Yanco Delta Wind Farm
Scoping Report

Virya Energy

Yanco Delta Wind Farm Project
27 April 2022

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Glossary and Terms

Term	Definition
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report Required under the NSW *National Parks and Wildlife Act 1974*, where harm may come to Aboriginal objects or a declared Aboriginal place because of a project. It is a study that looks at what can be done during and after the project to manage and protect these objects and places.
ACMA	Australian Communications and Media Authority
AEMO	Australian Energy Market Operator
AEP	Annual exceedance probability The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a flood event has an AEP of 5% (one in 20 chance), then there is a 5% chance of that flood event (or larger event) occurring in any one year
AHIMS	Aboriginal Heritage Information Management System
ALA	Aircraft Landing Area
ALARP	As Low As Reasonably Practicable
AQIA	Air Quality Impact Assessment
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AWS	Automatic weather station
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations 1998
CIV	Capital investment value
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSP	Community Strategic Plan
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DEC	Department of Environment and Conservation NSW (former)
DECC	Department of Environment and Climate Change NSW (former)
DECCW	Department of Environment, Climate Change and Water NSW (former)
DER	Distributed Energy Resources
DPE	Department of Planning and Environment NSW
DPI	Department of Planning Primary Industries NSW
DPIE	Department of Planning, Industry and Environment NSW

Term	Definition
EIS	Environmental Impact Statement
EnergyCo NSW	Energy Corporation of NSW
EMF	Electromagnetic field
EMI	Electromagnetic interference
EPA	Environment Protection Authority NSW
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment protection licence
ESB	Energy Security Board
ESOO	Electricity Statement of Opportunities
GHG	Greenhouse gas
GW	gigawatt
HIPAP	Hazardous Industry Planning Advisory Papers
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007, consolidated into State Environmental Planning Policy (Transport and Infrastructure) 2021
ISP	Integrated System Plan
kV	kilovolt
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LVIA	Landscape and Visual Impact Assessment
MDBA	Murray Darling Basin Authority
MNES	Matters of National Environmental Significance
MW	megawatt
NDC	Nationally Determined Contribution
NEM	National Electricity Market
NHMRC	National Health and Medical Research Council
Preliminary NIA	Preliminary Noise Impact Assessment
NPW Act	*National Parks and Wildlife Act 1979*
NPWS	National Parks and Wildlife Service
NRM	Natural Resource Management
NSW	New South Wales
NTSCORP Limited	Native Title Services Corporation Limited
NVIA	Noise and Vibration Impact Assessment

Term	Definition
OEH	Office of Environment and Heritage NSW (former)
OLS	Obstacle Limitation Surface
OSOM	Oversize-overmass
PAD	Potential Archaeological Deposit
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
Project area	The total area of land to which the Project applies.
RAP	Registered Aboriginal Party
REZ	Renewable Energy Zone
RFS	Rural Fire Service NSW
RMRP	Riverina Murray Regional Plan 2036
RNP	Road Noise Policy
RRL	Register of Radiocommunications Licences
SEARs	Secretary's Environmental Assessment Requirements
SEIA	Social Economic Impact Assessment
SEPP	State Environmental Planning Policy
South-West REZ	South-West Renewable Energy Zone
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011, consolidated into the Statement Environmental Planning Policy (Planning Systems) 2021
SSAL	State Significant Agricultural Land
SSD	State significant development
The Project	Development of a wind farm and battery energy storage system, and ancillary infrastructure
TSR	Travelling Stock Reserve
UNFCCC	United Nations Framework Convention on Climate Change
VRE	Variable Renewable Energy
WTG	Wind turbine generator

Executive Summary

Virya Energy Pty Ltd (Virya Energy, the Proponent) is seeking regulatory and environmental planning approval to construct, operate and maintain a maximum1,500 MW capacity wind farm and associated infrastructure collectively known as Yanco Delta Wind Farm (the Project). Up to 225 wind turbine generators (WTG) are proposed.

The Project would be located within Murrumbidgee Council Local Government Area (LGA) and Edward River Council LGA, north-west of the Jerilderie township, around the localities of Moonbria and Mabins Well. The Project would be located within the proposed South-West Renewable Energy Zone (REZ), in New South Wales. It would connect to Transgrid's proposed Dinawan Terminal Station, which is scheduled to be completed as part of Transgrid and ElectraNet's Project EnergyConnect in 2025.

The Project is deemed State Significant Development (SSD) under Section 2.6(1) in conjunction with Section 20 of Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021. As such, the Proponent is seeking consent under Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act). The Project will be referred to the Commonwealth Department of Agriculture, Water and Environment (DAWE) for determination of whether it is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act).

This Scoping Report provides preliminary information on the Project and its potential impacts and supports a request for Secretary's Environmental Assessment Requirements (SEARs). The Scoping Report will further support the preparation of an Environmental Impact Statement (EIS) which will be lodged to the Department of Planning and Environment (DPE) for assessment and to seek approval from the Minister for Planning.

Project summary

The Project would include:

- Up to 225 WTGs to maximum tip height of 270 metres
- Generating capacity of approximately 1500 megawatts (MW)
- Battery Energy Storage System (BESS), approximately 500 MW/500 megawatt hours (MWh) (type yet to be determined)
- Permanent ancillary infrastructure, including operation and maintenance facility, internal roads, hardstands, underground and overhead cabling, wind monitoring masts, central primary substation and up to five collector substations
- Temporary facilities, including site compounds, laydown areas, stockpiles, gravel borrow pit(s) and concrete batch plants, temporary roads and temporary monitoring masts.

Statutory framework

The Project area is zoned RU1 – Primary Production under the Conargo Local Environmental Plan 2013 and Jerilderie Local Environmental Plan 2012. While electricity generating works are not identified as a permissible land use under the Local Environmental Plans, they are permissible with development consent under Section 2.36(1) of the State Environmental Planning Policy (Transport and Infrastructure) 2021, which prevail to the extent of any inconsistency with any Local Environment Plan (Section 2.7 of the State Environmental Planning Policy (Transport and Infrastructure) 2021). The Project is, as such, permissible with development consent.

The Project would be classified as SSD as it meets the requirements of Section 2.6(1) in conjunction with Section 20 of Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021.

The assessment process for SSD requires a request for SEARs to be made. These SEARs are then to be addressed in an EIS that would be publicly exhibited and open to community submissions. Each submission would then be reviewed, and responses would be presented in a Submissions Report that will be made public. The EIS and response to submissions would then be considered by the Department of Planning, Infrastructure and

Environment in an assessment report. The consent authority would then determine the development application either by approving the application with conditions or rejecting it.

The consent authority for the Project is the Independent Planning Commission or the Minister for Planning under Division 4.7 of the EP&A Act.

Relevant environmental matters

The assessment of the likely environmental consequences of the Project has involved:

- Consideration of the construction and operational stages of the Project
- Desktop review of relevant databases, historic aerial photography and available background data
- Preliminary ecological field surveys and geotechnical investigations
- Development of a predictive model for areas of archaeological potential
- Review of State Significant Development Guidelines – Preparing a Scoping Report (DPIE, 2021c)
- Outcomes of stakeholder consultation to date.

The likely scope and extent of required assessment for each environmental matter has been identified as part of this Scoping Report in consideration of *State Significant Development Guidelines – Preparing a Scoping Report* (Department of Planning, Industry and Environment (DPIE), 2021c). The following Key Issues have been identified for further assessment during the preparation of the EIS:

- Biodiversity
- Landscape character and visual amenity
- Aboriginal heritage
- Non-Aboriginal heritage
- Hazards and risk
- Noise and vibration
- Traffic and transport
- Surface water and groundwater
- Flooding.

