be no impacts to the Balranald Airport OLS.

Aircraft Landing Areas

As a guide, an area of interest within a 3 nm radius of an ALA is used to assess potential impacts of proposed developments on aircraft operations. There are two ALAs within 3 nm of the Project Area - Jeraly ALA to the northeast and Keri-Keri ALA to the south).

The AIA assessed potential wake turbulence impacts from Project WTGs on these two ALAs. In assessing the potential maximum horizontal extent of wake turbulence impacts, a conservative area within 10 rotor diameters was applied, which for the Project represents a maximum area radius (from a WTG) of 1830 m.

For Jeraly Station the maximum horizontal extent of potential wake turbulence effects extends slightly within the 3 nm area surrounding Jeraly Station. However, aircraft departing or arriving at Jeraly Station ALA in the 3 nm area, and outside the standard circuit area, would be expected to be above the WTGs. The area within 1 nm of the Jeraly ALA was considered the area in which aircraft would conduct standard circuit operations immediately after takeoff and prior to landing. The AIA concluded that there was limited potential of wake turbulence affecting operations of aircraft arriving at and departing from Jeraly ALA from the southeast, and unlikely interference in the remaining circuit area. The landowner has been consulted regarding potential impacts.

Keri Keri ALA is owned and operated by the Project host landowner. Effects of wake turbulence could extend slightly into the 3 nm area of this ALA. However, aircraft departing or arriving at Jeraly Station ALA in the 3 nm area, and outside the standard circuit area, would be expected to be above the WTGs. The AIA concluded that there was limited potential of wake turbulence affecting operations of aircraft arriving at and departing from Keri Keri ALA from the north or northeast, and unlikely interference in the remaining circuit area. The landowner has been consulted regarding potential impacts.

Grid and Air routes Lowest Safe Altitude (LSALT)

Manual of Standards (MOS) 173 requires that the published LSALT for a particular airspace grid or air route provides a maximum 1000 ft clearance above the controlling (highest) obstacle within the relevant airspace grid or air route tolerances. **Table 6-66** presents the impacts to LSALTs and potential solutions.

TABLE 6-66 IMPACTS TO LSALTS AND POTENTIAL SOLUTIONS

Route / Grid ID	Grid / Route LSALT	Obstacle Height Limit	Impact on airspace design	Potential Solution
-	1,700 ft AMSL	700 ft AMSL	WTGs exceeds obstacle limit by 486 ft.	Raise 1700 ft Grid LSALT by 500 ft to 2,200 ft AMSL
-	1,800 ft AMSL	800 ft AMSL	WTG4 exceeds obstacle limit by 387.6 ft.	Raise 1800 ft Grid LSALT by 400 ft to 2,200 ft AMSL.
W762	2,100 ft AMSL	1,100 ft AMSL	WTGs exceed obstacle limit by 87.6 ft.	Raise LSALT by 100 ft to 2,200 ft AMSL.
H247	2000 ft AMSL	1,000 ft AMSL	WTGs exceed obstacle limit by 187.6 ft	Raise LSALT by 200 ft to 2,200 ft AMSL.

The Project site is located within two airspace grids with LSALTs of 1700 ft AMSL and 1800 ft AMSL, which provide clearance above obstacles with heights up to 700 ft AMSL and 800 ft AMSL respectively.

WTGs in the 1,700 ft Grid LSALT sector have heights in the order of 1,186 ft, which is 486 ft higher than the obstacle height limit of 700 ft AMSL. As such, the 1,700 ft Grid LSALT will need to be increased by 500 ft, to 2,200 ft AMSL.

WTG4 is tallest WTG within the 1,800 ft LSALT sector, at a maximum height of 1,187 ft, which is 387.6 ft higher than the 800 ft obstacle height limit. As such, the 1,800 ft Grid LSALT will need to be increased by 400 ft, to 2,200 ft AMSL.

There are two air routes within 7 nm of the Project – W762 and H247. WTGs exceed the obstacle limit of W762 by 87.6 ft, and of H247 by 187.6 ft. The AIA recommends raising the LSALT of W762 by 100 ft to 2,200 ft AMSL and of H247 by 200 ft to 2,200 ft AMSL The AIA concluded that the amendments to the Grid and Air Routes LSALTs are of a minor nature and will not create an adverse impact on aviation safety.

Airspace

The Project area is located outside of controlled airspace (wholly within Class G airspace) and is not located in any Prohibited, Restricted and Danger areas. It is considered that the Project area will therefore not have an impact on controlled or designated airspace.

Aviation Facilities

The Project area is located a sufficient distance from nearby certified airports and will not have an impact on the aviation facilities of those airports.

Radar Installations

Airservices Australia requires an assessment of the potential for the WTGs to affect radar line of sight.

The closest radar facility to the Project is the Mt Macedon SSR, 296 km to the south. The Project Area is outside the range of the Mt Macedon Radar and, therefore, will not impact the use and serviceability of this radar facility.

AIS Summary

Based on the Project layout and maximum blade tip height of up to 291.5 m AGL, the blade tip elevation of the highest WTG, WTG4, will not exceed 1187.6 ft AMSL and would:

- Not infringe any OLS surfaces;
- Not infringe any PANS-OPS surfaces;
- Have an impact on two grid LSALTs, namely:
  - The overlying 1700 ft Grid LSALT will need to be increased to 2,200 ft AMSL;
  - The overlying 1800 ft grid LSALT will need to be increased t to 2200 ft AMSL;
- Have an impact on nearby designated air routes, namely:
  - W762 LSALT will need to be increased to 2,200 ft AMSL;
  - H247 LSALT will need to be increased to 2,200 ft AMSL;
- Be unlikely to cause wake turbulence effects upon aircraft arriving at and operating within the standard circuit area at Jeraly Station ALA or at Keri-Keri ALA;
- Not have an impact on operational airspace;
- Be wholly contained within Class G airspace; and
- Be outside the clearance zones associated with civil aviation navigation aids and communication facilities.

6.7.1.5 HAZARD LIGHTING AND MARKING

Based on the risk assessment, it was determined that aviation lighting is not required for WTGs and wind monitoring towers (WMTs) near WTGs to maintain an acceptable level of safety to aircraft. However, given that aerial operators might use the airspace within the Project site and that it is expected that WMTs will be constructed prior to WTGs, the WMTs may be free-standing and not surrounded by any other obstacles. Therefore, the proposed temporary and permanent WMTs should be marked with red/white/red bands as per the NASF Guideline D. For temporary WMTs installed prior to WTG installation and WMTs that are not near a WTG, there will be an acceptable level of aviation safety risk associated with the potential for an aircraft collision provided obstacle lighting is fitted with medium intensity lighting at the top of the mast to ensure visibility in low light and deteriorating atmospheric conditions.

The following conclusions apply to hazard lighting and marking for the Project:

- With respect to CASR Part 139 Division 139.E.1 Notifying potential hazards 139.165, the proposed WTGs and WMTs must be reported to CASA. WTGs and WMTs must be marked in accordance with Part 139 MOS 2019 Chapter 8 Division 10 section 8.110;
- WTGs must be lit in accordance with Part 139 MOS 2019 Chapter 9 Division 4 9.30 and 9.31, unless an aeronautical study assesses they are of no operational significance, which this AIA does;
- With respect to marking of WTGs, a white colour will provide sufficient contrast with the surrounding environment to maintain an acceptable level of safety while lowering visual impact to the neighbouring residents;

- Temporary and permanent WMTs should be marked according to the requirements set out in MOS 139 Section 8.10 (as modified by the guidance in NASF Guideline D). Aviation marker balls and painting the top 1/3 of WMTs structures in red and white bands is an acceptable mitigation strategy;
- WTGs and permanent WMTs that are installed near a WTG will not require obstacle lighting to maintain an acceptable level of safety to aircraft; and
- Temporary WMTs that are installed prior to WTG installation, and WMTs that are not near a WTG, will require obstacle lighting to maintain an acceptable level of safety. These WMTs should be lit with medium intensity steady red obstacle lighting at the top of the WMT mast. Characteristics of medium intensity obstacle lighting in MOS 139, Section 9.33.

6.7.1.6 RISK ASSESSMENT

Informed by an extensive review of accident statistics data and relevant stakeholders, five potential risk events associated with WTGs and WMTs were identified in relation to aviation safety or potential visual impacts:

- Potential for an aircraft to collide with a WTG (controlled flight into terrain);
- Potential for an aircraft to collide with a WMT (controlled flight into terrain);
- Potential for a pilot to initiate manoeuvering to avoid colliding with a WTG or WMT resulting in collision with terrain;
- Potential for hazards associated with the Project to invoke operational limitations or procedures on operating crew; and
- Potential effect of obstacle lighting on neighbours.

The concept of worst credible effect (resulting in multiple fatalities) has been used for this risk assessment. Untreated risk is first evaluated, then, if the resulting level of risk is unacceptable, further treatments are identified to reduce the residual level of risk to an acceptable level.

A summary of the level of risk associated with the Project under the proposed treatment regime, with specific consideration of the effect of obstacle lighting, is provided in **Table 6-67**. The risk assessment is provided in full in Section 9.2 of the AIA (**APPENDIX L**).

TABLE 6-67 SUMMARY OF RESIDUAL RISKS

Risk Element	Consequence	Likelihood	Risk	Required Actions
Aircraft collision with (WTG)	Catastrophic	Unlikely	7	**Acceptable without obstacle lighting (ALARP)** Communicate details of the Project WTGs to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction.
Aircraft collision with wind monitoring tower	Catastrophic	Unlikely	7	**Acceptable without obstacle lighting (ALARP)** Although there is no obligation to do so, consideration has been made for marking the WMTs according to the requirements set out in MOS 139 Chapter 8 Division 10 Obstacle Markings, specifically 8.110 (5), (7) and (8). Communicate details of WMTs to local and regional operators and make arrangements to

Risk Element	Consequence	Likelihood	Risk	Required Actions
				publish details in ERSA for surrounding aerodromes following construction.
Avoidance manoeuvring leads to ground collision	Catastrophic	Unlikely	7	**Acceptable without obstacle lighting (ALARP)** Communicate details of the Project WTGs and WMTs to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction.
Effect on crew	Minor	Possible	5	**Acceptable without obstacle lighting (ALARP)** Communicate details of the Project WTGs and WMTs to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction.
Visual impact from obstacle lights	Moderate	Likely	7	**Acceptable without obstacle lighting** (zero risk of visual impact from obstacle lighting). If lights are installed, design to minimise impact.

6.7.1.7 MITIGATION MEASURES

Impacts to aviation and airspace will be mitigated through the implementation of specific management measures to address the issues described in **Table 6-68** below. As part of the detailed design of the Project, the Applicant will continue to investigate options to further avoid and minimise impacts to aviation and airspace.

TABLE 6-68 PROPOSED AVIATION MITIGATION MEASURES

Issue	Measures
Designed air routes and grids	To accommodate the WTGs at 1187.6 ft AMSL, the overlying 1,700 ft Grid LSALT will need to be raised by 500 ft to 2,200 ft AMSL and the overlying 1,800 ft grid LSALT will need to be raised by 400 ft to 2,200 ft AMSL; and Air routes W762 LSALT will need to be raised by 100 ft to 2,200 ft AMSL, and H247 LSALT will need to be raised by 200 ft to 2,200 ft AMSL.
Notification and reporting	'As constructed' details of WGT and WMT exceeding 100 m AGL must be reported to CASA *as soon as practicable after forming the intention to construct or erect the proposed object or structure*; 'As constructed' details of WGT and WMT coordinates and elevation should be provided to Airservices Australia; Any obstacles above 100 m AGL (including temporary construction equipment) should be reported to Airservices Australia NOTAM office until they are incorporated in published operational documents. With respect to crane operations during the construction of the Project, a notification to the NOTAM office may include, for example, the following details: The planned operational timeframe and maximum height of the crane; and Either the general area within which the crane will operate and/or the planned route with timelines that crane operations will follow; Details of the wind farm should be provided to local and regional aircraft operators prior to construction for them to consider the potential impact of the wind farm on their operations; and To facilitate the flight planning of aerial application operators, details of the Project, including the 'as constructed' location and height information of WTGs, WMTs and overhead transmission lines should be provided to landowners so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information.

Issue	Measures
Aerial operations	Whilst not a statutory requirement, the Applicant should consider engaging with any local aerial agricultural operators and aerial firefighting operators in developing procedures for such aircraft operations in the vicinity of the Project; and The Applicant should notify landowners of the identified landing ground within 3nm south of the Project Site to determine any impacts from the WTG proximity and potential wake turbulence effects, and with the owner of Jeraly Station ALA to determine any impacts from WTG wake turbulence effects
Marking of turbines	The rotor blades, nacelle and the supporting mast of the WTGs should be painted white, typical of most WTGs operational in Australia. No additional marking measures are required for WTGs.
Lighting of turbines	The Project will not require obstacle lighting to maintain an acceptable level of safety to aircraft.
Marking of WMTs	Consideration should be given to marking the temporary and permanent WMTs according to the requirements set out in MOS 139 Section 8.10 (as modified by the guidance in NASF Guideline D). Specifically: Marker balls or high visibility flags or high visibility sleeves should be placed on the outside guy wires; Paint markings should be applied in alternating contrasting bands of colour to at least the top 1/3 of the mast; and Ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground/vegetation.
Lighting of WMTs	Consideration should be given to lighting temporary WMTs installed prior to WTG installation and WMTs that are not near a WTG with medium intensity steady red obstacle lighting at the top of the WMT mast. Characteristics for medium-intensity obstacle lighting are contained in MOS 139.
Micro-sitting	The potential micro-siting of the WTGs and WMTs has been considered in the assessment with the estimate of the overall maximum height being based on the highest ground level within 100 m of the nominal WTG and WMT positions. Providing the micro-siting is within 100 m of the WTGs and WMTs is likely to not result in a change in the maximum overall blade tip height of the Project. No further assessment is likely to be required from micro-siting and the conclusions of this AIA would remain the same.
Overhead transmission line	Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations should be identified in consultation with local aerial application operators and marked in accordance with Part 139 MOS 2019 Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8).
Triggers for review	Triggers for review of this risk assessment are provided for consideration: Prior to construction to ensure the regulatory framework has not changed; Following any significant changes to the context in which the assessment was prepared, including the regulatory framework; and Following any near miss, incident or accident associated with operations considered in this risk assessment.

6.7.2 TELECOMMUNICATIONS

6.7.2.1 INTRODUCTION

An Electromagnetic Interference (EMI) Assessment was prepared to assess the potential impacts of the Project on existing telecommunications systems and identify mitigation and risk management measures to be implemented during construction and operation (Middleton Group, 2023; **APPENDIX M**).

WTGs have the potential to interfere with radiocommunication services. Two services that have the greatest potential to be affected are television broadcast signals and fixed point-to-point signals. Domestic television is commonly broadcast via terrestrial signals while point-to-point links are used for line-of-sight connections (e.g., data, voice, and video).

The EMI Assessment was prepared to address the requirements of the SEARs (**APPENDIX A**), with consideration of relevant stakeholder engagement (**Section 5**), targeted engagement (Section 7 of **APPENDIX M**), relevant legislation and the following guidelines:

- *NSW Wind Energy Guideline*; and
- *Draft National Wind Farm Development Guideline* (Draft National Guidelines).

6.7.2.2 METHODOLOGY

The scope of the EMI Assessment considered the following services:

- Point-to-point microwave links;
- Meteorological radar;
- Mobile voice-based communications;
- Wireless and satellite internet services;
- Broadcast and digital radio;
- Broadcast, digital and satellite television;
- Trigonometry stations; and
- Global Positioning System (GPS).

Information regarding radiocommunications licences within 150 km radius of the Project was obtained from the Australia Communication and Media Authority (ACMA) Register of Radiocommunications Licences (RRL) database (accessed 27 April 2022).

Consultation with operating services that may be impacted by the Project was also undertaken to understand potential EMI-related impacts to operations and services. The outcomes of this engagement are discussed below and detailed in Table 8 of **APPENDIX M**. Engagement to determine EMI-related impacts for the Project is still ongoing, and the outcomes of future consultation will be incorporated, as necessary, into the detailed design of the Project. This approach will ensure that any technological “fixes” required to ensure consistency of existing services are considered throughout the development of the Project.

Wind turbine electro-magnetic compatibility was not assessed; however, any electrical component installed in Australia must comply with the *Radiocommunications Act 1992* (*Cth*) and associated notices.

6.7.2.3 EXISTING ENVIRONMENT

Point-to-point Links

WTGs located close to point-to-point communication links have the potential to cause interference through three mechanisms - near-field effects, diffraction, and reflection or scattering of the signals. The Draft National Guidelines conservatively recommend that:

- Any radiocommunication site within 1 km of a proposed WTG be considered as having the potential to be impacted by near-field effects; and

- Consultation with service operators occur if any WTG is to be located within 2 km of a radiocommunication site.

From the ACMA RRL database, two communications sites registered with ACMA were identified within 2 km of the WTGs. Four communication links were identified within 2 km of the WTGs, three of which pass through the Project Area and are within 1 km of a WTG. Refer to **Table 6-69** for details regarding the links that traverse the Project Area.

TABLE 6-69 IDENTIFIED POINT-TO-POINT COMMUNICATION LINKS INTERSECTING THE PROJECT AREA

Link No.	BSL / Licence No.	Site 1	Site 2	Length, km	Frequency, MHz	Owner
1	10161921/1	Mallan Off Moulamein Road ID: 9012006	Axicom 60m Guyed Mast Willowvale 35812 Sturt Highway Yonga ID: 204310	46.8	5960	Optus Mobile Pty Ltd
2	1972816/1 1972817/1	Axicom 60m Guyed Mast Willowvale 35812 Sturt Highway Yonga ID: 204310	Murray River Council 75m Guyed Mast off Baldon Road Moulamein ID: 201494	41.5	404.35	NSW RFS
3	1145755/1	Sydney Water Corporation 32.5m Lattice Tower off Wendouree Lane ID: 370297	Murray River Council 75m Guyed Mast off Baldon Road Moulamein ID: 201494	67.2	450.55	NSW RFS

Meteorological Radar

Meteorological radars detect rain and thunderstorm events, as well as other phenomena such as flocks of birds, smoke or ash, which cause echoes to be visible. BOM radars typically detect rain between 2.5 km to 3.5 km above the ground within a radius of 250 km, and in some instances, beyond. Some wind farms are visible to meteorological radars, registering as static echoes.

The World Meteorological Organisation (WMO) recommends that WTGs are sited at a minimum, beyond 5 km from meteorological radars, and preferably beyond 20 km. The Operational Programme for the Exchange of Weather Radar Information (OPERA) and the radar programme of European Meteorological Services Network (EUMETNET) both state that:

- No WTG should be deployed within 5 km radius of C-band radars; and
- No WTG should be deployed within 10 km radius of S-band radars.

Table 6-70 summarises the nearest meteorological radars to the Project Area. No radars are within 30 km of the Project Area.

TABLE 6-70 NEAREST METEOROLOGICAL RADARS TO THE PROJECT AREA

Radar Name	Coordinates	Radar Type	Distance to Project Area
Mildura	34.28ºS, 141.59ºE	Meteor 735CDP, C-band, Dual Pol	220 km
Rainbow	35.99ºS, 142.01ºE	Meteor 735C (C-Band, Doppler and Dual Pol)	213 km
Yarrawonga	36.03ºS, 146.03ºE	WSR 81C C-Band	227 km
Hillston	33.55ºS, 145.52ºE	Meteor 735CDP (C-Band, Doppler and Dual Pol)	185 km
Wagga Wagga	35.17ºS, 147.47ºE	WF 100 C Band	313 km
Melbourne	37.86ºS, 144.76ºE	M1500-S1, 1°S-band Doppler radar	341 km

Mobile-based Voice Communications

Assessment of mobile network coverage maps within the region show that there is some mobile network coverage within the Project Area. There is one mobile-based voice communication tower (operated by Telstra) within 2 km of a WTG (as shown in Figure 10 of **APPENDIX M**).

Wireless and Satellite Services

Satellites typically provide pay-TV, wireless internet and satellite phone coverage, as well as TV coverage where there is no terrestrial service available. As such, the assessment considered potential interference with wireless and satellite services to dwellings in proximity to WTGs.

Broadcast and Digital Radio and Television

Broadcast and digital radio and television consists of analogue signals comprising both Amplitude Modulated (AM) signals and Frequency Modulated (FM) signals. AM and FM signals may be subjected to interference in close range of WTGs. Digital signals for both radio and TV tend to be more robust but can be susceptible to signal frequency variation if disrupted by WTG rotor paths.
No AM, FM, digital nor temporary licence transmitters are within 30 km of a WTG (as shown in Figure 19 of **APPENDIX M**).

Trigonometrical Stations, Survey Marks and GPS

Trigonometrical stations and survey marks are observation marks used for surveying or distance measuring purposes. GPS antennas and Electronic Distance Measuring (EDM) devices may be installed at some trigonometrical stations. No proposed WTG shares the same location as a survey mark. The nearest are located along the Sturt Highway adjacent to the northern boundary of the Project Area, 400 m north of WTG 27.

Global Navigation Satellite System (GNSS) networks are installed across Australia and provide the geodetic framework for their spatial data infrastructure. This includes the Australian Regional GNSS Network (ARGN) and the AuScope Network. Data from the GNSS networks also contribute to the International GNSS Service (IGS). There are no GNSS stations within 20 km of the Project Area. The closest GNSS station (MOUL) is 27 km away from the nearest WTG. The next closest GNSS stations (PIAN and BLRN) are 31 km and 55 km, respectively, from the nearest WTGs.

6.7.2.4 ASSESSMENT OF IMPACTS

Point-to-point Links

As discussed, WTGs have the potential to impact point-to-point communication links through three mechanisms – near-field effects, diffraction, and reflection or scattering effects. These are discussed below relative to the Keri Keri Wind Farm.

Near-field Effects

Near-field effects to point-to-point links occur in the vicinity of the transmitter and receiver and are typically caused by objects with inductive fields (such as WTGs) up to several hundred metres from the transmitter/receiver – though the precise impact is difficult to calculate.

Near field clearance distance of the identified Link 1 and Link 2 antennas was calculated as per the methodology presented in Section 6.3.1 of **APPENDIX M**. Based on this calculation, Link 1 antenna has a clearance distance of about 193 m, while Link 2 antenna has a clearance distance of about 52 m. No ACMA communication sites were found within 1 km of the Project WTGs**;** therefore, no material near-field effects to point-to-point links are expected because of the Project.

Reflection/scattering Effects

Reflection and scattering effects relate to the interference by an object that reflects the signal from a transmitter to a receiver on a point-to-point communication link. This process creates a longer path between the transmitter and receiver, which can cause undesirable temporal modulation. However, where the ratio of the strength of the intended signal to the interference signal is sufficiently high, the performance will be unaffected. This threshold varies from site to site. Generally, impacts on signal will be negligible beyond 2 km from a transmitter/receiver.

The nearest WTG (184) is more than 2.1 km from the two nearest point-to-point communication transmitter/receiver.

The owners of the impacted links (Link 1 – Optus Mobile, Link 2 – NSW RFS) were contacted for comment but had not responded by the time of writing. However, given the relative positions and the turbines, it is unlikely that the Project will cause significant reflection and scattering impacts on the nearby transmitter/receivers.

Diffraction Effects

Diffraction is where an object modifies a wave, by obstructing its path of travel. Fresnel zones define an envelope of influence along a point-to-point communication link, whereby a rotating WTG could adversely impact the signal. Typically, obstacles within the 1st Fresnel Zone will adversely impact the signal, whereas the impacts of obstacles beyond the 1st Fresnel Zone reduces with distance.

A more conservative approach for WTGs is often preferred – that is, maintaining a clearance of the full 1st Fresnel Zone, or clearance of the full 2nd Fresnel Zone. The latter is typically required for GHz (higher frequency) links. In some instances, the presence of a WTG penetrating the 1st Fresnel Zone will have no material impact on the link; in other instances, the presence of the WTG may have an impact, and mitigation strategies may be required.

The maximum radii of the 1st and 2nd Fresnel Zones (F_1 and F_2) of the point-to-point communication links that cross the Project Area is summarised in **Table 6-71**.

TABLE 6-71 MAXIMUM RADII OF 1ST AND 2ND FRESNEL ZONES FOR POINT-TO-POINT LINKS THAT TRAVERSE THE PROJECT AREA

Link No.	BSL / Licence No.	Length, km	Frequency, MHz	Nearest WTG #	Offset from LoS to WTG, m	F_1 Max, m	F_2 Max, m	Exclusion Zone Buffer, m
1	10161921/1	46.8	5960	76	470	24.26	34.30	125.80
2	1972816/1 1972817/1	41.5	404.35	184	268	87.65	123.96	144.09
3	1145755/1	67.2	450.55	162	240.5	105.71	149.50	154.93

For Link 1, the rotor extent of WTG 76 has 344 m clearance from the edge of its 2nd maximum Fresnel Zone (F_2). Optus Mobile Pty Ltd was consulted regarding the proximity of proposed WTGs to their licence; however, no comments have been received. Pending confirmation from Optus, this assessment determined that the WTG locations are unlikely to cause EMI impacts with Link 1.

For Link 2, the rotor extent of WTG 184 has 52 m clearance from the edge of the links 2nd maximum Fresnel Zone (F_2). NSW RFS was consulted regarding the proximity of proposed WTGs to this link; however, no comments have been received. Pending confirmation from NSW RFS, this assessment determined that the WTG locations are unlikely to cause EMI impacts with Link 2.

For Link 3, the rotor extent of WTG 162 is adjacent to its 2nd maximum Fresnel Zone (F_2). NSW RFS was consulted regarding this proximity of WTG 162 to this link; however, no comments have been received. Pending confirmation, this assessment determined that the WTG locations are unlikely to cause EMI impacts with Link 3; however, given the proximity, any future micro-siting of WTG 162 must consider potential impact to Link 3. This also applies to WTG 52, WTG 140 and WTG 186 which are also in the vicinity of the 2nd maximum Fresnel Zone of Link 3.

Summary of Potential Impacts to Point-to-point Links

Based on the assessment and consultation with link owners/managers, the WTGs are not sited in the near-field zones of any point-to-point transmitters/receivers, nor are they located in the reflection or scatter zones. Optus Mobile Pty Ltd who manages Link 1, and NSW RFS who manage Link 2 and 3, have yet to provide comments relating to the proposed WTG layout and their operations. Notwithstanding this, the assessment has shown that no WTGs will overlap with the 2nd maximum Fresnel Zone of any point-to-point links, and as such the Project is expected to have a negligible impact on these.

Meteorological Radar

As discussed, the WMO recommends that wind turbines are sited, at a minimum, 5 km from meteorological radars, and preferably beyond 20 km. This is commensurate with OPERA and EUMETNET who recommend that no wind turbines are within 5 km of a C-Band radar, or 10 km of a S-Band radar.

Based on a review of existing radars within the vicinity of the Project, there are no radars within 30 km of the Project. The closet radar is 185 km from the Project (a C-Band radar). As such the Project complies with WMO, OPERA And EUMETNET recommendations. Further, there is excellent coverage from the four radars within 250 km of the Project Area, giving good visibility of weather events in that region. As such, the Project is unlikely to cause adverse performance of the radars during life threatening weather events.

Consultation with the BOM was conducted. The BOM response is included in Appendix A.3 of **APPENDIX M**. BOM have requested some further assurances from the Applicant regarding operation of the wind farm, which do not strictly concern the current proposed placement of WTGs.

Mobile-based Voice Communications

As discussed, for mobile-based voice communication reduction in signal may occur if WTGs are in proximity. However, this can be mitigated by relocating the mobile phone receiver in the order of only tens of metres. For example, for mobile-based voice communication towers beyond the Project Area, there will not be any significant impact on the signal.

Based on the location of WTGs and existing mobile-based voice communication links, Telstra confirmed that the Project will cause no material impact on their existing microwave links and any future upgrades. Optus was consulted regarding their links; however, no response was received. Based on the assessment is it expected that Optus mobile-based voice communications links will not be impacted by the Project.

Wireless and Satellite Services

Satellite services to dwellings will only be impacted by a wind farm where WTGs are sites in proximity to receivers, impeding their view of the sky. Excluding the two associated dwellings within the Project Area, the two nearest non-associated dwellings are more than 2 km from the nearest WTG. They are therefore not expected to have wireless and satellite services impacted as a result of the Project.

Broadcast and Digital Radio and Television

No AM, FM, digital nor temporary licence transmitters are within 30 km of a WTG. Therefore, Project impact on such signals will be unlikely.

Trigonometrical Stations, Survey Marks and GPS

The assessment concluded that all GNSS stations are more than 20 km from the nearest WTG, and therefore the Project will impact on the GNSS networks.

Engagement with Geoscience Australia was initiated on 24 October 2022 (refer Appendix A.5 of **APPENDIX M**). Geoscience Australia responded on 1 of November 2022 that the proposed wind farm development will not cause any impact to the Commonwealth-owned trigonometrical stations and/or GNSS reference stations or associated assets.

Given the distance from the WTGs to identified survey marks, the Project can avoid any impacts during construction.

6.7.2.5 MITIGATION MEASURES

Given the distance from the WTGs, impacts to the survey marks during construction can be avoided. However, if construction works cannot avoid survey marks, a registered surveyor will be engaged and consultation with the NSW Government will be undertaken.

The BOM have requested some further assurances from the Applicant regarding operation of the wind farm, which do not strictly concern the currently proposed placement of WTGs. The BOM response states:

> *The assessment shows manageable impact on the Bureau of Meteorology's weather radar network, in normal weather conditions. As such, the Bureau could conditionally agree to this project. The Bureau requires a letter from the (wind) farm developer/owner to acknowledge that the operation of the proposed wind farm will include the following commitments:*
>
> 1. *Informing the Bureau of significant variation in turbine layout (i.e. by more than 100 m in any lateral direction, or alteration of tip height) between the initial plan and construction.*
> 2. *Providing advance notice (one week preferably) to the Bureau of any planned wind farm shutdown events for more than 12 hours, to allow the recalibration of radar systems.*
> 3. *Collaborate with the Bureau in the event of severe weather conditions to assist in endeavour of community safety.*

The Applicant is committed to further information sharing and collaboration with the BOM, as per the above recommendations.

6.7.2.6 CONCLUSION

Based on the EMI assessment and consultation with key stakeholders, the Project is unlikely to have material impact on:

- Wireless and satellite internet services;
- Broadcast and digital radio;

- Broadcast, digital and satellite television;
- Trigonometry stations; and
- GPS.

Although material impact is also unlikely for point-to-point links and mobile voice-based communications, stakeholder consultation is still pending with Optus and the NSW Rural Fire Service.

6.7.3 HEALTH AND ELECTRIC AND MAGNETIC FIELDS

6.7.3.1 INTRODUCTION

Electromagnetic Fields

Electromagnetic fields (EMFs) are associated with all electrical wiring and equipment. The strength of electric fields is related to the voltage of the EMF, or pressure, which forces electricity along wires. Electric fields are strongest close to their source, and their strength diminishes rapidly with distance from the source, in much the same way as the warmth of a fire decreases with distance. Many common materials (such as brickwork or metal) block electric fields, and, for all practical purposes, electric fields do not penetrate buildings. Electric fields are also shielded by human skin, such that the electric field inside a human body will be at least 100,000 times less than the external field. The units commonly used to describe electric field strength are volts per metre (V/m) or kilovolts (1,000 Volts) per metre (kV/m).

To demonstrate the range of electric fields that exist may be encountered daily, electric fields at normal user distance from appliances are generally of the order of tens of V/m. On the other hand, electric fields produced by electric blankets have been reported ranging from a few hundred to more than a thousand V/m.

Magnetic Fields

Magnetic fields result from the movement of electric charges, that is, an electric current. The strength of a magnetic field depends on the size of the current (measured in amps) and decreases with distance from the source. Because magnetic fields are related to the current rather than voltage, high voltage equipment is not the only source of magnetic fields encountered in everyday life. In fact, modern life involves frequent contact with magnetic fields from a variety of sources such as appliances and electrical machinery. While electric fields are blocked by common materials, this is not the case with magnetic fields. This is a reason why power lines may contribute to the overall magnetic fields in the environment and why burying power lines will not necessarily eliminate these fields. Magnetic fields are often described in terms of their flux density which is commonly measured in units of Microtesla (μT) or the older unit of Milligauss (mG).

Magnetic field measurements associated with overhead power lines and substations are shown in Table 6-72. The magnetic field from power lines are similar to that of a household stove and will vary with configuration, phasing and load (Australian Radiation Protection and Nuclear Safety Agency 2020c).

TABLE 6-72 TYPICAL VALUES OF MAGNETIC FIELDS*

Source	Location of Measurement (1 m above the ground)	Range of Measurements**	
		Microtesla (μT)	Milligauss (mG)
Distribution Line (street power lines)	Directly underneath	0.2 - 3	2 - 30
Distribution Line (street power lines)	10 m away	0.05 - 1	0.5 - 10
Substation	At substation fence	0.1 - 0.8	1 - 8
Transmission Line (high voltage power lines)	Directly underneath	1 - 20	10 - 200
Transmission Line (high voltage power lines)	At edge of easement	0.2 - 5	2 - 50

Notes:

* Measured Near Overhead Power Lines and Substations

**Levels of magnetic fields may vary from the range of measurements shown.

Switching stations typically do not have power transformers and thus would have lower magnetic fields than substations.

Source: ARPANSA 2020c.

6.7.3.2 STANDARDS AND GUIDELINES

The WHO recognises two international guidelines for EMF:

- The International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz -100 kHz) (2010); and
- Institute of Electrical and Electronics Engineers (IEEE) Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic and Electromagnetic Fields, 0Hz to 300 GHz.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is the Australian Government's primary authority on radiation protection and nuclear safety. ARPANSA regulates Commonwealth entities using radiation with the objective of protecting people and the environment from radiation. ARPANSA is also a contributor to ICNIRP.

The ICNIRP Guidelines provide EMF limits for electric fields internal to the human body, as well as reference levels. Reference levels are external, measurable levels that relate to the internal EMF limits. **Table 6-73** summarises the ICNIRP reference levels for exposure to external magnetic fields and electric fields respectively at 50 Hz as contained in ICNIRP (2010).

TABLE 6-73 REFERENCE LEVELS FOR EXPOSURE TO MAGNETIC FIELDS AND ELECTRIC FIELDS

	Magnetic Fields Reference Levels at 50 HZ	Electric Field Reference Levels at 50 HZ
General Public (general exposure)	200 μT	5 kV/m
Occupational (general exposure)	1,000 μT	10 kV/m

6.7.3.3 HUMAN HEALTH

EMFs associated with the generation, distribution and use of electricity is classed as extremely low frequency (ELF) EMF or power frequency EMF, which corresponds to a frequency of 50 Hz. ELF EMFs occupy the lower part of the electromagnetic spectrum and is non-ionising radiation, or in other terms, there is insufficient energy to cause ionisation and there is not enough energy to damage DNA (ARPANSA, 2020a).

Globally, concerns have been raised that EMFs associated with electrical equipment might have adverse human health effects, and a significant amount of research has been directed at studying potential effects. However, adverse human health effects from high-level exposure to ELF EMF has yet to be established.

The WHO (2020) recognises that to date no adverse health effects from ELF EMF, or long-term exposure to radiofrequency or power frequency fields have been confirmed. However, they also offer a note of caution that the possibility remains that such effects may exist. Similarly, ARPANSA state, with reference to the extensive scientific research that has been undertaken, that human exposure to EMF in the environment, including in the vicinity of power lines, does not pose long term effects and risks to human health (ARPANSA, 2020a).

The NSW Government's position on EMF effects has been informed by the sources stated above as well as the findings of the National Health and Medical Research Centre (NHMRC) and NSW Health, being that:

- Infrasound and low frequency sound generated by wind farms are well below the level that is harmful to humans; and
- Wind turbine electricity does not involve the production of greenhouse gases, other pollutants, emissions or waste – all of which can have significant effects on our health and well-being.

Advice from the NHMRC states that 'The level of ELF electromagnetic radiation close to wind farms is lower than the average level measured inside and outside suburban homes".

6.7.3.4 RISK ASSESSMENT

Potential impacts associated with EMFs would only occur during Project operation as electricity will not be generated during Project construction.

WTGs

EMF from WTGs is associated with their electrical reticulation and power transformer. Now dated research undertaken by Israel et al. (2011) and McCallum et al. (2014) are widely referenced in current research publications. These studies state that measured electric fields from a 3 MW WTG are 1.44E-03 kV/m and measured magnetic fields are 0.133 and 0.225 μT. Noting that this is a smaller turbine than that proposed for the Project; however, also noting that technology has advanced over the past decade with respect to minimising EMF. Regardless, upon extrapolation of these values for a Nordex 5.7 MW WTG, the levels are well below the ICNIRP reference levels. These levels were also recorded from the base of a WTG.

The nearest dwelling to a WTG is about 2.2 km with most dwellings located well over 5 km away (refer **Table 3-4**).

Substation, Switchyard

Key sources of magnetic fields within the substation include the transformer secondary terminations, cable runs to the switch room, capacitors, reactors, busbars, and incoming and outgoing feeders. Energy Networks Association (2016) state typically the highest magnetic fields at the boundary of a substation come from the transmission lines, and the magnetic field decreases to background levels within a few metres of the substation. Thus, it is considered that distribution substations are not a significant source of exposure. Substation design also needs to conform AS 2067 which requires that substations comply with ICNIRP reference levels both inside and outside the substation. Switching stations contain fewer sources of magnetic fields than substations (such as power transformers) and thus would likely be an even lower source of exposure than substations.

The nearest dwelling to the substations or switchyard is over 6 km away (refer **Table 3-4**).

Electrical Reticulation

The Project involves the construction of a 20 km 330 kV overhead transmission line to connect the Project from the switchyard to the Interconnector. The project will also require about 175.3 km of underground 33 kV cables, and 64.5 km of overhead 33 kV cables.

Recent estimates of electric field and magnetic fields for 33 kV underground cables are 2.4E-06 kV/m, and 8 μT respectively (Jacobs, 2022). For 330 kV overhead transmission lines electric fields of about 7.06 and magnetic fields of about 69 μT may be expected (Jacobs, 2022). These estimates are all below the ICNIRP reference levels.