The Scoping Report has also identified the following 'Other Issues' for assessment within the EIS document. These matters have potential impacts that are usually known and can usually be managed without leading to significant impacts on the environment:

- Land use and property
- Soils and contamination
- Socio-economic
- Aeronautical impacts
- Telecommunications and Electromagnetic interference (EMI) impacts
- Electromagnetic field (EMF) and health impacts
- Shadow flicker
- Blade throw
- Bushfire
- Air quality and greenhouse gas
- Waste
- Sustainability
- Cumulative impacts.

As part of the EIS, additional assessment would be carried out in conjunction with further Project design development. In assessing the Project, the key focus would be to avoid and minimise potential impacts on the environment, where reasonable and feasible. The assessment would also identify mitigation and management measures to minimise impacts during construction, operation and decommissioning of the Project.

Stakeholder engagement

Virya Energy has carried out preliminary stakeholder and community consultation, including providing information to Project landowners and all neighbouring dwellings within eight kilometres of any WTG; as well as to both Councils and the broader community. Virya Energy has offered to enter into participation agreements with the owners of all neighbouring dwellings.

Virya Energy will continue to engage with the community, Councils and government agencies in the preparation of the EIS. Community engagement is expected to be targeted at keeping Project landowners, near neighbours and key stakeholders informed of the assessment process and anticipated Project impacts such that concerns can be addressed and managed throughout the Project planning and design process.

1. Introduction

1.1 Project overview

Virya Energy is seeking approval for the proposed Yanco Delta Wind Farm (the Project). The Project would involve the construction, operation and maintenance of a wind farm with up to 225 wind turbine generators (WTGs), a battery energy storage system (BESS), generating capacity, and associated electrical infrastructure. The generating capacity of the wind farm is approximately 1,500 megawatts (MW). The Project would be located 10 kilometres north-west of the town of Jerilderie, in the localities of Moonbria and Mabins Well, within the Murrumbidgee Council and Edward River Council Local Government Areas (LGA).

The Project would be located within the South-West Renewable Energy Zone (REZ) in New South Wales. It would connect to Transgrid's proposed Dinawan Terminal Station, scheduled for completion as part of Project EnergyConnect in 2025.

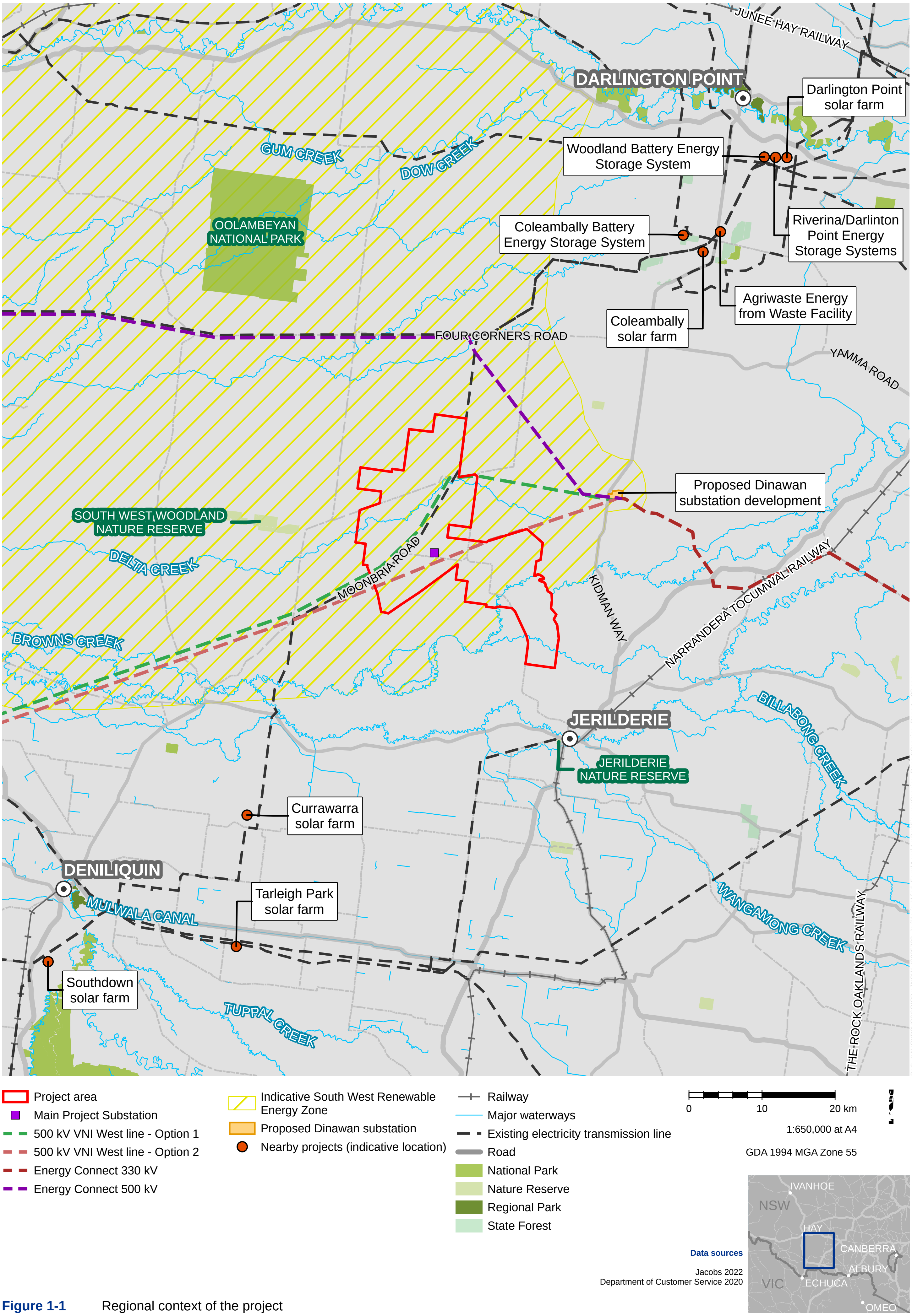
A map showing the Project in the regional context is provided in **Figure 1-1.** The Project area is defined as the property boundaries of Project landowners (i.e. landowners that have entered into agreements with Virya Energy to have WTGs or associated infrastructure on their properties). The Project would span over 420 lots, owned by nine landowners. The full list of lots is provided in **Appendix A**. A preliminary Project layout is provided in **Figure 1-2** This would be further refined in response to identified environmental constraints and ongoing stakeholder consultation.

1.1.1 Project objectives

The Project would contribute to meeting Commonwealth and NSW government renewable energy objectives and would be located within the South West REZ, a defined area planned for renewable energy development.

Specific Project objectives include:

- Contribute to and support the development of the South-West REZ by providing renewable energy generation capacity and improving the security, stability and resilience of the National Electricity Market (NEM)
- Facilitate the NSW shift away from coal fired power generation and supporting local communities in this transition towards clean and renewable sources of energy
- Avoid, minimise and mitigate adverse impacts on the environment and community during construction and operation
- Establish a strong network of positive and long-term relationships within the local community and contribute to economic and social growth
- Provide energy storage for sustainable renewable energy to enable continuous and reliable electricity output as part of a rapidly expanding industry in NSW.



Data sources

Jacobs 2022
Department of Customer Service 2020

Figure 1-1 Regional context of the project

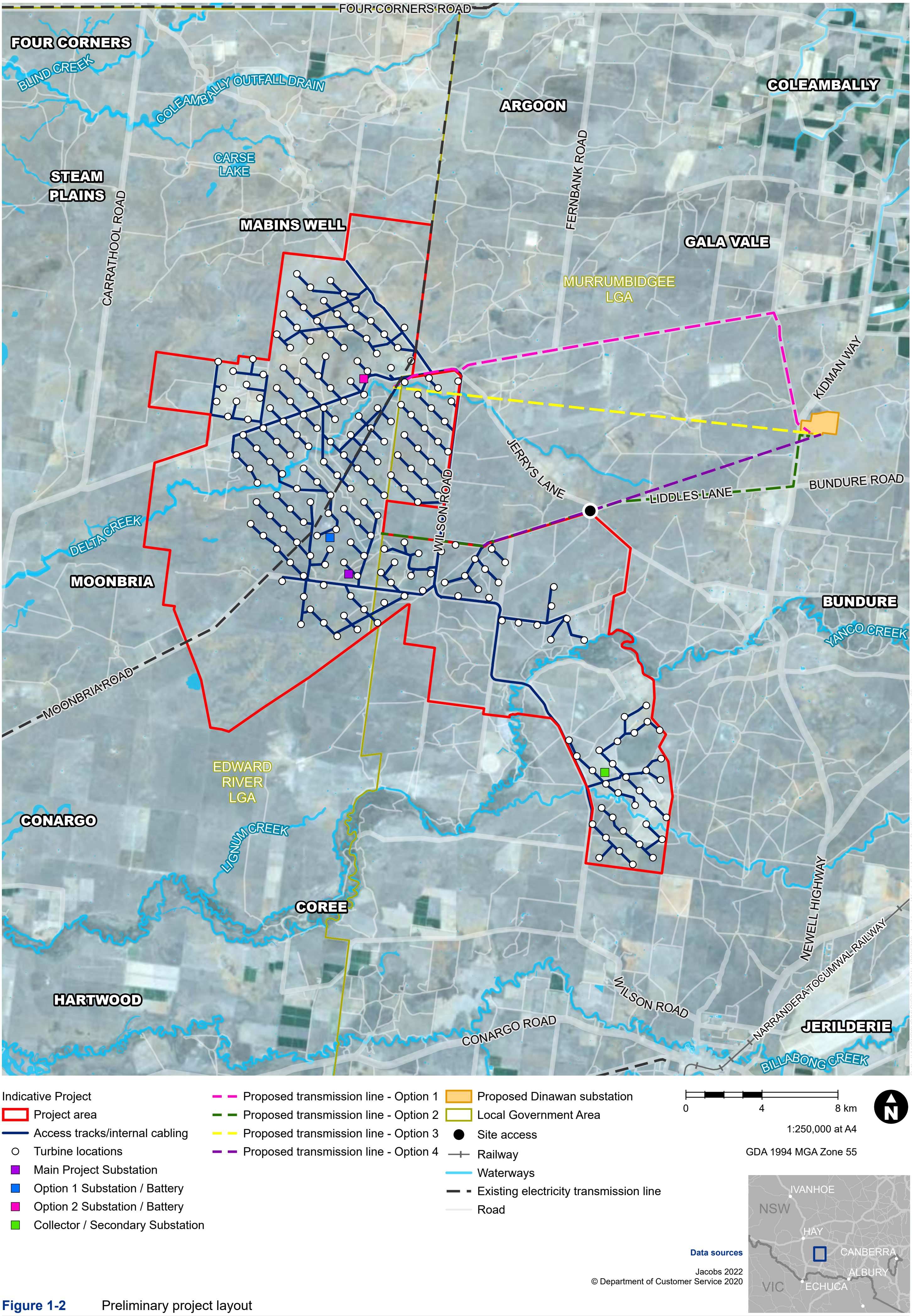


Figure 1-2 Preliminary project layout

1.2 Proponent

The Proponent for the Project is Virya Energy Pty Ltd (Virya Energy), an Australian company active in the development, financing, construction and operation of renewable energy infrastructure in Australia, with a primary focus on wind energy.

The company was established in March 2020 by German wind pioneer Joachim Ueckler as a complement to his business Energiequelle GmbH, one of the largest privately owned renewable energy developers in Europe with over 300 staff and 750 projects. Virya Energy is managed by Karl-Heinz Krampe and Steve Crowe. Joachim, Steve and Karl have a combined 70 years of experience in the development, construction and financing of large scale renewable energy projects.

In addition to the proposed Yanco Delta Wind Farm, Virya Energy are developing a pipeline of projects up to 1.5 GW in other states.

The details of the Proponent are provided in **Table 1-1**.

Table 1-1 Proponent details

Name	Virya Energy Pty Limited
Postal address	3/35 Stewart St, Brunswick, 3056
ABN	72 639 930 966

1.3 Project background

The NSW Government's Electricity Strategy (NSW Government, 2019b) and Electricity Infrastructure Roadmap (DPIE, 2020b) set out a plan to deliver the state's first five REZs in the Central-West Orana, New England, South-West, Hunter-Central Coast and Illawarra regions. These REZs would play a vital role in delivering affordable, reliable energy generation to help replace the State's existing power stations as they come to their scheduled end of operational life.

The Energy Corporation of NSW (EnergyCo NSW) has announced the draft declaration for a REZ in the South-West region of NSW between Jerilderie and Mildura, on the lands of the Wiradjuri, Yorta Yorta, Baraba Baraba, Wemba Wemba, Wadi Wadi, Madi Madi, Nari Nari, and Yitha Yitha people. The South-West REZ was chosen due to an abundance of high-quality renewable resources, proximity to Project EnergyConnect corridor, relative land-use compatibility and a strong pipeline of proposed projects.

The Project EnergyConnect has been proposed by Transgrid and ElectraNet and includes the development of an interconnector between Wagga Wagga in NSW and Robertstown in South Australia, with a connection from Buronga (Mildura) to Red Cliffs in Victoria. EnergyConnect (Eastern) refers to the section between Buronga and Wagga Wagga (330 kilovolt (kV) and 500 kV transmission) in NSW and includes the development of the Dinawan Terminal Station.

The completion of Project EnergyConnect would support the South-West REZ and support the Project by unlocking up to 1.2 GW of additional transmission capacity, transporting electricity from the REZ to homes and businesses across the State. The South-West REZ would be further boosted by the construction of a 500kV Victoria-NSW Interconnector West (VNI West) to Victoria due for completion in 2031.

The indicative location of the South-West REZ was first published in 2018 and updated in 2021 (NSW Government, 2021d). The Project would be located within the South-West REZ. A Developer Registration of Interest application was submitted by Virya Energy to Energy Corporation of NSW (EnergyCo NSW) for the Project in November 2021.

1.4 Strategies to avoid or minimise impacts

The Project has been selected as it would have a number of benefits over other options, including avoidance and minimisation of impacts. Alternatives considered for the Project are discussed in **Section 3.7**.