The nearest dwelling to the overhead transmission infrastructure is over 6 km away (refer **Table 3-4**).

BESS

A BESS creates EMFs from operational electrical equipment, such as transmission lines, transformers and inverters within BESS units. This equipment has the potential to produce EMFs in the range of 30 to 300 Hz.

There is limited information on typical measurement of magnetic fields around BESS. The magnetic field associated with a BESS will vary depending on several factors including configuration, capacity and type of housing. The BESS will be housed in enclosures or buildings, such as modified shipping containers, prefabricated structures, buildings or smaller cabinets, mounted on concrete slabs / footings. It is assumed that the typical magnetic field associated with a BESS will not be too dissimilar to that of a substation, as the transmission and transformers are likely to provide the greatest source. The BESS for the Project will be designed in accordance with relevant electrical safety standards.

The nearest dwelling to the BESS is over 7 km away (refer **Table 3-4**).

6.7.3.5 MITIGATION MEASURES

The Project has been designed to implement prudent avoidance by ensuring appropriate setbacks.

Prudent Avoidance

While compliance with standards and guidelines is important, guidelines are based on established effects only, so compliance does not imply absolute safety. As such, prudent avoidance is recommended. To ensure prudent avoidance, facilities should be designed to reduce the intensity of EMF and should be positioned with sufficient setbacks to minimise the EMF encountered by people over long periods.

The WHO (WHO, 2007) advocates this approach while addressing prudent avoidance in these terms:

> *…it is not recommended that the limit values in exposure guidelines be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection;*
>
> *Electric power brings obvious health, social and economic benefits, and precautionary approaches should not compromise these benefits; and*
>
> *Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted.*

Provision of Setbacks and Easements

Consistent with prudent avoidance principles, the Project incorporates significant setbacks (ranging from 2 to 9 km) between residential dwellings and Project components which will generate EMF. The setbacks are outlined in **Table 6-74** and provide assurance for the community in relation to all EMF generated from the Project.

TABLE 6-74 DISTANCE BETWEEN DWELLINGS AND PROJECT COMPONENTS

Project Component	Approximate Distance to Nearest Dwelling (m)
WTG	2,227
Substation North	9,776
Substation Middle	8,234
Substation South	7,606
BESS	7,606
Switchyard	6,447
Transmission Line	6,754

Additional Measures

Additional mitigation measures are also recommended to minimise EMF impact, and include, where practicable:

- Reduce phase spacing of overhead conductors to increase magnetic cancellation and reduce associated EMF levels. The reduction in phase spacing should not result in unacceptable levels of audible noise and radio frequency interference;
- Arrange underground cabling in trefoil or multicore cable arrangement to maximise the magnetic field cancellation and minimise magnetic flux density at 1 m AGL; and
- Increase the phase-to-ground separation associated with the Project transmission line to reduce the electric field strength and magnetic flux density at 1 m AGL.

6.7.3.6 CONCLUSION

Although there has been significant research undertaken, any adverse effects on the community from EMF have yet to be established. Regardless, the broadly accepted guideline in both Australia and overseas, which have been adopted by the Applicant, includes:

- Ensuring the design of Project infrastructure that may create EMF is in accordance with relevant guidelines; and
- Implementing a prudent avoidance approach.

Due to the low exposure likely to be generated by the Project and the general findings of the scientific community, no adverse impacts are expected from Project EMFs.

6.7.4 BUSHFIRE

6.7.4.1 INTRODUCTION

The SEARs require the EIS to:

- identify potential hazards and risks associated with bushfires and use of bushfire prone land;
- identify potential impacts on Yanga State Conservation Area including the risks that a wind farm would cause a bushfire;
- identify potential impacts on the aerial fighting of bushfires; and

- demonstrate compliance with *Planning for Bush Fire Protection 2019*.

In responding to the SEARs, a Bushfire Risk Assessment (ERM, 2024) was prepared and is provided in **APPENDIX N**.

This report identifies potential hazards and risks associated with the Project and use of bushfire prone land. It contains management and mitigation measures that are designed to address these obligations in accordance with NSW Rural Fire Service (RFS) guidelines, including *Planning for Bush Fire Protection* (PBP) (2019) inclusive of the PBP Addendum (2022). The assessment also considers the proposed locations of infrastructure associated with the Project, relative to any identified hazards and the requirements for separation distances.

The key objective of the Bushfire Risk Assessment is to identify the risks of bushfire and put forward management and mitigation measures that will reduce the likelihood of a bushfire impacting the Project Area and/or spreading from the Project Area to surrounding properties.

6.7.4.2 EXISTING ENVIRONMENT

The following information is relevant when assessing the existing conditions of the site in the context of bushfire risk:

- The Project Area is situated within the Hay Plains, which is characterised by a relatively flat topography with low relief and slight variation to elevations. Flat sites result in a significantly reduced risk in the spread of fires when compared to steep sites.
- A review of the NSW RFS Bushfire Prone Land mapping confirms that the Project Area is not currently recognised as being bushfire prone. The nearest area of bushfire prone land is located approximately 7.5 km east of the nearest turbine (WTG 50). It is noted that the Yanga State Conservation Area (which is located to the immediate west of the site) is not mapped as bushfire prone land; however, this area has been considered a bushfire hazard as part of this assessment.
- The relevant Bushfire Risk Management Plan (BFRMP) for the Project is the Mid Murray Zone BFRMP (2009). No land within (or in proximity) to the Project Area is mapped as a bushfire management zone.
- The existing land uses within vicinity of the Project Area is predominantly agricultural, and current bushfire control is limited to general land management practices including maintenance of access tracks and consideration of fire danger ratings and total fire bans.
- The prevailing weather conditions associated with the bushfire season (1 October to 31 March) are winds from the west around to the north, accompanied by high daytime temperatures and low relative humidity. These characteristics are known to occur in the area (as per data sourced from the Balranald weather station), which contributes to the fire hazard in the region. Dry lightning storms are known to occur frequently during the bushfire season, which may result in the starting of forest and grass fires.
- The Project Area, like many in eastern Australia, is within one of the most bushfire-prone areas of the world that is increasingly susceptible to climate change. Bushfire weather conditions in future years are projected to increase in severity for many regions, which will result in an earlier start to the bushfire season and increases in the number of extreme fire days, reduced opportunities for fuel reduction burning, and increasing challenges to management of fire risk to property, people and biodiversity.

Regarding mapping of bushfire prone land, Category 3 vegetation (including but not limited to grasslands and freshwater wetlands) will likely be added to the bushfire prone land mapping to align with the requirements of the NSW RFS Guide for Bushfire Prone Land Mapping (RFS, 2015). This is also supported by the strategic planning of the Murray River LGA, who propose to undertake a review of bushfire prone land mapping in collaboration with NSW RFS. This will result in an increase in bushfire-prone land in the area, and potentially within the Project Area.

6.7.4.3 RISK ASSESSMENT

Identification of Assets

The assets within the Project Area relevant to bushfire risk include:

- Project infrastructure;
- Site Access and Internal Access Tracks; and
- Temporary Facilities.

The assets surrounding the Project Area relevant to bushfire risk include:

- Off-site residential properties and farms;
- Potential new dwellings;
- National Parks and Conservation Areas; and
- Crown Land.

The identification of assets within and surrounding the Project Area is vital in ensuring appropriate risk identification and implementation of mitigation measures.

Fire History and Ignition Sources

The Mid Murray Zone Bushfire Management Committee reports that the zone which encompasses the Project Area has an average of 250 grass fires per year, of which up to 10 are categorized as major fires.

Historical bushfire events relevant to the Project Area include:

- There is record of a fire burning 14 km to the northwest of the Hay township in the 2016-2017 season. The fire was approximately 1,900 ha in size and resulted in a full canopy scorch (extreme severity rating) in some areas. The fire was located approximately 60 km to the northeast of the Project Area. The closest record of fire to the Project Area (approximately 40 km northeast) burned in the same year but was approximately 10–15% in size of the Hay record.
- Within the Yanga Park State Conservation Area, wildfire ignitions which are generally caused by lightning strikes have resulted in three fires of between 11 ha – 1 ha in size. The closest fire to the Project Area (1.8 km west of WTG 76) occurred for two days in November 2012 and burnt 0.47 ha of land (Fire No. 12112759632, The Willows).
- While the Yanga Precinct Fire Management Strategy acknowledges that fire history data in Yanga Park is incomplete, it notes that there is no verbal or recorded history of
- Large scale fires occurring across the reserve area.

Within the Mid Murray Zone, natural ignitions such as lightning strikes are likely and historically common across the region. Additionally, human-induced ignitions are also known to occur across the region, both accidently and intentionally (arson).

The assessment notes that the risk of fire occurring as a result of lightning strike may be reduced by the presence of wind turbines on a site, given that wind turbines:

- Include an in-built lightning protection system which safely dissipates the electricity from the blades or the nacelle to the ground to avoid damage to the components;
- Have a variety of on-board control systems specifically designed to mitigate the risk of fire; and
- Are to be constructed of non-combustible materials.

As a result, and as reported by The Australia Institute (2006), the risk that a wind farm itself will cause a fire is considered low, with the appropriate protection measures.

Firefighter And Public Safety

Respondents to a bushfire within the Project Area would likely include volunteers from the NSW RFS, as well as nearby associated and non-associated landowners. Some volunteer firefighters may not be trained in structural and electrical firefighting; therefore, a Bushfire Emergency Management and Operations Plan (BEMOP) will be prepared for the Project. The BEMOP will detail appropriate risk control measures to be implemented to safely mitigate potential risks to the health and safety of firefighters and first responders on the site. This plan is to be prepared in consultation with NSW RFS and prior to the commencement of construction.

Other relevant aspects for firefighter and public safety include:

- Potential interference to local and regional radio transmissions by wind farm infrastructure. This has been addressed within the EMI Assessment. The EMI Assessment determined that the Project is unlikely to result in interference to relevant communications links;
- The combination of dense smoke and hot gases generated by a large fire directly under or near a high voltage power line can create a conductive path that increases the potential for a ‘flashover’. This is to be addressed within the BEMOP; and
- The risk of arcing in dense smoke is reduced as WTGs have a detection system that protects them from surges, arcing and other electrical hazards. Electrical systems will also be shut down as soon as arcing is detected.

Summary Of Bushfire Risk Factors

The bushfire risk factors for the Project include:

- Fire resulting in injury and/or loss of life – for workers and visitors, firefighters, and the local community;
- Damage to on-site infrastructure – extensive and widespread loss of infrastructure;
- Damage to surrounding properties and/or off-site infrastructure – extensive and widespread loss of infrastructure/property; and
- Damage to ecological values/assets – impacts on threatened species and ecological communities.

The proposed mitigation measures to reduce these impacts is provided in the following section.

6.7.4.4 MITIGATION MEASURES

Mitigation comprises of complementary strategies which are required to provide the best possible protection outcome for the wind farm and the community. In terms of design principles to minimise risk, the wind farm layout will be designed to:

- Provide a defendable space around infrastructure; and
- Ensure that appropriate access, egress and manoeuvrability within the wind farm is provided for first responders.

These measures are summarised in **Table 6-75** below.

TABLE 6-75 BUSHFIRE MITIGATION AND MANAGEMENT MEASURES

Measure	Action
Asset Protection Zones (APZ) An APZ is typically designed to separate a vulnerable asset from the bushfire hazard (vegetation/fuel). APZs do not eliminate the fire risk but can lower it to an extent where fire control is more feasible or damage to the asset is reduced or eliminated. The APZ and perimeter road is to be constructed as the first stage of development and maintained for the life of the Project.	The APZ recommended for Project infrastructure include: • minimum 20 m APZ to be established around each wind monitoring masts; • minimum 20 m APZ to be established on all sides of the substations, switching station, BESS and O&M Buildings (noting that the current project designs currently provides up to 35m wide APZ around the BESS and substation); and • minimum APZ of 24m to be established around the accommodation compound with minimum construction standards of BAL-12.5 applying. Each WTG will be mounted on a concrete foundation (approximately 25 m in diameter) located on a cleared hardstand area. The specifications recommended for the APZ include: • All APZ are to be managed as an inner protection zone (IPA) for the life of the development as outlined within Appendix 4 of PBP 2019, and NSW RFS 'Standards for Asset Protection Zones'; • APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners. This includes the neighbouring National Parks estates; • Mineral earth fire break i.e., dirt or gravel; • No trees and shrubs planted within the APZ; and • Where possible, increase the distance between the trees and the APZ.
Wind farm construction Refers to all measures provided within the construction phase of the Project.	Mitigation measures recommended to be implemented during construction: • Water supplies for bushfire/fire protection are to be installed and made accessible at the commencement of construction; • Appropriate bunding is to be put in place in areas where there is potential for flammable fuels and oils to leak and create bushfires or other environmental risks. Flammable consumables storage must be in cleared areas away from potential ignition sources; • Appropriate signs to be installed to assist emergency response crews navigate the site (see below); • Implement a permit system for high ignition risk work during first danger periods; • Adherence to restrictions on Total Fire Bans or days of high fire danger during operations;

Measure	Action
	• Suitable firefighting equipment (specific requirements to be confirmed in consultation with NSW RFS) will be present onsite; • Fire extinguishers or firefighting equipment to be carried in vehicles where practicable; • Emergency communications equipment to be carried where practicable; • Combustible waste (including cleared vegetation) must be removed to minimize the risk fire. If it is not possible, the temporary storage must have sufficient space to prevent fire propagation; • Vehicle refueling will be undertaken in designated area and in accordance with protocols to minimise fire risk; • A manifest (and safety data sheets) for any battery, diesel or other dangerous goods storage/handling, including the class identification, quantity, type (bulk or packaged) and location must be prepared. Appropriate material (including absorbent, neutralisers, equipment and personal protective equipment) for the clean-up of spills is to be provided and available onsite; • Smoking to be restricted to prescribed areas, and suitable ash and butt disposal facilities to be provided; • All plant, vehicles and earth moving machinery to be cleaned of any accumulated flammable material; • A Bushfire Emergency Management and Operations Plan will be developed prior construction; and • On days when Very High fire danger or worse is forecast, relevant fire information to be checked regularly for the occurrence of any fires likely to threaten the site.
Operational measures Refers to all measures provided within the operational phase of the Project and is to be adhered to throughout the life of the Project.	The following measures are recommended to be implemented during the entire period of operation: • The Project is to be controlled by a remote SCADA system from a control room located within the permanent site operations and maintenance facility. The SCADA system will allow remote operation of all WTGs with the ability to shut-down individual or all WTGs if required; • NSW RFS will be provided with maps and GPS coordinates of the final wind turbine layout and identification information for individual wind turbine sites for their internal response planning; • Regular liaison with CASA and the RAAF Aeronautical Information Service; • Safe working and emergency response procedures for all work tasks to be developed and implemented. • Maintenance staff to be trained in the basic first response firefighting techniques. • Firefighting equipment to be provided and maintained capable of controlling and suppressing small initial outbreaks of fire. At a minimum, these are to be located on the outside of the switching station, substation, BESS and O&M buildings. • Vegetation fuels throughout the windfarm are to be maintained in a minimal condition by grazing, or with additional slashing or mowing if required.
Access tracks and road network Refers to all measures provided for the on-site road network within	• Site access points are to be constructed during the first stage of development, with the final design to enable safe access and egress for the construction workforce and emergency service personnel arriving to undertake firefighting operations.

Measure	Action
the Project area and is to be adhered to within the construction phase and throughout the life of the Project.	• Site access points and internal access tracks are to be maintained for the life of the Project. Access tracks throughout the wind farm must include appropriate signage for site egress and for emergency response crews to effectively navigate the Project Area. • Roads shall provide sufficient width and other dimensions to ensure safe unobstructed access and allow firefighting crews to operate equipment around the vehicle, and dead-end roads are to incorporate a sufficient turn-around area to minimise the need for vehicles to make multipoint turns. • To enable access for NSW RFS, all roads will be maintained to the minimum standards outlined within the NSW RFS Fire Trail Standards and the NSW RFS Fire Trail Design, Construction and Maintenance Manual.
Fire preparedness and response Refers to all measures provided to ensure that safety of all people on and within proximity of the site and is to be adhered to throughout the life of the Project.	A Bushfire Emergency Management and Operations Plan and Emergency Management Plan is to be prepared and stored at an 'Emergency Information Cabinet' at the main entrance to the wind farm and provided to local emergency responders. These documents are to include: • A detailed site plan identifying, using GPS coordinates, each turbine tower location; • A safe method of shutting down and isolating the WTG if required (noting that the turbines automatically shut down if they are close to functioning outside their design conditions); • Control and coordination arrangements for emergency response (e.g., evacuation procedures, emergency assembly areas and procedures for response to hazards); • Agreed roles and responsibilities of onsite personnel (e.g., equipment isolation, liaison, evacuation management); • Up-to-date contact details of site personnel and any relevant off-site personnel who could provide technical support during an emergency; • A manifest (and safety data sheets) for any battery, diesel or other dangerous goods storage/handling, including the class identification, quantity, type (bulk or packaged) and location. Appropriate material (including absorbent, neutralisers, equipment and personal protective equipment) for the clean-up of spills is to be provided and available onsite; • Clearly states work health safety risks and procedures to be followed by firefighters, including personal protective clothing; • Minimum level of respiratory protection; • Minimum evacuation zone distances; • Activation of water spray/foam systems and any other response/protection measures; and • Any other risk control measures required to be followed by firefighters.
Transmission lines Refers to all measures provided to mitigate risks involved with the on-site transmission lines and is to be adhered to throughout the life of the Project.	Certain activities are to be restricted within the transmission line easement, such as planting and growing trees, construction of buildings, or erection of antennae or masts.

Measure	Action
Water storage Refers to all measures provided in relation to water storage and is to be considered during the design phase and then maintained throughout the life of the Project.	There is no reticulated water supply to the site. Water supply is to be designed to provide filling points for fire tanker units near the wind farm entrance. A storage capacity of 50,000 litres is recommended, based on two refills of six tanker units with a capacity of 4,000 litres. The required capacity for water storage is to be confirmed in consultation with NSW RFS and should be noted within the Bushfire Emergency Management and Operations Plan.

6.7.4.5 CONCLUSION

In summary, the risk that the wind farm itself will cause a fire is minimal, and the proposed development is not currently located within a bushfire prone landscape.

In any event, fires on land with extensive grasslands and arid shrublands should not be underestimated, and thus have been considered as a fire hazard requiring mitigation measures as part of this assessment. These measures and treatments are proposed to be a combination of complementary strategies, all of which are intended to provide the best possible protection outcome for the wind farm and the community.

The detailed mitigation measures outlined in the Bushfire Risk Assessment have been developed to ensure that the wind farm development does not present any increased risk of widespread fire across the landscape and are to be applied for the life of the Project.

6.7.5 PRELIMINARY HAZARD ANALYSIS

6.7.5.1 INTRODUCTION

The SEARs require the EIS to assess the risks relating to the battery storage element of the Project, including:

- A preliminary risk screening completed in accordance with the State Environmental Planning Policy (Resilience and Hazards) 2021; and
- A Preliminary Hazard Analysis (PHA), prepared in accordance with the Hazardous Industry Planning Advisory Paper No. 6, 'Hazard Analysis' and Multi-level Risk Assessment (DoP, 2011).

The PHA must consider all recent standards and codes and verify separation distances to on-site and off-site receptors to prevent fire propagation and compliance with Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning (DoP, 2011).

A BESS of up to 200 MW/800 MWh (which provides approximately four hours of storage) is proposed as part of the Project. The BESS is proposed to be 400 m by 300 m and will include a 35 m Asset Protection Zone buffer to all sides. While the model and design specification of the BESS will be determined during detailed design phase, the final model and design specifications will remain within the specifications assessed in the PHA report.

The PHA report is included in **APPENDIX O**.

6.7.5.2 METHODOLOGY

The assessment was carried out in accordance with the requirements of the '*Hazardous Industry Planning Advisory Paper*' (HIPAP) No. 6 Hazard Analysis, and included the following steps:

1. Establish the study context;
2. Identify hazards resulting from the operations of the BESS and events with the potential for offsite impact (Hazard Identification);
3. Analyse the severity of the consequences for the identified events with offsite impact (e.g. fires and explosions [Consequence Analysis]);
4. Determine the level of analysis and risk assessment criteria;
5. Analyse the risk of the identified events with offsite impact (Risk Analysis); and
6. Assess the estimated risks from identified events against risk criteria to determine acceptability (Risk Assessment).

The PHA assessed the events associated with proposed operation of the BESS.

The HIPAP No. 4 *Risk Criteria for Land Use Safety Planning guideline* (HIPAP 4) outlines that a risk assessment criterion be considered when assessing the land use safety implications for the development of a potentially hazardous nature. The risk criteria informing the preliminary hazard assessment was undertaken following the guidance provided in HIPAP No. 4.

Hazard Identification

The following hazards have been identified:

- Battery Storage – the most common BESS consists of an array of lithium-ion batteries (LIB), which re classified as a Class 9 dangerous good (UN No. 3480). The main hazards of LIB include:
  - Overheating with toxic gas generation and emission to atmosphere and potential exposure to toxic gases such as Carbon Monoxide (CO), Hydrogen Chloride (HCl), Hydrogen Fluoride (HF) and Hydrogen Cyanide (HCN).
  - Overheating with flammable gas generation within the container (CO, Hydrogen, hydrocarbons such as Benzene, Ethylene), ignition and explosion within the container, and potential for escalation to adjacent containers.
  - Fire in Lithium-ion battery, escalating into the packs in the container, with potential for escalation to adjacent containers.
- Electrical Hazards – potential hazards that include:
  - Power converter fire and explosion.
  - High voltage transformer fire/ explosion, and potential for escalation.
  - Electrical fire in sub-station (arcing etc.).
  - Contact with electricity.
- Other Hazards – potential hazards that include:
  - Vehicle interaction with infrastructure (collision hazards).
  - Natural hazards (earth tremor, adverse weather).
  - Dangerous goods storage and handling.

- Wind Turbine Hazards – potential hazards relating to blade thrown, ice throw, tower/nacelle collapse and turbine fires. Wind Turbine Hazards are included within the study and addressed within a separate chapter of the EIS (**Section 6.7.6**);
- Health – EMF resulting from the generation, transmission and distribution of electricity. EMF impacts are excluded from the study and addressed within a separate chapter of the EIS (**Section 6.7.3**);
- Bushfire – Bushfire hazards are excluded from the study and addressed within a separate chapter of the EIS (**Section 6.7.4**).

The Hazard Identification Register is provided in full in Section 4.7 Table 12 of **APPENDIX O**, with the findings (as relevant to this chapter) summarised as follows:

- A total of twenty potentially hazardous events were identified;
- The specific BESS hazards relate to risks associated with battery fire and battery explosion;
- The specific electrical hazards relate to risks associated with transformer or converter fire/explosion, inverter failure and contact with electricity; and
- There are a range of other hazards associated with the proposal, including the potential for natural hazards and those associated with the construction and operational phase of the project.

6.7.5.3 RISK ANALYSIS

Battery Fire

There are several causes of battery fires, including:

- Electrical failures – overcharging or over discharging;
- Internal short-circuit;
- Damaged battery;
- Battery overheating; and
- Frequent charging and discharging of the battery capacity and degradation of battery resulting in overheating.

The consequences of a battery fire may result in the escalation of the fire to other battery packs and modules, thermal radiation and escalation to an adjacent battery container, or toxic gas generation and/or combustion.

While noting that there is no established methodology for quantitatively assessing fire hazards, a range of previous studies were reviewed and referenced in analysis of the risk of battery fire. As BESS fire modelling is still in the developmental stages with limited field data, it is difficult to quantitatively model BESS fires.

However, with reference to all available data, it can be concluded that fire escalation to adjacent containers can be prevented, provided that adequate fire protection is provided such as cooling adjacent containers.

While separation distances allow for explosion escalation prevention and enables approach of the fire by firefighting personnel, the study also concludes that the thermal radiation effects of BESS fires would be confined within the site and there would be no offsite thermal radiation effect.

Toxic Gas Exposure

The production of flammable and toxic gasses is possible when a battery pack overheats, with typical compositions including Carbon Dioxide (36.9% in Off Gas), Ethane (21.1% in Off Gas) and Carbon Monoxide (11.9% in Off Gas). When assessing the Off Gas composition of overheating of Lithium Phosphate BERES, there is a total flammable gas content of 54.7%, and a toxic gas concentration of 17.4%.

Figures 14-17 of the PHA details the injury concentrations through dispersion modelling for the four types of toxic components (Hydrogen Chloride - HCl, Hydrogen Fluoride - HF, Carbon Monoxide – CO and Hydrogen Cyanide – HCN), with the injury concentration taken as the ERPG-3 level, at which a person may experience life-threatening effects if exposed for more than 1 hour.

The findings from the dispersion modelling at ERPG-3 level are summarised as:

- For HCl, HF, HCN and CO dispersions, the toxic substance stays in the dispersing plume, released 5 m AGL and does not result in injury or irritation producing concentrations at ground level;
- For HF dispersion, the distance to ERPG-3 concentration ranges from 6 m to 42 m from the container, the longest distance being for vent for wind conditions F1.4 (1.4 m/s, Pasquil stability F). The HF ERPG-3 for F1.4 may reach outside the site boundary, but not at ground level;
- For HCN dispersion, the distance to ERPG-3 concentration ranges from 4 m to 18 m from the container, the longest distance being for vent for wind conditions F1.4 (1.4 m/s, Pasquil stability F). The HCN ERPG-3 for F1.4 would not reach outside the site boundary and does not reach ground level;
- For CO dispersion, the distance to ERPG-3 concentration ranges from 3.5 m to 17.5 m from the container, the longest distance being for vent for wind conditions F1.4 (1.4 m/s, Pasquil stability F). The ERPG-3 for F1.4 would not reach outside the site boundary and does not reach ground level;
- There is no toxic injury impact to personnel or public from CO, HCl, HF and HCN in the emission of off gases as the toxic concentrations do not reach ground level; and
- Entry into the container for firefighting will require self-contained breathing apparatus to be worn by the fire fighters.

Similar analysis (sound within Figures 18-21 of the PHA) was conducted at the ERPG-2 level, where toxic concentrations at which a person exposed may experience irritation and discomfort, but not injury effects, was carried.

The findings from the dispersion modelling at ERPG-3 level are summarised as:

- Toxic concentrations to ERPG-2 level do not reach ground level, except for HF at low wind speeds;

- Toxic concentrations to ERPG-2 level for HCl, HF, HCN and CO cover a range of 4-82 m and may reach the southern Operations and Maintenance facility plot but are confined entirely within the site boundary;
- F stability occurs for only 2% of time during daytime but can occur for up to 30% of the time at night; and
- A frequency assessment was not carried out because injury / irritation risk criteria are only relevant for residential & sensitive uses, and the consequence distances do not reach these areas.

Battery Storage Container Explosion

The off-gas composition previously referred to in this chapter does not include hydrogen. According to previous studies undertaken on the subject, hydrogen evolves as part of the off gases, and gets consumed in the process once the gas reaches the sensors, hence it not being reported. A maximum of 30% hydrogen could be present.

When assuming a 30% Hydrogen content, the top three Off Gas contents by percentage are Carbon Dioxide (31.3% in Off Gas), Hydrogen (30.3% in Off Gas) and Ethane (18.2% in Off Gas).

In relation to the consequences of explosion, the assessment is based on the total amount of flammable gas present in the container taken as the stoichiometric mixture (the worst-case explosion scenario), at the time of ignition.

The flammable gas concentration in the container at the time of ignition is taken as 0.0591 kg/m^3 (the geometric mean of LFL and UFL), with the flammable gas content is 1.15 kg. The explosion overpressures generated by ignition of the gas cloud are calculated using the TNT explosion model in PHAST.

As per Table 18 of the PHA, it was found that there would be:

- No offsite impact from a battery storage container explosion;
- An explosion in one container may result in incident escalation and domino effect in this instance of two containers that are located within 3 m of one another; and
- If a high CO alarm is raised, then personnel entry into a BESS container is not advisable due to the potential for an explosion.

Recommendations and mitigation measures in relation to the above are provided within this chapter.

6.7.5.4 RISK ASSESSMENT

The following table details a comparison of the risk analysis with reference to the NSW DPIE Hazardous Industry Planning Advisory Paper No. 4, '*Risk Criteria for Land Use Safety Planning*', and is broken down into three key sections:

- Individual Fatality Risk Criteria;
- Injury Risk; and
- Risk of Property Damage and Accident Propagation.

TABLE 6-76 RISK CRITERIA COMPARISON

Criterion Description	Criterion Value per annum	Comment
Individual Fatality Risk Criteria		
Hospitals, schools, child-care facilities, old age housing	0.5×10^{-6}	Distances to fatal consequences from fires and explosions are not reached at these land uses for hazards associated with the wind farm. There is also significant uncertainty in frequency assessment of this evolving technology. Frequency assessment was carried out for blade throw hazard and found to satisfy the risk criteria. Consequences resulting in potential fatality do not reach industrial areas.
Residential, hotels, motels, tourist resorts	1×10^{-6}	
Commercial developments including retail centres, offices, and entertainment centres	5×10^{-6}	
Sporting complexes and active open space	10×10^{-6}	
Industrial	50×10^{-6}	
Injury Risk		
Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kW/m2.	50×10^{-6}	Potentially hazardous consequences (viz. >4.7 kW/m2 or >7 kPa) are not reached at these land uses for fire / explosion hazards associated with the BESS.
Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kPa.	50×10^{-6}	
Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure.	10×10^{-6}	Potentially hazardous consequences are not reached at these land uses for fire hazards associated with the BESS.
Toxic concentrations in residential and sensitive use areas should not cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community.	50×10^{-6}	
Risk of Property Damage and Accident Propagation		
Incident heat flux radiation at neighbouring potentially hazardous installations or at land zoned to accommodate such installations should not exceed the 23 kW/m2 heat flux level.	50×10^{-6}	Potentially hazardous consequences (viz. >23 kW/m2 or >14 kPa) are not reached at these land uses for fire / explosion hazards associated with the BESS and WTG systems.
Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings should not exceed the 14 kPa explosion overpressure level.	50×10^{-6} /	

Based on the above assessment, it is concluded that there is negligible offsite risk of fatality, and hence there are no societal risk implications as outlined within HIPAP No. 4, Figure 3: 'Indicative Societal Risk Criteria'.

The assessment implicitly assumes that an effective safety management system is in place to manage the risks, which forms part of the mitigation and management measures found in the next section of this chapter.

6.7.5.5 MITIGATION MEASURES

The PHA recommends a series of mitigation and management measures:

- The provision of suitable separation (minimum of three metres) between adjacent containers;
- Suitable infrastructure such as forced ventilation, an alarm system, a CO detector and bollards/protective barriers to prevent or mitigate against failure (and the associated risks of failure) of the BESS;
- Cross-referencing the risks associated with the BESS in the Emergency Response Plan, so that emergency response personnel can take appropriate precautions to protect themselves from any hazards and escalating events; and
- Ensuring that the BESS is complaint with all relevant NFPA 855 Compliance Requirements (which are detailed further within the **APPENDIX O**).

6.7.5.6 CONCLUSION

The following conclusions are made following assessment of the Project:

- The thermal radiation, explosion and toxic gas effects of a BESS fire would be confined within the site, and as such there would be no potentially injurious offsite effects;
- A separation distance of three metres between adjacent containers should prevent escalation from an explosion of off gases generated in one container from battery overheating. The separation would also allow enable approach for firefighting purposes, should this be required;
- Toxic gas concentrations that produce injury or irritation level are confined entirely within the site boundary, and do not reach ground level;
- If a high CO alarm is raised, personnel entry into a BESS container is not advisable due to the potential for an explosion. The ventilation system should be maintained, and the unit shut down until the alarm is cleared;
- The thermal radiation impacts from transformer fires are localised with no potentially injurious offsite effects;
- The DPE risk criteria for land use safety planning in HIPAP No. 4 do not apply to the O&M buildings and the BESS since these facilities are within the boundary of the proposed development;
- To comply with Section 2.4.2.1 of HIPAP No. 4, the individual fatality risk levels for industrial sites at levels of 50 in a million per year (50×10^{-6} per year) should, as a target, be contained within the boundaries of the site where applicable. This criterion is satisfied; and
- The proposed development complies with the relevant DPE *Criteria For Land Use Safety Planning*.

Following assessment of the preliminary hazards associated with the development and operation of the Project, it is considered hazards can be mitigated to a reasonable level that would result in negligible risks of injury and fatality.

6.7.6 BLADE THROW AND RELATED HAZARDS

6.7.6.1 INTRODUCTION

Assessment of blade throw and other related hazards was prepared to assess the potential impacts of hazards associated with WTGs and to identify mitigation and risk management measures to be implemented during construction and operation (Arriscar, 2024; **APPENDIX O**).

There are three main points of failure from a WTG:

- Detachment of a blade (blade throw);
- Collapse of the supporting tower; and
- Collapse of the nacelle (i.e., detachment from the tower).

Other related hazards include:

- Turbine fire; and
- Ice throw (i.e., ice detachment from the blade).

Assessment of the potential failure events and related hazards relevant to the proposed WTG locations and specifications was undertaken in accordance with industry-recognised methodologies and the following guidelines:

- *NSW Wind Energy Guideline*; and
- Draft *National Wind Farm Development Guideline* (Draft National Guidelines).

The full assessment is presented in Section 5.2 of the PHA prepared for the Project (Arriscar, 2023; **APPENDIX O**).

6.7.6.2 BACKGROUND

A WTG is constructed of around 25,000 components, which are grouped into several main systems, such as the foundation, tower, nacelle, hub and blades.

Blade Throw

A blade throw incident can occur when an entire WTG blade becomes separated from its hub at the metal-to-metal root joint. In modern WTGs, the speed of a blade being separated from the hub is typically slow enough that the control system will detect an abnormality and the machine will fault and shut down, preventing a blade throw event (MMI Engineering Ltd, 2013). Nonetheless, blade throw events may occur due to instantaneous failure of the bearing or hub flange fastening system (MMI Engineering Ltd, 2013). In this instance, it is possible a blade could be thrown from the hub if the control system fails to detect an abnormality (e.g., vibration, imbalance, under power).

Other causes of WTG blade throw may include extreme environmental conditions, incorrect design for ultimate or fatigue loads, low strength of the materials, failure of turbine control system, and human error (including incorrect installation) (Carbone & Afferrante, 2013; Rastayesh, Long, Dalsgaard Sorensen, & Thons, 2019).

The blades to be installed for the Project will each blade be up to 91.5 m long and consist of two structural shell sections and web design. The main materials used in the blades are carbon fibre and woven glass fibres infused with epoxy resin. Polyurethane glue is the primary material used to assemble blade shells and web. After the gluing process, the blades are ground and polished to ensure the correct finish. Given this construction technique, the scenario of a blade fragmenting is very unlikely and is not discussed further in this assessment.

Tower and Nacelle Collapse

WTG towers are nowadays designed and built to be stable and reliable; however, there remains a risk, albeit it low, that a tower can collapse. Tower collapses typically result from adverse environmental conditions, engineering malpractices, mechanical errors or defects, or human error such as incorrect installation. Similarly, there have been instances where the nacelle has collapsed for reasons that are like those that may lead to a tower collapse.

Ice Throw

An ice throw incident can occur when ice accumulates on WTG blades during cold weather conditions, such as freezing rain or snow. When these ice-covered blades rotate, the centrifugal force can cause chunks of ice to be thrown and can pose a hazard to nearby structures, vehicles, or people, and potentially cause damage or injury.

Turbine Fire

A fire in the nacelle may occur due to a lightning strike, electrical malfunction including potential overheating, mechanical malfunction, or maintenance errors or defects. These fires are relatively infrequent, with reported fire frequencies of approximately 1.7E-04 fires per WTG per year to 5.8E-04 fires per WTG per year. Some example fires are described in the European Confederation of Fire Protection Associations (CFPA) *Wind Turbines Fire Protection Guidelines* (2010).

The 'Standard operating temperature range' for the nominated WTG is noted as -20 °C to 43 °C. While the average maximum temperatures relevant to the Project area are well below this upper limit, daily maximum temperatures can exceed this on occasion during summer months. This is not considered to present an increased risk of turbine fire or malfunction, as the built-in turbine operating and safety systems would minimise any risk to an acceptable level.

The falling burning components pose a potential hazard to people and a potential escalation hazard (e.g. if this burning debris were to fall into the BESS area).

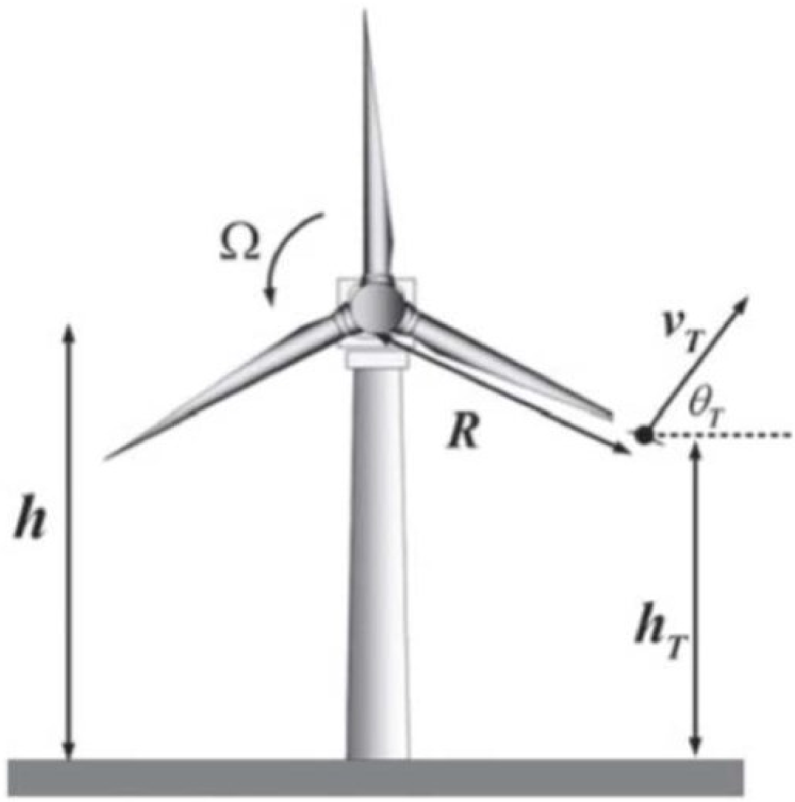
A fire in the nacelle may be difficult to extinguish due to its height AGL and can lead to a secondary fire on the ground due to falling burning components, such as parts of the blade. Bushfire risks due to a turbine fire are addressed separately in **Section 6.7.4**.

6.7.6.3 METHODOLOGY

Blade Throw

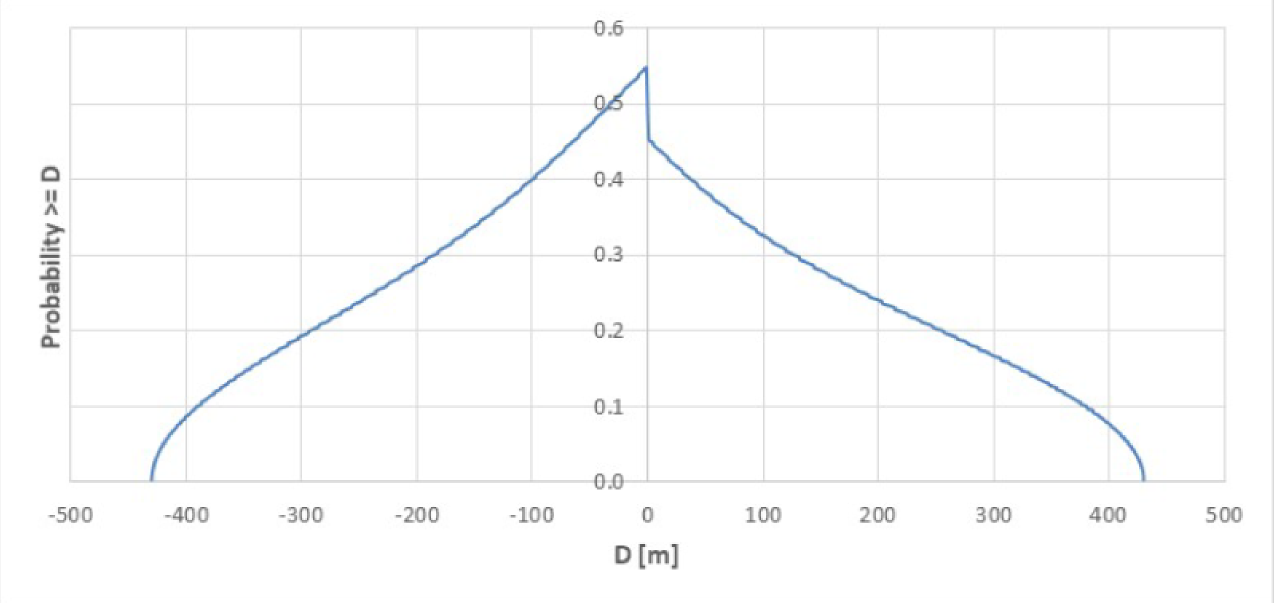
The lateral throw distance is the driving factor for the maximum extent of the potential risk contours for a blade throw event. Neglecting aerodynamics, the maximum range of a projectile may be estimated using the formula presented in Rogers et al. (2011) as discussed in **APPENDIX O** with parameters displayed in **Figure 6-27**.

FIGURE 6-27 BLADE THROW DIAGRAM (ROGERS ET AL., 2011)



Using the formula of Rogers et al. (2011), and assuming an equal probability of failure at any angle of rotation, the probability versus distance distribution for an entire blade fragment (at nominal rpm speed) is shown in **Figure 6-28**. The length and width of the potential impact area for a Project WTG was assumed to be equivalent to twice the fragment length (i.e., 2 x 91.5 m for a full blade). The direction of blade throw was assumed to be perpendicular to the wind direction with the probability of each wind direction factored into the risk calculation.

FIGURE 6-28 EXAMPLE DISTANCE DISTRIBUTION FOR BLADE THROW AT NOMINAL RPM



Tower and Nacelle Collapse

In the event of a collapse at the base of a tower, a person or object may be impacted if located within a distance equal to the tip height of the WTG which, for the Project, is up to 291.5 m. A break in the lower or upper half of the tower was assumed to occur at the centre of the corresponding half, which reduced the maximum impact distance. The width of the proposed impact area was assumed to be equal to the rotor diameter which, for the Project, is 183 m. The direction of collapse was assumed to be the same direction as the wind with probability of each wind direction factored into the risk calculations.

In the event of a nacelle collapse, a person of object may be impacted if located within a distance equal to half the rotor diameter (i.e. rotor radius) which, for the Project, is up to 91.5 m. This assumes that the nacelle collapses at its junction with the tower. The width of the potential impact area was assumed to be equivalent to be the rotor radius i.e., 91.5 m.

Ice Throw

The maximum distance for ice throw for an operating WTG can be estimated with empirical formulas (refer **APPENDIX O** for details).

The formula is widely accepted as being conservative (i.e., ice throw will remain within this zone) and is typically used as the maximum ice throw distance for screening purposes.

Average wind speed at the hub height is derived from site meteorological data and is 8.1 m/s.

Considering the relevant formulas contained in **APPENDIX O**, **Table 6-77** presents the estimated range of ice throw hazard and was applied to each WTG within the Project to determine potential impacts.

TABLE 6-77 ESTIMATION OF ICE THROW HAZARD RANGE

Combined Height of Blade and Tower, m AGL	Rotor Diameter (*D*), m	Hub Height (*H*), m	Max. Ice Throw Distance, (*dt*), m	68% of Max. Ice Throw Distance, m	1.4 x Tip Height, m	Ice Drop from Stopped Turbine, (*df*), m @8.1 m/s Windspeed
291.5	183	200	574.5	390.7	408.1	157.4

6.7.6.4 ASSESSMENT OF IMPACTS

Blade Throw, Tower and Nacelle Collapse

The frequency (per turbine per year) of blade throw, tower collapse or nacelle collapse reported in various sources is summarised in **Table 6-78**. The frequency data from the Wind Turbine Handbook (2019) was assumed to be applicable to the Project as it represents the most recent data.

TABLE 6-78 FREQUENCY (PER TURBINE PER YEAR) OF BLADE THROW, TOWER COLLAPSE OR NACELLE COLLAPSE

Failure Case	**Probability per year**				
	Ref[1]	**Ref[2]**	**Ref[3]**	**Ref[4]**	**Ref[5]**
Tower Collapse					
Break at base	3.2E-04 (0.32%)	3.2E-04 (0.32%)	1.3E-04 (0.13%)	1.3E-04 (0.13%)	1.5E-05 (0.015%)
Break in lower half	-	-	-	-	3.5E-05 (0.035%)
Break in upper half	-	-	-	-	8.0E-06 (0.008%)
Loss of an entire blade	8.4E-04 (0.84%)	8.4E-04 (0.84%)	8.4E-04 (0.84%)	8.4E-04 (0.84%)	6.2E-04 (0.62%)
Nominal operating rpm	4.2E-04 (0.42%)	4.2E-04 (0.42%)	-	8.4E-04 (0.84%)	6.2E-04 (0.62%)
Mechanical braking (1.25 x nominal rpm)	4.2E-04 (0.42%)	4.2E-04 (0.42%)	-	-	--
Emergency (2.0 x nominal rpm)	5.0E-06 (0.005%)	5.0E-06 (0.005%)	-	5.0E-06 (0.005%)	5.0E-06 (0.005%)
Loss of blade tip	2.6E-04 (0.26%)	-	-		-
Nacelle collapse	1.3E-04 (0.13%)	1.3E-04 (0.13%)	3.2E-04 (0.32%)	4.0E-05 (0.04%)	1.8E-05 (0.018%)

[1]Braam & Rademakers (2002)
[2]Handbook Risicozonering Wind turbines (2002)
[3]UK HSE (2013)
[4]Handbook Risicozonering Wind turbines (2014)
[5]Wind Turbine Handbook (2019)

Assumptions:

- Nominal rpm is regular operation during power production, from the lowest wind speed that the turbine turns on (typically c. 3 m/s) to the highest wind speed that the turbine turs at (typically c. 23 m/s)
- Mechanical breaking no longer occurs in modern wind turbines.

Location-specific risk of a blade throw, tower collapse and nacelle collapse were assessed at the following locations:

- BESS;
- All O&M facilities;
- Willowvale Rest Area, Sturt Highway; and
- Non-associated dwellings.

BESS

The closest WTGs to the BESS are WTG37 (718 m), WTG39 (441 m) and WTG40 (768 m). At normal operating speed and based on the specifications of the WTGs to be installed for the Project, the maximum distance that a blade is likely to travel is under 500 m. However, the probability that a blade will travel this distance is extremely low (i.e., the probability decreases as the distance from the WTG location increases).

The BESS and substation areas are not normally occupied areas. Operational staff may visit these facilities at times during a normal working day; however, risk to operational personnel is very low. To comply with Section 2.4.2.1 of HIPAP No. 4, individual fatality risk levels for industrial sites at levels of 50 in a million per year (50E-06 per year) should, as a target, be contained within the boundaries of the site where applicable. The 50E-06 contour does not encroach on occupied buildings on the site.

O&M Facilities

Based on distance and risk probability the maximum risk from blade throw at the BESS is 10E-06 or 0.001%. There is no risk from WTG structural failure at the southern O&M facility which is located adjacent to the BESS. There is also no risk from WTG structural failure at either the northern or central O&M facilities.

Willowvale Rest Area

Risk from WTG structural failure was assessed at the Willowvale Rest Area, Sturt Highway, adjacent to the northern boundary of the Project Area. WTGs 186 (595 m), 177 (454 m) and 26 (644 m) are the closest to the Willowvale Rest Area. Based on distance and risk probability the maximum risk from blade throw at the Willowvale Rest Area is 10E-06 or 0.001%.

It is noted that Willowvale Rest Area would be occupied infrequently and for short periods at any one time. The occupancy of the area is not known; however, daily traffic volumes suggest that occupancy Willowvale Rest Area is very low. On that basis, risk at 10E-06 or 0.001% is deemed acceptable.

Non-associated Dwellings

The closest non-associated dwellings (ID99 and ID19) were assessed for risk from WTG structural failure. No risk contours reach these dwellings, therefore risk criteria at these dwellings would not be met.

The risk contour for 50E-06 per year does not reach the non-associated dwellings, indicating that the risk would satisfy the risk criteria for dwellings.

Ice Throw

Using **Table 6-77**, the maximum ice throw hazard range (574.5 m) is significantly less than the distance to the closest residence (approximately 1,085 m). However, ice throw may pose a hazard for personnel at:

- Northern substation;
- Central substation;
- Central O&M building;
- Southern substation; and
- BESS.

Ice throw may also pose a potential hazard when driving along roads or accessing the WTGs during icing conditions.

There are 18 WTGs located near the edge of the Project Area where the maximum ice throw hazard range of 574.5 m extends outside the site (WTGs 1, 3, 4, 5, 6, 13, 25, 49, 50, 75, 76, 98, 105, 127, 128, 151, 170 and 175).

Of those WTGs, some have maximum ice throw hazards that impact on public roads:

- Keri Keri Road is impacted by 3 WTGs: 76, 105 & 128; and
- Sturt Highway is impacted by 10 WTGs: 1, 6, 14, 26, 27, 28, 29, 30, 31 and 177.

The PHA (**APPENDIX O**) showed that the likelihood of ice formation is very low. This analysis is based on an approach that has been very conservative and expected to an over-estimation of the icing duration. It was concluded that the potential for ice formation is not credible for the WTGs in the Project Area. Therefore, the marginal excursion of the risk contours on public roads and Project infrastructure, based on a conservative estimate, should be considered acceptable.

6.7.6.5 MITIGATION MEASURES

At present there is no Australian or New Zealand standard for the design of large WTGs (rotor swept area above 200 m^2). In the absence of such standards, the International Electrotechnical Commission (IEC) Standards are accepted as the default for the design of WTGs. The IEC is a global organisation that prepares and publishes international standards for all electrical, electronic, and related technologies.

The following IEC Standards will be used for the design and construction of the Project which will reinforce the confidence that blade throw will represent a very low risk:

- *IEC WT 01:2001 System for conformity testing and certification of wind turbines* — rules and procedures: Defines a certification system for WTGs. It specifies rules for procedures and management to carry out conformity evaluation of WTGs, with respect to specific standards and other technical requirements, relating to safety, reliability, performance, testing and interaction with electrical power networks;
- *IEC 61400-1:2005 Wind turbines Part 1: design requirements*: This guidance specifies essential design requirements to ensure the engineering integrity of WTGs. It provides an appropriate level of protection against damage from all hazards during the planned lifetime and is concerned with all subsystems of WTGs such as control and protection mechanisms, internal electrical systems, mechanical systems and support structures;

- *IEC 61400-12-1:2005 Wind turbines Part 12-1: power performance measurements of electricity-producing wind turbines*: Specifies a procedure for measuring the power performance characteristics of a single WTGs and applies to the testing of WTGs of all types and sizes connected to the electrical power network;
- *IEC 61400-23 WTG systems – Part 23: full-scale structural testing of rotor blades*: Defines the requirements for full-scale structural testing of WTG blades and for the interpretation and evaluation of achieved test results. Static load tests and fatigue tests are considered in this standard;
- *IEC 62305-1/3/4 Protection against lightning*: Together, these parts describe how to design a Lightning Protection System and requirements to prevent injury to people and structure by means of a Lightning Protection System, and the protection of electrical and electronic systems; and
- *IEC 61400-4:2012 Wind turbines — Part 4*: design requirements for WTG gearboxes: Provides guidance on the analysis of the WTG loads in relation to the design of the gear and gearbox elements.

Inspection and Testing Procedures will be initiated and audited during the construction and commissioning phase. Once testing finds all WTG components including the blades are passed, the WTG will be commissioned for operation.

A comprehensive operations and maintenance program will be implemented to ensure that WTG faults are prevented or detected and rectified quickly, minimising the risk of occurrence of a serious or dangerous problem. This will include inspecting blades for micro-cracks using current best practices. If any cracks above engineering thresholds are detected, the WTG will be immobilised until a replacement blade can be installed.

The wind energy industry is constantly developing measures to limit the cost of blade damages, such as sensors to identify blade weaknesses and enable early maintenance and management measures which will also assist in mitigating blade throw risks. Additionally, preventing structural failures such as fatigue resistance of WTG subassemblies can prevent a blade throw event (MMI Engineering Ltd, 2013). Industry data and research indicates that the frequency of subassembly failure leading to blade throw has reduced due to an increased understanding of the mechanisms that lead to such failure and improvements in blade and subassembly design and manufacturing (Ribrant & Bertling, 2007).

6.7.6.6 CONCLUSION

The DPE risk criteria for land use safety planning in HIPAP No. 4 (5) do not apply to the O&M building and the BESS (or substation) since these facilities are within the boundary of the proposed development (the DPE risk criteria also do not apply public roads).

However, to comply with Section 2.4.2.1 of HIPAP No. 4, 'Individual fatality risk levels for industrial sites at levels of 50 in a million per year (50E-06 per year) should, as a target, be contained within the boundaries of the site where applicable'.

It was found that the risks of blade throw are at acceptable levels as the 50E-06 per year contours do not encroach on any occupied buildings within the Project Area and the risk contour for 50E-06 per year does not reach any non-associated dwellings.

6.8 WATER AND SOILS

6.8.1 INTRODUCTION

An assessment of the available water resources, including both groundwater and surface water, as well as the risk of flooding within the Project Area was conducted to inform the impacts on water resources from the Project.

A detailed flooding and hydrology assessment was conducted by BMT Group Ltd, with a summary of the report included in **Section 6.8.4.3** and the full report included in **APPENDIX P**. A conceptual soil and water management plan has been developed to inform the necessary mitigation measures to mitigate the risk of erosion and sedimentation (refer **APPENDIX T**). These assessments were conducted to satisfy the requirements set out by the SEARs (refer **APPENDIX A**), and in consideration of the following guidelines:

- 'Guidelines for Controlled Activities on Waterfront Land' (DPI, 2018);
- 'Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings' (DPI, 2003);
- 'Policy & Guidelines for Fish Habitat Conservation & Management' (DPI, 2013);
- The following Water Sharing Plans under the *Water Management Act 2000*:
  - 'Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources Order 2020';
  - 'Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012';
  - 'Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources Order 2020';
- 'NSW Floodplain Development Manual 2005' (DPI, 2005);
- 'Managing Urban Stormwater: Soils & Construction' (the 'Blue Book') (Landcom, 2004);
- 'Best Practice Erosion and Sediment Control' (BPESC) (IECA, 2008);
- 'Australian Rainfall and Runoff: A guide to flood estimation' (ARR) (Ball J, et al., 2019); and
- Murrumbidgee River Floodplain Hay to Maude Phase A – Flood Study and Data Collection' (Webb, McKeown and Associates, 2008).

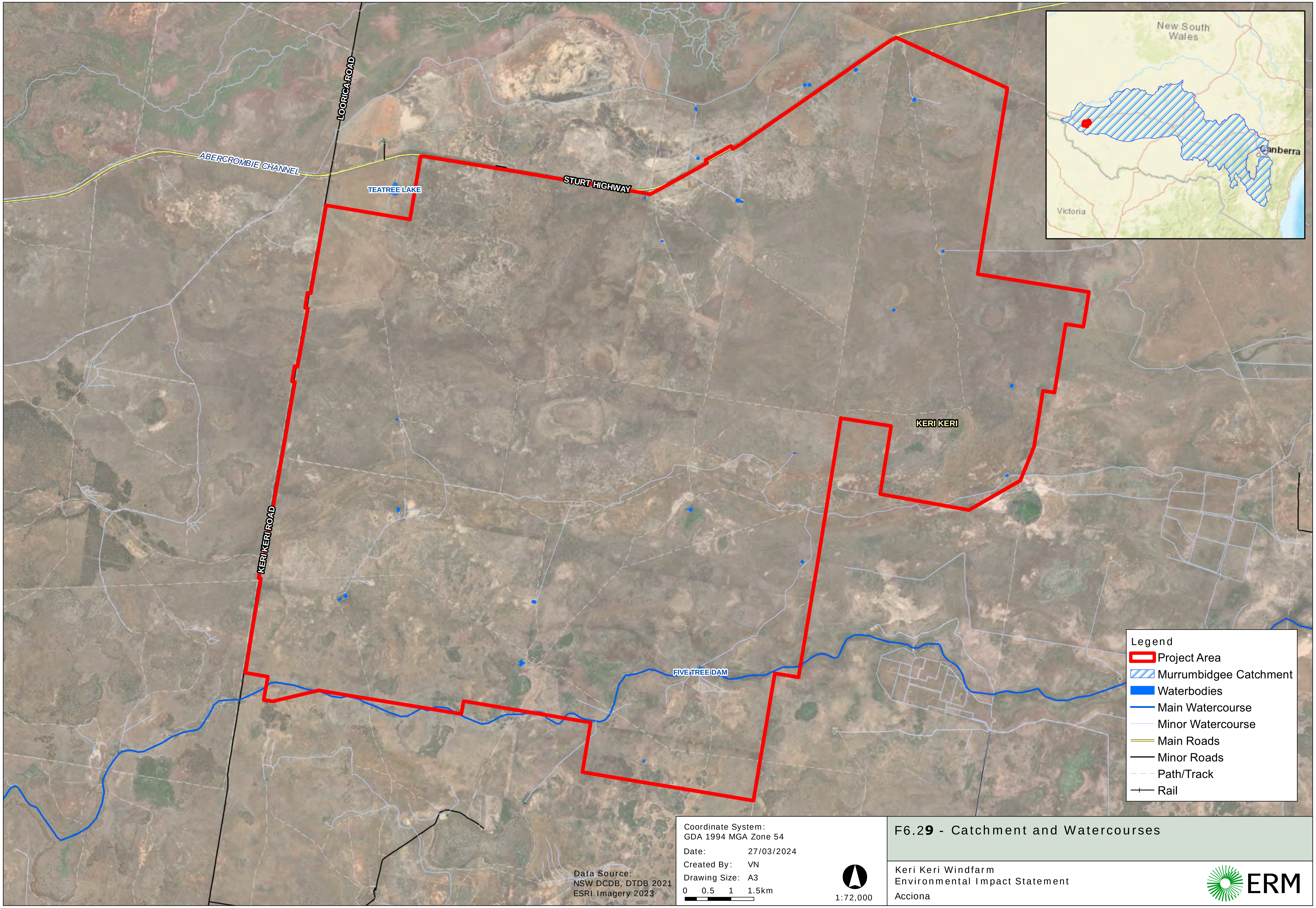
6.8.2 EXISTING ENVIRONMENT

6.8.2.1 SURFACE WATER AND WATER COURSES

The Project Area is within the Western Local Land Services area and Murrumbidgee catchment of the Murray Darling Basin. The Murrumbidgee catchment covers about 84,000 square-kilometres (km^2) and comprises the region popularly known as the Riverina plains (DPIE, 2020). It is bound by the Lachlan catchment to the north, the Murray catchment to the south and the lower Murray-Darling catchments in the west. The dominant surface water feature within the catchment is the Murrumbidgee River.

At the closest point, the Project Area is located approximately 30 km south of the Murrumbidgee River and 50 km north of the Murray River. The Project Area is located within the IBRA Riverina Bioregion (refer **Figure 6-29**). The RIV Bioregion is characterised by extensive riverine floodplains and is dominated by chenopod shrublands and native grasslands. The climate is semiarid with low, winter-dominant rainfall, hot summers and cool winters.

The Abercrombie Creek, an ephemeral stream of the Murrumbidgee catchment, flows east-west through the southern portions of the Project Area. In addition, there are several irrigation channels present throughout the Project Area, with the main feeder being the Abercrombie Channel to the north. All creeks and watercourses within the broader area are non-perennial, and there are no wetland areas or lakes (other than small farm dams) within the Project Area.



F6.29 - Catchment and Watercourses

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

0617753_KKWF_EIS_G019_R0.mxd

Wetlands and Riparian Environments

The Project Area is located within the Lowbidgee Floodplain. The Lowbidgee floodplain covers about 200,000 ha and includes some of the largest lignum wetlands in New South Wales. It is an important bird breeding site, particularly for the Royal Spoonbill, Great Egret, Straw-necked Ibis, Australian White Ibis and Glossy Ibis. The Lowbidgee floodplain is listed as a Nationally Important Wetland in the Directory of Important Wetlands of Australia; subsequently, it is subject to several national and international agreements to protect its ecological assets.

Water Quality Objectives

The NSW Water Quality Objectives (WQOs) are the agreed environmental values and long-term goals to achieve healthy waterways in surface water catchments across the State. The WQOs include a range of water quality indicated to help assess the current conditions of waterways and their ability to support its respective uses and values.

As part of the interstate River Murray Waters Agreement administered by the Murray-Darling Basin Authority (MDBA), water resources in the Murrumbidgee River Basin are shared between NSW, Victoria and South Australia. Under the Murray-Darling Basin Plan, there is a requirement to develop water quality management plans for each water resource plan area within the Murray-Darling Basin with the purpose of providing a framework to protect, enhance and restore water quality that is suitable for a range of outcomes. The Water Quality Management Plan for the Murrumbidgee Water Resource Plan Area (NSW DPE, 2019b) identifies relevant water quality objectives for the Murrumbidgee watercourse and the water quality targets required to achieve these objectives.

Murrumbidgee Water Resource Plan Area WQO have been developed to provide guideline levels to assist water quality planning and management. Considering the Project Area is situated across tributaries that are third order and above, meeting the WQO is vital for protecting the local ecosystem, environmental values, and downstream water uses. The Murrumbidgee Catchment WQO are detailed in **Table 6-79**.

TABLE 6-79 MURRUMBIDGEE CATCHMENT WATER QUALITY OBJECTIVES

Catchment Area	Applicable Water Quality Objectives	
Murrumbidgee	• Indigenous Peoples	*Maintain water quality to protect First Nations people's water dependent values and uses*
	• Environment	*Maintain water temperature within the regulated Murrumbidgee River within target ranges that support water dependent ecosystems.*
		Maintain dissolved oxygen (DO) and pH measurements within target ranges that support water dependent ecosystems
	• Drinking water – disinfection only, or • Drinking water – clarification and disinfection, or	*Maintain the quality of raw surface water for treatment for human consumption.*
		Reduce the mobilisation of toxicants and pesticides.
		Reduce contamination from pathogens into water sources.

Catchment Area	Applicable Water Quality Objectives	
	• Drinking water – groundwater	*Protect, maintain or enhance connectivity between water sources to support downstream processes including priority carbon and nutrient pathways*
	• Irrigation Water Supply	*Maintain the quality of surface water for irrigation use*
		Maintain turbidity (T), total nitrogen (N) and total phosphorus (P) within target ranges to minimise eutrophication in the WRP Area
	• Primary Contact Recreation	*Maintain the quality of surface water for recreational use*
		Manage the risk of harmful algal blooms in recreational use areas.
	• Water Supply	*Maintain good levels of water quality*
		Protect, maintain or enhance water quality to ensure it is fit for purpose
	• Salinity	*Manage water source salinity concentrations and salt mobilisation within Murrumbidgee end-of-valley and irrigation targets*
	• Water Treatment	*Reduce severity of hypoxic blackwater events in streams and refuge pools from major flooding events*

Waterway health is assessed against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 (formerly ANZECC, 2000). The Guideline establishes values for various water quality measures which support the WQOs. The WQOs are considered in the development of water quality mitigation measures discussed in **Section 6.8.5**.

Fisheries Management and Key Fish Habitat

The FM Act does not define Key Fish Habitat (KFH); however, the NSW DPI definition of KFH was developed to include all marine and estuarine habitats up to highest astronomical tide level (that reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank. Small headwater creeks and gullies (known as first and second order streams), that only flow for a short period after rain are generally excluded, as are farm dams constructed on such systems. Wholly artificial waterbodies such as irrigation channels, urban drains and ponds, salt and evaporation ponds are also excluded except where they are known to support populations of threatened fish or invertebrates.

There are numerous first order and second order unnamed tributaries located across the Project Area; however, these are generally ephemeral gullies and are characteristic of the drainage lines of the existing topography. There is one named tributary (Abercrombie Creek) classified as Strahler third order or above within the Project Area. There are no waterways classified as KFH.

TABLE 6-80 SUMMARY OF KEY WATERWAY FEATURES WITHIN THE PROJECT AREA

Named Tributary	Strahler Stream Order	Key Fish Habitat	Stream Type	Relevant Features
Abercrombie Creek	4	No	Ephemeral	Flows east-west through the southern portions of the Project Area
Unnamed tributary	4	No	Ephemeral	Flows east-west through the northern and central portions of the Project Area
Unnamed tributary	3	No	Ephemeral	Flows north and south in the southern portion of the Project Area
Unnamed tributary	3	No	Ephemeral	Flows north -south in the north-western portion of the Project Area

Waterfront Land

These waterways would not meet the definition of rivers that constitute 'waterfront land' under the *Water Management Act 2000*. As such, the Project does not involve works within 40 m of the high bank of any river, lake, or wetlands (collectively waterfront land).

6.8.2.2 GROUNDWATER RESOURCES

Existing Groundwater Bores

There is one groundwater bore recorded within the Project Area. The depth of groundwater with the Project Area has been recorded at approximately 7.6 and 14 m bgl at GW084018 and GW032657, located to the eastern and northern of the Project Area respectively.

A search of Water NSW's real time data website (WATERNSW, 2024) identified an additional seven registered bores within a 5 km radius of the Project Area. The bores are primarily registered for stock and domestic purposes. A summary of bore details is provided in **Table 6-81**.

TABLE 6-81 GROUNDWATER BORE DETAILS WITHIN AND IN PROXIMITY TO THE PROJECT AREA

Bore ID	Location	Status / Use	Total Depth (m)	Groundwater Bearing Zone (m bgl)
GW032657	Within Project Area	Functioning / Stock and Domestic	54.9	Not provided
GW032654	East of Project Area	Functioning / Stock and Domestic	54.9	Not provided
GW032656	East of Project Area	Functioning / Stock and Domestic	54.9	Not provided
GW015362	North of Project Area	Unknown / Stock and Domestic	52.7	14.3 – 19.2 20.4 – 32.60 37.2 – 43.3

Bore ID	Location	Status / Use	Total Depth (m)	Groundwater Bearing Zone (m bgl)
GW065210	North of Project Area	Unknown / Monitoring	218	Not provided
GW032401	West of the Project Area	Functioning / Stock and Domestic	103.6	Not provided
GW032599	East of Project Area	Unknown	121.9	Not provided
GW084018	East of Project Area	Unknown / Monitoring	11.5	7.6 – 11.5

Excavations for Project construction will be shallow, with the turbine foundation construction activity at approximately 3 m and cuttings up to approximately 5 m, therefore it could be expected that the proposed construction activities are unlikely to intercept groundwater.

Aquifer Interference Policy

The *NSW Aquifer Interference Policy* (2012) describes the assessment process for protecting and managing potential impacts of aquifer interference activities on the water resources of NSW.

Section 3.3 of the Aquifer Interference Policy identifies activities such as trenching, access tracks, and building and work pads as activities defined as having minimal impact on water dependent assets. The Project works are considered as having minimal impact on water dependent assets with the most significant excavation works being the work pads and associated wind turbine foundations to a depth of approximately 3 m - 5 m. Cuttings may be approximately 5 m. Aquifer interception is not anticipated, noting the estimated depth of the water table exceeding >7.6 m from existing recorded bore depths.

Groundwater Dependent Ecosystems

An assessment of the number and type of Groundwater Dependent Ecosystems (GDEs) within and adjacent the Project Area was conducted through a review of the GDE Atlas (BoM, 2024). A summary of GDEs within or surrounding the Project Area are presented in **Table 6-82**.

TABLE 6-82 GROUNDWATER DEPENDENT ECOSYSTEMS WITHIN THE PROJECT AREA

GDE Type	Description
Aquatic	• Small scatterings of moderate and low potential GDEs (national study) are mapped within the Project Area.
Terrestrial	• Moderate potential terrestrial GDE's are mapped across majority of the Project Area; and • Small scatterings of high potential GDEs (regional study) are mapped within the Project Area. • The regionally mapped GDE is the cotton bush open shrubland of the semi-arid warm zone.
Subterranean	• There are no subterranean GDEs mapped across the Project Area.

6.8.2.3 SOIL PROFILES AND CHARACTERISTICS

An online review of soil characteristics was undertaken to survey the mapped characteristics of the Project Area.

A search of eSPADE (DPE, 2022c) identified two soil profiles (1000157-113 and -57) recorded within the Project Area, and a further six within 5 km of the Project Area. These eight soil profiles are described in **Table 6-83**.

TABLE 6-83 SOIL PROFILES

Soil Profile	Survey Date	Easting /Northing	Horizons	Physiography	Surface pH
1000157-113	01/07/1981	763372 /6148878	4	Plain under grassland /herbland on alluvium lithology and used for native pasture. Slope 1.0% (estimated). profile is mod. well drained, erosion hazard is slight, and no salting evident	6.5
1000157-57	04/11/1980	763322 /6147028	4	Swamp under swamp complex and used for native pasture. Slope 1.0% (estimated). Surface condition is cracked, profile is poorly drained, erosion hazard is slight, and no salting evident	7.0
1000157-92	27/11/1980	232613 /6158435	3	Prior stream under low shrubland on alluvium lithology and used for native pasture. Slope 2.0% (estimated). Surface condition is hard set, profile is mod. well drained, erosion hazard is moderate, and no salting evident	8.5
1000157-58	04/11/1980	761972 /6140378	4	Plain under woodland shrub understorey and used for native pasture. Slope 1.0% (estimated). Surface condition is hard set, profile is imperfectly drained, erosion hazard is moderate, and no salting evident	6.5
1000157-115	26/03/2006	760199 /6140576	4	Backplain in alluvial plain under woodland shrub understorey on unconsolidated, clay, alluvium lithology and used for timber/scrub/ unused. Slope 0.0% (estimated), aspect flat. profile is imperfectly drained, and no salting evident	-
1004554-156	02/06/2005	231592 /6160510	3	Hills and used for native pasture. erosion hazard is very high, and no salting evident	6.5
1004554-150	02/06/2005	765191 /6157612	2	Extensive clearing at the site, used for native pasture, with native pasture in the general area	5.5

Soil characteristics that are available from the eSPADE database are summarised in **Table 6-84**.

TABLE 6-84 SOIL CHARACTERISTICS FROM DESKTOP REVIEW

Characteristic	Description
Landform and Elevation	The elevation of the Project Area ranges between 60 m AHD and 75 mAHD.
Slope	The slope degree across the Project Area is typically 0-1%, although some areas are mapped with a slope degree of 1-5%.
Soils Hydrologic Groups	Hydrological Grouping of soils in NSW is a four class system, which identifies the soils infiltration and permeability characteristics. Across the Project Area, the soils are assigned ratings of S and D, representing the soils having high to very slow infiltration respectively. These two soil classes can be described as: • A – soils having high infiltration rates, even when thoroughly wetted and consisting chiefly of deep, well to excessively-drained sands or gravels. These soils have a high rate of water transmission and have low water run-off potential. • D – soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission. Majority of the Project Area (and development footprint) is located within the area mapped as D. A narrow selection of A, aligning with higher elevation, across the centre of the Project Area from east to west.
Soil Reoglith Stability	The Soil Regolith Stability classification (aka. soil erodibility) is used in the assessment of soil erosion and water pollution hazards. Regolith includes all soil layers and biological cover above bedrock, with the classification assessed to a depth of one metre. The soil regolith stability is not mapped across the Project Area.
Modelled Soil Erosion Hazard	The modelled soil erosion (bare) across the Project Area is 20 -50 t/ha/year, presenting slight but potentially significant limitations.
Soil Acidity	Soil acidity modelling demonstrates that across the Project Area, soil acidity ranges between a pH of 6 and 7.3 in the 0-30 cm layer, which aligns the extent of area mapped with a pH between 6.5 and 7.3 is greater. These soil pH characteristics are not considered to be restrictive to construction activities or any revegetation activities that may be required.
Acid Sulfate Soils	A review of acid sulfate soil risk mapping has identified that no potential acid sulfate soils (PASS) are expected to occur across the Project Area (Naylor, et al., 1998). A search for acid sulphate soils was undertaken on 20 March 2024. The development footprint is not mapped within a known area of acid sulphate soils. The probability of encountering acid sulphate soils within this locality is extremely low.

6.8.3 PROJECT WATER DEMAND

6.8.3.1 CONSTRUCTION WATER DEMAND

During the construction period, water will need to be sourced for the following purposes:

- Concrete production (batching plant);
- Construction of roads and hardstands;
- Concrete washout;

- Biosecurity (vehicle and equipment) wash downs;
- Soil and fill conditioning; and
- Dust suppression.

Based on an understanding of the construction requirements and the construction schedule, estimates have been made on the likely quantities of water required. Note that these volumes may change marginally during detailed design and further geotechnical assessment of the soil conditions.

Based on an understanding of the construction requirements and the construction schedule, estimates have been made on the likely quantities of water required. The estimated total construction water demand is summarised in **Table 6-85** and is based on the construction of 155 WTGs. All water volumes are displayed on an annual basis.

TABLE 6-85 WATER DEMAND BY ACTIVITY

Project Stage	Activity	Water Requirement (ML)
Construction	**Non-Potable Water Supply**	
	Foundation concrete volume for WTGs	14
	General Use including roads and earthworks compaction	100
	Dust Suppression – 30 months of construction	40
	Total (non-potable)	**154**
	Potable Supply	
	Potable (drinking) supply for site amenities	6.5
	Total (potable)	**6.5**
Operation	Potable (drinking) supply for site amenities	0.25
	Total	**0.25**

6.8.3.2 WATER SUPPLY OPTIONS

The preferred water supply option for the Project is to use existing groundwater bores and install additional groundwater bores as required. The final determination for water sources for the Project will occur during the detailed design phase (i.e., following Project approval). These will be identified once the design has been finalised and prior to the construction phase of the Project.

The Project may also store and use water from the numerous dams that are within the Project Area. Water within those dams could be supplemented with water imported from offsite, allowing the construction contractor to store the required water closer to construction activities. The main construction activities that would require water to be include soil conditioning, dust suppression and potential revegetation across the Project Area. Potable water would be required for use within the site compounds.

The following water supply options have been identified to supply water during the construction and operation of the Project (refer **Table 6-85**). The water allocations and water supply are displayed in **Table 6-86**.

TABLE 6-86 WATER SUPPLY OPTIONS FOR THE PROJECT AREA

Supply Options	Key Considerations
Groundwater Pumping	Aquifer licenses for the MDB Lachlan Fold Belt have been allocated 3,992 ML, of which 29 ML is for the environment. 7,220 ML has been carried over into this year. 1,431 ML has been used and 79,982 ML is available to use. Aquifer licenses for the Lower Murrumbidgee Shallow Groundwater have been allocated 5,201 ML, of which 0 ML is for the environment. 9,970 ML has been carried over into this year. 2,290 ML has been used and 8,112 ML is available to use. Aquifer licenses for the Lower Murrumbidgee Deep Groundwater have been allocated 442,386 ML, of which 6,905 ML is for the environment. 489,072 ML has been carried over into this year. 98,155 ML has been used and 442,386 ML is available to use
Extraction from farm dams	A potential water source is water from farm dams or potentially from the Hay or Balranald treated wastewater supply and the Abercrombie Creek. Review of online available water (AWD) from the Murrumbidgee Western Water Source determined that were was currently 29,719 ML of unregulated water available, 14,870 ML has been allocated, of which 9,948 ML is for the environment . 9.9 GL is currently available for use. River flow data from the Tombullen Creek at Downstream Tombullen Weir Outlet showed that daily flow rates were recorded from 10 ML/day to 1,747 ML per day .
Surface Water Supply from Permanent Water Source	
Commercial Water Tanker	If required, the Applicant may source high quality water for concrete production required for the construction of the Project, via commercial water tankers which will be transported to the site batching plant via tanker trucks. This water could potentially be sourced from existing Council supplies, subject to agreement with the relevant Council(s).

6.8.3.3 WATER LICENSING

Water Sharing Plans

Section 4.41 of the EP&A Act confirms that approved SSD does not require approvals under WM Act Section 89 (water use), Section 90 (water management work) or Section 91(2) (controlled activity). However, Section 91(3) aquifer interference approvals are not exempt (aquifer interference approvals have not been activated). The WM Act regulates the use and interference with surface and groundwater in NSW through 'Water Sharing Plans' (WSP).