Strategies that have been used to inform the selection of the Project area and to avoid or minimise impacts included consideration of the following:

- There is low population density and homogenous agricultural land use within and surrounding the Project area and, as a result, the number of sensitive receivers would be minimised
- WTG placement has been planned to avoid proximity to neighbouring dwellings to ensure generous setbacks are maintained
- Preliminary consultation with the local community, including neighbours to the Project, has received positive feedback
- The Project is expected to be highly compatible with existing pastoral land uses, as minimal impact to current agricultural activities are expected during both construction and operation
- The placement of WTGs would actively utilise less than 0.5% of the Project area
- Early consultation with landowners and neighbours, including offering to enter into participation agreements with owners of all habitable dwellings within eight kilometres of any WTG
- The Project would have good access to the proposed electricity transmission infrastructure that would be built as part of Project EnergyConnect, as well as being located in a strategically supported REZ
- The terrain is generally flat and is expected to result in simple construction compared to other geographic areas.

The key strategies that will be adopted during the Project EIS preparation and detailed design, through to construction and operation to further avoid or minimise any potential impacts include:

- Refining Project design, such as access track, underground cable routes and WTG locations to avoid native vegetation clearing and minimise potential heritage impacts where possible
- Refining the siting of Project elements within the Project area to avoid and minimise negative community impacts and to reduce potential effects on sensitive receivers
- Selection of preferred transmission line to avoid native vegetation clearing and property impacts
- Considering the need and sizing of asset protection zones and other forms of bushfire protection to reduce potential impact on native vegetation, wildlife and the community.

1.5 Related development

Related development refers to any existing or approved development that would be incorporated into the Project, or development by the Proponent that is required for the Project but would be subject to a separate approval process.

Currently there are no existing or approved developments that would need to be incorporated into the assessment of the Project.

1.6 Purpose and structure of this report

This Scoping Report has been prepared to demonstrate the studies and consultation carried out to date and assist in the identification of the matters Virya Energy will assess in the EIS and the community and stakeholder consultation that will be carried out. This Scoping Report supports the application for SEARs which would guide the preparation of an EIS for lodgement. The EIS would be part of the development application to be submitted to the NSW Minister for Planning for approval under Division 4.7, Part 4 of the EP&A Act.

The purpose of this report is to provide the Minister for Planning and DPE with adequate Project context and details in order to obtain project-specific SEARs. This report has been prepared giving consideration of the 'NSW Wind Energy Framework' which comprises:

- Wind Energy Guideline for State Significant Wind Energy Development (DPE, 2016a)
- Wind Energy: Noise Assessment Bulletin (Noise Bulletin) (DPE, 2016b)
- Wind Energy: Visual Assessment Bulletin (Visual Bulletin) (DPE, 2016c)
- Standard Secretary's Environmental Assessment Requirements
- Wind Energy Framework Q&As.

The structure and content of this report are outlined in **Table 1-2**.

Table 1-2 Structure and content of this report

Chapter	Description
Chapter 1 Introduction	Outlines key elements of the Project and the proponent and the purpose of this report (this Chapter)
Chapter 2 Strategic context	Provides an outline of the justification and need for the Project, as well as an overview of the development process and options considered to date
Chapter 3 Project	Provides a description of the Project, including the likely preliminary Project layout, proposed construction activities and alternatives considered
Chapter 4 Statutory context	Provides an outline of the statutory context, including applicable legislation and planning policies
Chapter 5 Engagement	Outlines the stakeholder and community engagement carried out to date and the consultation that will occur during the next phases of the Project
Chapter 6 Proposed assessment of impacts	Provides a preliminary description of the existing environment, initial consideration of potential direct and indirect environmental impacts, and the proposed assessment approach for these impacts
Chapter 7 Conclusion	Summarises the findings of this report

2. Strategic context

2.1 Project need/benefit

The NSW Government has identified a need to facilitate the delivery of new generation infrastructure to replace at least four coal fire power stations that are scheduled to close within the next 15 years, starting in 2023 (NSW Government, 2021b). In addition, several expected closure dates have been proposed to be brought forward, including Eraring Power Station which may close in 2025, Bayswater Power Station by 2033, and Mount Piper Power Station by 2040. The development of electricity infrastructure is necessary to maintain a reliable, secure and affordable supply, while contributing to substantial local social and economic development and driving decarbonisation in NSW. The development of renewable energy infrastructure would contribute to a State electricity generation network with lower associated carbon emissions than non-renewables. In addition, the local environmental footprint of wind generation in particular is smaller than other forms of renewable generation.

The Project would be located in the South-West REZ. The REZs are identified as strategically advantageous for energy generation, storage and transmission due to their exceptional renewable energy resources and geographic proximity to existing infrastructure. Establishing new renewable generation capacity, such as wind in the REZs, would align with the NSW Government's Electricity Strategy (NSW Government, 2019b) and Electricity Infrastructure Roadmap (DPIE, 2020b). The REZs are also selected due to their relatively minor environmental, heritage and land-use constraints (NSW Government, 2020b). The development of the REZs would benefit from high interest and investment from the private sector and further diversify the current mix of energy resources in the State (further information is provided in **Section 2.2.3.2**).

The Project would provide a significant amount of new generation capacity which would support the transition towards increased renewable energy penetration in the grid and facilitate the planned retirement of coal fired power stations in NSW. The supply of additional generation capacity would help meet load demand as a result of the retiring thermal generation.

The use of wind power as the predominant generation type for the Project has been driven by the following factors:

- Wind energy can be harnessed at night, particularly in the evening when electricity demand is high; solar energy, as an alternative, cannot be harnessed at night or during cloudy conditions
- Night generation takes advantage of spare network capacity to charge batteries or for off-site pumped hydro storage while solar wouldn't
- WTGs contribute less carbon dioxide (CO_2) to the atmosphere than other renewable forms of generation. Generally, a WTG produces 4.64 grams of CO_2/1 kilowatt hour (kWh) while solar generation produces 70 grams of CO_2/1kWh (Regen Power, 2021)
- Wind power consumes less energy and produces more energy compared to solar power
- Solar requires 30-35 times the land area per MWh produced, therefore, would not be conducive with areas that have high native vegetation value or important agricultural land
- Onshore wind energy generation is one of the lowest-cost technologies and this cost is projected to continue to decrease in the near future.

Further, the Project would deliver renewable, low-cost energy to the NEM and would contribute to the NSW Government's 2050 net zero emissions target. Renewable energy such as wind energy would contribute towards cleaner electricity generation and reduce greenhouse gas emissions to mitigate potential impacts of climate change.

The Project would also provide opportunities for local and regional investment, accompanying the growth of the renewable energy sector across NSW and in the South-West REZ.

In addition, the Project would generate investment in regional Murray Riverina, as well as the local Edward River Council LGA and Murrumbidgee Council LGA communities, as there would be a wide range of opportunities for local contractors and suppliers and other businesses, as well as contributing to a community benefit fund.

The Project benefits also include delivering financial and social benefits to communities, including in the form of:

- Local investments and financial contributions to Project landowners, neighbours and local councils
- Increased demand for local services and businesses which can boost economic activity in the region
- Increased employment opportunities in the short to medium term
- More renewable energy with lower electricity prices for consumers and businesses across the NEM in the long-term (refer to **Section 6.11**).

2.1.1 Viability

Wind resource monitoring indicates that wind speeds are relatively consistent at the Project area and surrounding region, which would help make the wind farm viable at the Project area. Wind speed data indicate the average wind speed at 150 metres above ground level around the Project area is about 7.5 metres per second (m/s) (DNV GL, provided to the NSW Department of Industry, Skills and Regional Development, 2016). Virya Energy has ongoing on-site measurement data confirming this.

While no target generation capacity has been specified for South-West REZ, the grid upgrade and proposed infrastructure to be developed by Transgrid and ElectraNet (for Project EnergyConnect) in this region is expected to help unlock up to 1.2 GW of additional transmission capacity to support the South-West REZ, which would enhance the viability of the Project to provide additional renewable energy generation to the NEM.