The provisions of the WSP applies where water supply for the Project is to be accessed via surface water and/or groundwater. Existing licensed water extraction from surface water sources within the area is primarily for domestic stock purposes. The total number of WALs for water sources relevant to the Project and the total allocations available (WaterNSW, 2024) are summarised in **Table 6-87**.

TABLE 6-87 WATER SHARING PLANS AND SHARE COMPONENTS (FY24-25)

Water Sharing Plan	Effective Date	Category	Total Number of Share Components	No. of WALs
Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2016 (Western Water Source)	July 2016 to June 2026	• Domestic and Stock	70	10
		• Domestic and Stock [Stock]	20	4
		• Unregulated River	14,870	12
Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020 (Lower Murrumbidgee Shallow Groundwater Source)	July 2020 to June 2030	• Aquifer	5,201	30
Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020 (Lower Murrumbidgee Deep Groundwater Source)		• Aquifer	272.825	396
		• Aquifer (Community and Education)	23	2
		• Aquifer (Town Water Supply)	20	1
		• Domestic and Stock [Stock]	324	1
		• Local Water Utility	2,210	3
Water Sharing Plan for the Lachlan Fold Belt MDB Groundwater Source	July 2020 to June 2030	• Aquifer	74,174.7	1068
		• Aquifer (General Security)	0	1
		• Aquifer (Town Water Supply)	467.35	6
		• Local Water Utility	3370.5	36
		• Local Water Utility (Domestic and Commercial)	65	2
		• Salinity and Water Table Management	236	1

Except for basic landholder rights, all other water extraction either requires an authorisation under a WAL or some form of exemption. The WM Act establishes categories and sub-categories of access licenses. The most relevant WAL categories for the Project are the 'unregulated river' (for surface water extraction) and aquifer (for groundwater extraction) categories. The total entitlement or share component for each category of access license that applies at the start of the plan is estimated and is included in the relevant plan.

Extraction from a surface water supply from an unregulated water source (e.g., Abercrombie Creek) will require a WAL under Section 56 of the WM Act in accordance with the annual extraction limits of the '*Water Sharing Plan for the Murrumbidgee Unregulated Water Sources 2016*' and access rules for the relevant water source (as listed in **Table 6-79**).

There is the potential for one or more new groundwater production bores to be installed to supply water for construction. If this option is pursued, then an application for a WAL under Section 56 of the WA Act will be required, in accordance with annual extraction limits and access rules of the relevant water sharing plan.

The Project may also store water for use during construction in the numerous dams that are within the Project Area. Water within those dams could be supplemented with water imported from offsite. Should additional groundwater bores or water from other sources covered under the relevant water sharing plan be required, the Applicant would seek to obtain a WAL, and other relevant approvals, subject to availability.

The Project Area is located within the NSW Great Artesian Basin Groundwater – Warrego Management Area.

6.8.4 ASSESSMENT OF IMPACTS

6.8.4.1 CONSTRUCTION AND OPERATIONAL IMPACTS

Water resources and soils will be subject to disturbance during construction activities to allow for site establishment, installation of infrastructure and replacement of soils for rehabilitation. Specific construction activities that will potentially impact soils, and resultant potential downstream watercourse impacts, are outlined in Table 6-88.

TABLE 6-88 POTENTIAL CONSTRUCTION AND OPERATIONAL IMPACTS TO SOILS AND WATER

Construction Activities	Potential Construction Impacts to Soils and Water	Potential Operational Impacts to Soil and Water
All-weather Unsealed Road Network	• Creation of fugitive dust due to vehicle movements; • Erosion of unsealed roadways and resultant sedimentation of runoff from road surfaces; • Erosion of roads and roadside drainage in areas of steep terrain or in inappropriately 'finished' locations; • Insufficient compacting of the road surface which could lead to erosion or batter slips in areas of steep terrain; and • Mud tracking at the confluence of internal access roads with the public road network.	• Creation of fugitive dust due to vehicle movements; • Erosion of roads and roadside drainage in areas of steep terrain; and • Mud tracking at the confluence of internal access roads with the public road network.
Watercourse Crossings	• Erosion of drainage lines and subsequent sedimentation; • Removal of vegetation and subsequent increased erosion potential; • Any vehicle movement across unaltered watercourses during construction phase leaving wheel tracks and causing damage to creek beds; • Potential for any unstable steep banks collapsing under weight of vehicles/machinery; and • Bank erosion at creek crossings from culvert installations.	• Any vehicle movement across unaltered watercourses during operational phase leaving wheel tracks and causing damage to creek beds; and • bank erosion at culvert crossings.
Water Supply	• Over-extraction of surface water or groundwater resulting in reduced environmental flows, reduced water availability for existing licensed users and impacts on water dependent ecosystems.	• Potential for erosion and subsequent sedimentation of runoff during heavy rainfall.
Establishment of hardstands (e.g., crane pads, access roads laydown areas etc)	• Erosion of relatively large, disturbed areas during establishment and subsequent sedimentation of runoff.	• Not required during operational phase.
Turbine and Transmission Pole Foundations	• Erosion of soils around turbine/pole foundations; • Potential increase to water filtration and subsequent impacts to groundwater; and • Erosion from spoil stockpiles and subsequent sedimentation should it reach a waterway.	• Not required during operational phase.
Dewatering	• Potential interception of subsurface water during construction of turbine foundation, requiring dewatering.	• Not required during operational phase.

Construction Activities	Potential Construction Impacts to Soils and Water	Potential Operational Impacts to Soil and Water
Ancillary Infrastructure (e.g., substation, operations, and maintenance facility)	• Erosion of relatively large, disturbed areas during establishment and subsequent sedimentation of runoff; and • Erosion from spoil stockpiles and subsequent sedimentation should it reach a waterway.	• Not applicable during operational phase.
Stockpile Management	• Erosion of stockpiles and loss of soil resource; and • Subsequent sedimentation impacts.	• No soil is anticipated to be stockpiled on site during the operational phase.
General Construction Activities (e.g., Machinery Operations)	• Erosion of soil stockpiles created during excavation works; • Hydrocarbon spills from machinery (burst hoses, mechanical failures, leaking machinery, etc.); • Contamination of soils from poor refueling practices; and • Discovery of previously contaminated sites.	• N/A

Groundwater Dependent Ecosystems

Impacts to GDEs are not anticipated, as the maximum construction depth is 5 m bgl, and is therefore not anticipated to intersect groundwater (7.6 m bgl). If intersected, the groundwater table would only be intersected for short periods of time during construction and operation, and hence is not considered at risk of significant impact.

6.8.4.2 SOIL EROSION HAZARD ASSESSMENT

Erosion hazard was estimated using the Revised Universal Soil Loss Equation (RUSLE), as required within the Blue Book. The RUSLE provides a quantitative estimation of erosion hazard based on five factors: rainfall erosivity; soil erodibility; slope length and gradient; soil cover and management practices. A detailed description of the RUSLE equation and its contributing factors is provided in Landcom (2004).

The RUSLE equation is represented by:

A = R K LS P C, where,

- A = computed soil loss (tonnes/ha/yr);
- R = rainfall erosivity factor;
- K = soil erodibility factor;
- LS = slope length/gradient factor;
- P = erosion control practice factor; and
- C = ground cover and management factor.

The assumptions of the factors used for this equation is provided in **Table 6-89**.

TABLE 6-89 RUSLE FACTORS DETERMINATION

Factor	Assumptions	Adopted Value
R	• The rainfall erosivity factor, R, is a measure of the ability of rainfall to cause erosion. It is the product of two components; total energy (E) and maximum 30 minute intensity for each storm (I30). So the total EI for a year is equal to the R-factor. • A strong correlation between the R-factor and the 2-year ARI, 6-hour storm event (denoted S) was identified and small-scale maps of the R-factor for all New South Wales is provided in Landcom (2004). The Project Area is located between two R-factor contours of 300 and 600, and hence a R-factor of 450 has been selected.	450
K	• The soil erodibility factor, K, is a measure of the susceptibility of soil particles to detachment and transport by rainfall and run-off. Texture is the principle component affecting K, but structure, organic matter and permeability also contribute. In the RUSLE, it is a quantitative value that is normally experimentally determined. • Soil K-factor data was estimated with reference to the soil descriptions provided in eSPADE. Generally, K-factor ranges from 0.005 (very low) to 0.075 (very high) (Landcom 2004). The Project Area K factor was mapped between 0.01 – 0.06, with majority of the Project Area mapped as 0.02-0.03. It is noted that the majority of the disturbance would occur on the area	0.04

Factor	Assumptions	Adopted Value
	mapped 0.02-0.03, a maximum K-factor of 0.04 has been adopted.	
LS	• The slope length-gradient factor, LS, describes the combined effect of slope length and slope gradient on soil loss. It is the ratio of soil loss per unit area at any particular site to the corresponding loss from a specific experimental plot of known length and gradient. The LS factor can be read from Table Al in Landcom (2004). It should be noted that an increase in slope gradient has a proportionately greater effect on LS, compared with an increase in slope length. • The Project Area has variable gradients including some areas with slopes up to about 5% (and in some areas higher), but in the turbine locations is commonly only gently sloping with gradients less than 0-1%. Slope lengths in disturbed areas would be typically less than 80 m. Under the combination of 80 m slope length and 5 % gradient the LS Factor is 1.19. Under the combination of 80 m slope length and 5 % gradient the LS Factor is 1.19.	1.19
P	• The erosion control practice factor, P, is the ratio of soil loss with a nominated surface condition ploughed up and down the slope. It is reduced by practices that reduce both the velocity of run-off and the tendency of run-off to flow directly downhill. At construction and mining sites, it reflects the roughening or smoothing of the soil surface by machinery. • The P-factor of 1.3 that is normally assigned to compacted construction sites has been adopted for this assessment.	1.13
C	• The cover factor, C, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. The most effective method of reducing the C-factor is maintenance, or formation of a good ground cover. The best practices are those that reduce both the amount of soil exposed to raindrop impact and the erosive effects of run-off. • The C-factor assigned here during construction operations is 1.0, typical of that for bare, compacted soil. Table A3 in Landcom (2004) provides estimated C-factors for various cover types. It is worth noting that the C-factor is the factor that can be most readily manipulated to affect a change in erosion hazard. For example, changing the soil surface from a condition of bare, compacted earth (C = 1.0) to one with 70% cover of grasses (C = 0.05) leads to a proportionate reduction in soil loss, i.e. 20 times lower erosion hazard.	1.0
	Calculated A Value	**24.2 t/ha/year**

The overall erosion hazard has been assessed as very low (as per Table 4.2 of *Managing Urban Stormwater: Soils and Construction Volume 1 Fourth edition*). This is a consequence of favourable climatic conditions (low rainfall erosivity) and the lower slope gradient where disturbance will generally occur on slopes under 5%, which limit the generation of high velocity, erosive run-off. Localised areas of greater erosion hazard will exist, for example in areas of concentrated water flow, such as along watercourses and table drains. Particular attention to erosion control should be applied in these areas.

Sensitive Locations

Yanga SCA is located adjacent to the west of the Project Area. The primary impact identified to Yanga SCA is erosion and sedimentation from surface water run-off from the Project Area. Sedimentation and control measures are outlined in **APPENDIX T**, with the specific consideration to the management of sensitive areas.

6.8.4.3 FLOODING AND HYDROLOGY ASSESSMENT

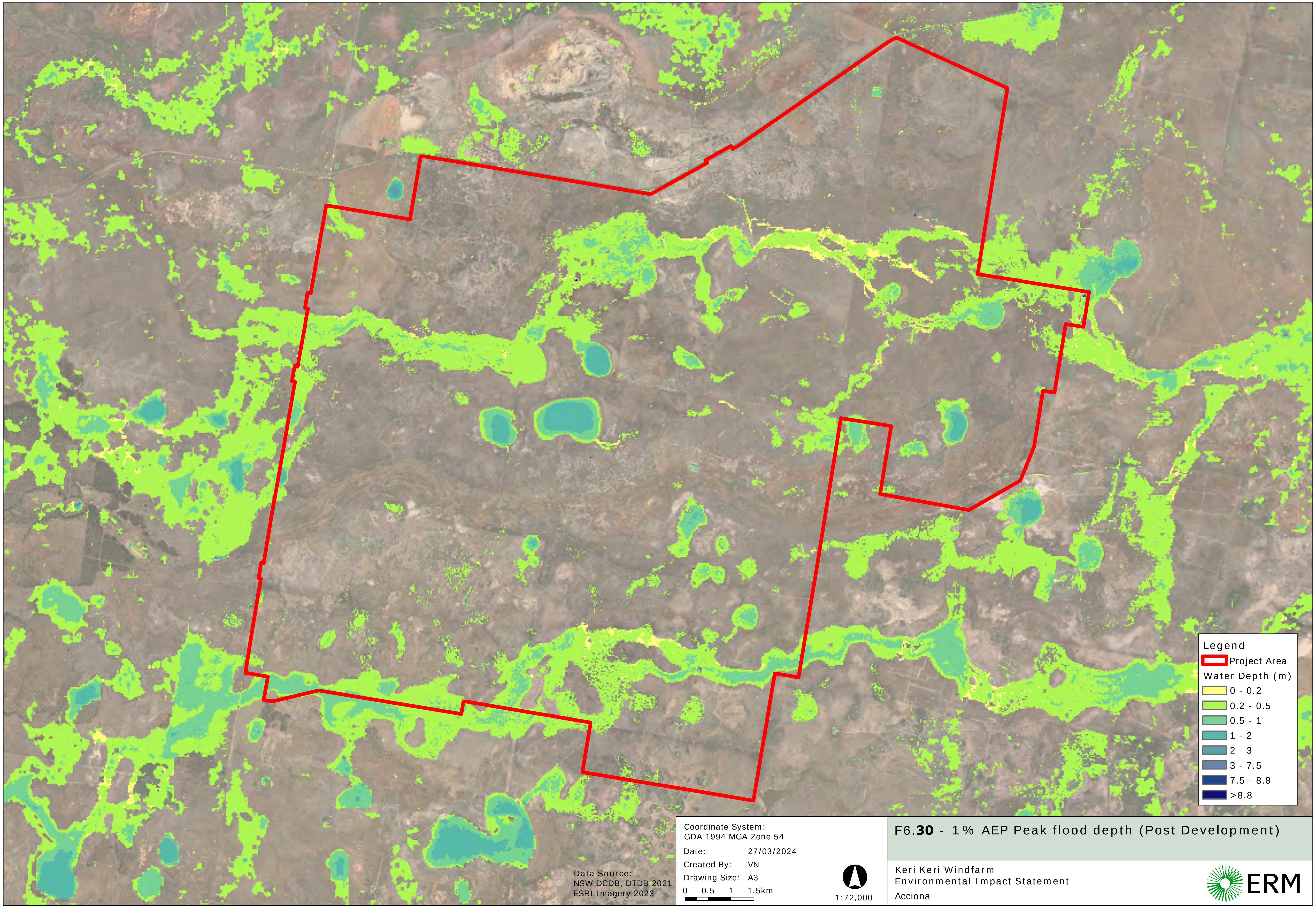
Hydraulic models were developed to simulate the 20%, 5%, 1%, 0.5% and 0.2% Annual Exceedance Probability (AEP) and probably maximum flood (PMF) events using a rain-on-grid (RoG) TUFLOW hydraulic model based on ARR 2019 data. The model will design the design flood event for a range of storm durations (critical durations) across 35 sub-catchments in the vicinity of the Project Area. The hydraulic models for the assessment were developed to simulate the dynamic interactions between watercourses and floodplains, as well as overland flow paths within the Project Area, using TUFLOW modelling software developed by BMT.

A summary of the assessment findings is presented in **Table 6-90**.

TABLE 6-90 FLOOD IMPACT ASSESSMENT FINDINGS SUMMARY

Aspect	Flood Assessment Finding
Flood depths and levels	• Flood level impacts were observed within the developed scenario outside the proposed Project Area for all events except 20% AEP. • These flood impacts are considered to be non-detrimental to the Project, as affected areas are in the Yanga State Conservation Area with no visible structures. Flooding impacts are outside of the development footprint from the 20% AEP to 0.2% AEP events. • Impacts of up to 30mm are apparent towards the eastern part of the Site in the vicinity of some of the turbines, which are considered non-detrimental.
Flood velocities	• Flood velocities for the events from 20% AEP up PMF event show that there is very slow moving water in the Abercrombie Creek (<0.4 m/s). The modelled flood behaviour determined that the surface flow hydrodynamics are significantly storage driven due to shallow slopes and the presence of many small basins within the catchment, resulting in significant ponded water depths in the 20% AEP flood event.
	• Due to low flood velocities, it is considered that there will be limited erosion, destruction of riparian vegetation or reduce in the stability of river banks and watercourses. Changes to flood velocity as a result of the Project are anticipated to be negligible

Aspect	Flood Assessment Finding
Flood Hazards	• There were no significant flood hazards identified, with modelled flood hazards and extents considered to be compatible with the Project (H1-H3).
Flood Function	• No significant changes to existing flood function are anticipated as a result of the Project, with flood extents and functions also considered compatible with the Project.
Climate Change	• The 0.5% and 0.2% AEP flood events displayed a corresponding increase in flood velocities and hazards as compared to the other modelled scenarios. There was no significant increase in flood velocity modelled.
Emergency Management	• The Project Area is subject to H3 and above hazards in the event of a 5% AEP flood. This could limit access to some areas of the Project Area, most of which would be inundated in the modelled PMF event. • In the event of a PMF flood, it is considered that there will be sufficient time (3-7 day critical duration) for staff to evacuate. It is recommended that the Project Area be closed while inundated with flood waters. • Emergency management measures may be required to mitigate risks associated with access or isolation during flood events.



Coordinate System:
GDA 1994 MGA Zone 54

Date: 27/03/2024

Created By: VN

Drawing Size: A3

0 0.5 1 1.5km

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F6.**30** - 1% AEP Peak flood depth (Post Development)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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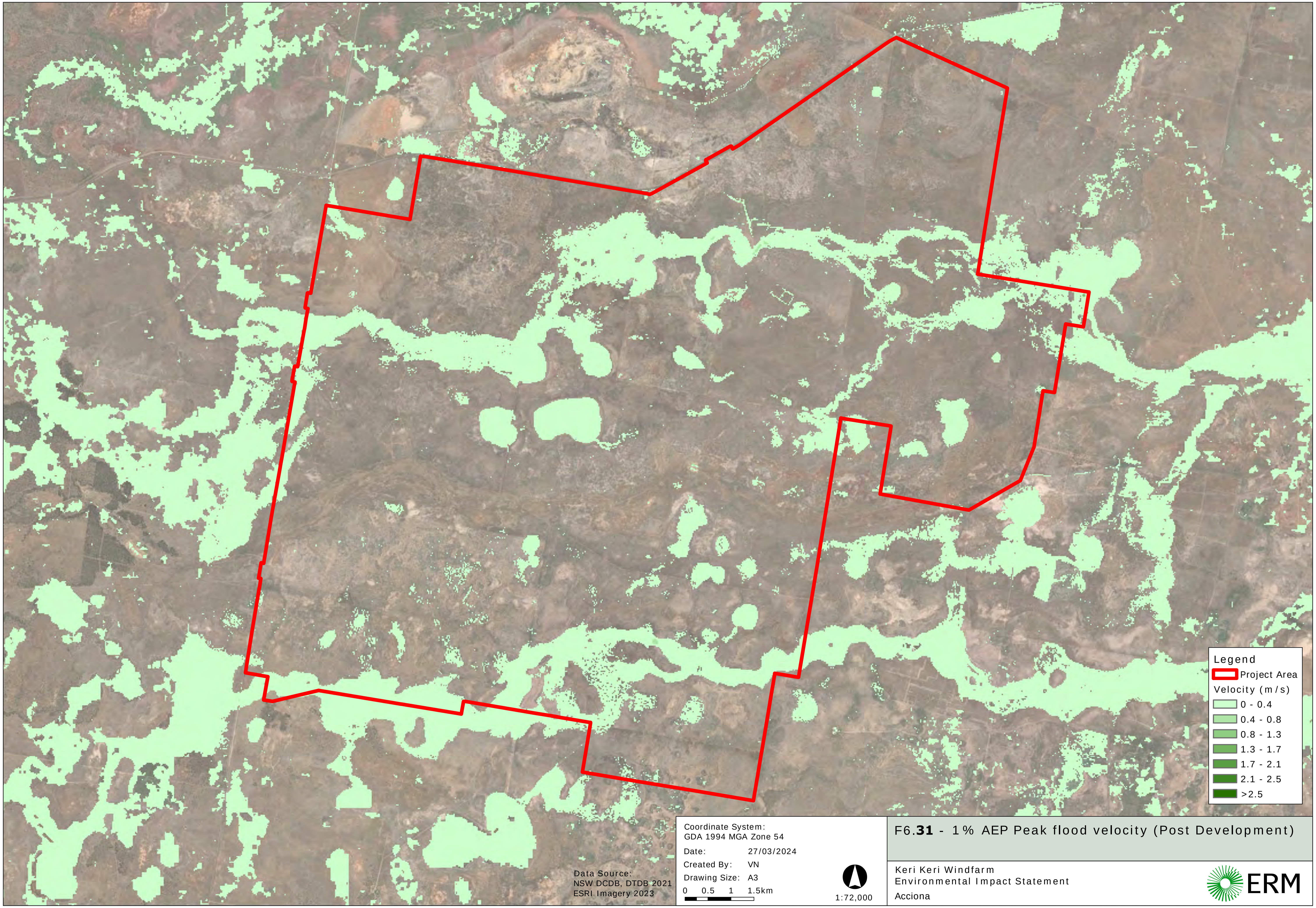

F6.31 - 1% AEP Peak flood velocity (Post Development)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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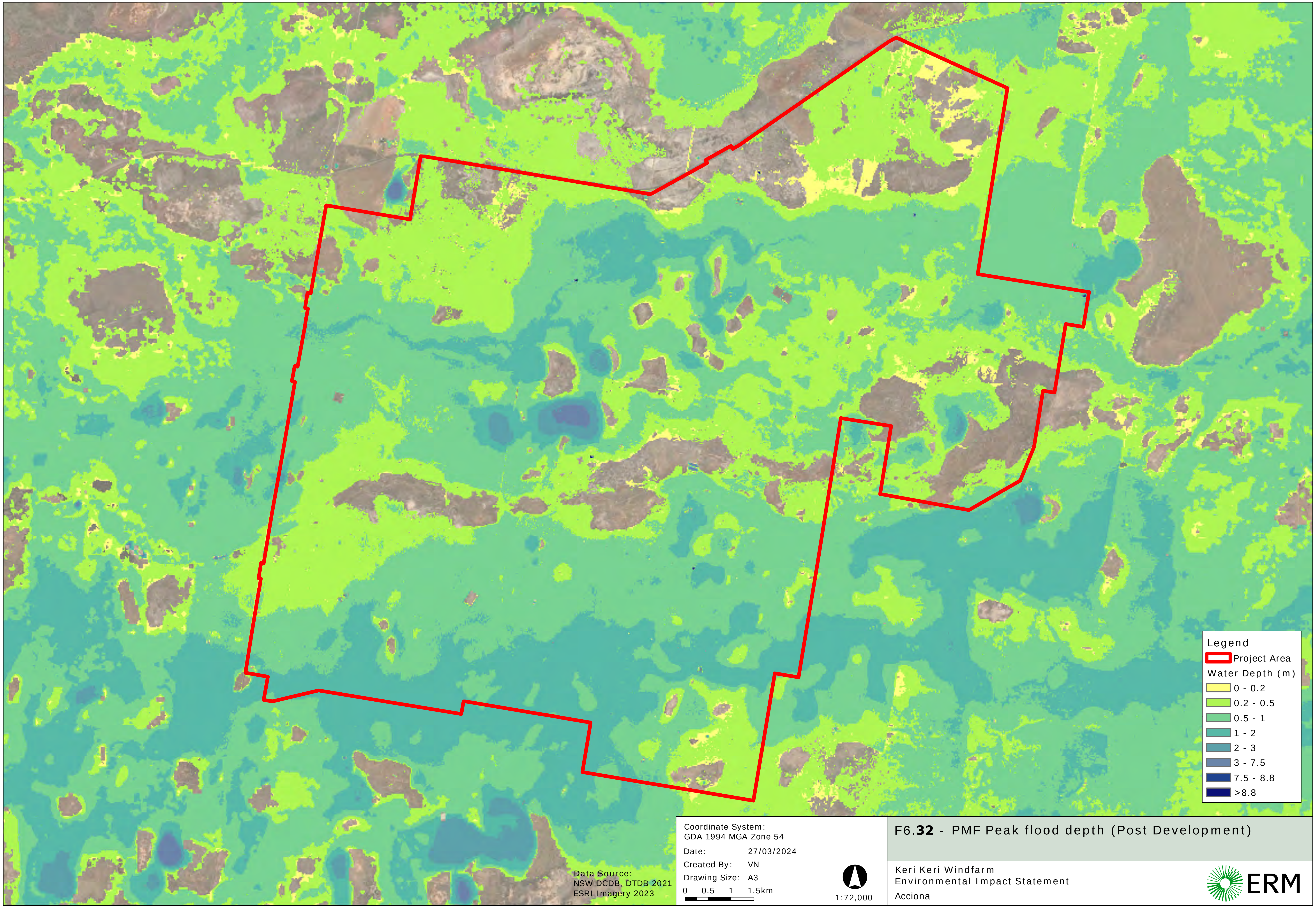

F6.32 - PMF Peak flood depth (Post Development)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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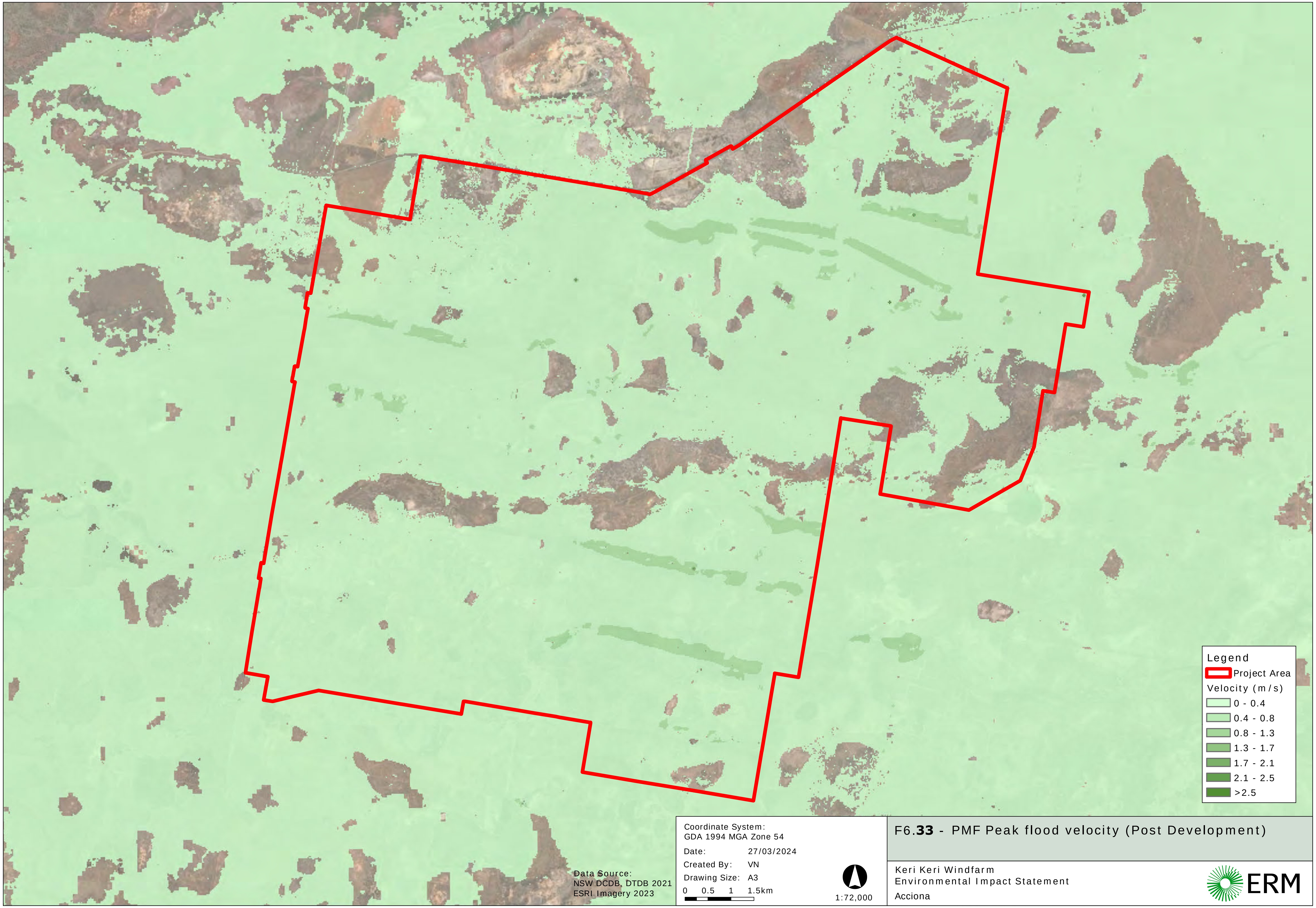


Coordinate System:
GDA 1994 MGA Zone 54
Date: 27/03/2024
Created By: VN
Drawing Size: A3
0 0.5 1 1.5km
1:72,000

Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023

F6.**33** - PMF Peak flood velocity (Post Development)

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

0617753_KKWF_EIS_G023_R0.mxd

6.8.5 MITIGATION MEASURES

6.8.5.1 WATER AND SOILS

The following measures will be implemented to minimise impacts to water resources, most of which relate to erosion and sedimentation runoff:

- Should additional groundwater bores or water from other sources covered under the relevant water sharing plan be required, the Applicant will seek to obtain a WAL, and other relevant approvals, subject to availability;
- Prepare a Soil and Water Management Plan (SWMP) prior to the commencement of construction. The SWMP will be prepared by a suitably qualified person and be accompanied by progressive Erosion and Sediment Control Plan (ESCP) to address specific high-risk areas identified during detailed design. The SWMP will be prepared in accordance with the Managing Urban Stormwater guidelines, particularly Volumes 2A and 2C;
- Stage construction activities to minimise the duration and extent of land disturbance;
- Investigate site features and access constraints, and design the Project to minimise disturbance areas;
- Divert upslope (clean) stormwater around the disturbed site and capture sediment-laden run-off from within the disturbed site for diversion to sediment control devices;
- Strip and stockpile topsoil for use in subsequent rehabilitation of the Project Area, promptly and progressively as works progress; and
- Inspect and maintain erosion and sediment control devices for the duration of the Project.

Further management measures that will be employed to minimise the Project impacts are included in **Table 6-91**.

TABLE 6-91 EROSION AND SEDIMENTATION MITIGATION AND MANAGEMENT

Aspect	Mitigation Measures
Stormwater Management	• Diversion of clean stormwater run-on away from areas that will be disturbed by construction activities using earth banks or catch drains; • Installation of temporary or permanent diversion banks sized by a suitably qualified professional; • Collect dirty water in earth banks or catch drains for diversion to sediment control structures; • Installation of check dams using rock aggregate, sandbags or geotextile "sausages" may be installed within drains and diversion channels to help reduce flow velocity and consequent erosion, especially on steep sections; and • Maintain slope lengths no greater than 80 m in disturbed areas and preferably <50 m on exposed road surfaces and steep slopes.
Erosion Control	• Stabilise the access point by sealing with concrete, asphalt or loose rock fill; • Limit unnecessary vehicle movements across the Project Area; • Limit the stripping of topsoil to within two weeks of commencing construction activities;

Aspect	Mitigation Measures
	• Stockpiles will be located 40 m from any natural waterways, and are to have a 5 m buffer from areas that are likely to receive concentrated water flows; • Cover or stabilise stockpiles not in use; • Prevent the generation of dust by keeping unsealed access tracks moist during dry or windy conditions; and • A suitably qualified person will design all areas of concentrated flow (e.g., diversion banks and waterways) to remain stable during the design storm event.
Sediment Control	• Sediment traps will be used to treat sediment laden run-off that is generated from disturbed areas and maintain the sediment as close as possible to its source; • Sediment traps such as sediment fencing, earth or mulch bunds, geotextiles, rock or a combination of these may be employed to manage stormwater run-off across the site; and • Sediment basins may be required for larger capture areas of the Project Area to capture dirty water run-off.
Site Rehabilitation	• Rehabilitation of disturbed areas will occur progressively during the construction period to allow for the stabilisation of individual site areas and to prevent erosion and sedimentation issues; • Site stabilisation could be managed through vegetative cover, mulch, rock armouring, paving, concrete, geofabrics and synthetic soil binders; and • Site stabilisation will be determined on a site by basis and will be included within the Progressive ESCPs.
Trenching	• When designing sediment control measures, avoid trenching immediately prior to forecasted rainfall and avoid trenching in areas of concentrated, permanent water flows; • Fill trenches as soon as possible after opening, aim for three days from opening to closing trench; • Separate topsoil from subsoil materials when excavating and manage the reuse of topsoil during rehabilitation to avoid risk of erosion and sedimentation; • Progressively backfill trenches and rehabilitate as soon as possible following excavation; • Appropriate sedimentation measures should be used for perpendicular or parallel (across grade) contours to adequately manage stormwater impacts. These measures include, but are not limited to, the use of sandbag plugs or bulkheads for perpendicular trenching or the compaction of excavated soils to create earthbanks uphill from the excavation for parallel excavations; and • Minimisation of the disturbance area.
Dewatering	• Dewatering will be conducted if water collects in trenches, sediment traps or low-lying depressions following rain events; and • Water collected from the dewatering could be re-used for dust suppression or watering of rehabilitated areas so long as no run-off can directly discharge to a waterway.
Unsealed Internal Access Roads	• Maintain good stormwater drainage on unsealed roads across the Project Area; • Use of table or metre drains along the road alignment to enable adequate drainage. These drains need to be properly installed and stabilised; • Minimise cut and fill by constructing the road at-grade wherever possible; • Employ outfall drainage or crowned road surfaces (depending on road placement) to enable roads to shed water;

Aspect	Mitigation Measures
	• Avoid the formation of windrows along road shoulders when grading; • Cross-banks (or rollover banks) or cross-drains should be considered in suitable locations to shed water from the road surface, discharging water in well vegetated, stable areas; and • Use of rolled erosion control products to stabilise road batters.
High Risk Areas	• Areas deemed high risk for potential erosion and sediment control risk such as areas of steep slopes, flow paths of high velocity or in proximity to named waterways, will be identified during detailed design; and • Additional management of these areas will be required to manage greater rainfall events.

Conceptual Soil and Water Management Plan

A conceptual SWMP was developed (refer **APPENDIX T**) to outline the fundamental principles to manage the potential erosion and sedimentation impacts from the Project. As part of the Project's detailed design, the Applicant will continue to investigate options to further avoid and minimise impacts from erosion and sedimentation. The conceptual SWMP was developed in accordance with the following guidelines:

- 'Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of Services' (Volume 2A) (DECC, 2008a); and
- 'Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads' (Volume 2C) (DECC, 2008b).

Site Monitoring and Maintenance

An inspection, maintenance and cleaning program will be required to maintain the effectiveness of the outlined mitigation and management measures. The recommended inspection schedules will be developed as part of the detailed SWMP during the detailed design phase and will include:

- Inspections during and following storms to check the operation of the installed controls;
- Redesign of inadequate devices; and
- Visual monitoring of potential dust during construction activities to mitigate any air quality impacts.

6.8.5.2 FLOODING MITIGATION AND MANAGEMENT

In addition to the soil and water mitigation and management measures, the following will be undertaken to further manage flooding impacts as a result of the Project:

- Emergency flood management measures during construction and operation of the Project, including:
  - Monitoring of the NSW Hazards Near Me app for extreme weather warnings that may result in flooding;

- Site evacuation and closure in the event of a local warning advising of the potential for flooding; and
- Site closure until floodwaters have receded entirely and safe access to the Project has been restored.

6.8.6 CONCLUSION

A review of water resources within the Project Area and catchments determined that there was adequate water supply to support Project development. Potential impacts to the Project will largely be limited to impacts to water and soil during construction, and flooding inundation during a PMF flood event. The development of a SWMP as part of the CEMP for the construction period is recommended to ensure that risks of erosion and sedimentation are adequately managed in accordance with the conceptual SWMP.

Flood impacts observed due to the proposed development are considered to be non-detrimental. Low flood velocities (<0.4 m/s) will allow sufficient time for site evacuation and closure in the event of a PMF flood event.

6.9 LAND AND AGRICULTURE

6.9.1 INTRODUCTION

An Agricultural Impact Assessment (AGIA) was prepared by Tremain Ivey Advisory to assess the potential impacts of the Project on agriculture and soils with respect to land capability. The AGIA also identifies relevant management measures to mitigate the identified impacts. Refer to **Section 6.8.4.2** for soil-specific impact assessment and management measures.

The AGIA is provided in **APPENDIX Q**.

The AGIA was prepared to address the requirements of the SEARs (**APPENDIX A**), in consideration of relevant stakeholder engagement (**Section 5**), targeted engagement, relevant legislation and the following guidelines:

- The Land and Soil Capability Assessment Scheme (OEH, 2012);
- Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land (OEH, 2013);
- Agricultural Land Use Mapping Resources in NSW (Squires, 2017);
- Infrastructure Proposals on Rural Land (DPI, 2013b);
- Development adjacent to National Parks and Wildlife Service Lands (DPIE, 2020);
- Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2021); and
- Riverina Murray Regional Plan 2041 (DPE, 2023).

The scope of the AGIA incorporated the following:

- Land and soil capability (LSC) mapping and the results of any site verification completed to confirm land capability;

- Include consultation with neighbouring landholders to identify the potential project impacts (if any) on immediately adjacent land;
- Describe project impacts (if any) on immediately adjacent land;
- Describe the consultation undertaken; and
- Consider measures to reduce the impacts on neighbouring agricultural land.

6.9.2 METHODOLOGY

The AGIA was prepared using the following methodologies:

- Landowner consultations and property inspections (which occurred on 19 September 2022) to obtain information on the agricultural enterprises conducted on the Project footprint and the landowners' perceived impacts of the Project on these enterprises;
- A telephone consultation was undertaken with one neighbouring landowner on 16 September 2022;
- Other consultation to identify the main biosecurity risks associated with the Project and recommended mitigation measures was undertaken by telephone with various biosecurity officers from the Murray River Council and Murray Local Land Services (LLS);
- The existing environment was described primarily using a desktop study;
- The assessment of the impacts on agriculture was based on the desktop study, consultations with landowners and other stakeholders, property inspections and professional knowledge; and
- The identification of mitigation and management measures based on the above.

The above was applied to the land bound by the Project Area during construction and operation.

6.9.3 EXISTING ENVIRONMENT

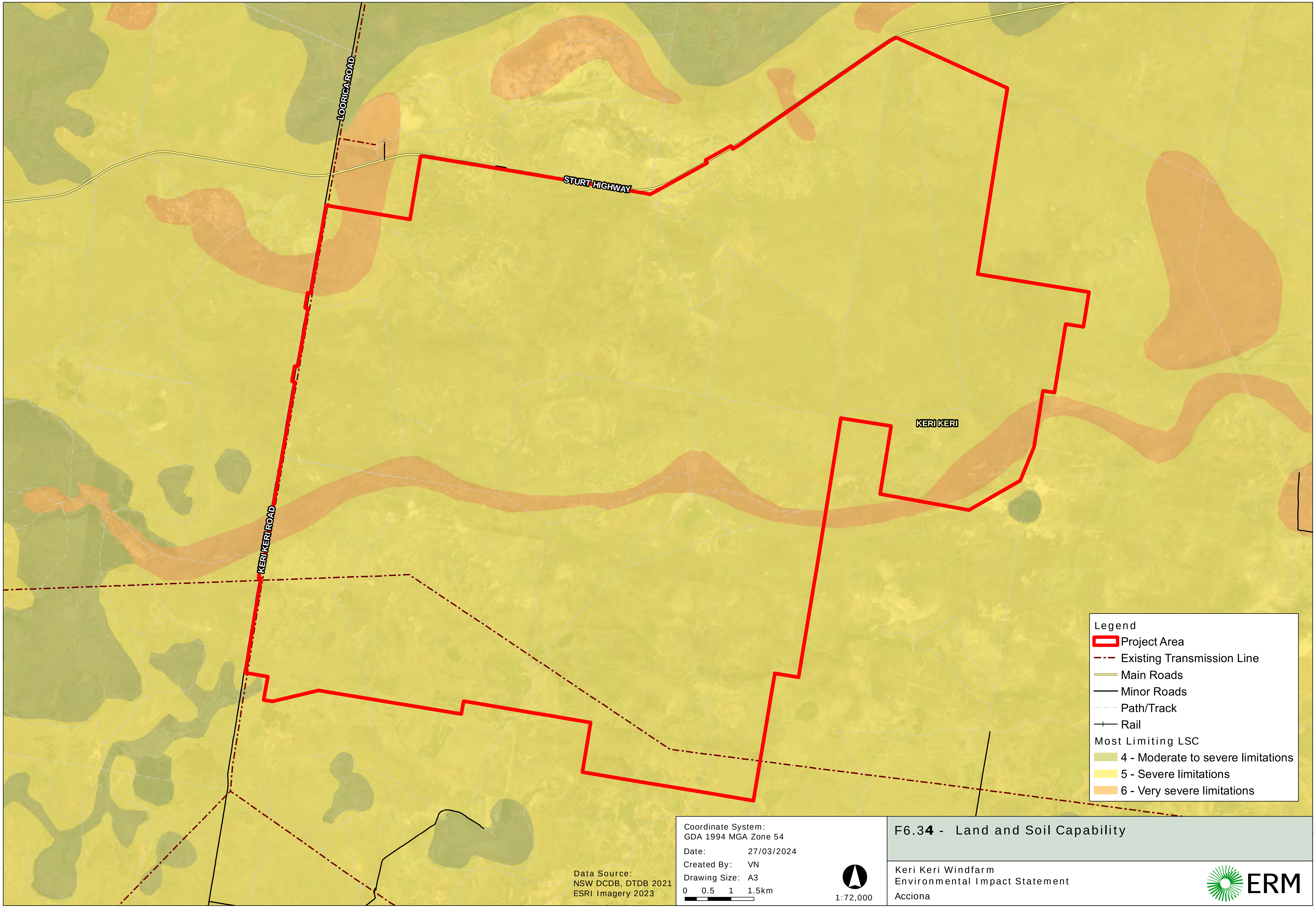
The Project Area is located within the Murray River LGA, consisting of a relatively flat alluvial riverplain landscape with a slight fall in elevation (approximately 70 m AHD) from east to west. The landscape is crossed by an intermittent watercourse, Abercrombie Creek, across the southern boundary.

6.9.3.1 LAND AND SOILS

A desktop review of existing soils information for the site was conducted and reviewed existing soil types, livestock water sources, land use and LSC. The key findings of the desktop assessment are included in **Table 6-92** below and in full in Section 4 of **APPENDIX Q**.

TABLE 6-92 REVIEW OF EXISTING SOIL DATA FOR THE PROJECT AREA

Soil Characteristic	Description
Soil Types	The dominants soil types that were mapped within the Project Area include: • **Vertosols**: soils with clay texture throughout the profile, display strong cracking when dry, and shrink and swell considerably during wetting and drying phases. • **Rudosols**: Rudosols soils with a sandy, weakly developed profile. They are typically acid throughout the profile and plant nutrient availability is quite variable. They may have good infiltration but usually low water holding capacity. • **Chromosols**: soils with a distinct texture contrast between the loamy A horizons and the clayey B horizons, but the latter is neither strongly acidic nor sodic.
Livestock Water	Water for livestock is mainly supplied by a piped water scheme (Abercrombie Water Efficiency Scheme) using water pumped from the Murrumbidgee River at Yanga Woolshed. The water is pumped into tanks and distributed to livestock via pipes and troughs.
Land Use	There are three land uses that were identified within the Project Area. These land uses included (in reference to the Project Area): • Grazing of native pastures (17,091 ha); • Cropping (680 ha); and • Marsh & wetland (242 ha). • The dominant land use that will be impacted by the construction of the wind farm is cropping.
LSC	A map of the LSC class across the Project Area is presented in **Figure 6-34**. The Project Area consists of the following LCS classes: • **LSC Class 5** (94% of the Project Area) moderate–low capability land: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation; and • **LSC Class 6** (6% of the Project Area) low capability land: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.
Biophysical strategic agricultural land (BSAL)	Mapping of BSAL was undertaken by the then NSW Department of Planning and Environment. This mapping indicates that there is no BSAL in the Project area
State significant agricultural land (SSAL)	The draft mapping indicates that there is no SSAL in the Project area.


LOORICA ROAD
STURT HIGHWAY
KERI KERI ROAD
KERI KERI
Legend
Project Area
Existing Transmission Line
Main Roads
Minor Roads
Path/Track
Rail
Most Limiting LSC
4 - Moderate to severe limitations
5 - Severe limitations
6 - Very severe limitations
Data Source:
NSW DCDB, DTDB 2021
ESRI Imagery 2023
Coordinate System:
GDA 1994 MGA Zone 54
Date: 27/03/2024
Created By: VN
Drawing Size: A3
0 0.5 1 1.5km
1:72,000
F6.34 - Land and Soil Capability
Keri Keri Windfarm
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ERM
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6.9.3.2 BIOSECURITY

As the Project Area is set within a rural, isolated setting with intensive agricultural industries, the management of biosecurity risks must be considered. Common biosecurity risks identified near the Project Area that have been identified as a threat to agriculture include those summarised in **Table 6-93**.

TABLE 6-93 REVIEW OF REGIONAL BIOSECURITY RISKS TO THE PROJECT AREA

Element	Description
Weeds	The following weeds have been reported near the Project Area: • African boxthorn (*Lycium ferocissimum*); • Coolatai grass (*Hyparrhenia hirta*); • Galvanised burr (*Sclerolaena birchii*); • Horehound (*Marrubium vulgare*); • Noogoora burr (*Xanthium occidentale*); • Prickly pears (*Cylindropuntia* and *Opuntia* species); • Silverleaf nightshade (*Solanum elaeagnifolium*); • Spiny burrgrass (*Cenchrus longispinus* & *Cenchrus spinifex*); and • St. John's wort (*Hypericum perforatum*). Weeds that have been identified within the Murray Regional Strategic Weed Management Plan (Murray LLS, 2017) as State and regional priority weeds include: • Bathurst burr (*Xanthium spinosum*); • Blue heliotrope (*Heliotropium amplexicaule*); • Khaki weed (*Alternanthera pungens*); • Scotch & Illyrian thistles (*Onopordum* spp.); • Spiny emex (*Emex australis*); and • St Barnaby's thistle (*Centaurea solstitialis*). Problematic weeds present in the district with the potential to become more widespread that were mentioned by landowners during consultations included Bathurst burr, prickly saltwort (*Salsola australis*), galvanised burr (*Sclerolaena birchii*) and black roly poly (*Sclerolaena muricata*).
Pest Animals	Various pest animals have been identified in proximity to the Project Area, including foxes, feral cats, wild rabbits, feral pigs, kangaroos, feral goats and wild goats. Some species (such as pigs and goats) are threats as they can harbour and transmit both endemic and exotic diseases. Plague locusts and mice can also cause problems in certain seasons.
Animal and Plant Diseases	The following diseases have been identified as possible to occur within the Project Area: • **Footrot**: is not considered by landowners to pose a major threat due to the relative rarity and the unlikelihood of it being introduced into the Project Area by Project activities; and • **Ovine Johne's Disease** (OJD): although the Project Area is within a low prevalence area, one of the Project landowners has expressed concern regarding the risk of OJD being introduced to the Project Area.

6.9.3.3 AGRICULTURAL PRODUCTIVITY

A review of the agricultural industry within the region determined that approximately 95% off the Murray River LGA was used for agriculture, with 57% of the total area used for grazing purposes (ABS, 2022).

The average 'stocking' rate of the regional area was 1.43 units per ha in 2020-2021, which is lower than the average NSW rate of 1.53 units per ha. The key livestock within the Murray River region includes sheep and lambs, with other less common livestock including meat and dairy cattle, goats, pigs and poultry.

The total gross value of agricultural production across the Murray River LGA in 2020-21 (ABS, 2022b) was $316 M. A breakdown of the key areas of agricultural production is included in **Table 6-94**, with a more detailed breakdown included in Section 4.5.4 of **APPENDIX Q**.

TABLE 6-94 TOTAL GROSS VALUE OF AGRICULTURAL PRODUCTION

Agricultural Sector	Gross Value
Broadacre Crops	$141,427,502
Horticultural Crops	$62,191,226
Livestock Products	$112,128,558
Total	**$315,747,286**

The Project Area has typically run sheep for meat and wool production. The productivity aspects for the landholders within the Project Areas that were considered as part of the AGIA are included in **Table 6-95**.

TABLE 6-95 AGRICULTURAL IMPACTS WITHIN THE PROJECT AREA

Landowner	Size	Current Operations
1	• Forms 84% of the Project Area • The Project Area encompasses approximately 15,131 ha (63% of the property)	• Merino sheep stud • Some cropping – reliant on seasonal conditions • Carrying capacity has been 5,500 ewes on approximately 24,000 ha (0.23 sheep/ha).
2	• Forms 16% of the Project Area • The Project area encompasses approximately 2,870 ha (69% of the property)	• Ewe weaners • Carrying capacity has been 1,500 ewe weaners on approximately 4,160 ha (0.36 sheep/ha)

6.9.4 ASSESSMENT OF IMPACTS

6.9.4.1 CONSTRUCTION AND OPERATION

The key impact of the Project to agricultural land use of the Project Area is the temporary or permanent removal of some areas from production to accommodate the construction of the Project. The land use within the areas that would experience this disturbance are used for grazing, with none of the WTGs proposed to be built on land that has previously been cropped.

Operation of the Project will result in change in some land use where permanent change in some land use where permanent infrastructure would be established, with agricultural production in these areas reduced during the life of the Project. Grazing operations would be able to continue on other areas of the Project.

It is considered that the overall impact on agricultural land use would be limited to the areas that will be directly impacted by construction. The following impacts to agricultural operations have been identified for the Project.

TABLE 6-96 IDENTIFIED IMPACTS FROM CONSTRUCTION AND OPERATION

Element	Construction Impacts	Operational Impacts
Land Area	• Approximately 1,137 ha of grazing land will be impacted by construction so that little or no grazing is possible. • Landowner 1 has expressed a plan to destock the Project Area during construction. This will have a large impact. • Landowner 2 expects to continue to graze during the construction period, with the impact expected to be relatively low.	• Impact on grazing operations would be minimal. • Approximately 225 ha of the Project Area will be impacted by operations so that little or no grazing is possible. This is approximately 1.25% of the Project Area. • The impacted area is only grazing land, with no cropping area expected to be impacted.
Income	• The full list of assumptions used to calculate a loss of income is included in Section 5.1.3 of **APPENDIX Q**. • The loss in income to Landowner 1 during the whole construction period was estimated to be $928,832. • The loss in income to Landowner 2 during the whole construction period was estimated to be $22,874. • As both properties are currently understocked, it is noted that the loss of income might be less than what is indicated above. • Destocking during construction is unnecessary, and the decision to do so reflects the higher risk that is present to the sheep stud owned by Landowner 1. • If the loss could be mitigated on Property 1 to the same level as assessed for Property 2 (that is, 15% of potential income) by a combination of continued grazing and utilisation of spare grazing capacity on other parts of the property, the total gross loss of grazing income on the Project area would be reduced to approximately $162,000 over 24 months.	• The loss in income to Landowner 1 per year of operation was estimated to be $7,912. • The loss in income to Landowner 2 per year of operation was estimated to be $1,105.
Biosecurity	• There is a risk that animal diseases, plant diseases, feral pests and weeds could be introduced or spread during construction of the Project. This could cause an increase in costs and decrease the incomes of host landholders. • Potential carriers of weed seeds, plant material and diseases include vehicles (especially tyres), machinery and personnel (clothing and footwear). Biosecurity matter also has the potential to be spread by soil and water movements associated with construction works.	• Access for inspections, maintenance and repairs to the transmission line easement present a biodiversity risk to the Project Area. • The risk of spreading of weeds, pests and disease during operations is lower due to less vehicle and personnel movement.

Element	Construction Impacts	Operational Impacts
	• The Project Area is less susceptible to biosecurity risks due to the separation from major populations, intensive industry and semi-arid climate. • Maximum risk of the spread of weeds across the Project Area is associated with construction due to earthworks, increased vehicle and personnel movements and increased growth of weeds from increased soil disturbance. • The risks associated with pest and livestock diseases are considered to be low due to the low probability of spread being caused by Project activities and the low prevalence of disease in the area. • Foot and mouth disease is an emerging issue in Indonesia, and appropriate measures would be implemented if there is any risk of introduction via the Project. • The Project is unlikely to significantly change the number or movement of existing pests within the Project Area. • Biosecurity risks associated with plant diseases and pests would be low due to the limited cropping, horticultural and irrigation industries near the Project Area.	
Restricted Movement	• It is considered unlikely that construction activities would substantially restrict movements of landowners, agricultural workers, their livestock or equipment within the Project Area. • Any restrictions would be of relatively short duration and in limited location and are hence there should be little or no restriction on movements for agricultural purposes.	• It is unlikely that the operation of the Project would significantly restrict the movements of landowners, workers, livestock or equipment.
On-ground Agricultural Operations	• Impact to any on-ground operations is considered low. • The impact of dust generation from construction activities is considered low.	• Impacts from on-ground agricultural processes are very low due to the prevalence oof low input native pastures and the lack of cropping within the Project Area.
Impacts on Aerial Agricultural Operations	• The past and likely future use of aerial agriculture in the Project area is very limited and therefore impacts would be minimal.	• The past and likely future use of aerial agriculture in the Project area is very limited and therefore impacts would be minimal. • Transmission lines have the potential to impact drone operations if these are to be flown in the Project area.

Element	Construction Impacts	Operational Impacts
Impacts on Livestock Enterprises	• Although livestock habituate to disturbances, the noise and movement of construction vehicles and other construction activities may have an impact on livestock in specific circumstances, especially during sensitive periods such as calving and lambing. • Grazing management would also be disrupted if construction activities result in paddocks being temporarily unavailable for grazing or cause a disruption to the grazing pattern of livestock.	• Potential disturbance to livestock from noise and movement disturbance. • The potential for the damage to fences or other livestock infrastructure, or having gates left open, are also lower.
Fire Risk	• Fires have the potential to be started by human activities, equipment and vehicles during construction. • Particular fire risks may involve hot work or the storage and use of dangerous materials.	• Fires have the potential to be started by human activities, equipment and vehicles during operation, although at a lower risk than during construction. • Mechanical failure of a transmission line, or operation under fault conditions, also has the potential to cause fire. • Project infrastructure has the potential to impact fire-fighting efficiency due to decreased aerial access, risk of sagging transmission lines during extreme temperatures and safety access issues around the WTGs.
Travelling Stock Reserves and Livestock Routes	• There are no travelling stock reserves (TSRs) or livestock highways in the Project Area. • There are two contiguous TSRs adjacent to the north-west corner of the Project area, and Keri Keri Lake TSR is approximately five km south of the Project Area. • It is not considered that the Project will impact these TSRs are neither are used for travelling stock or stock watering.	• No identified impacts during operation.
Frost Risk	• No identified impacts during construction.	• There is some evidence the WTGs reduce the prevalence of frost. However, as the Project Area is relatively free from incidences of frost and does not contain areas of cropping, first is unlikely to impact the Project.

6.9.4.2 CONSIDERATION OF OTHER SENSITIVE AREAS

There are currently no exploration mining or petroleum licenses granted within the Project Area. There are also no Crown Lands within the Project Area, although there are several Crown paper roads.

Yanga SCA is directly west of the Project Area. Additional considerations to ensure that construction and operational activities that are associated with the Project do not impact the integrity of the conservation area are required. The primary impact identified to Yanga SCA is erosion and sedimentation from surface water run-off from the Project Area, bushfire risk, and the introduction of noxious weeds or pest species to the Project Area. Refer to **Section 6.9.6.2** for relevant mitigation measures.

6.9.4.3 CUMULATIVE IMPACTS

The cumulative impact of other proposed developments in the area to the agricultural industry is considered small. As all identified Projects have a relatively small impact to agriculture, and the total amount of agricultural land taken out of production relative to entire Project Areas, the impact to the regional agricultural productivity is anticipated to be minor. Consequently, the effect on regional agricultural production would be minimal and no impact on the number of persons employed in the agricultural sector would be expected.

Regionally, solar farms are anticipated to have a larger impact to agricultural production than transmission lines and wind farms. As the Project Area is not used for cropping, and the impact to grazing is minimal, it is considered that the Project will not have significant cumulative impacts to regional agriculture.

6.9.5 LAND USE CONFLICT RISK ASSESSMENT

The Project Area has historically been used for agricultural purposes, noting land clearing of the area to allow for agricultural utility. The main land uses of the surrounding area are agriculture and tourism. Surrounding land uses are described in **Section 3**.

To understand compatibility with other land uses, identifying and assessing the potential for land use conflict to occur between neighbouring land uses is key. This process helps land managers and consent authorities assess the possibility for and potential level of future land use conflict.

In accordance with the Land Use Conflict Risk Assessment (LUCRA) Guide, a risk ranking matrix is used to rank the identified potential land use conflicts, by assessing the environmental, public health and amenity impacts according to both the ‘probability of occurrence’ and the ‘consequent of the impact’.

The risk ranking matrix yields a rank from 1 to 25. A rank of 25 is the highest magnitude of risk (aka. an almost certain and severe risk) while a rank of 1 represents the lowest (aka. a rare and negligible risk). Each activity associated with the Project has been assigned an initial risk ranking determined through the risk ranking matrix.

Activities which score a risk ranking of 10 or lower are considered a low risk for conflict to arise and subsequently do not need further management to reduce their potential impact. However, for activities that were identified to have a risk ranking above 10, the LUCRA is designed to define controls through various management strategies to reduce the risk for conflict.

To lower the risk values of activities associated with the proposed development, relevant risk reduction controls are identified for each identified potential conflict as management strategies. Consideration is given to lower both the probability and the negative consequences. The risk reduction controls will allow a revision of the risk level based on the implementation of the management strategies. The objective is to identify and define controls that lower the risk ranking score to 10 or below.

In this way, management strategies are developed to minimise such effects or potential for land use conflict to arise. For each of the management strategies, performance targets and monitoring requirements are identified.

This LUCRA process has identified and assessed the potential for activities associated with the Project to potentially cause land use conflict. The management strategies listed in **Table 6-97** provide plans to reduce identified potential conflict items that originally received a Risk Rating above 10. To ensure these management strategies are successfully implemented, performance monitoring is an important ongoing tool throughout the construction and operation stages of the Project. Performance targets are outlined below in **Table 6-97**.

TABLE 6-97 LAND USE CONFLICT RISK ASSESSMENT AND MANAGEMENT STRATEGY

Identified Potential Conflict	Associated Activity	Original Risk Ranking (ORR)	Management Strategy (Risk Reduction Measures)	Revised Risk Ranking (RRR)	Performance Target
Adjacent Land Use Activities	Agriculture	Probability: B Consequence: 3 ORR: 17	• Consideration of neighbouring activities will be taken during the preparation of the Environment Management Strategy (EMS). • Onsite dust suppression will be adopted to minimise the potential of dust dispersion generated from the Project impacting upon neighbouring land. • Conversely, adjacent land uses are not anticipated to significantly impact upon the operation and functionality of the Project.	Probability: D Consequence: 5 RRR: 2	• Comply with Conditions of Approval (CoA) and Environment Protection Licence (EPL); and • Management measures in EMS
	Recreation	Probability: C Consequence: 3 ORR: 13		Probability: D Consequence: 5 RRR: 2	
Water Quality	Run off from surface disturbance activities resulting in changes to local water quality, quantity and surface water flows	Probability: C Consequence: 3 ORR: 13	• Consideration to water impacts have been taken into account in the water and soils assessment in the EIS, with erosion and sediment control measures described within the Conceptual Soil and Water Management Plan. • Ongoing consultation between the Applicant and the community to identify and address concerns as they arise. • Implementation of approved mitigation and management measures as described in **Appendix B**.	Probability: D Consequence: 4 RRR: 5	• Comply with Conditions of Approval (CoA) and Environment Protection Licence (EPL); and • Management measures in EMS, Soil and Water Management Plan (SWMP), and Erosion and Sediment Control Plan (ESCP).

Identified Potential Conflict	Associated Activity	Original Risk Ranking (ORR)	Management Strategy (Risk Reduction Measures)	Revised Risk Ranking (RRR)	Performance Target
Traffic	Increased traffic movements along local roads, resulting in machinery, vehicles or livestock damages	Probability: D Consequence: 3 ORR: 9	• The TIA identified impacts and recommended mitigation measures to minimise risk of construction traffic to other road users. Compliance with the proposed mitigation measures is expected to reduce the risk of traffic and surrounding land users. • Ongoing community consultation and complaints management.	Probability: E Consequence: 4 RRR: 3	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
	Increased traffic movements causing delay to local road users and agricultural transport vehicles	Probability: D Consequence: 4 ORR: 5		Probability: E Consequence:5 RRR: 1	
Visual	Changed visual amenity to locals from the installation of turbine infrastructure	Probability: A Consequence: 3 ORR: 20	• Visual impacts during the Project operational phase were assessed in the Landscape and Visual Impact Assessment. Where visual impacts were identified, mitigation measures were proposed. It is anticipated that compliance with these measures will enable the	Probability: C Consequence: 4 RRR: 8	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
Agriculture	Biosecurity concerns from increased movements (weeds and pest)	Probability: B Consequence:3 ORR: 17	• Biodiversity of weeds and pests was assessed as part of the AGIA, with specific mitigation measures for the control of identified species. It is anticipated that compliance with these measures will adequately mitigate biosecurity risks that are associated with the Project. • Ongoing consultation with neighbors to identify and manage future biodiversity risks.	Probability: D Consequence: 4 RRR: 5	• Comply with Conditions of Approval (CoA); and • Management measures in EMS.
	Loss of agricultural land due to wind farm infrastructure	Probability: A Consequence:4 ORR: 16	• The impact to the regional agricultural industry has been assessed as part of the AGIA. Mitigation measures have been imposed to allow for the Project Area to be	Probability: D Consequence:5 RRR: 2	• Comply with Conditions of Approval (CoA); and

Identified Potential Conflict	Associated Activity	Original Risk Ranking (ORR)	Management Strategy (Risk Reduction Measures)	Revised Risk Ranking (RRR)	Performance Target
			rehabilitated at the cessation of the Project operation. • A Decommissioning and Rehabilitation Management Plan will be		• Management measures in EMS
	Livestock behaviour and breeding	Probability: D Consequence: 3 ORR: 9	• A noise impact assessment (NIA) has been conducted to assess potential risk to unacceptable noise generated by the project. Appropriate mitigation measures have been included in **Appendix B**.	Probability: D Consequence: 4 RRR: 5	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
Aviation	Aerial application for agriculture	Probability: D Consequence: 3 ORR: 9	• Aerial applications for agriculture are limited within the Project Area and were assessed in the AGIA. Minimal potential impacts were identified.	Probability: E Consequence: 4 RRR: 3	• Successful implementation of aviation mitigation measures.
Bushfire	Increased risk of fire from the BESS, resulting in higher bushfire risk, loss of livestock and loss of life	Probability: C Consequence: 2 ORR: 18	• A bushfire impact assessment has been undertaken as part of the EIS, with a bushfire management plan to be prepared and implemented prior to the start of construction to protect wind farm assets. • An asset protection zone has been established around the BESS, which ensures that fire cannot spread from the Project infrastructure to adjoining properties, or from adjoining properties to Project infrastructure.	Probability: D Consequence: 2 RRR: 14	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
Biodiversity	Decreased biodiversity value on the project area and associated local areas	Probability: B Consequence: 4 ORR:17	• Biodiversity was assessed within the BDAR, with measures taken to minimise, avoid and mitigate impacts to biodiversity where identified. These measures consider the management of weeds and pests to spread from the Project Area to adjacent lands.	Probability: D Consequence: 4 RRR: 5	• Comply with Conditions of Approval (CoA); and • Management measures in EMS

Identified Potential Conflict	Associated Activity	Original Risk Ranking (ORR)	Management Strategy (Risk Reduction Measures)	Revised Risk Ranking (RRR)	Performance Target
Rehabilitation and decommissioning	Land degradation during decommissioning reducing future agricultural capability	Probability: C Consequence: 3 ORR: 13	• Rehabilitation of the Project Area was assessed as part of the AGIA. Proposed mitigation measures are anticipated adequate to enable the land to return to its former land use.	Probability: D Consequence: 4 RRR: 5	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
Noise	Increased noise generation during the construction period	Probability: C Consequence: 4 ORR: 8	• A noise impact assessment (NIA) has assessed noise related to construction and operational activities. Mitigation measures will be implemented to ensure that noise is within guideline values.	Probability: D Consequence: 5 RRR: 2	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
Health	Impacts from EMF on livestock	Probability: D Consequence: 2 ORR: 14	• Impacts from EMF were assessed in the preliminary hazard assessment (PHA). The Project design has reduced the potential impacts from EMF to exceed accepted levels.	Probability: E Consequence: 5 RRR: 1	• Comply with Conditions of Approval (CoA); and • Management measures in EMS
Air Quality	Dust generation during construction	Probability: D Consequence: 3 ORR: 9	• Dust suppression mitigation measures have been included as mitigation measures for various aspects of the Project design. With the implementation of these measures, it is anticipated that project construction and operation will not have a	Probability: E Consequence: 4 RRR: 3	• Air quality impacts and dust suppression will mitigated through measures included within a CEMP.
Social	Employment	Probability: C Consequence: 1 ORR: 22	• A social impact assessment has been undertaken to assess the impact of the Project on the local workforce, including availability of seasonal and agricultural workers. Mitigation measures are detailed **APPENDIX B**.	Probability: D Consequence: 3 RRR: 9	• Comply with Conditions of Approval (CoA); and • Management measures in EMS

6.9.6 MITIGATION MEASURES

6.9.6.1 CONSTRUCTION AND OPERATION

The AGIA identified relevant management and mitigation measures that can be employed to minimise proposed impacts to the Project. The following mitigation and management measures are proposed for the Project.

TABLE 6-98 IDENTIFIED MITIGATION AND MANAGEMENT MEASURES

Impact	Environmental Safeguard
Structures	• Location of permanent and temporary structures will be strategically placed to avoid or minimise disturbance to grazing and land.
Disruption Impacts	• Landholders are to be consulted regarding required adjustments to any property infrastructure. • Property infrastructure is to be managed in accordance with landholder requirements. • Any damage to property infrastructure caused by construction must be replaced in a timely manner in consultation with the landowner. • Use of existing roads, tracks and other existing disturbed areas should be prioritised. • Vehicular or plant movement should be confined to one route to minimise disturbance to open spaces.
Fire	• A bushfire management plan would be prepared prior to construction start for the management of bushfire risks during the construction and operation periods.
Rehabilitation	• Disturbed areas should be stabilised and appropriately rehabilitated as soon as practicable following disturbance during construction.
Livestock Disturbance	• Management of noise intensive industries during sensitive periods within the livestock reproduction cycle (in consultation with landholder). • Management of vehicle movements and other activities in the vicinity of livestock should be managed through landholder consultation. • Livestock should be moved away (in consultation with landholders)
Biosecurity	• Implementation of biosecurity protocols that include recording the name, location, date and time for all people visiting the Project Area. • Washing down of all vehicles prior to entering any agricultural areas and when moving between paddocks with known weed infestations. • Temporary fencing comprising of chain link fencing up to 2 m high, to be installed surrounding construction facilities. • Permanent security fencing to be installed around operational facilities including the BESS, O&M facility and substations.
Weed Control	• Where present weeds will be managed in consultation with the landowners. • Where present within the permanent development footprint, weeds will be managed in accordance with the *Biosecurity Act 2015* and the Murray Regional Strategic Weed Management Plan 2017-2022.
Operational Access Impacts	• Fencing and access arrangements, such as locked gates and requirements for opening and closing of gates, would be determined in consultation with landowners. • Any damage caused by maintenance activities should be repaired promptly.
Decommissioning	• The Project Area will be returned to its former state at Project end of life. • Removal of all above ground infrastructure, hardstand surfaces, access tracks and other bare areas will be rehabilitated to native pasture. This process may include the addition of topsoil, restored drainage, and restoration of vegetation.

Impact	Environmental Safeguard
	• Underground infrastructure (such as cables and footings) would be removed to a depth of 500 mm below ground surface but may otherwise remain. • Contaminated material or waste would be removed or managed in accordance with relevant guidance and landholder consultation. • Weed infestations would be managed during the decommissioning Projects.

6.9.6.2 SENSITIVE AREAS

Suitable measures to manage perceived impacts to sensitive areas are outlined in **Table 6-9999**.

TABLE 6-99 SENSITIVE AREAS MITIGATION MEASURES

Impact	Mitigation Approach
Soil Erosion and Sedimentation	• Incorporate all measures included in Section 6.8 to manage erosion and sedimentation. • Process run-off water through additional sediment controls (e.g. sumps or sediment basins) and discharge at a low, non-erosive frequency. • Maintain as much vegetation as practicable and fence off areas of retained vegetation during construction. • Rehabilitate cleared or disturbed areas as soon as possible.
Biosecurity	• Siting of site infrastructure back from the Yanga State Conservation Area, with the appropriate retention of native vegetation where possible. • Employment of measures outlined in **Table 6-97** to manage site-based biosecurity issues.
Fire and Asset Protection Zones	• The Bushfire Management Plan will set out the relevant management measures during construction and operation. • All fencing erected for the Project should be constructed from non-combustible materials and designed for the intended purpose.
Noise, Visual, Air Quality and Amenity Impacts	• Development of site-specific management plans (where required) to mitigate impacts from noise, visual amenity, odour and dust.

6.9.6.3 REHABILITATION MANAGEMENT

The following measures will be implemented for rehabilitation:

- Consultation with key stakeholders including landholders;
- All above ground structures not required for the ongoing agricultural use of the land, including the WTGs, transformer stations, and substation, will be removed and the land rehabilitated to ensure it can be returned to agricultural use;
- Access tracks and hardstands not requested by the landowner to be retained will be removed and land rehabilitated and returned to agricultural use;
- Below ground infrastructure, including cabling and the WTG foundations, will be left *in situ* to avoid further disturbance and minimise clearing. The infrastructure will be removed to a minimum of 0.5 m below the ground surface and where required will be covered in clean fill material and topsoil;
- Rehabilitated areas will be adequately graded to reflect the slope of the surrounding area and to mitigate the risk of soil erosion;

- Preparation of a Decommissioning and Rehabilitation Plan for the Project no less than five years prior to decommissioning and / or in accordance with any project approval requirements.

The rehabilitation process is considered to take up to 18 months to complete.

6.9.7 CONCLUSION

The impact of the Project on agricultural activities would be small. The magnitude of these impacts would be constrained by the following factors:

- The relatively small amount of agricultural land permanently removed from production compared to the total Project Area and the total regional agricultural land;
- The continued grazing on most of the Project area during operation;
- The lack of any impact on cropping land;
- The relatively low agricultural productivity of the Project area;
- Low cumulative impacts;
- The relatively low biosecurity risk in the Project area, further reduced after mitigation measures are implemented; and
- Effective mitigation measures would be implemented to reduce the impacts of the Project on the agricultural industry.

The impact of the Project on agricultural productivity at a regional scale would be minimal due to the above factors. This loss would also have a negligible impact on agricultural support services, processing and value adding industries.

6.10 AIR QUALITY

6.10.1 INTRODUCTION

This section discusses the potential air quality related impacts associated the Project and summarises the mitigation measures to manage impacts to air quality that are associated with the Project.

Due to the lack of significant point and fugitive sources of air pollutants from the Project, a quantitative assessment was not deemed necessary.

6.10.2 METHODOLOGY

The following methodology was undertaken to assess the impact of the Project to air quality:

- Description of the local climate, including rainfall, wind speed and wind direction;
- Description of existing air quality based on background and monitoring data;
- Identification of sensitive receivers;
- Qualitative assessment of Project emissions; and
- Development of mitigation and management measures to control impacts.

6.10.3 EXISTING ENVIRONMENT

6.10.3.1 LOCALITY OVERVIEW

The Project Area is in a rural setting that is primarily used for agricultural purposes. It is unlikely that agricultural operations will have a significant influence on local and regional air quality.

Figure 3-5 identifies the dwellings within and surrounding the Project Area. There are two associated dwellings and 16 non-associated dwellings located within 8 km of the Project Area. These dwellings are primarily located on adjacent farms. The rural locality of Keri Keri was last reported (2016 census) to have a population of 10 people (ABS, 2023a) but was not captured in the 2021 Census due to its low population. Larger townships and localities exist to the west, Balranald (population of 2,208) and southeast, Moulamein (population 489) (ABS, 2023b). This sparse population density reflects the Project's rural setting.

6.10.3.2 LOCAL CLIMATE

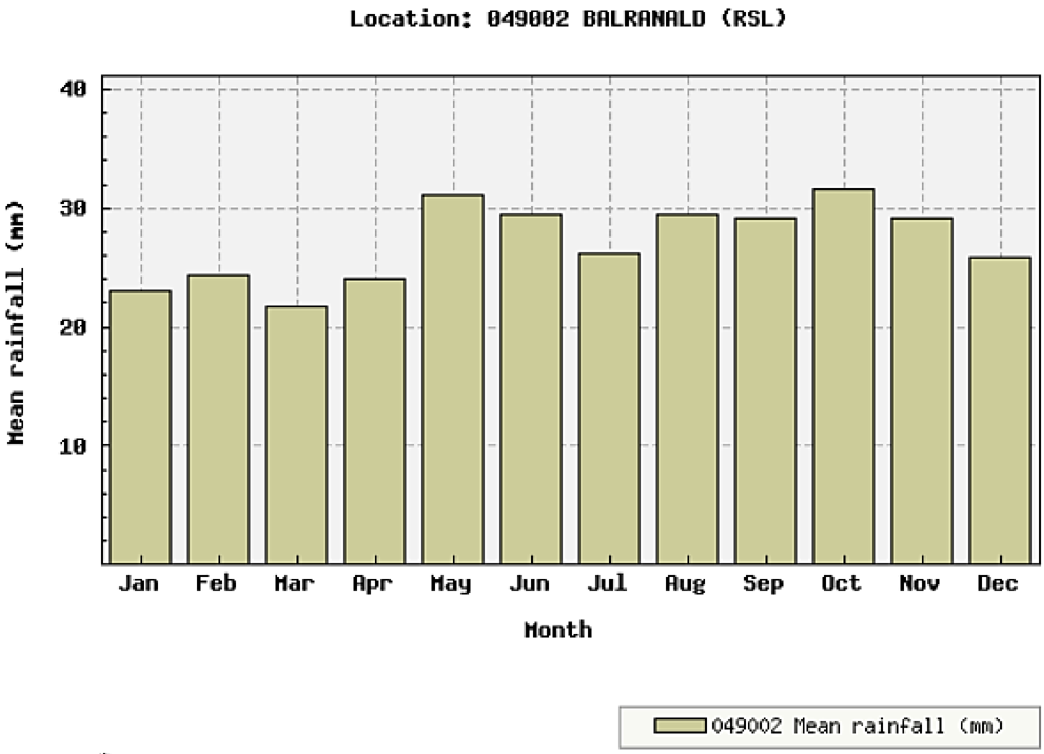
The Project is located within the RIV Bioregion. The Riverina Bioregion climate is characterised as semi-arid with low, winter-dominant rainfall, hot summers and cool winters.

The closest operating weather station is located at Balranald (RSL) (BoM Weather Station No 049002), located 41 km from Project Area. The mean annual rainfall (mm) for Balranald for the period between 1879 and 2024 is provided in **Table 6-100** and is presented graphically in **Figure 6-35**. The mean annual rainfall at Balranald was reported to be 325.2 mm, with the highest rainfall reported in October (31.6 mm) and the lowest mean rainfall in March (21.8 mm).