The Project area would be located approximately 12 kilometres from the proposed Dinawan Terminal Station and the Project area is intersected by the existing 132 kV transmission line (**Figure 1-2**), however there is very little spare capacity in the existing grid network at this location. The Dinawan Terminal Station has been proposed by Transgrid as part of Project EnergyConnect and completion is scheduled for 2025.

2.2 Strategic policy context

2.2.1 International

Australia is party to the Paris Agreement, which came into force in 2016. Parties to the Paris Agreement reached consensus at the 2015 United Nations Climate Change twenty-first Conference of the Parties (COP21) to strengthen the global response to climate change by:

- Keeping the increase in global average temperature to well below 2°C above pre-industrial levels
- Pursuing efforts to limit temperature increase to 1.5°C.

As part of the 2021 United Nations Climate Change twenty-sixth Conference of the Parties (COP26), the parties reaffirmed the global targets above to keep temperature rise at 1.5°C, and sought to accelerate the phase-out of coal. At COP26 agreement was reached to make the Paris Agreement fully operational (UNFCCC, 2021).

In 2015, under the Paris Agreement, the Australian Government committed to reduce emissions by 26% to 28% below 2005 levels by 2030.

The energy sector is a key part of the low emissions effort, as electricity generation contributes to a significant proportion of total carbon emissions and the growth of renewables is, as such, crucial in the transition to a low emission future.

In 2021, the Australian Government communicated an updated and enhanced Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat. The updated NDC was submitted as part of Australia's obligations under the Paris Agreement and includes the following:

- Adopts a target of net zero emissions by 2050
- Commits to Australia's seven low emissions technology stretch goals
- Reaffirms Australia's target to reduce emissions by 26% to 28% below 2005 levels by 2030
- Adds that Australia will exceed this by up to nine percentage points.

The low emissions technology stretch goals set out in Australia's Long-Term Emissions Reduction Plan (Commonwealth of Australia, 2021) and Technology Investment Roadmap First Low Emission Technology Statement 2020 (Commonwealth of Australia, 2020b) would enable Australia to achieve the NDC committed targets.

The Project would be consistent with the overall national emissions reduction effort and would contribute wind technology to drive down emissions in the energy sector.

2.2.2 National

2.2.2.1 2020 Integrated System Plan

The supply and use of electricity in the NEM are managed by the Australian Energy Market Operator (AEMO). The AEMO published the 2020 Integrated System Plan (ISP) which provides an actionable roadmap for eastern Australia's grid network (AEMO, 2020). The 2020 ISP identifies the optimal development path for the NEM including development opportunities and has forecast significant growth in in Distributed Energy Resources (DER) such as household and commercial photovoltaic (PV) installations, and Variable Renewable Energy (VRE) such as grid scale solar and wind energy.

A 'Step Change' scenario is now predicted likely to occur (AEMO, 2021c; AEMO 2021a), indicating that renewable energy growth over the past several years have developed at a faster pace than expected and the earlier closure of coal plants than planned in NSW is also possible. Across the predicted scenarios in the 2020 ISP, over 26 GW of new grid-scale VRE is required throughout the NEM to meet a growing demand, most of which would be located in REZs that maximise the value of geography and weather. By 2031-32, the 'Step Change' scenario anticipates around 9.5 GW of new VRE in New South Wales (including capacity committed since November 2019), and 12 GW by 2034-35.

Strong economics and state renewable energy targets are continuing to drive VRE, with over 1.5 GW of committed and anticipated wind development and more than 49 GW of wind development being proposed as of the NEM Generation Information October 2021 update (refer to **Figure 2-1**) (AEMO, 2021c). In the 'Step Change' scenario, up to an additional 50 GW of VRE would be required by 2040.

To enable the expected growth in VRE, dispatchable generation is also needed to firm up the variable output from renewable sources such as wind and solar. Energy storage provided as part of the Project BESS would further enable VRE to meet times of peak demand by storing surplus generation for discharge during periods of high demand.

The Project would contribute to the VRE requirements identified in the 2020 ISP and would strengthen renewable energy supply as well as deliver flexible dispatchability through the wind farm and the associated BESS infrastructure.

The 2022 ISP is currently being developed and a draft 2022 ISP has been published by AEMO for consultation (AEMO, 2021a). If the 2022 ISP comes into force during the EIS preparation, the new ISP will be considered.

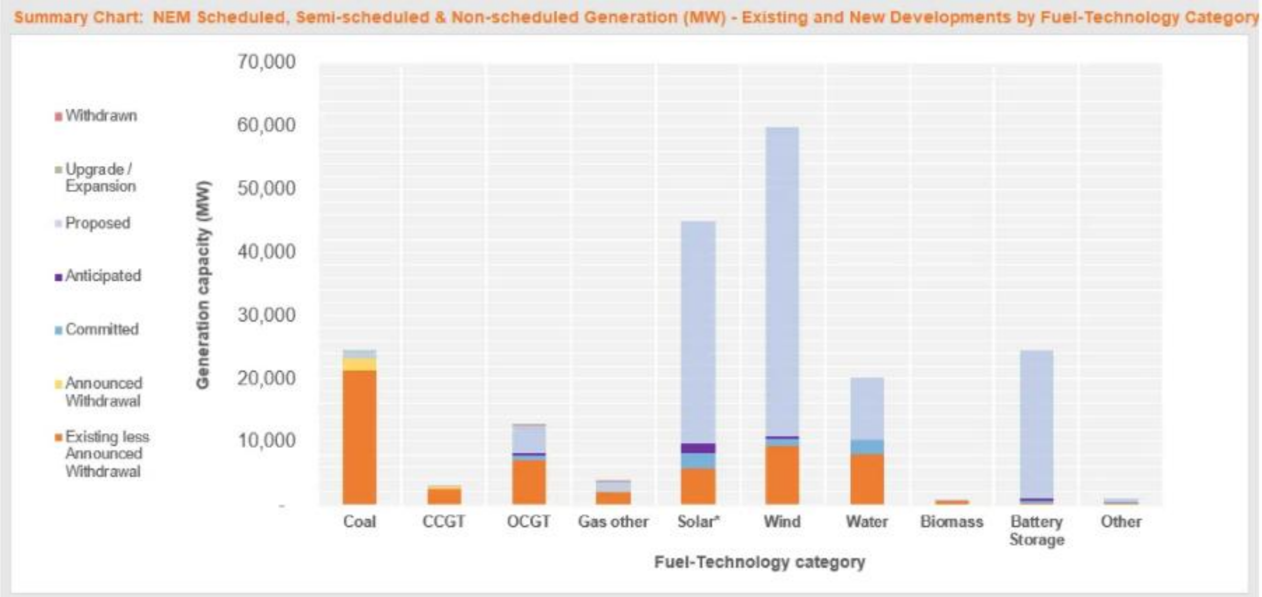


Figure 2-1 Graph showing existing and new development in the NEM by fuel-technology category (AEMO, 2021c)

2.2.2.2 Electricity Statement of Opportunities 2021

Each year the AEMO publishes the Electricity Statement of Opportunities (ESOO) to provide technical and market data for a 10-year outlook. In the 2021 ESOO, the AEMO further confirmed accelerated growth in VRE in recent years and forecast there would be sufficient renewable resources to supply all NEM with 100% instantaneous renewable penetration by 2024-2025.