TABLE 6-100 MEAN RAINFALL (MM) BALRANALD WEATHER STATION (049002) 1879-2024

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean rainfall (mm)	23.1	24.3	21.8	24.1	31.1	29.4	26.1	29.4	29.1	31.6	29.2	25.8	325.2

FIGURE 6-35 MEAN RAINFALL (MM) BALRANALD WEATHER STATION (049002) 1879-2024



Australian Government
Bureau of Meteorology

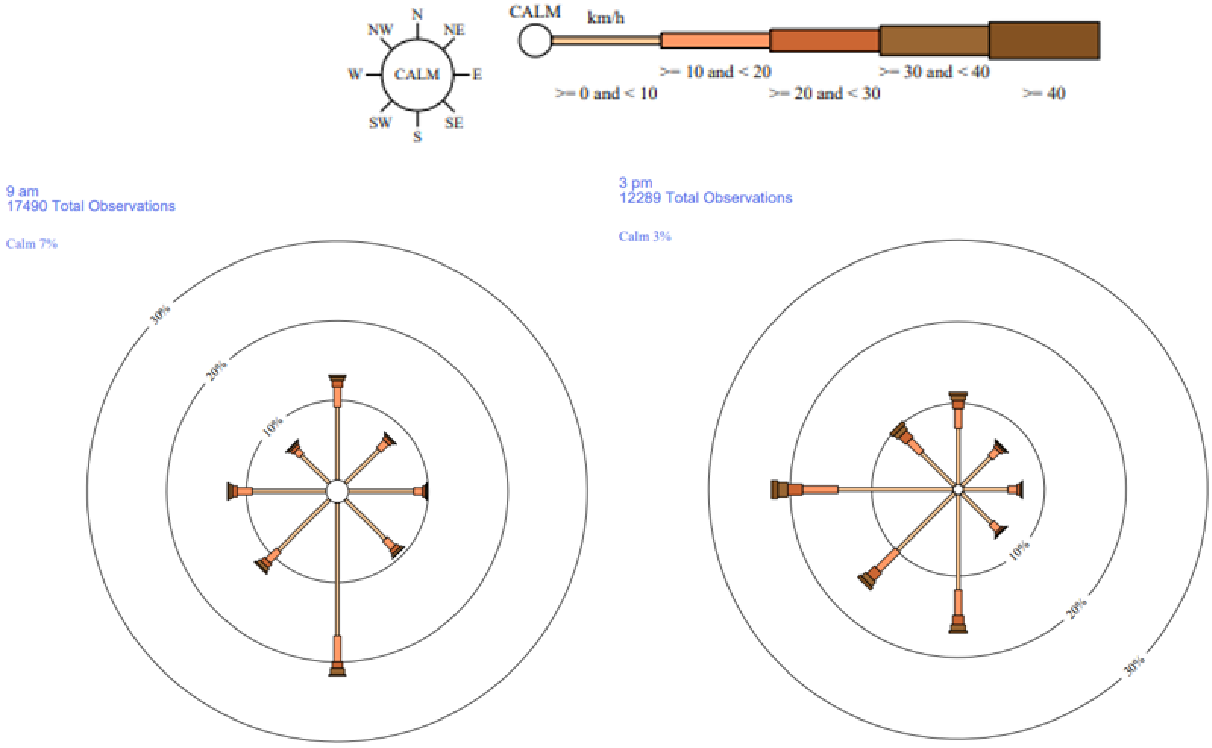
Wind Conditions

Across Australia, wind speed and wind direction measurements are made at various times of the day. Historically, these measurements tended to occur at 9am and 3pm. Wind roses summarise the occurrence of winds at a location, showing their strength, direction, and frequency, noting that:

- The percentage of calm conditions is represented by the size of the centre circle – the bigger the circle, the higher the frequency of calm conditions;
- Each branch of the rose represents wind coming from that direction, with the top of the diagram representing winds blowing from the north (e.g., northerly winds); and
- The length of the bar represents the frequency of occurrence of winds from that direction, and the colour and width of the bar sections correspond to wind speed categories.

The local wind speed and direction based on records recorded at Balranald Weather Station using records from 1965 – 2023 (BoM, 2024). These records are measured at 9 am and 3 pm (refer **Figure 6-36**).

FIGURE 6-36 9AM AND 3PM WIND SPEED VS DIRECTION AT BAL WINDSPEED VS DIRECTION AT BALRANALD WEATHER STATION (049002) 1965-2023



The dominant wind direction in the Balranald region is from the south during the 9 AM observations, and from the west at 3 PM. Windspeeds exceeded 40 km/h 20% of the time for both 9am and 3pm observations at their dominant directions.

6.10.3.3 LOCAL AIR QUALITY

The Project is located on land zoned entirely as RU1 (Primary Production). There are no heavy-emitting industries in Keri Keri or Balranald that are considered to have a significant impact to the air quality within the township.

Existing sources of air emissions in the locality include:

- Vehicle emissions – expected to be low for the site considering the low traffic volumes along the Sturt Highway;
- Dust generated during dry periods – generated from traffic, ploughed agricultural land, livestock grazing (particularly mustering) or agricultural machinery; and
- During winter months there may be minor increases in particulate matter due to smoke emissions from residential heating, and periodic backburning.

Air quality monitoring stations are installed at Hay (approximately 80 km east) and Euston (approximately 105 km west) of the Project Area. The stations provide hourly pollutant concentration data, including for particulate matter PM10 and PM2.5 and total suspended particles (TSP). These monitoring stations provide an indication of rural air quality. Both Hay and Euston typically recorded “good” daily air quality index (AQI) ratings (DPE, 2023).

6.10.4 ASSESSMENT OF IMPACTS

6.10.4.1 CONSTRUCTION

Air Quality

Emissions to the atmosphere from the Project are expected to predominantly be associated with construction activities which will be temporary and limited to:

- Localised dust emissions generated by land disturbance; and
- Exhaust emissions of civil construction and vehicle, plant, and machinery.

The anticipated construction timeframe for the Project is 24 months, with peak construction activities to occur over a 12-month period. During the construction phase, dust particles and other air quality emissions could potentially be released from activities including:

- Earthworks including clearing, erosion and sediment control, site levelling, access tracks, site drainage works, fencing and foundations;
- Construction activities associated with new or upgraded access tracks and roads;
- Excavation works and stockpile management;
- Mobile concrete batching plants;
- Rock crushing;
- Transport of material and equipment and haulage activities along unsealed roads;
- Processing and handling of material;
- Transfer points; and
- Loading and unloading of material.

Vehicular access within the Project Area will be provided via sealed roads; however, several new internal unsealed access tracks will be required to be constructed. The implementation of the recommended mitigation measures in **Section 6.10.5** will ensure that the Project can be constructed without any significant impact to local and regional air quality.

Greenhouse Gas Emissions

Direct GHG emissions are those emissions that are principally the result of the following activities undertaken by an entity:

- Generation of electricity, heat or steam. These emissions result from combustion of fuels in stationary sources;
- Physical or chemical processing. Most of these emissions result from manufacture or processing of chemicals and materials, e.g., the manufacture of cement, aluminium, etc.;
- Transportation of materials, products, waste and employees. These emissions result from the combustion of fuels in entity owned/controlled mobile combustion sources, e.g., trucks, trains, ships, aeroplanes, buses and cars; and
- Fugitive emissions. These emissions result from intentional or unintentional releases, e.g., equipment leaks from joints, seals, packing, and gaskets; methane emissions from coal mines and venting; hydrofluorocarbons (HFC) emissions during the use of refrigeration and air conditioning equipment; and methane leakages from gas transport.

The use of heavy machinery, equipment and heavy vehicles during construction of the Project will be limited to the construction phase and emissions will be localised and are therefore considered to be negligible.

6.10.4.2 OPERATION

Air Quality

During operations, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. However, ongoing maintenance of infrastructure and land will result in minor, localised vehicle and machinery emissions. These impacts will be temporary and minor.

The Project does not include any point or fugitive source of offensive odours pursuant to section 129 of the POEO Act.

Greenhouse Gas Emissions

The Project will contribute to air quality improvement through the displacement of GHG emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of approximately 2.6 Mt-CO_2e pa, as well as other particles that are associated with coal-fired power production. This is a substantial contribution towards minimising air pollution and reducing GHG emissions, thus a key environmental benefit of the Project relates to GHG emissions reduction.

6.10.4.3 DECOMMISSIONING

Potential impacts to air quality during the decommissioning of the Project would be similar to those during construction, with the omission of clearing vegetation and earthworks that are required for site preparation.

Additionally, at the time of decommissioning the Applicant will consider best available technologies to avoid and minimise air quality impacts, which may include the potential for decommissioning to be undertaken using future technology such as electrical vehicles.

Therefore, air quality impacts during decommissioning are expected to be less than those generated for construction.

6.10.5 MITIGATION AND MANAGEMENT

The implementation of mitigation measures will ensure that the Project will not generate significant air quality impacts during construction, operation or decommissioning.

Air quality impacts associated with the Project will be temporary and minor during the construction phase of the Project. Appropriate measures will be included in an Environmental Management Strategy (EMS) and associated subplans (e.g., Construction and Operation Environmental Management Plans), and implemented to minimise the potential for offsite dust impacts resulting from construction. As part of the detailed design, the Applicant will continue to investigate options to further avoid and minimise impacts.

Measures to be included in the EMS may include, where appropriate:

- Watering roadways or preparing roadways with coarse gravel or other road coverings where required to minimise wheel-generated offsite dust emissions;
- Covering and/or stabilising material loads which may generate dust, such as aggregates, during transport into and within the construction site where practicable;
- Managing soil stockpiles through stabilisation, light watering or the use of covers;
- Minimising vegetation clearance, including clearing vegetation in stages, and stabilisation of cleared areas where practicable;
- Managing vehicle speed when travelling on unsealed roads;
- Controlling the speed of dumping from tip trucks;
- Minimising vehicle movements, where practicable;
- Cleaning and washing of vehicles, plant and equipment;
- Regular inspection and maintenance of all vehicles, plant and equipment to ensure operational efficiency; and
- Regular monitoring of environmental conditions during construction, such as wind, that may result in dust generation and implementation of control measures as specified above.

With the implementation of mitigation measures, dust is unlikely to cause offsite impacts during construction and similarly during decommissioning.

During the operation phase, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. The Project will contribute to the improvement of air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of approximately 2.6 Mt-CO_2e pa which is a substantial contribution towards the reduction of anthropogenic generated GHG emitted to the atmosphere.

6.10.6 CONCLUSION

Potential impacts to air quality will largely be limited to the construction phase of the Project during activities such as vehicle/plant/equipment use, dust suppression and stockpile management. Ongoing maintenance of infrastructure and land will result in minor, localised vehicle and machinery emissions during the operational phase of the Project.

These potential impacts are effectively offset by the expected abatement of 2.6 Mt-CO_2e pa during the Project's lifetime, which will contribute to targets set on the state, national and global scale, as described in **Section 2.2**.

6.11 WASTE MANAGEMENT

The SEARs require the EIS to "identify, quantify and classify the likely waste streams to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste".

6.11.1 STATUTORY CONTEXT AND GUIDELINES

The assessment has been undertaken commensurate with the relevant requirements of the following legislation, policy and guidelines:

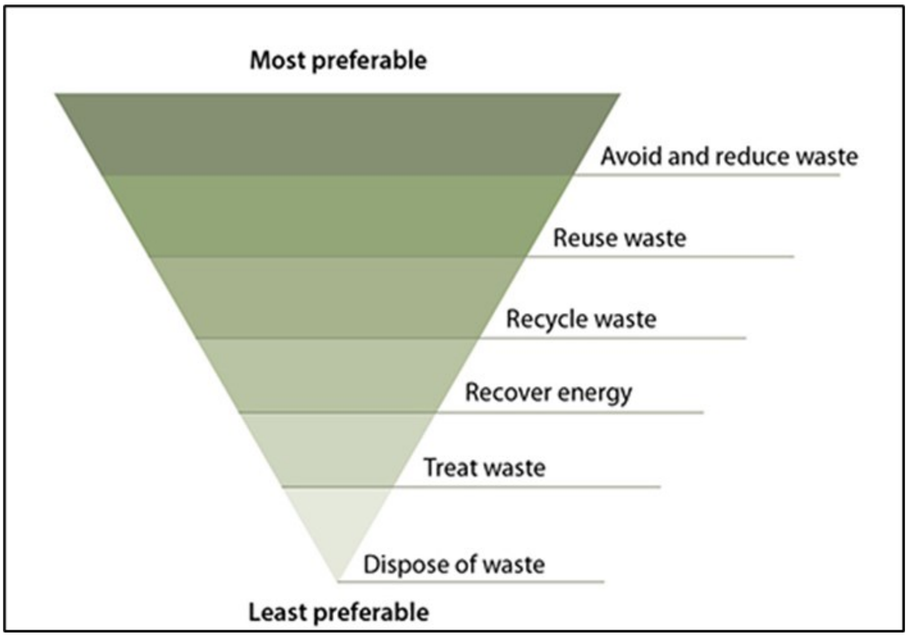
- *Protection of the Environment Operations Act 1997*;
- *Protection of the Environment Operations (Waste) Regulation 2014*;
- *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act);
- NSW Waste Avoidance and Resource Recovery Strategy 2014-2021 (NSW EOA, 2014a);
- Waste Classification Guidelines (NSW EPA, 2014a); and
- Resource Recovery Orders and Exemptions issued by the NSW EPA.

Best practice for waste management is to implement the resource management hierarchy principles, in accordance with the WARR Act and as set out in the Waste Classification Guidelines (Figure 6-37), which specify:

1. Avoid and reduce waste;
2. Reuse waste;
3. Recycle waste;
4. Recover energy;
5. Treat waste; and
6. Disposal of waste.

This waste assessment for the Project has followed this hierarchy.

FIGURE 6-37 WASTE HIERARCHY



Schedule 1, Division 1 of the POEO Act provides waste classifications, specifically:

- General solid waste (non-putrescible);
- General solid waste (putrescible);
- Hazardous waste:
- Liquid waste;
- Restricted solid waste; and
- Special waste.

6.11.2 EXISTING WASTE MANAGEMENT FACILITIES

Existing waste management facilities located in the Murray River Council LGA and surrounding LGA's are listed below in **Table 6-101**. Murray River Council LGA have five landfill sites, with one facility licensed under the POEO Act (MRC, 2023).

TABLE 6-101 EXISTING WASTE MANAGEMENT FACILITIES

Waste Management Facility	Responsible Local Council, Location and Hours of Operation	Waste Streams Accepted	Approx. Distance to Project (by road)	EP License
Mathoura Waste Transfer Station	• Murray River Council • Clifton Street West, Mathoura • Tuesday, Thursday and Sunday 8am to 4pm	Waste, general solid waste (putrescible and non-putrescible), waste tyres	200 km	-
Barham Waste Transfer Station	• Murray River Council • East Barham Road, Barham • Wednesday 9am to 5pm, Sunday 1pm to 5pm	Waste, general solid waste (putrescible and non-putrescible), waste tyres	158 km	-
Goodnight Landfill	• Murray River Council • Goodnight Road, Goodnight • Sunday 9am to noon	Waste, general solid waste (putrescible and non-putrescible)	82 km	-
Koraleigh Landfill	• Murray River Council • Koraleigh Road, Koraleigh • Wednesday 9.30am to 12.30pm, Sunday 1pm to 5pm	Waste, general solid waste (putrescible and non-putrescible)	107 km	-
Moulamein Landfill	• Murray River Council • Tchelery Road, Moulamein • Wednesday 1pm-5pm, Sunday 9am to 1pm	Waste, general solid waste (putrescible and non-putrescible)	62 km	-
Moama Waste Management Facility Centre Road	• Murray River Council • Centre Road, Moama NSW • 7 am to 5 pm Monday to Friday; and 9 am to 4.30 pm week-end and public holidays.	Waste, general solid waste (putrescible and non-putrescible), asbestos waste, waste tyres, clinical and related waste.	190 km	EPL 7395

Waste Management Facility	Responsible Local Council, Location and Hours of Operation	Waste Streams Accepted	Approx. Distance to Project (by road)	EP License
Deniliquin Waste Disposal Depot	• Edward River Council • Hay Road, Deniliquin NSW • None specified	Waste, general solid waste (putrescible and non-putrescible), asbestos waste, waste tyres, clinical and related waste	135 km	EPL 6188

6.11.3 WASTE GENERATION AND MANAGEMENT

Waste would primarily be generated during the Project construction and decommissioning phases. It is anticipated that wastes generated during operation would be minimal, associated with maintenance. Waste management is to be overseen by an authorised Waste Management contractor.

6.11.3.1 WASTE MANAGEMENT PRINCIPLES

A Waste Management Plan (WMP) will be prepared prior to construction of the Project and will describe the measures to be implemented to manage, reuse, recycle and safely dispose of waste. Specific measures to be included in the Waste Management Plan will include the following:

- Removal and handling of packaging waste;
- Separation of recyclable and non-recyclable materials with clearly identified areas to allow the separation of materials;
- Optimisation of on-site material usage (including prefabricated materials) to prevent excessive use or wastage;
- Separation of materials that meet Resource Recovery Orders for reuse at locations with appropriate planning approvals and managed under the relevant Resource Recovery Exemptions;
- Waste receptacles will be collected on a regular basis by licensed contractors or Council collection service and transported for offsite disposal at an appropriately licensed landfill or recycling facility;
- All waste disposal will be in accordance with the POEO Act and Waste Classification Guidelines (NSW EPA, 2014a);
- Waste tracking will occur for any types and quantities of waste that trigger the requirement for tracking;
- An objective of ensuring that any use of local waste management facilities does not exhaust available capacity, nor disadvantage the local community;

- Installation and operation of septic systems according to the Council regulations;
- All fuels, oils and hazardous substances used onsite will be stored in appropriately bunded locations to prevent release to the environment. Bulk storage areas for fuels, oils and chemicals used during construction will be contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with AS 1940- 2004 The Storage and Handling of Flammable and Combustible Liquids;
- In the event water is polluted by chemicals and/or firefighting materials (e.g., foams), the water will be collected, and disposed at an approved Liquid Waste Treatment Facility. A designated refuelling area should be established with drip trays installed and spill kits on stand-by. Should refuelling in the field be required, absorptive mats and drip trays are to be used in the refuelling process; and
- Training for all on-site personnel in appropriate waste management and prevention measures.

Targeted management strategies have been identified for each waste type, as detailed in **Table 6-102**.

6.11.3.2 ANTICIPATED WASTE GENERATION AND MANAGEMENT

The anticipated waste types generated by the Project during the construction, operation and decommissioning phases are detailed in **Table 6-102**. Quantities listed in the table are estimates.

Waste streams generated across all Project phases will be managed as described in the table and using the waste hierarchy, as illustrated in **Figure 6-37**. Further detailed breakdown of the waste types and quantities will be included in a Waste Management Plan to be prepared prior to construction. As an overarching principle, the waste minimisation hierarchy of avoid / reduce / reuse / recycle / dispose will be applied wherever possible to all decommissioning wastes. Any waste that is unable to be reused, reprocessed or recycled will be disposed of at a facility approved to receive that type of waste.

TABLE 6-102 IDENTIFICATION OF PROJECT WASTE STREAMS AND CLASSIFICATIONS

Waste Classification*	Waste Type	Waste Stream	Source	Estimated Quantity	Project Phase	Management
General solid waste (non-putrescible)	Green waste	Reuse	Site establishment and clearing of development footprint	N/A (reuse)	Construction	Onsite reuse where possible or reused offsite in accordance with the Mulch Resource Recovery Order and Exemption (NSW EPA, 2016).
General solid waste (non-putrescible)	Spoil	Reuse	Site earthworks	N/A (reuse)	Construction	Onsite reuse where possible or reused offsite as Virgin Excavated Natural Material or the Excavated Natural Material Resource Recovery Order and Exemption (NSW EPA, 2014b) (as applicable). Any offsite disposal to occur at appropriately licenced landfill.
General solid waste (non-putrescible)	Concrete	Recyclable	Construction waste, footings and laydown construction, decommissioned turbine footings and laydown areas	100 tonnes	Construction, Decommissioning	Source separated and stored in separate receptacles / storage areas. Reused onsite where feasible; reused offsite in accordance with the Recovered Aggregate Resource Recovery Order and Exemption (NSW EPA, 2014c); or transported off site for recycling.
General solid waste (non-putrescible)	Timber (incl. pallets)	Reuse / General Waste	Construction and packaging waste, store, workshop	250 m^3	Construction, Operation	Timber is to be reused on the site, including (where possible). Stored in separate receptacles / storage areas. Reused onsite where feasible or offsite transport for recycling. Unused pallets returned to source.
General solid waste (non-putrescible)	Plastic packaging	Recyclable	Construction and packaging waste, store, workshop, O&M office	1000 kg	All phases	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling.

Waste Classification*	Waste Type	Waste Stream	Source	Estimated Quantity	Project Phase	Management
General solid waste (non-putrescible)	Plastics (PET)	Recyclable	Construction waste, store, workshop, O&M office	500 kg	All phases	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling.
General solid waste (non-putrescible)	Cardboard packaging / paper waste	Recyclable	Construction waste, store, workshop, O&M office	230 m^3	All phases	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling.
General solid waste (non-putrescible)	Glass	Recyclable	Construction waste, store, workshop, O&M office	565 kg	All phases	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling.
General solid waste (non-putrescible)	Empty chemical drums	Recyclable	Construction waste, store, workshop, site maintenance	450 drums	All phases	Recycled via contractor or returned to supplier.
Liquid waste	Paint	Hazardous waste	Construction waste, store, workshop, site maintenance	500 L	Construction, Operation	Stored separately and transported by a licensed regulated waste contractor to a licenced regulated waste receiver for disposal.
General solid waste (non-putrescible)	Oil spill clean-up material	Hazardous waste	Construction waste, store, workshop, site maintenance	7000 L	All phases	Collected oily rags and spill clean-up material will be collected in regulated waste bins and transported by a licenced regulated waste contractor to a licenced regulated waste receiver for disposal.
Liquid waste	Waste oils, lubricants and liquids	Hazardous waste	Construction waste, store, workshop, site maintenance, decommissioned turbines and substation transformers	3,400 L	All phases	Stored separately and transported by a licensed regulated waste contractor to a licenced regulated waste receiver for disposal.

Waste Classification*	Waste Type	Waste Stream	Source	Estimated Quantity	Project Phase	Management
General solid waste (non-putrescible)	Metals (ferrous and non-ferrous)	Recyclable	Offcuts, damaged items, site maintenance, decommissioned turbines, O&M facility, substation and switching station	700 – 2000 kg per turbine	All phases	Scrap metal will be stored in for periodic transportation offsite to applicable recycling facilities.
General solid waste (non-putrescible)	Electronics and electrical infrastructure	Reuse, Recyclable, General solid waste	Offcuts, damaged items, site maintenance, decommissioned turbines, transformers, conductors, switches.	114 kg	All phases	Transported from site and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a).
General solid waste (non-putrescible)	Recyclable domestic waste	Recyclable	Construction offices, O&M office	7 tonnes	All phases	Stored in dedicated recyclable bins for periodic transportation offsite to applicable recycling facilities.
General solid waste (non-putrescible)	PPE	Recyclable	Construction and operational offices	1,600 kg	All phases	Recyclable PPE will be stored in large industrial bins for periodic transportation offsite to applicable recycling facilities.
Liquid waste	Septic tank waste	Sewage	Ablutions during construction, operations and decommissioning	800 kL	All phases	Collected waste will be transported by a licenced regulated waste contractor to a licenced regulated waste receiver for disposal.
General solid waste (putrescible)	Domestic wastes	General solid waste	Construction, operational and decommissioning offices.	7,900 m^3	All phases	Transported from site and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a).

* as per Schedule 1, Division 1 of the POEO Act

6.11.3.3 CONSTRUCTION PHASE

Waste generated during the construction would mainly be from works associated with site establishment and earthworks, including construction of access tracks and landscaping. During this phase, the onsite use of waste would be limited to reuse of excavated materials, including topsoil, excavated rock and sediment recovered from erosion and sediment control devices which will be reused onsite as general fill material, or will be incorporated within landscaping materials, where possible.

Some types of waste, such as hazardous chemicals, cannot be safely recycled and direct treatment or disposal is the most appropriate management option.

Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the *'Waste Classification Guidelines: Part 1 Classifying Waste'* (NSW EPA, 2014a). The Waste Classification Guidelines provide direction on the appropriate classification of waste, specifying requirements for management, transportation and disposal of each waste category.

The predominant types and classification of waste streams generated by the Project are listed in **Table 6-102**.

Under the waste definitions in the POEO Act, most of the waste generated during the construction phase would be classified as general solid waste, either putrescible or non-putrescible. Staff facilities such as transportable amenities buildings at the site would also produce sanitary wastes defined as general solid wastes (putrescible) is accordance with the relevant waste definitions under the POEO Act.

6.11.3.4 OPERATION PHASE

During the operational phase of the Project, the waste streams will be limited to minor quantities of putrescible waste associated with site maintenance activities and domestic and sewage waste (collected in septic tanks) from the O&M facilities. Collected waste will be transported by a licenced regulated waste contractor to a licenced regulated waste receiver for disposal.

Materials such as fuels and lubricants, redundant equipment and metals may require replacement over the operational life of the Project.

In general, the potential impacts associated with waste generation and management during the operational phase would be similar to those for construction, albeit at a much smaller scale. Waste streams during the operation of the Project would be limited to minor quantities of putrescible waste from staff amenities, redundant equipment, and general waste from maintenance activities.

6.11.3.5 DECOMMISSIONING PHASE

The decommissioning and site rehabilitation process will be undertaken in accordance with the NSW EPA's Waste Classification Guidelines, or any other guidelines relevant at the time of decommissioning, and shall generally include:

- Obtaining all necessary consents for decommissioning, demolition, remediation and rehabilitation;
- Consultation with stakeholders prior to and during the process;
- Preparation and implementation of a Decommissioning and Rehabilitation Environmental Management Plan;
- Deactivation, securing, making safe, isolation, and closure of the wind turbines, substations, and ancillary infrastructure;
- Installation of erosion and sediment controls as necessary;
- Removal of all liquids and other consumables from turbines, plant and electrical equipment;
- Removal and safe disposal of waste and hazardous materials;
- Dismantling or demolition and removal of turbines, buildings, structures, plant, equipment, services and other objects, excluding subsurface foundations, and services 200 mm below ground surface level, using best management practices for demolition and rehabilitation;
- Recycling the majority of the wind farm and substation components for scrap and materials, salvage and reuse with minimal disposal to landfill;
- Rehabilitation of the impacts of construction and decommissioning the wind farm and its components;
- Rehabilitation of the wind farm civil infrastructure components, including top soiling where necessary and seeding with local and indigenous vegetation;
- Maintaining the site in context of sediment and erosion control and weed management;
- Compliance with all laws applicable to the decommissioning, demolition or rehabilitation processes; and
- Monitoring of residual risks.

At Project retirement, the facility would be decommissioned with the various structures, plant, equipment and buildings de-energised, disconnected, dismantled, demolished and removed. It should be noted that the operating life of a BESS unit will be much shorter than the wind farm and would be expected to be decommissioned earlier than the wind farm.

The decommissioning and rehabilitation of the Project will be undertaken in accordance with the requirements and objectives of the Development Consent determined by the Minister for Planning and the requirements of the Landowner Agreements for the Project.

It is anticipated all major onsite decommissioning activities would be completed within a period of two years, with ongoing site monitoring and rehabilitation activities continuing for up to a further two years beyond this time. A dedicated Decommissioning and Rehabilitation Plan will include the management of decommissioning waste.

6.12 ECONOMIC

6.12.1 INTRODUCTION

The SEARs require the EIS to state any economic impacts or benefits of the project for the region and the State, including:

- Consideration of any increase in demand for community infrastructure services;
- Details of how the construction workforce will be managed to minimise local impacts; and
- Consideration of the construction workforce accommodation.

In responding to the SEARs, an Economic Assessment was prepared by Gillespie Economics.

Assessment of the regional and Statewide economic impacts were conducted utilising the input-output (IO) analysis. Qualitative consideration was given to:

- The potential impacts of the Project;
- The potential impacts of cumulative projects in the immediate area;
- The demand for regional and Statewide labour resources; and
- Other inputs to production.

The Economic Assessment report is included in **APPENDIX R**.

6.12.2 BACKGROUND

The Study Area that is relevant to the regional Economic Assessment consists of land in proximity to the Project area (approximately one hour driving distance). These areas include land within:

- Balranald LGA;
- Hay LGA; and
- Murray River LGA.

These areas have been included based on potential to:

- Provide labour and non-labour inputs to the Project;
- Derive economic benefits from the construction and operation of the Project;
- Experience impacts from reduction in agricultural activity; and
- Experience impacts from increased demand for labour and other inputs to production.

In 2021, the population of the region was 17,940 people and the labour force 8,172 people. Murray River LGA accounted for 72% of the population and 71% of the labour force.

The health of an economy can be judged by population change, as places that can attract population create increased demand for goods and services and thus more jobs. Over the past several decades, populations have been declining in many rural LGAs. However, the combined population of the regional economy has been growing at an average rate of 0.34% since 2006, compared to 1.34% per year for NSW. Again, this is driven by the Murray River LGA which had an average population growth rate of 1.06 since 2006, whereas Balranald and Hay LGAs populations declined across that period. The regional population is expected grow at an average rate of 0.7% between 2021 and 2041.

The main occupation of usual residents of the region were Managers, Professionals, Technicians and Trade Workers and Labourers, with all categories heavily influenced by the Murray River LGA workforce numbers. The most significant employment sectors for the region were *Local Government Administration, Hospitals (except Psychiatric Hospitals), Sheep Farming (Specialised), Grain-Sheep or Grain-Beef Cattle Farming, and Primary Education*. From an individual LGA perspective, the main employment sector for residents of Balranald was *Grape Growing*, while for residents of Murray River and Hay LGAs was *Sheep Farming (Specialised) and Hospitals (except Psychiatric Hospitals)*. The *Agriculture, Forestry and Fishing* sector is the most significant employment industry sector for the region, with *Accommodation and Food Services* sector also a prominent industry sector across the regional economy.

The value added for the regional economy was estimated at $850 M for 2021 (**APPENDIX R**) led by the following exporting industries:

- Agriculture, Forestry and Fishing ($399 M) mainly Sheep, Grains, Beef and Dairy Cattle Sector, and Other Agriculture;
- Manufacturing ($95 M) mainly Iron and Steel Manufacturing, Bakery Product Manufacturing, Sawmill Production Manufacturing, Meat and Meat Product Manufacturing, Wine, Spirit and Tobacco Manufacturing;
- Public Administration ($53 M);
- Accommodation and Food Services ($49 M); and
- Construction ($46 M).

These five industry sectors account for 78% of the total regional exports.

6.12.3 ASSESSMENT OF IMPACTS

The Project would provide economic activity to the regional and NSW economy during both construction and operation.

6.12.3.1 CONSTRUCTION PHASE

Construction expenditure is associated with manufacturing of equipment and expenditure across the following three construction sectors of the IO industry classification:

- *Heavy and Civil Engineering Construction Sector* – includes businesses involved in engineering construction and project management services for a diverse range of activities including on-site assembly of heavy electrical machinery from prefabricated components, transmission lines, road construction etc.;
- *Construction Services Sector* – includes businesses involved in earthmoving work such as levelling of construction sites, excavation of foundations, trench digging, concreting services, electrical services, hire of earthmoving plant with operator etc.; and
- *Non-Residential Building Construction Sector* – includes businesses engaged in the construction of industrial buildings.

The assessment has conservatively assumed that all machinery manufacturing will occur outside the state of NSW.

Over the two-year construction phase, average monthly employment is estimated to peak at 650 FTE, with average annual employment for the peak 12-months of construction (Year Two) being 400 FTE.

Based on the IO coefficients of the three construction sectors of the industry classification, $141 M of expenditure would be required across these sectors to generate the level of onsite workforce for a year.

The average annual construction impacts of the Project on the regional economy for the peak 12-months of construction are estimated at up to:

- $217 M in annual direct and indirect output;
- $74 M in annual direct and indirect value-added;
- $22 M in annual direct and indirect household income; and
- 524 direct and indirect jobs.

The impacts for Year One of construction (average annual employment of 327) are to be lesser, in proportion to the average annual employment levels.

The average annual construction impacts of the Project on the NSW economy for the peak 12-months of construction are estimated at up to:

- $340 M in annual direct and indirect output;
- $135 M in annual direct and indirect value added;
- $93 M in annual direct and indirect household income; and
- 910 direct and indirect jobs.

It is noted that the economic impacts are greater for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy, and thus greater production-induced and consumption-induced flow-on effects.

The construction of the Project has been assessed as impacting up to 1,137 ha of agricultural land that is currently used for sheep grazing, to which the associated AGIA (**APPENDIX Q**) estimates the foregoing of a maximum of $475,853 per annum in revenue.

The annual regional direct and indirect impact of foregone agriculture during Project construction is estimated at up to:

- $0.73 M in annual direct and indirect regional output;
- $0.31 M in annual direct and indirect regional value-added;
- $0.08 M in annual direct and indirect household income; and
- Two direct and indirect jobs.

Representing approximately 0.1% of direct agricultural economic activity in the region, it is considered that the agricultural impacts from the construction of the Project are negligible.

6.12.3.2 OPERATION PHASE

A similar assessment of the Project was undertaken for when it was in an operational phase, based on the following inputs:

- Estimated operational employment of twelve (three of which are assumed to reside in the region); and
- Output and expenditure profile as per the coefficients in the *Electricity Generation* sector of the region and NSW IO models.

The Project operation is estimated to make up to the following total annual contribution to the regional economy:

- $244 M in annual direct and indirect regional output;
- $210 M in annual direct and indirect regional value-added;
- $1 M in annual direct and indirect household income; and
- 34 direct and indirect jobs.

The Project operation is estimated to make up to the following total annual contribution to the NSW economy:

- $282 M in annual direct and indirect regional output;
- $229 M in annual direct and indirect regional value-added;
- $13 M in annual direct and indirect household income; and
- 132 direct and indirect jobs.

Like the construction phase, the economic impacts of operation of the Project are greater for the NSW economy due to less leakage of direct and indirect expenditure compared to the regional economy.

The operation of the Project has been assessed as impacting up to 225 ha of agricultural land (currently used for sheep grazing). The AGIA (**APPENDIX Q**) estimates this will equate to $9,017 per annum in forgone revenue from impacts to the *Sheep, Grain, Beef* and *Dairy Cattle* sector. Consequently, the annual agricultural impacts are considered to be minor.

6.12.4 MITIGATION AND MANAGEMENT MEASURES

Although the economic activity associated with the construction and operation of the Project would outweigh the loss of economic activity from the minor and temporary impact on agricultural production, a demand for a suitably qualified construction workforce in the region may impact on local businesses.

To minimise this risk, the Applicant proposes to work in partnership with local councils and the community to deliver a range of economic mitigation and management measures, including:

- Employment of regional residents where they have the required skills and experience;
- Participating, as appropriate, in business groups, events or programs in the regional community;
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive;
- Establishment of a Community Benefit Fund to be managed through a Voluntary Planning Agreement with Councils with the intention of supporting local non-profit organisations, community programs/events, local businesses, training, and services/infrastructure;
- Lease payments to host landowners that provide an alternative drought proof income with potential flow-on benefits to the regional economy; and
- Continued agricultural activities during the operational phase of the Project and reinstatement of full pre-project agricultural production following project decommissioning.

The above measures are to be enacted in tandem with those referenced within the Agricultural and Social Impact chapters of this EIS.

6.12.5 CONCLUSION

Following assessment of the regional economic impacts using the input-output analysis, it is considered that Project will provide positive economic activity to the regional economy during both the construction and operation phase. This economic activity will outweigh the minor and insignificant contraction in regional economic activity from the reduced agricultural activity within the development footprint.

6.13 SOCIAL

6.13.1 INTRODUCTION

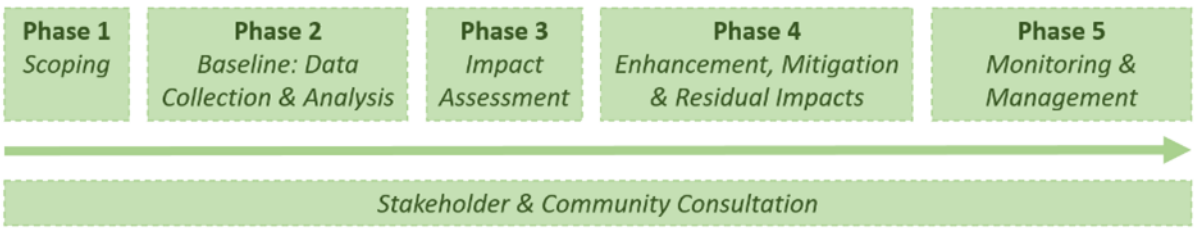
A Social Impact Assessment (SIA) was undertaken for the Project to identify and assess potential social impacts, provide management measures to minimise impact, and monitoring to track the success of these measures. The SIA is provided in full in **APPENDIX S**.

The SIA addresses the relevant requirements of the SEARs (**APPENDIX A**) and considers all relevant stakeholder engagement as described in Section 5. The SIA considered the following guidelines:

- 'Social Impact Assessment Guideline for State Significant Projects' (SIA Guideline) (DPE, 2023a); and
- 'Technical Supplement: Social Impact Assessment Guideline for State Significant Projects' (SIA Technical Supplement) (DPE, 2023b).

Figure 6-38 outlines the steps taken to complete the SIA.