The 2021 ESOO also identifies some risks to the reliability of VRE including severe weather events or impacts of extreme temperature on wind farms that may reduce generation output unexpectedly (AEMO, 2021b).The Project, along with other planned new energy generation and storage infrastructure, would contribute to bridging any reliability gaps between supply and demand, and future transmission investment expected across NSW. Further, the network is currently experiencing increasing coal plant failures caused by high temperature events and unavailability of secure power supply. The Project would help reduce the risks of power loss to the NEM by providing an alternate source of energy to the network during these events.

2.2.2.3 COAG Energy Council independent reviews

The Independent Review into the Future Security of the National Electricity Market – Blueprint for the Future (the Finkel Review) (Finkel et al., 2017) provides a plan to maintain security and reliability in the NEM and lower emissions in the transition towards decarbonisation in the electricity sector. The Finkel Review was initiated by the Council of Australian Governments Energy Council (COAG Energy Council) and outlines the blueprint to help achieve Australia's commitment to the COP21 target of a 26% to 28% reduction in emissions by 2030, from 2005 emission levels.

The Finkel Review provided that delivering a secure grid network with a high VRE penetration is technically and economically feasible and that there are no technical barriers to a high VRE penetration in the Australian context (Finkel et al., 2017). This aligns with 2020 ISP and the AEMO forecasts for the NEM (AEMO, 2020). The increased penetration of VRE generators, such as the proposed Project, can also set a downward pressure on prices in the NEM, where VRE can become the price setter and set a zero or negative starting price in the wholesale market (Finkel et al., 2017). The Finkel Review recommended the NEM to transition early on towards emissions reduction trajectory and emphasised the need for stability solutions like battery energy systems to balance out the fluctuations of renewable energy. Another recommendation is for new generators to be required to bring forward dispatchable capacity to the market in regions where reliability could be at risk in coming years.

The Project would support the recommendations of the Finkel Review and would provide renewable wind energy generation which can increase the supply of low cost electricity to the NEM. Further, in providing BESS infrastructure to support the wind farm, the Project is directly aligned with Finkel Review commendations (Finkel et al., 2017).

2.2.2.4 Other relevant reports

Table 2-1 identifies other national policies and reports are relevant to the Project.

Table 2-1 Other National policies and reports

Report/Policy	Description	Relevance to Project
ESB Market 2025 Directions Paper	The former COAG Energy Council tasked the Energy Security Board (ESB) with developing advice on a long-term, fit-for-purpose market framework to support reliability that could apply from the mid-2020s. The ESB has flagged the need for the construction of 26 GW to 50 GW of VRE over the next two decades. The ESB Post 2025 electricity market design (ESB, 2021b) is establishing reforms to support the energy transition and the shift towards grid-scale renewables in Australia. The ESB's overall objective is to deliver reforms that ensure sufficient VRE resources and storage capacity are in place before anticipated coal fired power plant closures, and before generator exits cause significant price or reliability shocks to consumers. The ESB recommendations (ESB, 2021b) would align with 2020 ISP and REZ development.	The Project would be consistent with the ESB Post 2025 design and would contribute to towards the requirement for increased VRE penetration in the NEM.
GenCost 2020-21 Final Report	The GenCost 2020-21 final report (Graham et al., 2021) provides projections of future changes in costs of electricity. GenCost 2020-21 projected that improvements in capacity factor for wind would continue to make onshore wind resources one of the lowest cost available. In a high VRE penetration scenario, the capital costs for wind generation are also projected to continue to decrease over time through to 2030 and 2050. The report also determined that onshore wind and large-scale solar PV are the only variable renewables that are cost competitive and are the lowest cost technology by a significant margin. Similarly, battery storage technologies have had high cost reduction rates over time in recent years and would continue to decrease in application for grid-scale projects.	The Project aligns with the GenCost 2020-21 projections and would provide low-cost electricity supply into the grid. The Project would provide additional renewable generation capacity in addition to battery energy storage and would feed into the overall reduction of capital costs and levelised cost of electricity in renewable energy generation and storage technology across the NEM.
Technology Investment Roadmap 2020	The Technology Investment Roadmap 2020 (Commonwealth of Australia, 2020b) provides a national framework to accelerate low emissions technologies. The Technology Investment Roadmap is part of Australia's Long-Term Emissions Reduction Plan, a whole-of-economy plan to achieve net zero emissions by 2050. The Technology Investment Roadmap Discussion Paper provides an indicative shortlist of technology priorities, of which onshore wind is one priority technology to contribute towards low emissions electricity sector (Commonwealth of Australia, 2020a). The Discussion Paper also emphasised energy storage as an immediate priority for the energy sector to enable orderly management of increased VRE supply to maintain security and reliability.	The Project would be consistent with the Commonwealth Government's low emissions technology priorities.

2.2.3 NSW

2.2.3.1 NSW Net Zero Plan Stage 1: 2020-2030

The NSW Net Zero Plan Stage 1: 2020-2030 (Net Zero Plan) (NSW Government, 2020a) outlines the NSW Government's approach to growing the economy and employment and reducing emissions over the next decade. This includes investments in emissions reduction, particularly within regional NSW. The Net Zero Plan targets net zero emissions by 2050 in NSW. Where previously the emissions reduction target under the Net Zero Plan was 35% by 2030, the NSW Government has announced in 2021 that the new objective is to deliver a 50% reduction by 2030, compared to 2005 emissions levels.

The Net Zero Plan: Stage 1 Implementation Update (NSW Government, 2021b) builds on the Net Zero Plan. The Plan is forecast to reduce the State's annual emissions by 28.6–37.3 million tonnes of carbon dioxide equivalent by 2030 and this has been reinforced in the Implementation Update. This means the State's annual emissions are projected to reduce to 47% to 52% below 2005 levels by 2030. The Plan is also:

- Positioning NSW industries to take advantage of the growing demand for low carbon products in global markets
- Supporting NSW businesses in attracting low cost finance from investors in sustainable assets
- Helping NSW businesses reduce their climate related financial risks (NSW Government, 2021b).

The Project would align with the emissions reduction target in NSW by developing renewable wind energy infrastructure and contributing to decarbonisation and the transition away from coal in the electricity sector.

2.2.3.2 NSW Electricity Strategy 2019

The NSW Electricity Strategy 2019 (NSW Government, 2019b) sets out a plan to deliver the first five REZs in the State's Central-West Orana, New England, South-West, Hunter-Central Coast and Illawarra regions. The NSW Government strategies support the implementation of the 2020 ISP and the NSW Government has committed to a minimum 12 GW of new transmission capacity by 2030 and has determined the cheapest resources of generation are large-scale wind and solar farms located in the REZs (DPIE, 2020b).

The Energy Corporation of NSW (EnergyCo NSW) is the statutory authority taking the lead and coordination for REZ projects. It is anticipated that the REZs would deliver benefits for NSW (EnergyCo NSW, 2021) including:

- More reliable energy from significant amounts of new energy supply
- Energy bill savings from reduced wholesale electricity costs
- Emissions reduction from a cleaner energy sector
- Community partnership from strategic planning, best practice engagement, benefit sharing.

The REZs, as established by the Electricity Strategy and the Electricity Infrastructure Roadmap, would incentivise significant large scale renewable energy and storage projects and support around $20 billion in private sector investment (EnergyCo NSW, 2021).

The draft declaration of the South-West REZ was released on the 25 March 2022, in which the Project would fall into as shown in **Figure 1-1** and **Figure 2-2**. The Project would not be contingent on the development or completion of the REZ. It would still enable the objectives and target benefits of the Electricity Strategy and Electricity Infrastructure Roadmap.