FIGURE 6-38 SIA PROCESS



The phases adopted by the SIA are as follows:

- Phase 1: Scoping aimed to capture and characterise the likely social impacts to inform Project planning and ensuring level of assessment is proportionate to the scale and nature of the likely social impacts;
- Phase 2: The social baseline describes the social context in the absence of the Project. It documents the existing social environment, conditions and trends relevant to the impacts identified. The social baseline is the benchmark against which direct, indirect and cumulative impacts are predicted and analysed;
- Phase 3: The impact assessment undertaken in the SIA places people at the centre and considers the impacts from their perspective. The primary and secondary data collected and compiled for the social baseline, including community voices, is then assessed with the rigorous impact significance methodology, as outlined in the SIA Technical Supplement. In this approach, impact significance is understood as the likelihood of an impact occurring combined with the magnitude of impacts, both positive and negative, and prior to the application of any mitigation or management measures;

- Phase 4: Following the assessment of impacts, measures to avoid and/or minimise negative impacts are considered, including those implemented in earlier stages of Project planning and development. Where avoidance or minimisation is not possible, management strategies are identified. Where an impact is predicted to be positive, measures to enhance positive impacts are identified to ensure the maximum benefit to the community across all impact significance ratings; and
- Phase 5: The accuracy of the impact assessment, progress towards implementation of mitigation and management measures, and their effectiveness is understood through implementation of a monitoring and management framework. The framework includes a program for monitoring the predicted social impacts against actual impacts that arise as a result of the Project.

6.13.2 EXISTING ENVIRONMENT

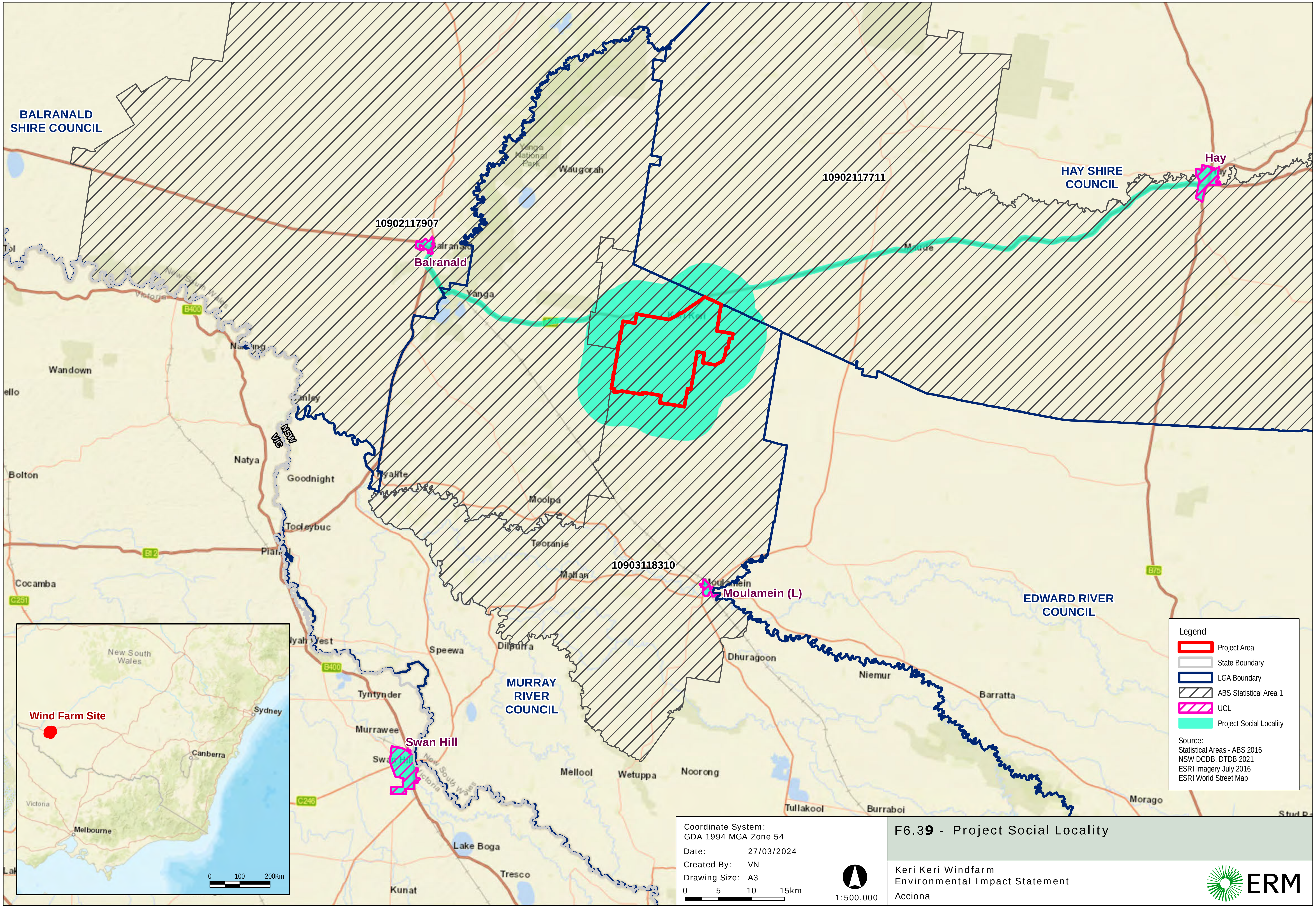
6.13.2.1 SOCIAL LOCALITY

The first step in a SIA is the scoping process, which helps to define the social area of influence, or Social Locality (**Figure 6-39**), as well as the potential interactions between the Project and people surrounding the Project who may experience impacts.

For the purposes of the SIA, the Social Locality includes the Project Area, the area surrounding the Project Area where noise, visual and other impacts may occur, the haulage routes where similar amenity impacts may be experienced, and the communities in larger centres that may provide workers or goods and services to the Project.

The Project's Social Locality is comprised of the following three components:

- The Project Area and immediate surrounding areas: located within the Murray River LGA. State level data for NSW and national level data for Australia are used to provide an understanding of the broader and comparative social context within which the Project sits;
- The transportation and haulage routes: wind farm components are anticipated to be transported from either the Port of Newcastle or Port of Adelaide to the Project Area (routes described in **Section 3.4.4**); and
- The surrounding towns and regional centres: Balranald is the nearest regional centre and may provide goods and services to support the construction phase of the Project. ABS Urban Centres and Localities (UCLs) provide baseline data for this regional centre.



Coordinate System: GDA 1994 MGA Zone 54
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F6.39 - Project Social Locality

Keri Keri Windfarm
Environmental Impact Statement
Acciona

ERM

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6.13.2.2 SOCIAL BASELINE

Locality and Land Use Context

The Project Area's immediate surroundings comprise sparsely populated rural farm properties. The Project Area contains limited social infrastructure or commerce, with the closest services available in Balranald, located approximately 30 km north-west of the Project Area.

The Project Area is spread over rural properties zoned 'RU1: Primary Production' under the Wakool LEP. The area surrounding the Project Area is generally also zoned RU1 – Primary Production, except for the Yanga State Conservation Area to the west of the Project Area, which is zoned C1 – National Parks and Nature Reserves.

Historically, the Project Area has mainly run Merino sheep for meat and wool production. The property that forms majority of the Project also undertakes some irregular cropping on a share farming basis. The Project surrounds are also generally used for sheep grazing and irrigated cropping and contains an extensive network of irrigation channels.

Population Demographics

The demographic of the Social Locality is generally characterised by an ageing population, consistent with that of the LGA and surrounding town centres. This Social Locality also has a much higher proportion of residents identified as Indigenous Australian when compared to the state of NSW. Section 4.2 of APPENDIX S below further summarises the primary ABS datasets used to provide key demographic data across the Project's Social Locality, drawing on select ABS datasets.

Access and Connectivity

The Project Area is adjacent to the Sturt Highway to the north, Keri Keri Road to the west, and rural properties to the south and east. The key access points into the Project Area are along northern boundary via the Sturt Highway and the Keri Keri Road running in parallel to the western boundary of the Project Area.

The Project Area is not accessible by public transport, and the closet railway station is in Swan Hill. Several airports are located within the region, including Deniliquin (DNQ), Swan Hill (SWH), Mildura (MQL), Griffith (GFF), Albury (ABX), and Wagga Wagga (WGA) airport.

The Hay LGA, approximately eight hours from Sydney and five hours from Melbourne, is ideally located with highways and main roads leading south to Shepparton, Bendigo and Melbourne, east to Wagga Wagga and Canberra, and northeast to Bathurst and Dubbo. This makes the route a popular drive and destination for tourists, bringing economic activity into the area. Hay can be accessed by public transport via train from Sydney or Melbourne to Cooramundra, with connecting bus services to Hay. There are also taxi services available in both Hay and Edward River LGAs.

Social Infrastructure and Community Wellbeing

Social infrastructure comprises schools and other education institutions, medical services, emergency services, recreational facilities and community organisations. Some commercial services are also listed under social infrastructure, such as childcare facilities.

Balranald

Balranald (population 1,063) (ABS UCL 2021) is located approximately 30 km from the Project Area and is a regional centre that may service the Project. Balranald provides medical services including, the Balranald District Hospital, Balranald Multipurpose Service (multipurpose service with 24-hour emergency and hospital services, residential aged care, and a range of primary and allied health services) and the Balranald Community Health Centre. The heritage and cultural activities in Balranald include the Malcolm Building Museum, the Old Balranald Goal, the Balranald Men's Shed and the discovery skate park and playground. Balranald also had a range of accommodation options, as well as FoodWorks and IGA.

Moulamein

Moulamein (population 339) (ABS UCL 2021) is located 50 km southwest of the Project Area and includes the Moulamein Art Gallery run by volunteers run gallery which is also serves cakes and refreshments. The gallery holds regular art workshops and exhibitions. Beside the gallery is a newly built Woolshed Pavilion by the men's shed group, and Howard Park which contains a public toilet block, a playground and a skate park. The Moulamein Football and Netball Club is located along Moulamein Road and contains a sports oval and two netball courts. During the site visit in February 2023, signage was exhibited about lighting upgrades which have been funded by the NSW Government.

Adjacent to the sports oval is the car park and trail leading to the 'Big Tree' – one of the largest River Red Gums in the Riverina which is positioned along the banks of the Edward River. The Big Tree is a Meeting Place and is considered culturally significant with Traditional Owners. Across the Edward River is the restored Old Court House, which served as courthouse for the town from 1890 to 1968. Moulamein is serviced by a Community Health Centre, the Edward River Gardens Residential Aged Care Facility, and has a local preschool and primary school.

Hay

The town of Hay (population of 2,882) (ABS UCL 2021) is located 75 km northeast and hosts a private and public primary school, a public high school, a childcare centre, TAFE campus, a hospital, a church, two NSW Rural Fire stations, and various shops, restaurants, and cafes. A finding from stakeholder engagement was that there is low enrolment in local schools (e.g., eight students enrolled in Year 12 at the Hay Memorial High School). Hay also includes a variety of sporting and social clubs, aged care services, support services, religious groups, a post office, supermarkets, accommodation and community infrastructure such as a library and memorial hall. Hay has a Health Service which provides primary health care services including community nursing, early childhood nursing, mental health services, palliative care, physiotherapy, speech therapy and nutrition. Bendemeer also has a range of accommodation options, a corner store, IGA, and FoodWorks.

Swan Hill

Swan Hill (population 10,869) (ABS UCL 2021) is a nearby regional centre serving the Project Area. The Swan Hill District Health provides a 24-hour emergency department and a range of acute care services for the region. Swan Hill also has two separate medical centres, the Swan Hill Medical Group and the Swan Hill Primary Health Medical Centre. Emergency services based in Swan Hill include VIC Police, Ambulance Station and CFA (Country Fire Authority). Swan Hill has private and public primary and high schools. A variety of religious organisations and churches are present in Swan Hill, along with branches of the Returned Services League (RSL), Swan Hill Rotary Club, and several sporting and recreation clubs including a boxing club, AFL football and netball clubs, bowls club, squash club, gymnastics club, lawn tennis and croquet club. The Swan Hill Justice Service Centre is in Swan Hill and is relatively close to the Project Area.

Other social infrastructure and activities includes the regional art gallery in Swan Hill, the Lake Boga Boat Museum, the Murray Downs golf and country club, and the Swan Hill Region Cycling and Walking Guide. This guide comprises trails for the Riverside Park, Murray Downs Track, Lake Boga and Pental Island. The surrounding regional centres to the Project include four councils, Hay Shire Council, Balranald Shire Council, Murray River Council and Swan Hill Rural City Council.

Community Values

Balranald, Hay, and Swan Hill are the regional centres which provide services to smaller surrounding towns, such as Moulamein.

Balranald

Balranald is the closest regional centre to the Project Area and was described during stakeholder engagement as a friendly and relaxing community with an older population. Balranald hosts a range of community events, such as fishing competitions, markets and theatre.

Moulamein

Moulamein is south of the Project Area and was described by the community during engagement as being a connected small community that is reasonably prosperous due to its location on the Murray River and considered to be a “can-do” community. Moulamein showcases numerous events and activities, including markets, the annual fishing competition, canoeing, kayaking and water skiing.

Hay

Hay, located over an hour drive east of the Project Area is known as an agricultural and cropping region that is generally regarded as one of the best wool growing merino regions in Australia. In addition to wool, the LGA supports sheep meat and beef cattle industries, an established cropping industry including the production of lettuce, pumpkins, tomatoes, maize, cotton, and wheat. Attractions such as festivals, museums and galleries has allowed tourism to act as another economic driver. Outdoor pursuits throughout the region include gardens, parks, and camping sites which are popular for locals and tourists.

Yanga

The Yanga National Park, Reserve and Conservation Area is a valued recreation area for the purposes of tourism, fishing, hiking, bird watching. The Yanga National Park, Reserve and Conservation Area also contains a number of heritage listed homesteads, woolsheds and camping grounds. Yanga Lake was very significant during the pastoral era (1840s-1980s) because they enabled large areas of saltbush pasture on the surrounding waterless plains to be utilised for sheep grazing. The grasses produced around the lake shore as water receded were also excellent cattle feed. Yanga Lake was also the centre of operations for several commercial fishing families during part of the last century.

Housing and Accommodation

Rental affordability and availability are the most likely portion of the housing market to respond to change in population prompted by large projects and is a key component for economic vitality of communities and wellbeing of individuals (Lawrie, Tonts, & Plummer, 2011). Generally, housing stress can occur when rent exceeds 30% of a low-income household gross income.

SGS Economics & Planning (SGS) in partnership with National Shelter, Beyond Bank, and Brotherhood of St Laurence have published the Rental Affordability Index (RAI) since 2015 (SGS, 2022). The findings identify that in Quarter 2, 2022 Hay was considered 'Very Affordable', while for the Murray River LGA (including Balranald and Swan Hill) Quarter 2, 2022 the data was unavailable (SGS, 2022).

Vacancy Rate

SQM Research's housing vacancy rate data draws on a combination of ABS data and online data from monitoring major property listing sites to provide a time-series analysis on a monthly and postcode scale (SQM Research 2022).

A review of housing vacancy data (SQM Research, 2022) shows that postcode 2715 (containing Balranald) in February 2021 had the highest vacancy rate at 1.2%, by December 2022 the vacancy rate had dropped to 0.0%. Postcode 2733 (containing Moulamein) had a peak vacancy rate of 4.5% in June 2010 and dropped to 0.0% in March 2023. Postcode 2711 (containing Hay) had a peak vacancy rate of 6.3% in May 2020, by October 2020 the rate dropped to 2.7% and by December 2022 the vacancy rate was at 0.3%. Postcode 3585 (containing Swan Hill) experienced its highest vacancy rate in March 2013 at 2.0% and by December 2022 the vacancy had dropped to 0.4%.

Overall, the LGAs of the Social Locality include the Hay LGA which has a vacancy rate of 17.4% and Murray River LGA with a vacancy rate of 16.0% (ABS, 2021).

Rental Availability

Regarding rental availability in the social locality, at the time of writing in March 2024, postcode 2711 (containing Hay), had one rental property available. Postcode 2715 (containing Balranald) and postcode 2733 (containing Moulamein) currently have no rental properties available, and postcode 3585 (containing Swan Hill) has seven rental properties available (REA Group, 2022). According to 2021 ABS data, 27 of 140 (19.3%) of existing rental properties in Balranald LGA are managed by real estate agencies. In the Murray River LGA, 325 of 685 (47.4%) rental properties are managed by real estate agencies (ABS, 2021).

Short-term tourist accommodation such as hotels, motels, cabins and caravan parks are important in regional areas to provide accommodation for visitors and to support regional tourism and economic activity. The following is an overview of short-term accommodation providers in the Social Locality:

- Three providers within Murray River LGA;
- Eight providers within Balranald LGA; and
- Eleven providers within Hay LGA.

Accommodation Camps

Balranald is experienced with temporary workforces and their accommodation and service challenges due to the prior development of projects across the LGA. Balranald hosts an existing temporary accommodation camp or "Donga Camp" which was developed for the Sunraysia Solar Farm by QCV, a joint venture of Qantac Villages and Harvey Norman Holdings Ltd (James Golsworthy Consulting, 2018). The "Donga Camp" has capacity to provide acommodation for 169 people, and further capacity for 120 people as of January 2024. It is understood that a Development Consent has also been issued that will allow for a increase in capacity to accommodate 400 people. It is anticipated that the "Donga Camp" will be used across multiple projects within the Social Locality, including mining and other infrastructure projects.

The Project will develop and use an on-site workers accommodation camp to house most of the non-local workforce during the construction phase. This development of the on-site workers accommodation camp and associated facilities will align with the proposed construction period for the Project (i.e., Q1 2025) and is detailed in **Section 3.3.7.5**.

Given the limited capacity of existing short-term accommodation options and long-term housing pressures outlined in the previous sections, an on-site accommodation camp is considered an appropriate option to mitigate the risks of exacerbating these existing accommodation issues.

6.13.3 ASSESSMENT OF IMPACTS

The key drivers of social change that may affect communities in the Social Locality resulting from the Project relate to:

- Accommodation arrangements and locations for construction workforce and, to a lesser extent, the operational workforce;
- Procurement opportunities for local businesses and employment opportunities for the local workforce;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers, etc.); and
- Land use and landscape changes leading to changes in amenity (e.g., visual) and changes to Country (Aboriginal cultural heritage).

Technology to support renewable energy projects is continuously evolving and improving. Accordingly, following the 30-year operational timeframe, components of the wind farm may be upgraded to prolong the life of operation, or decommissioned and the land returned to the original land use. Given the timeframe involved, the Decommissioning Phase has not been assessed in this SIA. It is noted that the potential social impacts associated with the decommissioning of the Project will be considered as part of a future Decommissioning Plan (or similar).

In assessing the potential impacts, the SIA has considered the:

- Characteristics of the Project, including the timing, duration and intensity of activities (where known);
- Issues raised by stakeholders during the engagement process; and
- Outcomes from technical studies undertaken by the Project (noise, visual, cultural heritage etc.).

The likelihood of an impact occurring along with its magnitude of impact as assessed above combine to yield a rating of social impact significance, as described in **Table 6-103**.

TABLE 6-103 ADAPTED DPE SOCIAL IMPACT SIGNIFICANCE MATRIX (DPE, 2023B)

		Magnitude level				
		1 Minimal	**2 Minor**	**3 Moderate**	**4 Major**	**5 Transformational**
Likelihood level	**A** Almost certain	Medium	Medium	High	Very High	Very High
	B Likely	Low	Medium	High	High	Very High
	C Possible	Low	Medium	Medium	High	High
	D Unlikely	Low	Low	Medium	Medium	High
	E Very unlikely	Low	Low	Low	Medium	Medium
*Where impacts are positive the following colour scale is used:						
	Positive		Low	Medium	High	Very High

Table 6-104 provides an overview of predicted impacts likely to be experienced by different stakeholder groups pre-mitigation and post-mitigation, as well as cumulative impacts likely to arise from additional projects in the wider region.

TABLE 6-104 SUMMARY OF PROJECT IMPACT ASSESSMENT

Project Activities and Potential Impacts	Impact Category and Stakeholders Affected	Pre-Mitigation/ Enhancement Rating			Post-Mitigation / Enhancement (Residual Rating)		
		Magnitude of Impact	Likelihood	Impact Significance	Residual Magnitude of Impact	Residual Likelihood	Residual Impact Significance
Construction Phase							
Stakeholder and Community							
Project engagement is not transparent and inclusive. Stakeholders do not feel they have been heard and are unable to influence Project decisions.	Decision-making Systems: Project Neighbours, Wider Community	Minor	Possible	**Medium**	Minimal	Unlikely	**Low**
Employment and Procurement							
Increased demand for labour creates direct and indirect employment and training opportunities for the local community.	Livelihoods: Local Workforce, Wider Community	Moderate	Possible	**Medium**	Moderate	Likely	**High**
Increased demand for labour creates skills shortages. Other businesses in the region cannot find the skilled employees they need to operate their businesses due to the presence of the Project.	Livelihoods: Local Businesses	Minor	Possible	**Medium**	Minor	Unlikely	**Low**
Increased demand for goods and services helps to stimulate the local economies. Businesses within the Social Locality benefit from increased economic activity associated with the construction workforce and Project material requirements.	Livelihoods: Local Businesses	Moderate	Possible	**Medium**	Moderate	Likely	**High**

Project Activities and Potential Impacts	Impact Category and Stakeholders Affected	Pre-Mitigation/ Enhancement Rating			Post-Mitigation / Enhancement (Residual Rating)		
		Magnitude of Impact	Likelihood	Impact Significance	Residual Magnitude of Impact	Residual Likelihood	Residual Impact Significance
Local Disruptions							
Transportation of materials and equipment to the Project Area has the potential to cause road traffic inconvenience and safety impacts for road users along the haulage routes to site and on local roads. Risk of traffic injury or in the worst case a fatality, resulting from increased vehicle movements during the transportation of goods and workers to and from the site.	Health and Wellbeing: Host Landowners, Project Neighbours, Wider Community, Visitors to the Region	Major	Likely	**High**	Moderate	Possible	**Medium**
Increased disruption, congestion and wear and tear on local roads, leading to inconvenience for road users and requirement for more frequent repairs.	Health and Wellbeing: Host Landowners, Project Neighbours, Wider Community, Visitors to the Region	Major	Likely	**High**	Moderate	Possible	**Medium**
Construction environmental impacts, including noise, vibration, dust, visual amenity, and increased risk of fire. Various impacts resulting from construction activities, generally felt by people living in proximity to construction activities, such as degradation of air quality and health impacts as a result of increased generation of dust and particles from land clearing, and the use of heavy vehicles and equipment.	Health and Wellbeing: Host Landowners and Project Neighbours	Moderate	Likely	**High**	Moderate	Possible	**Medium**

Project Activities and Potential Impacts	Impact Category and Stakeholders Affected	Pre-Mitigation/ Enhancement Rating			Post-Mitigation / Enhancement (Residual Rating)		
		Magnitude of Impact	Likelihood	Impact Significance	Residual Magnitude of Impact	Residual Likelihood	Residual Impact Significance
Accommodation and Worker Influx							
Increased demand for short, medium, and long-term accommodation to house construction workforce leads to shortages of private and tourist accommodation, and increased rents.	Way of Life: Wider Community, Visitors to the Region	Moderate	Possible	**Medium**	Minor	Very Unlikely	**Low**
Decisions to accommodate the construction workforce will result in the inequitable distribution of Project benefits.	Livelihoods: Local businesses, Wider Community.	Moderate	Possible	**Medium**	Minor	Unlikely	**Low**
Increased demand for local services including retail, social infrastructure and recreational facilities, and emergency services due to temporary increase in local population.	Access: Wider Community Local Businesses, Visitors to the Region	Moderate	Possible	**Medium**	Minor	Unlikely	**Medium**
Operation Phase							
Employment and Procurement							
Direct and indirect jobs will be created due to the Project.	Livelihoods: Local Workforce	Moderate	Likely	**Medium**	Major	Likely	**High**
Demand for locally procured goods and services during the operation phase of the Project. There is strong interest in the local economic opportunities associated with Project procurement.	Livelihoods: Local Businesses	Moderate	Likely	**Medium**	Major	Likely	**High**

Project Activities and Potential Impacts	Impact Category and Stakeholders Affected	Pre-Mitigation/ Enhancement Rating			Post-Mitigation / Enhancement (Residual Rating)		
		Magnitude of Impact	Likelihood	Impact Significance	Residual Magnitude of Impact	Residual Likelihood	Residual Impact Significance
Diversification of income streams for rural businesses (host landowners). Landowners will receive payments for hosting wind turbine infrastructure, diversifying the income streams that are available to them.	Livelihoods: Host Landowners	Major	Almost Certain	**Very High**	Major	Almost Certain	**Very High**
Land Use and Landscape							
Perceived potential impacts to neighbouring land values is common with opposition to wind farms and was mentioned during stakeholder engagement.	Livelihoods: Host Landowners and Project Neighbours	Minor	Unlikely	**Low**	Minimal	Unlikely	**Low**
Altered rural character, including visual amenity impacts. Changes to rural landscape character through installation of industrial infrastructure.	Surroundings: Host Landowners, Project Neighbours, Wider Community, Visitors to the Region	Minor	Likely	**Medium**	Minor	Possible	**Medium**
The EMI of the WTGs will impact the performance of an electronic devices.	Livelihoods: Host Landowners, Project Neighbours, Wider Community, Visitors to the Region	Minor	Unlikely	**Low**	Minimal	Very Unlikely	**Low**

Project Activities and Potential Impacts	Impact Category and Stakeholders Affected	Pre-Mitigation/ Enhancement Rating			Post-Mitigation / Enhancement (Residual Rating)		
		Magnitude of Impact	Likelihood	Impact Significance	Residual Magnitude of Impact	Residual Likelihood	Residual Impact Significance
Aircraft safety associated with the WTG locations and tip heights. Potential impacts on aerial agriculture and water bombing for fire suppression activities.	Livelihoods: Host Landowners, Project Neighbours, Emergency Services	Minor	Likely	**Medium**	Minor	Possible	**Medium**
Altered landscapes have the potential to impact tangible and intangible Aboriginal heritage.	Culture: Traditional Owners	Major	Possible	**High**	Minor	Unlikely	**Low**
Stakeholder and Community							
Development of a Community Benefit Fund, a Project-specific community benefit sharing scheme, which may generate positive outcomes for the local community.	Community: Wider Community	Major	Almost Certain	**Very High**	Major	Almost Certain	**Very High**
Impacts to community cohesion through divided opinions about the desirability of the Project in the community. Community cohesion is potentially impacted at the level of relationships between individuals who support the Project and those who do not support the Project.	Community: Project Neighbours, Wider Community	Minor	Possible	**Medium**	Minor	Unlikely	**Medium**
Real or perceived adverse potential health impacts associated with blade glint and shadow flicker, with electromagnetic interference, noise generation from WTG operation, or from potential damage to WTG structures (e.g., blade coming free).	Health and Wellbeing: Host Landowners and Project Neighbours	Minor	Likely	**Medium**	Moderate	Possible	**Medium**

Project Activities and Potential Impacts	Impact Category and Stakeholders Affected	Pre-Mitigation/ Enhancement Rating			Post-Mitigation / Enhancement (Residual Rating)		
		Magnitude of Impact	Likelihood	Impact Significance	Residual Magnitude of Impact	Residual Likelihood	Residual Impact Significance
Cumulative Impacts							
Cumulative socio-economic impacts from an additional project in the region. Cumulative impacts affecting access to services are possible, particularly trades and accommodation arising from this Project combined with other proposed renewable development projects in the region.	Surroundings: Wider Community	Major	Likely	**High**	Moderate	Likely	**High**
Cumulative impacts arising from the transportation of materials and equipment to the Project Area has the potential to cause wear and tear on roads, road traffic congestion and community safety impacts for road users.	Surroundings: Wider Community	Major	Possible	**High**	Major	Unlikely	**Medium**
Cumulative visual amenity impacts from an additional project associated with the region. Cumulative impacts to surroundings are likely, particularly visual amenity across the wider area arising from this Project combined with other proposed renewable development projects in the region.	Surroundings: Wider Community	Moderate	Possible	**Medium**	Moderate	Possible	**Medium**

6.13.4 MITIGATION MEASURES

The preliminary Social Impact Management Plan (SIMP) contained in Section 6 of **APPENDIX S** provides a summary of the management and mitigation measures relevant to the identified Project impacts during construction and operation. Management and mitigation measures may include:

- Develop and implement a CEMP informed by the EIS to manage construction environmental impacts, consistent with component studies included in the EIS, which includes (but not limited to) dust, bushfire and biosecurity risk management;
- Update and implement a SEP to engage surrounding landowners and wider community to publicise environmental measures in place to protect aquatic environments, to understand traffic movements and local road use patterns and preferences, and to understand land devaluation concerns;
- Create awareness amongst the community, in partnership with LGAs and other partner organisations to foster a better understanding as to the ways prospective workers may be able to take part in the Project (e.g., using a Project specific website and through existing communication channels within the LGAs);
- Develop and implement complaint management mechanisms to ensure that community concerns are identified and acted upon;
- Develop and implement a Local Employment Plan and Local Content Plan with the Engineering, Procurement and Construction (EPC) Contractor to consider the following:
  - Local procurement incentives to achieve maximum local employment;
  - Monitor for skills shortages within the region to consider with EPC recruitment objectives;
  - Monitor for local price inflation and goods availability attributable to increased demand from the Project workforce;
  - Achieve maximum local economic impact through targeted procurement of local goods and services;
  - Track and report on the local content used for the Project in order to demonstrate the extent to which local content is being accessed;
- Develop and implement a Workforce Accommodation Management Plan which will include the following measures:
  - Monitor for impacts to accommodation availability and cost inflation attributable to Project workforce accommodation arrangements;
  - Monitor for accessibility impacts to local services attributable to increased service demand from the Project workforce. If service accessibility is identified e.g., increased wait times to access medical services, consider recruiting additional temporary resources to the area;
- Establish, implement and publish information of the CBF to the wider community;
- Engage surrounding landowners and local aerial agricultural and aerial firefighting operators to discuss exclusion zones and address aerial spraying and water bombing concerns;
- Implementation of the ACHMP informed by the heritage assessments in the EIS;

- Implementation of the TMP informed by the TIA in the EIS; and
- Implementation of the visual amenity mitigation measures as informed by the LVIA in the EIS.

Additionally, the SIA provides a monitoring framework for the social impact management measures during construction and operation phases of the Project (refer Section 7 of **APPENDIX S**). The monitoring framework will be integrated with the broader EMS to be developed for the Project.

The monitoring framework key aims are to verify the predicted impacts and identify any other impacts that may arise, confirm that management measures are being implemented as planned, and assess the effectiveness of the management measures.

The monitoring activities will include:

- Record queries and complaints received from stakeholders, local employment, employee retention rate, number of apprenticeships, number of training programs undertaken, number of trees planted to fulfil required screening planting mitigations;
- Ensure major contractors report on local employment;
- Report on number of and value of contracts with local and regional businesses; and
- Record and publish detailed information on funds available and payments made through the CBF.

6.13.5 CONCLUSION

The key drivers of social change that may affect communities in the Social Locality resulting from the Project relate to:

- Accommodation arrangements and locations for construction workforce and, to a lesser extent, the operational workforce;
- Procurement opportunities for local businesses and employment opportunities for the local workforce;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers, etc.); and
- Land use and landscape changes leading to changes in amenity (e.g., visual) and changes to Country (Aboriginal cultural heritage).

Mitigation measures described in the SIMP aim to maintain ongoing engagement with the local community, provide grievance mechanisms and implement monitoring plans to minimise escalation of any issues described in this SIA.

6.14 CUMULATIVE IMPACTS

6.14.1 INTRODUCTION

The Cumulative Impact Assessment Guidelines for State Significant Projects (CIA Guidelines) require the consideration of impacts from the Project in combination with other past, present and reasonably foreseeable future SSDs (DPIE, 2021d).

The CIA Guidelines state that the assessment should focus on the key matters that are within the immediate geographical area of influence of the Project (e.g., within proximity to the Project Area) and within the relevant strategic context.

This section draws on the relevant aspect-specific assessments undertaken as part of the preparation of this EIS, which have identified and addressed potential cumulative impacts related to that aspect.

The CIA Guidelines state that the CIA is to focus on the key matters that could be materially affected by the cumulative impacts of the Project and other relevant future developments. As such, an assessment of the potential cumulative impacts to aspects including biodiversity, historic heritage, water, bushfire, air quality and waste has not been undertaken as it is considered that these potential impacts are primarily confined to the Project Area and are negligible in a broader context.

6.14.2 EXISTING ENVIRONMENT

In accordance with the CIA Guidelines, the Project has considered past, present and reasonably foreseeable future SSD projects, and only included the types of development specified in Section 3.4 of the CIA Guidelines.

The Project will contribute to the overall development of the South West REZ. Relevant proposed, approved, under construction and operational SSDs known at the time of finalisation of this EIS and within and in the vicinity of the South West REZ are shown in **Figure 6-40** and summarised in **Table 6-105**. As shown, most of these developments are renewable energy projects.

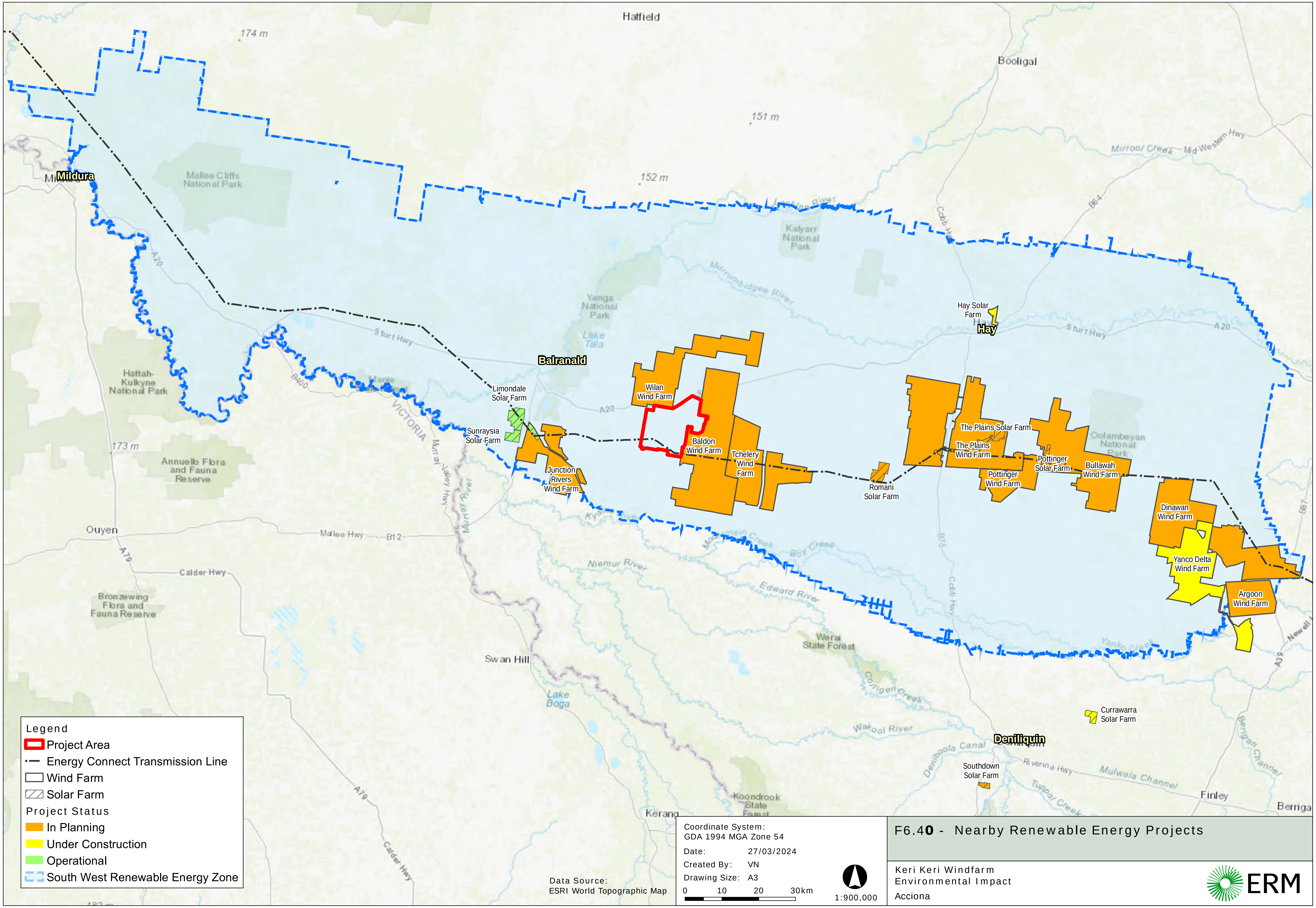

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TABLE 6-105 PROXIMATE SSD WITH CUMULATIVE POTENTIAL

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).
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.	153 km south-east	• Construction expected to commence 2025. • Construction period up to 36 months. • Commissioning expected 2028.

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

Project	Description	Distance (km) [1]	Construction Period / Timeline
	• 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.		
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 (Prepare EIS)	• 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.	93 km north-west	• Construction period expected to last 12-months.

Project	Description	Distance (km) [1]	Construction Period / Timeline
	• Currently under construction.		
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	0 km (transects the Project Area)	• Construction and remediation work expected to be completed in 2025.

6.14.3 STRATEGIC PLANNING FRAMEWORK

Section 2 of this EIS discusses the strategic context of the Project with reference to relevant strategic planning publications. In consideration of the Project and relevant future developments, most of those detailed align with the relevant objectives of the:

- United Nations Sustainable Development Goals;
- UNFCCC COP28 and COP21;
- Australian Government's Renewable Energy target;
- *Climate Change Act 2022*; and
- NSW Government Commitments.

Most relevant future developments identified are renewable energy developments that will provide affordable, reliable and sustainable energy. These developments will assist Australia and NSW in meeting their respective emissions reduction targets. They will also assist NSW in the development of affordable, reliable and sustainable renewable energy generation, transmission and storage. The South West REZ will connect multiple generators and storage in the same area, to capitalise on economies of scale to deliver cheap, reliable and clean electricity for homes and businesses in NSW.

The Project, as well as the relevant future developments have or are all progressing assessments required under their relevant planning approvals pathways, which will minimise impacts on the environment and their respective social localities. For example, most of the wind and solar farms would have had to undertake a visual impact assessment and implement either design modifications or management measures to avoid or minimise impacts. This process assists in preserving the rural landscape, which is a key objective of relevant local strategic planning statements and community strategic plans.

More broadly these developments will provide social and economic benefits to the region. They will encourage economic development within the region, by supporting both employment and economic growth. While all developments would endeavour to hire locally, it is inevitable that skilled labour from outside of the region would be also required; however, this will also benefit local business and the community through an increased in demand for local services, and diversification of communities.

6.14.4 CUMULATIVE IMPACT SUMMARY

Potential cumulative impacts associated with the Project have been addressed in relevant technical assessments and the relevant findings summarised in this EIS. A summary of the potential cumulative impacts of key environmental aspects is provided below.

6.14.4.1 BIODIVERSITY IMPACTS

It is anticipated that the removal of native vegetation as a result of the 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.

6.14.4.2 ABORIGINAL AND HISTORIC CULTURAL HERITAGE

As the Project Area contains Aboriginal Objects, there are cumulative impacts associated with any land uses which would result in impacts to these elements. This is particularly noteworthy due to the general lack of registered AHIMS sites otherwise registered within the region. It is also acknowledged that continued development within the Riverina Murray Region has the potential to result in a cumulative impact to the cultural values of the local area. However, changes to the Project design to avoid Aboriginal heritage sites where possible has mitigated cumulative impacts across the region.

Note that there were no historic heritage impacts identified.

6.14.4.3 NOISE IMPACTS

The proposed Willan Wind Farm, immediately to the north of the Project, has the potential to contribute wind turbine noise to the Project's sensitive receivers due to its proximity, as shown in **APPENDIX I**.

The nearest non-associated and worst-affected dwelling impacted by the Project and the proposed Wilan Wind Farm is Dwelling 19. This dwelling is 2,227m from the nearest WTG in the Project and 1,300 m the nearest WTG in the proposed Wilan Wind Farm (based on the Scoping Report for Wilan Wind Farm (Biosis, 2022). It should be noted that dwelling 19 is associated with Wilan Wind Farm.

The Scoping Report for Wilan Wind Farm (Biosis, 2022) notes the following:

Cumulative noise levels associated with concurrent operation of the Project, the nearby Keri Keri Wind Farm and Baldon Wind Farm projects have also been considered. An assessment of the predicted noise levels for each wind farm has demonstrated that potential cumulative noise effects need to be considered but do not affect the compliance outcomes for any of the assessed projects.

It should be noted that the findings in the Wilan Wind Farm Scoping Report are based on the Keri Keri Scoping Report (ERM, 2022) which had originally assessed 176 wind turbines with a total capacity of 1,003 MW. With the latest Keri Keri Wind Farm total capacity being 883.5 MW (155 wind turbines), the predicted cumulative noise levels in the Wilan Wind Farm Scoping Report are expected to be lower.

Ancillary equipment for the Keri Keri Solar Farm which have the potential to contribute to a cumulative ancillary noise impact are not confirmed at this stage. Based on the proposed location of Keri Keri Solar Farm, noise from ancillary equipment is unlikely to the contribute to the Project predicted ancillary noise levels. Notwithstanding this, the ancillary noise assessment for the Keri Keri Solar Farm shall consider ancillary noise sources from Keri Keri Wind Farm and Wilan Wind Farm.

Based on the above, cumulative noise impacts at any of the Project's sensitive receivers are unlikely.

6.14.4.4 LANDSCAPE AND VISUAL IMPACTS

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the Project in conjunction with other SSDs (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future. Cumulative visual effects may also affect the way a landscape is experienced and can be positive or negative. Where they comprise benefits, they may be considered to form part of the mitigation measures.

Of the SSDs listed in Table 6-105, Wilan Wind Farm (WWF), Keri Keri Solar Farm and Baldon Wind Farm (BWF) are located in close proximity to the Project. Through the application of the Multiple Wind Turbine Tool undertaken in the LVIA (**APPENDIX K**), it was identified that:

- The highest level of visibility of all three wind farm projects is likely to occur along the Sturt Highway and at dwellings 45, 80-81, 70-71, 77 and 107, although it was noted that these dwellings are more likely to have views from WWF and BWF, with a more distant view of the Project;
- BWF and distant views of the Project will be present from dwellings 42, 12, 89 and 90. It is considered likely that dwelling 42 is associated with BWF;
- The majority of WWF and the Project will be likely be visible from Dwellings 19 and 99. Dwellings 19 and 99 are associated with WWF, with the Applicant undergoing consultation with these landholders;
- Willowvale Rest Area will have a high visual impact from both WWF and the Project. The existing landscape character from this viewpoint is considered to be low scenic quality, and does not offer any key landscape of scenic features; and
- No dwellings or key public viewing locations were identified within 4,000 m of the Keri Keri Solar Farm panels. The nearest dwellings are dwellings 93 and 62 which have been identified as associated dwellings for the Project.

6.14.4.5 AGRICULTURAL PRODUCTION AND LAND USE IMPACTS

The cumulative impact of the Project and other SSDs on agriculture for the region is considered low. As all identified Projects have a relatively small impact to agriculture, and the total amount of agricultural land taken out of production relative to entire Project Areas, the impact to the regional agricultural productivity is anticipated to be minor. Consequently, the effect on regional agricultural production would be minimal and no impact on the number of persons employed in the agricultural sector would be expected.

Regionally, solar farms are anticipated to have a larger impact to agricultural production than transmission lines and wind farms. As the Project Area is not used for cropping, and the impact to grazing is minimal, it is considered that the Project will not have significant cumulative impacts to regional agriculture.

6.14.4.6 TRAFFIC AND TRANSPORT IMPACTS

The Project Area is within the South-West REZ, which comprises of operational renewable energy developments, as well as a number of proposals that are in the construction or planning phase.

The projects most likely to result in cumulative impacts are the Wilan Wind Farm, Baldon Wind Farm, Tchelery Wind Farm, Junction Rivers Wind Farm and Project EnergyConnect. While these projects are located within close proximity of the Sturt Highway and are expected to use this road as the key construction transport route, the Wilan Wind Farm, Baldon Wind Farm and the EnergyConnect projects are likely to be operational prior to the commencement of construction activities at the Project site, which ensures that there will be no significant cumulative traffic implications associated with these projects.

For the remaining projects with likely overlaps in construction timing (Tchelery Wind Farm and Junction Rivers Wind Farm), it is considered that there will be no significant cumulative traffic impacts given the significant spare capacity in the surrounding road network to accommodate construction traffic.

Frequent communication between the construction contractor for the Project (once appointed) and other concurrent construction contractors that share a common route with the proposed development will assist to minimise associated traffic impacts.

6.14.4.7 BUSHFIRE

Multiple projects (in varying phases of completion) within proximity of the Project have the potential to result in cumulative impacts. The cumulative impacts related to bushfire mitigation include:

- Volunteer fire-fighter workload – while response call outs should not significantly increase because the ignition risk will be low, there will be an ongoing requirement for briefing on the Emergency Management and Operations Plan.
- Construction stage transport and road use – the bushfire mitigation measures will add a small percentage to the total construction traffic and road use.
- Ongoing operations – there are not expected to be any cumulative operational impacts.

The proximity of multiple projects of s similar scale actively managing fire risk could assist in management responses and may create a positive cumulative impact, when measured against the existing conditions.

In consultation with key stakeholders, the preparation of the Emergency Management and Operations Plan will consider the most current information available regarding fire risk from and toward surrounding land uses.

6.14.4.8 AVIATION IMPACTS

The aviation impact assessment determined that it was unlikely that the Project would cause cumulative light impacts or wake or turbulence impact to any nearby ALAs.

6.14.4.9 ECONOMIC IMPACTS

The economic assessment includes an assessment of relevant future SSD projects located within 100 km of the Project area and/or within the South West REZ. The cumulative impact assessment considered the multiple projects proposed in the region, which can result in magnification of economic impacts and a competition for resources. Each issue relevant to the cumulative impact assessment is qualitatively addressed in **Table 6-106**.

TABLE 6-106 ECONOMIC CUMULATIVE IMPACT SUMMARY

Issue	Impact
Initial Cumulative Labour Stimulus	There are more than 13 renewable energy projects of varying capacity proposed, approved or under construction in the region. The main cumulative economic impact of these projects (and other regional projects that are not related to energy) is to generate a large demand for a suitably qualified construction workforce in in the region. The labour demand is to be met from a mixture of the regional workforce as well as the wider NSW and Australian workforce.
Population Impact	It is unlikely all the cumulative labour demand can be met from the existing residents of the region, and cumulative job stimulus results in workers (and their families) relocating to regional areas that can result in population growth (or abate population decline), including in areas experiencing population decline. Population growth is an important driver of the health of regional economies with regional migration increasing demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability.
Accommodation Impact	Cumulative regional population changes driven by regional employment growth will increase demand for short-term and long-term accommodation. This may increase housing prices and rents, and cause shortages of short-term accommodation that might otherwise be used for tourism or other purposes. However, given the more temporary nature of population change, normal longer term housing supply adjustments may be tempered and so there will be a need to encourage and facilitate the provision of additional accommodation including temporary workforce camps. It is noted that the Project proposes on-site accommodation for its temporary construction workforce so is unlikely to impact on regional accommodation shortages.
Regional Job Growth	Cumulative demand for labour in regional areas can help address the jobs growth imbalance between Australia's faster-growing large cities, and the regions by: • providing opportunities for the existing and future regional workforces • attracting middle-and high-skilled workers and families to regional areas reducing outmigration of the regional workforce to look for employment in cities, and • increasing regional labour force participation. Regional projects can therefore provide a boom to non-coastal regional economies that have experienced low growth or decline due to globalisation and associated structural adjustment.

Issue	Impact
Stimulus to Regional Economic Activity	Cumulative projects in regional NSW will provide a substantial boost in direct economic activity in the region as well as flow-on economic activity to businesses that are able to supply the goods and services required for project construction and operation and that are demanded by workers.
Impacts on Other Sectors of the Economy	Excess demand for construction workers can in the short run lead to increased construction sector wages and attraction of workers from other relevant sectors. Other impacts could include labour shortages in other areas of the economy, rising inflation, and excess demand for inputs to construction. Short run excess demand for inputs to construction such as quarry materials, concrete etc. could also result in rising costs (prices) for these factor inputs and potentially shortages for other uses. However, markets are expected to adjust in the medium term with increased labor force participation, new quarry proposals to supply demand and enable wages and prices to return to previous levels.
Agricultural Impacts	The assessment finds that the negative regional economic impacts of the loss of agricultural land for the project were negligible in comparison to the positive regional economic activity from the project. Similar findings are likely to apply across most renewable energy projects on land that tends to be on low land capability soils. The cumulative impact of projects on the regional economic activity of agriculture is therefore likely to be minor.
Mitigation Measures	The magnitude and duration of cumulative wage, price and supply shortages will largely depend on the ability of the labour, housing, and other markets to make supply adjustments. Use of FIFO/DIDO and workforce accommodation will reduce impacts on the regional labour market (wage increases and labour shortages) and accommodation market (price/rent increases). However, this will also reduce regional economic activity benefits as FIFO/DIDI workers will repatriate most of their income back to their home region. The ability of the labour, housing, and other markets to make timely supply adjustments (housing supply adjustments, new quarry proposals) may in some instances be impacted by local planning systems, requiring Council's to be aware of any flow-on effects of their decision making powers.

6.14.4.10 SOCIAL IMPACTS

Wind farms can provide a significant economic boost to local communities, both during the construction and operational phases. Feedback received during stakeholder engagement centred around the cumulative socio-economic benefits of large-scale renewable energy projects across the South West REZ, with some stakeholders explaining that the Project, along with others in the region, will help to contribute to the sustainability of the region from both an economic and environment perspective.

Despite this however, stakeholders also raised potential areas of concern, including:

- Cumulative impacts arising from the transportation of materials and equipment to the Project Area has the potential to cause wear and tear on roads, road traffic congestion and community safety impacts for road users;
- Amenity related impacts (i.e., visual). The LVIA identified that there is potential for cumulative visual impacts to arise from the simultaneous visibility of the Project, Wilan Wind Farm (760 m north of the Project Area), Baldon Wind Farm (350 m west of the Project Area) and Keri Keri Solar Farm (southwest corner of the Project Area). Accordingly, consideration will need to be given to impacted dwellings, and how visual impact can be appropriately managed to reduce amenity concerns; and
- Cumulative impacts affecting access to services are possible, particularly trades and accommodation arising from this Project combined with other proposed renewable development projects in the region.

6.14.5 MITIGATION MEASURES

APPENDIX B provides a consolidated summary of all the Project’s environmental management and monitoring measures, identifying all the commitments in the EIS. These measures will also minimise cumulative impacts. No specific mitigation measures to minimise cumulative impacts were identified.

7. PROJECT JUSTIFICATION

This section provides a broad justification and evaluation of the Project with reference to its environmental, economic, and social impacts, and the principles of ecologically sustainable development. It evaluates how the relevant strategic factors and statutory requirements have been satisfied. This section includes a review on how the community views about the Project have been addressed and how the uncertainties associated with the Project could be managed.

7.1 PROJECT DESIGN EVOLUTION

The Project has been subject to an ongoing iterative design and siting process with the objective of developing an efficient Project that avoids and minimises environmental and social impacts. The Project layout for which approval is sought has identified and considered environmental risks and, where relevant, feasible and reasonable addressed issues raised during stakeholder engagement.

A range of alternative Project designs were considered to avoid potential environmental impacts, as detailed in **Section 2.3.4**. The Applicant has continued to evolve the design as technical assessments were progressed avoiding or minimising impacts to, for e.g., areas of high biodiversity value containing remnant woodland vegetation, sensitive Aboriginal cultural heritage areas, and to minimise landscape and visual amenity (refer **Section 6**). The irregular shape of the Project Area and Development Footprint is a legacy of this process.

Where potential impacts could not be avoided, design principles were sought to minimise impacts and/ or mitigation measures proposed to manage the extent and severity of impacts. The mitigation and management measures proposed to minimise impacts across all aspects assessed are summarised in **APPENDIX B**.

Since the scoping phase (refer Scoping Report [ERM, 2022]) the design has been refined as shown in **Figure 2-2** to **Figure 2-4**, which included:

- Relocation and reduction of the number of WTGs from up to 176 WTGs (Scoping Report [ERM, 2022]) to up to 155 WTGs (this EIS) to avoid areas of high biodiversity and Aborigianl heritage constraint, and minimise visual impacts to dwellings 19 and 99;
- Reducing the internal electrical reticulation network from approximately 383 km to approximately 239.8 km to minimise potential impacts to biodiversity and cultural heritage;
- Alterations to the layout of anciallary infrastructure, such as internal access tracks and electrical reticulation to avoid areas of cultural heritage sensitivity; and
- Optimisation of the Project layout and improvement of the electrical reticulation design through considered use of overhead transmission lines and main substations.

As necessary, the Project will continue to evolve, within the assessment area, to ensure that the placement of infrastructure and extent of construction activities will be further optimised to provide additional avoidance and minimisation of impacts.

7.2 CONSISTENCY WITH STRATEGIC CONTEXT

Section 2.2 presents an overview of the key regulatory commitments, strategic goals, local and regional plans that are relevant to the Project. The Project is consistent with key regulatory commitments and strategies as it will:

- Help NSW and Australia reduce its reliance on coal and gas-fired energy production, which is linked to atmospheric pollution, water pollution, land pollution and human health impacts;
- Contribute to a net reduction in NSW and Australia's greenhouse gas emissions by replacing coal and gas fired energy generation, which are greenhouse gas emission intensive, with a proven, reliable renewable energy source. Greenhouse gases have been linked to climate change; therefore, the Project will provide a benefit to current and future generations in line with the principles of ecologically sustainable development;
- Improve the security and reliability of the NEM with the inclusion of a 200 MW / 800MWh BESS that will provide dispatcheable energy storage;
- Generate enough renewable energy to supply up to 579,000 average NSW homes per year;
- Contribute to the continued growth of renewable energy generation and storage capacity in the South West REZ (and NSW);
- Generate employment, leading to local economic stimulus, including provision of approximately 910 direct and indirect jobs for the peak 12-months of construction and 34 direct and indirect operational jobs in the region, in addition to the estimated 132 direct and indirect operational jobs for NSW;
- Generate economic stimulus to the regional and NSW economy of:
  - Up to $217 M in direct and indirect output to the regional economy and up to $340 M to NSW economy during construction;
  - Up to $244 M in direct and indirect output to the regional economy and up to $282 M to NSW economy during operations;
- Provide ongoing benefit-sharing with the community through the CBF proposed to be implemented for the life of the Project to provide continuing value to the Murray River LGA and regional community, by supporting local and meaningful community development or neighbourhood-level initiatives that have strong community support;
- Provide a diversified income stream for landowners (hosting Project infrastructure) through payments to host landowners. The income provided can assist rural landowners make farms more resilient to the impacts of droughts, fires and commodity price fluctuations; and
- Ensure mitigation measures will be applied to avoid or minimise impacts.

7.3 COMPLIANCE WITH RELEVANT STATUTORY REQUIREMENTS

As discussed in **Section 2.2**, the Project will support the Australian and State governments strategies, plans and polices to achieve their respective renewable energy and greenhouse gas emission reduction targets. Importantly, the Project will contribute to the continued growth of renewable energy generation and storage capacity in the South West REZ.

The Project is also consistent with several regional community goals, including those in the Murray River Local Strategic Planning Statement 2020 and Murray River Council Community Strategic Plan 2022-2032, as described in **Section 2.2**.

The permissibility of the Project has been described in **Section 4.2**, and the compliance of the Project with other approvals, as well as mandatory matters for consideration are outlined in **Sections 4.3** to **4.5**, **Section 6** and **APPENDIX C**. An assessment of the consistency of the Project with the objects of the EP&A Act pursuant to Section 1.3 is provided in **APPENDIX C**.

Through the adoption of management and mitigation measures described throughout **Section 6** and compiled in **APPENDIX B**, and appropriate design and site selection the Project complies with statutory requirements.

7.4 CONSISTENCY WITH COMMUNITY VIEWS

Engagement comprised a range of stakeholders including NSW and Australian Government agencies, the nearby community and community groups, Aboriginal groups, proximate landowners and infrastructure owners, as described in **Section 5**.

A significant number of engagement activities were conducted throughout the development of the EIS and scoping phase to discuss the Project with the community and to build an understanding of potential concerns, opportunities and mitigation strategies. These included community drop-in sessions, one-on-one meetings, phone and email interactions, community events, workshops, Project's website, newsletters, flyers, letters, factsheets, briefings, media releases, social media and site visits (refer **Section 5**).

Feedback from the community included both positive and negative views on a range of aspects of the Project. Overall, the Project is supported by a significant number of local community members in the Murray River LGA, who have recognised the benefits of the Project as a source of employment opportunities, long-term support to community groups, events, and service providers and generation of clean energy.

During engagement activities, key issues raised included impacts of the Project on opportunities for local contractors, suppliers and workforce, workforce accommodation, landscape and visual amenity, biodiversity, Aboriginal and historic heritage, traffic management and road maintenance during the construction phase, land use, and bushfire risk. The Applicant will continue to work with the community to address such issues (refer **Section 5.3**).

7.5 SCALE AND NATURE OF IMPACTS

The Project will primarily be developed on land with a lack of remnant woodland vegetation and in a manner to avoid impact to wetland areas. The Project layout has been designed to maximise the use of existing disturbed areas and to avoid and/or minimise impacts to identified biodiversity and Aboriginal cultural heritage values, and nearby non-associated receivers. Progressive design iterations for the wind farm, BESS, and associated infrastructure have continued throughout the development of this EIS with key drivers being measures to avoid and minimise environmental and social impacts in line with the Avoid-Minimise-Mitigate-Offset design hierarchy.

7.5.1 ENVIRONMENTAL IMPACTS

This EIS and relevant technical assessments have assessed the potential impacts of the Project to various environmental aspects, these are summarised in **Table 7-1**.

As outlined in **Section 6**, the potential environmental impacts associated with the Project can be appropriately managed through the implementation of recommended management, mitigation and monitoring measures. These are compiled in **APPENDIX B.**

TABLE 7-1 ENVIRONMENTAL IMPACTS SUMMARY

Aspect	Environmental Impacts
Biodiversity	The Project layout and Development Footprint have been refined to avoid and minimise impacts to biodiversity to the greatest extent feasible. For example, the full mapped extent of PCT 26, which conforms to the Weeping Myall Woodland TEC, has been avoided by the Project. The BDAR also concluded that no impacts to SAII entities are expected. However, the Project will result in direct impact on native vegetation and potential habitat of Candidate threatened species as follows: • Slender Darling Pea (*Swainsona murrayana*) – 789.20 ha • Mossgiel Daisy (*Brachyscome papillosa*) – 1,021.82 ha • Chariot Wheels (*Maireana cheelii*) – 769.52 ha • Little Eagle (*Hieraaetus morphnoides*) – 16.33 ha Importantly most of these areas of potential impact were calculated based on assumed presence of candidate species. The BDAR has assumed presence of these species as the survey effort for these species specified in the BAM was not met due to significant weather events, the large project area, and short survey windows. The Applicant intends to continue survey for these species, during the requisite season, post-submission of the EIS. Direct impacts of the Project are based on the total area of vegetation assumed to be clear across four vegetation zones within the Disturbance Footprint. To compensate for unavoidable clearing or native vegetation and species habitat, offsets are proposed.
Aboriginal Cultural Heritage	The surveys undertaken to inform the ACHAR identified 209 new Aboriginal cultural heritage sites within the Project Area. Nine (9) previously registered Aboriginal sites were within the Project Area. Throughout the development of the EIS, the design has been refined to avoid most of these new and existing Aboriginal cultural heritage sites. However, up to 9 of these sites were assessed as subject to potential high impact as they are within the proposed permanent infrastructure area, and 4 were assessed as subject to potential high impact as they are within the proposed disturbance footprint. All other sites were assessed as subject to potential moderate or low impact as impacts can be easily avoided.
Historic Heritage	There are no items listed on the National and Commonwealth Heritage Listing, State Heritage Register, Wakool LEP and/or Section 170 Heritage Register within 5 km of the Project Area. Due to the limited historical material observed during surveys and outside the proposed Development Footprint, the Project has nil to low potential to impact any historic heritage sites.
Noise and Vibration	During operations, the NVIA predicted that the noise emissions from the Project will not exceed the PNTLs at any noise sensitive receiver. The NVIA assessed the worst-case predicted noise levels at the nearest dwellings (Associated and Non-Associated) against criteria from the Bulletin. The NVIA has found no impact to noise sensitive receivers. Further, based on the low noise levels predicted for the Project, it is not considered that cumulative noise impact of the Project and nearby SSDs will result in any adverse noise impacts.

Aspect	Environmental Impacts
Traffic and Transport	Four site accesses have been designed to allow access to the Project Area during construction and operation. One direct access off Stuart Highway to the site and three accesses via the Stuart Highway / Keri Keri Road / Loorica Road intersection. The construction and operation of the Keri Keri Wind Farm can be undertaken without significant adverse impacts to surrounding road network taking into consideration the proposed mitigation measures detailed in the TIA, including the implementation of a Traffic Management Plan and necessary intersection improvement works. Overall, the road network can accommodate the traffic, loads and type of vehicle movements generated by the Project during construction and operation, and in consideration of the cumulative traffic movements generated by other major projects. Therefore, no impact from the Project on the road network is expected.
Landscape and Visual	The preliminary assessment included in the LVIA identified thirteen (13) non-associated dwellings within 8 km that required a detailed assessment. Three (3) additional dwellings (dwellings 105, 106 and 108) more than 8 km from a Project WTG were identified also included in the detailed assessment. Detailed assessments were also undertaken for eight (8) lots with dwelling entitlements. The LVIA concluded that most of the non-associated dwellings would have a '**negligible**' or '**low**' visual impact rating. Two (2) dwellings with assessed with the potential for a '**moderate**' visual impact. Existing vegetation will minimise the visibility of majority of the turbines from all non-associated dwelling and the implementation of mitigation measures will assist with minimising changes in the landscape over time. Thirteen (13) public viewpoint locations within the Study Area were assessed according to the viewer sensitivity level rating. Four (4) of these were classified as being Visual Influence Zone 2 (VIZ2 – moderate). The assessment concluded that even though these viewpoints were rated VIZ2 – moderate, the existing land use, vegetation and other factors minimises these.
Hazards and Risks	Aviation Safety – The Aviation Impact Assessment determined that the Project would not infringe on any OLS or PANS-OPS surfaces; however, it would impact on two grid LSALTs and designated air routes that will need to be raised to 2,200 ft. While wake turbulence effects were assessed as unlikely for aviation operations at Jeraly Station ALA and Keri Keri ALA, consultation with those landowners is recommended. The Project was assessed to not have an impact on operational airspace, is wholly contained within Class G airspace, and would be outside the clearance zones associated with civil aviation navigation aids and communication facilities. Night lighting was only recommended on meteorological monitoring masts that are not in proximity to WTGs. Telecommunications – Adequate clearance is provided between the proposed WTGs and the nearest point-to-point telecommunication transmitter/ receiver. The WTGs are not located in the reflection or scatter zones. Optus Mobile Pty Ltd who manages Link 1, and NSW RFS who manage Link 2 and 3 have been consulted regarding the proposed WTG layout and required clearances, and are yet to provide comments. It is generally possible to design around these issues as the link paths and potential interference zones for these signals can be determined. Other conflicts can be readily resolved by application of standard management and mitigation measures. Electric and Magnetic Fields – Potential measured electric fields from the proposed WTGs are considered to be below the ICNIRP reference levels. The Project has been designed to implement prudent avoidance by reducing the intensity of EMF and ensuring appropriate setbacks from the WTGs, overhead transmission line, substations and BESS to the nearest dwelling. Bushfire - The risk that the wind farm itself will cause a fire is minimal as the Project is not located on bushfire prone land. However, bushfire hazards were identified and natural ignitions such as lightning strikes are historically common within the Mid Murray Zone. The assessment notes that the risk of fire occurring as a result of lightning strikes may be reduced by the presence

Aspect	Environmental Impacts
	of an in-built lightning protection system in the WTGs. APZ will be applied as per guidelines and a Bushfire Emergency Management and Operations Plan will be prepared to manage risk. Preliminary Hazard Analysis - A PHA was completed for the Project, primarily related to eh BESS facility. The Hazard Identification Register identified a total of twenty potentially hazardous events. However, it was concluded that there is negligible offsite risk from the Project, and hence there are no societal risk implications. Blade Throw – The blade throw risk assessment established that the risk associated with a blade throw event was very low given the distance of project infrastructure to non-associated dwelling and setbacks applied between WTGs and ancillary infrastructure like the BESS.
Water and Soils	Key impacts on water resources from the Project are related to the increased risk of erosion and sedimentation as a result of construction activities and the disturbance to the Project Area. For the developed scenario, the assessment observed flood level impacts outside the Project Area for all events except 20%AEP; however, this was only up to 46 across the floodplain for a PMF event. These estimated flood impacts were considered non-detrimental. No significant flood hazards were identified, nor significant changes to existing flood function were anticipated as a result of the Project. Modelling of the events from 20% AEP to the 0.2% AEP showed that there are relatively low hazards along the Abercrombie Creek (up to Hazard Category H3). This could limit access to some areas of the Project Area, most of which would be inundated in the modelled PMF event. In the event of a PMF flood, it is considered that there will be sufficient time (3-7 day critical duration) for staff to evacuate. Emergency management measures may be required to mitigate risks associated with access or isolation during flood events. A SWMP will be prepared prior to the commencement of construction works and it will be accompanied by Progressive ESCP to mitigate potential soil and water impacts arising from the Project. All necessary mitigation measures will be implemented to manage potential impacts to adjacent areas, including Yanga SCA.
Land and Agriculture	Agricultural activities will be maintained within the Project Area (as much as possible) for the duration of the construction and operational phases of the Project. The Agricultural Impact Assessment identified that the impact of the Project on agricultural activities and productivity would be low due to the small amount of agricultural land that would be permanently removed from production compared to the total Project area (less than 600 ha across the 18,000 ha Project Area).
Air Quality	The impacts of the Project on air quality are concentrated during the construction activities, such as earthworks, land clearing, and movement of vehicles along unpaved roads. Overall, the Project will provide benefit impacts as it will improve air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations.
Waste	Waste generated during construction, operation and decommissioning of the Project can be minimised in accordance with statutory requirements. A WMP will describe the measures to be implemented to manage, reuse, recycle and safely dispose of waste.

7.5.2 ECONOMIC IMPACTS

The Project is justified economically due to the economic stimulus and benefits it will provide to the region, which includes the LGAs of Hay, Balranald, Murray River and, more broadly, NSW.

During construction (approx. 24-months), the Project will generate around 650 FTE jobs and the impact on the regional economy is estimated at up to $217 M in annual direct and indirect output, $74 M in direct and indirect annual value added, $22 M in direct and indirect annual household income, and 524 direct jobs and indirect jobs. Further, the construction impacts of the Project on the NSW economy are estimated at up to $340 M in annual direct and indirect output, $135 M in annual direct and indirect value added, $93 M in annual direct and indirect household income, and 910 direct jobs and indirect jobs. The Project will create demand for regional labour resources and regional inputs to production. No impacts of the Project on wage or price increases or production shortages are anticipated.

During operations, the Project will create a total annual contribution to the regional economy of $244 M in direct and indirect output, $210 M in direct and indirect value added, $1 M in direct and indirect household income, and 34 direct and indirect jobs. In the NSW economy, the Project is estimated to make a total annual contribution of $282 M in direct and indirect output, $229 M in direct and indirect value added, $13 M in direct and indirect household income, and 132 direct and indirect jobs. Demand for regional labour resources and regional inputs to production will be created in smaller rates during operations. Consequently, the Project will not impact wage or price increases or production shortages.

The Project would require inputs during its construction and operations for maintenance activities, and products and services required by the Project's workforce. Businesses that can provide the inputs would directly benefit from the Project by way of an increased economic activity. However, because of the inter-linkages between sectors, many indirect businesses will also economically benefit from the Project.

The employment and economic opportunities created by the Project have been supported by the community during engagement and consultation activities (refer **Section 5**).

The potential cumulative impacts of the Project and nearby SSDs on the economy activity are generally positive. These are associated with the demand for construction workforce, as described in **Section 6.12.3.1**.

7.5.3 SOCIAL IMPACTS

The Project will provide a diversified income stream for rural landholders and neighbours through lease payments to host landholders. The income provided to landowners hosting Project's infrastructure or landowners that may be impacted by the Project can help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.

A CBF is proposed by the Applicant whereby eligible community initiatives could be funded through annual contributions to the fund. The Applicant has proposed that the CBF be managed through a VPA with Murray River Shire Council, governed by Subdivision 2, of Division 7.1 of Part 7 of the Ep&A Act. Funds will be awarded to local projects and programs that are successful in the applications/proposal process. Acciona and Murray River Shire Council are still in negotiations on the VPA.

While the Project has the potential to generate environmental impacts, it is considered that these can be appropriately managed with the implementation of the mitigation and management measures, as summarised in **APPENDIX B**. These measures will also address the community concerns and associated social impacts identified during the stakeholder engagement process (refer **Section 5**).

Further, during construction, the Applicant will work with contractors, local communities, neighbours and local council, to plan and manage construction to minimise disturbance. Construction management will include:

- Regular and ongoing communication with the community;
- Working during standard construction hours, or as defined in **Section 3.4.2**;
- A rigorous safety culture; and
- Environmental monitoring.

Given the net benefit and commitment from the Applicant to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to the Keri Keri locality, Murray River Region and broader NSW community.

7.6 COMPLIANCE AND MONITORING

An EMS will be developed to provide the overall framework for environmental management during the construction, operation, decommissioning and rehabilitation of the Project to ensure that appropriate measures and processes are in place to manage identified environmental risks and provide for ongoing continual improvement. The EMS will incorporate mitigation measures that have been identified throughout this EIS and associated technical assessments and will include relevant management plans.

APPENDIX B provides a summary of the environmental management commitments of the Project which will be implemented to avoid, minimise and where necessary, offset the potential environmental impacts associated with the Project.

Prior to the commencement of construction, detailed design and layout plans will be finalised. Environmental mitigation and management measures outlined in the EMS and the associated environmental management plans will be prepared and submitted as required by the conditions of development consent.

7.7 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

7.7.1 THE PRECAUTIONARY PRINCIPLE

The environmental impacts of the Project have been carefully evaluated in this EIS and where practicable have been avoided, mitigated, managed or offset. Various options have been considered for the wind farm, BESS and associated infrastructure having regard to environmental risks. Ultimately, options with lower environmental impacts and risks have been selected to avoid and minimise potential biodiversity and heritage impacts.

The site suitability and Project alternatives selection process, as detailed in **Section 2.3** of this EIS, have thoroughly considered and sought to minimise the likely impacts to the local environment. Where uncertainty exists, measures have been suggested to address the uncertainty.

Management measures have been proposed for all significant environmental impacts. As such, is no threat of serious or irreversible damage to the environment.

7.7.2 INTERGENERATIONAL EQUITY

The 'State of the Climate' (BoM & CSIRO, 2022) draws on the latest monitoring, science and projection information to describe variability and changes in Australia's climate. The following statement on climate change is highlighted in the report:

> "Observations, reconstructions of past climate and climate modelling continue to provide a consistent picture of ongoing, long-term climate change interacting with underlying natural variability. Associated changes in weather and climate extremes—such as extreme heat, heavy rainfall and coastal inundation, fire weather and drought—have a large impact on the health and wellbeing of our communities and ecosystems."

At the local context, the 'Murray River Local Strategic Planning Statement 2020' (LSPS) has made the following statements to achieve Priority 9 about climate change and natural hazards:

> "commit to reducing our carbon dioxide equivalent emission levels while being transparent and engaged with our communities;
>
> promote local renewable energy projects by collaborating with energy providers and implementing best practice waste management."

Additionally, the 'Riverina Murray Regional Plan 2041' (RMRP) recognises that planning for the region needs to:

> "… support well located renewable energy industries and the consequent transition away from fossil fuels."

Objective 13 of the RMRP also states that:

> "The NSW Government has committed to net zero emissions by 2050, requiring greater renewable electricity generation, transmission and storage. Renewable energy is now the cheapest form of new electricity generation and is key to the net zero target."

The Project is consistent with the principles of inter-generational equity as it involves a new renewable energy resource which will abate an estimated 2.6 Mt-CO_2e of GHG annually, which is an action against climate change that will benefit future generations.

Other environmental benefits associated with the Project include reduction in emissions that impact air quality and water use from wind power generation when compared to impacts from Projects which input to traditional coal fired power stations. Further, the additional income provided to landowners through the host landowner agreement and CBF will help farm become more resilient to the impacts of climate change.

Following decommissioning, the Project Area will be rehabilitated and made suitable for continued agricultural activities, or renewable energy generation, both of which would provide benefits for future generations.

7.7.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

Conservation of biodiversity has been a fundamental consideration throughout Project development. Extensive desktop and field assessment has been undertaken to understand the anticipated biodiversity impacts. The findings of the biodiversity assessment have informed an ongoing iterative design for the layout of the Project and siting of turbines and other key infrastructure.

Impacts to biodiversity will be avoided, mitigated and offset where necessary to ensure that there is no net loss in biological diversity and that ecological integrity is maintained (refer **Section 6.1**).

7.7.4 IMPROVED VALUATION, PRICING AND INCENTIVE MECHANISMS

The Project enables the use of a valuable resource, wind energy, which is otherwise lost if the Project does not proceed. The Project further contributes to the transition from fossil fuel generation sources. The Project will reduce air, water and land pollution from coal-fired power stations, which currently bear none of the external costs of such pollution.

The environmental consequences of the Project and mitigation measures with potential for adverse impacts have been considered and identified in this EIS (refer **Section 6**). Implementing the mitigation measures will impose an economic cost on the Applicant, which increases the costs of the Project.

Project benefits are considered to outweigh the costs. The Project will generate up to 650 FTE jobs during construction and 34 FTE direct and indirect jobs during operations and will provide economic benefits to the local community. It will also provide tangible and durable financial benefits to the community through the CBF and VPA.

7.8 CONCLUSION

The Project involves the construction, operation, maintenance and where relevant decommissioning of a wind farm with up to 155 WTGs, a BESS with a capacity of 200 MW / 800 MWh and associated infrastructure. The Project will contribute significantly to reducing carbon emissions and human induced climate change as part of the necessary and ongoing clean energy transition from fossil fuels.

The Project has been carefully designed and sited to minimise environmental impacts in consultation with the local community and relevant stakeholders. The residual environmental and social impacts identified throughout the EIS and technical assessments will be managed through the mitigation and management measures summarised in Section 6 and Appendix B.

The Project will not result in significant impacts on the environment, or the local community and these impacts will be significantly outweighed by the strong strategic and economic benefits which the Project will deliver. The Project will:

- Assist the Federal and NSW Governments to fulfil their targets and policies to increase renewable energy supply and reduce carbon emissions;
- Assist in meeting energy demand as part of the market transition from traditional energy sources; and
- Deliver economic benefits to regional and local communities.

The Project represents a positive addition to the local and wider NSW economy and the NEM. Through the implementation of proposed mitigation and management measures, it is considered that this Project is consistent with the objects of the EP&A Act and is in the public interest.

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APPENDIX A REGULATORY REQUIREMENTS AND WHERE ADDRESSED

APPENDIX B MITIGATION AND MANAGEMENT SUMMARY

APPENDIX C STATUTORY COMPLIANCE

APPENDIX D STAKEHOLDER ENGAGEMENT

APPENDIX E ESTIMATED DEVELOPMENT COST REPORT

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APPENDIX F DETAILED MAPS AND PLANS

APPENDIX G BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

APPENDIX H ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

APPENDIX I NOISE AND VIBRATION IMPACT ASSESSMENT

APPENDIX J TRAFFIC AND TRANSPORT ASSESSMENT

APPENDIX K LANDSCAPE AND VISUAL IMPACT ASSESSMENT

APPENDIX L AVIATION IMPACT ASSESSMENT

APPENDIX M TELECOMMUNICATIONS AND EMI ASSESSMENT

APPENDIX N BUSHFIRE RISK ASSESSMENT

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APPENDIX O PRELIMINARY HAZARDS ANALYSIS

APPENDIX P FLOOD ASSESSMENT

APPENDIX Q LAND AND AGRICULTURAL ASSESSMENT

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APPENDIX R ECONOMIC IMPACT ASSESSMENT

APPENDIX S SOCIAL IMPACT ASSESSMENT

APPENDIX T CONCEPTUAL SOIL AND WATER MANAGEMENT PLAN

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