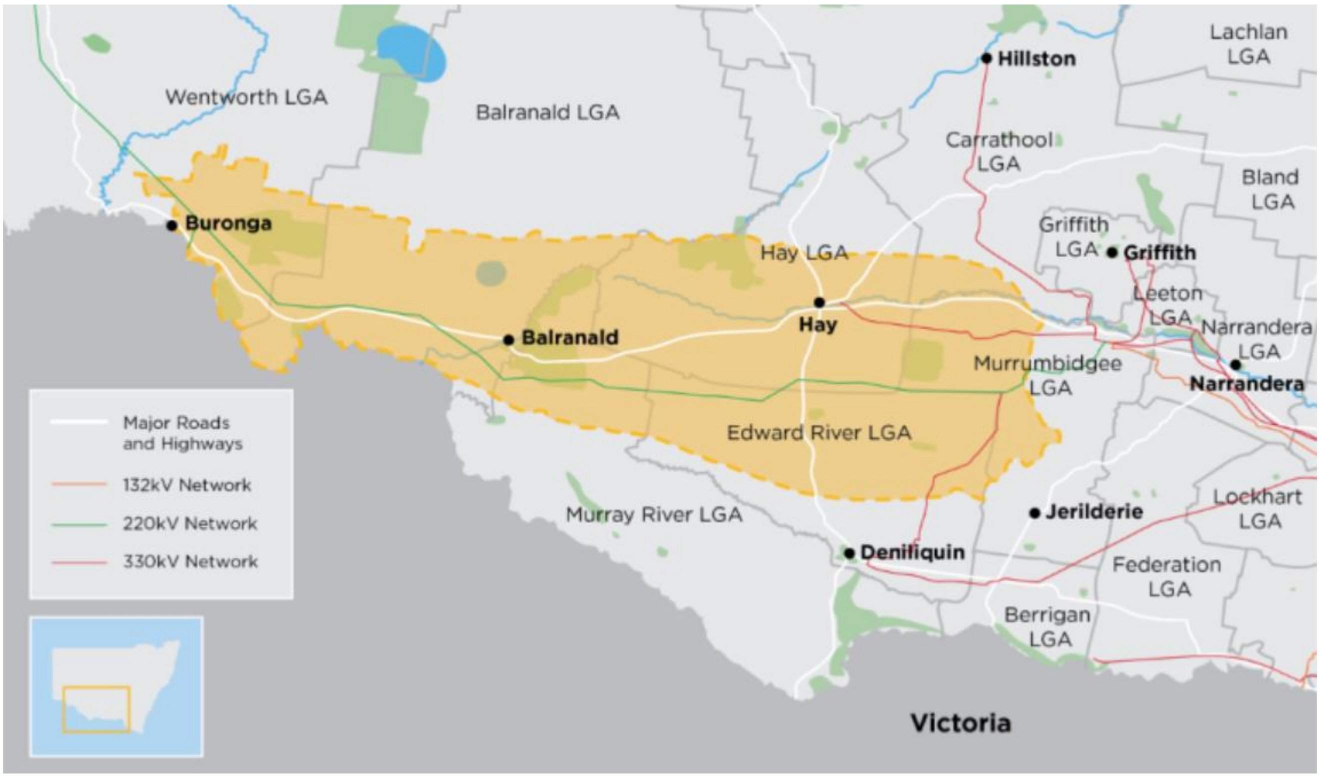


Figure 2-2 Indicative boundary for South-West REZ (NSW Government, 2021d)

The Strategy also provides that the VRE share of generation capacity is expected to continue to grow, as during peak demand periods renewable generation is crucial to help add supply (NSW Government, 2019b). The Project would supply significant amounts of renewable energy to the NEM and support the growth and co-location of low-emission generation capacity in the proposed South-West REZ.

2.2.3.3 NSW Electricity Infrastructure Roadmap 2020

The Electricity Strategy 2019 is also closely aligned with the Net Zero Plan and the NSW Government subsequently released the NSW Electricity Infrastructure Roadmap 2020 (DPIE, 2020b), which is enabled by the *Electricity Infrastructure Investment Act 2020*. The Electricity Infrastructure Roadmap builds on the framework developed in the Electricity Strategy and sets out the rationale for policies and programs that would drive investment in new energy infrastructure (DPIE, 2020b).

The objectives of the Electricity Infrastructure Roadmap are to encourage investment in new generation, storage and transmission in REZs, while using a holistic approach to land-use planning and community consultation to drive social and economic development in regional NSW. Projects supported under the Electricity Infrastructure Roadmap would be required to address and assess potential social impacts, local economic benefits, and use best practice community engagement with local and regional stakeholders (DPIE, 2020a). While households and businesses would be expected to see reduced energy bills, landowners would also benefit from leasing their land for new infrastructure, where the level of investment facilitated by the Electricity Infrastructure Roadmap would anticipate around $280 million in lease payments to 2042 in the South-West REZ (DPIE, 2020b).

The Project would be consistent with the objectives of the Electricity Infrastructure Roadmap and Virya Energy has already commenced consultation with stakeholders to provide inputs to the planning, design and environmental impact assessment process.

2.2.3.4 Draft State Significant Agricultural Land Map

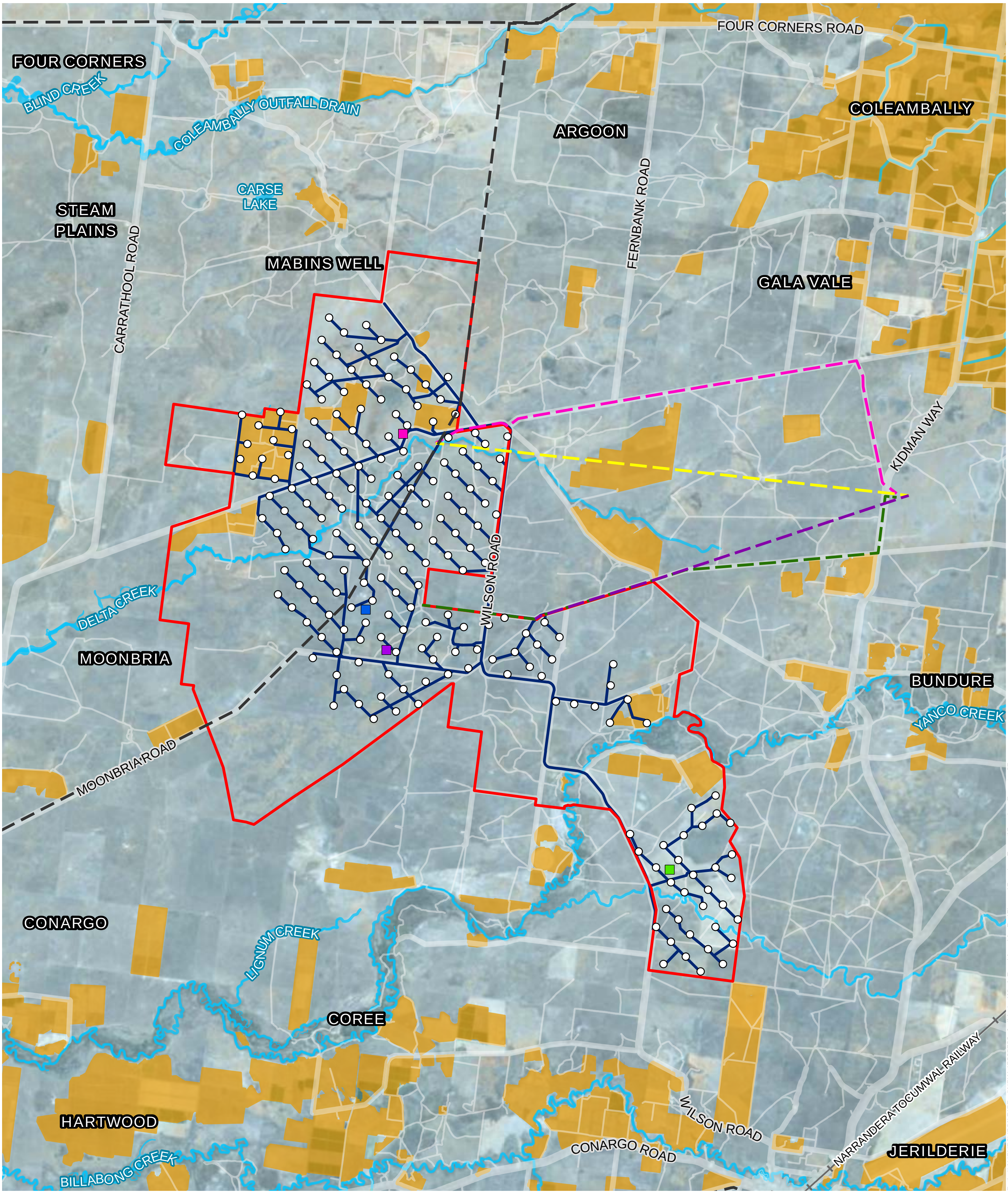
The NSW Department of Primary Industries (DPI) is currently carrying out a mapping program to identify State Significant Agricultural Land (SSAL), which would inform future agricultural land use planning policies (DPI, 2021a). The Draft SSAL is at an early draft stage and was recently on exhibition, inviting comments from agencies and the public. Based on feedback collected during the exhibition period, the draft map is ongoing iterations and would refine the areas considered the best agricultural lands in the state.

The current Draft SSAL map shows land with certain biophysical attributes such as soil fertility, rainfall and also includes irrigated areas. While the Draft SSAL map has not been finalised and no applicable planning policies are in force, there are some mapped areas of SSAL within the Project area as shown in **Figure 2-3**.

Should the SSAL map come into force and any statutory State Significant Agricultural Land Use Planning Policy be developed during the preparation of the EIS, any strategically important agricultural land uses would be considered as part of the Project planning and design.

2.2.4 Regional and local

Table 2-2 identifies other regional and local policies and reports are relevant to the Project.



Indicative Project
Project area
Access tracks/internal cabling
Turbine locations
Main Yanco Delta Substation
Option 1 Substation / Battery
Option 2 Substation / Battery
Collector / Secondary Substation
Proposed transmission line - Option 1
Proposed transmission line - Option 2
Proposed transmission line - Option 3
Proposed transmission line - Option 4

State Significant Agricultural Land - (DPI 2021)

Railway
Waterways
Existing electricity transmission line
Road

0 4 8 km
1:250,000 at A4
GDA 1994 MGA Zone 55

Data sources
Jacobs 2022
DPI 2021
© Department of Customer Service 2020

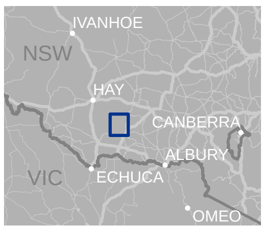


Figure 2-3 Draft State Significant Agricultural Land mapping

Table 2-2 Regional and local policies and reports

Report/Policy	Description	Relevance to Project
20-Year Economic Vision for Regional NSW	The 20-Year Economic Vision for Regional NSW - Refresh (2021 Economic Vision Refresh) (NSW Government, 2021a) provides an update on the 2018 Economic Vision and is based on refreshed priorities and principles for regional NSW, including: • Reliable accessible water and energy • A skilled labour force for current and future needs of the regions • Regulation and planning to promote commercial opportunities • Sustainable economies and communities are better able to recover from shocks. In particular, the 2021 Economic Vision Refresh includes two new investment areas – visitor economy infrastructure and affordable energy. In addition, 50 new priorities would drive long-term stimulus into emerging sectors and future industries, such as renewable energy and gas. This investment and diversification of the future regional NSW economy is expected to enable economic growth and recovery, including $120 million for REZs to unlock the significant pipeline of large scale renewable energy and storge projects (NSW Government, 2021a). Renewable energy is identified as a key emerging industry in regional economies of NSW under the 2021 Economic Vision Refresh, where future markets and communities would need to be supported by innovative industries such as renewable energy to enable reliable, affordable and sustainable energy future that supports a growing economy (NSW Government, 2021a).	The Project would support the investment objectives of the 2021 Economic Vision Refresh and enhance the diversification of the local and regional economy by developing a new large-scale wind farm in the South-West REZ.
Murrumbidgee Council Economic Development Strategy	The Murrumbidgee Council Economic Development Strategy (Murrumbidgee EDS) (Murrumbidgee Council, 2018) aims to guide economic development in the Murrumbidgee Council area. Six strategic themes were identified to support the implementation of the Murrumbidgee EDS: • Attract new business investment • Support existing business to grow and diversify • Education, training and skills development • Grow the population • Infrastructure • Develop and promote tourism.	The Project would bring new investment opportunities and facilitate the delivery of energy infrastructure to support development of electricity infrastructure in the Murrumbidgee Council area.

Report/Policy	Description	Relevance to Project
	Through the strategic themes for economic development, the Murrumbidgee Council aims to create opportunities and work with new and existing industries to proactively provide regional economic opportunities, development, and tourism that can lead to stability and future growth (Murrumbidgee Council, 2018). Specifically, the outcomes from the Murrumbidgee EDS include: • An affordable and attractive area to invest and conduct business • A resilient business community offering a range of local employment opportunities • An attractive and supportive environment for industry investment (less Government red tape) • Increase 'new' industry investment and industry growth/diversification • Provision of industrial land in Darlington Point • Job creation. The Murrumbidgee Council also recognises that the private sector is the major contributor to economic development.	
Edward River Council Economic Development Strategy 2018-2021	The Edward River Council Economic Development Strategy (Edward River EDS) (Edward River Council, 2018b) identifies that the provision of infrastructure is key to support local economic growth and attract new business investment in the Edward River Council region. Key actions include seeking new public and private investment and to explore potential alternative energy sources to drive economic activity.	The Project would be consistent with the strategies, actions and goals of the Edward River EDS.
Statement of Strategic Regional Priorities 2018-2022	Edward River Council and Murrumbidgee Council are both members of the Riverina and Murray Joint Organisation (RAMJO, 2018). RAMJO developed the Statement of Strategic Regional Priorities to establish priorities for the regional areas, which include: • Water security • Energy security and affordability • Transport connectivity • Digital connectivity • Health services • Industry, workforce, job growth (including education).	The Project would support Priority Pillar 2 – Energy security and affordability for the RAMJO council regions and also align with the RAMJO vision to collaborate and ensure long-term sustainability, wellbeing and liveability of the region's communities.

Report/Policy	Description	Relevance to Project
Murrumbidgee Council Local Strategic Planning Statement 2020	The strategic planning vision for the Murrumbidgee Council area is 'to experience land use and development outcomes in the future that both benefit the community and minimise environmental impacts'. (Murrumbidgee Council, 2020). This direction builds upon the Murrumbidgee Community Strategic Plan (CSP) and includes strategic agenda *EG1: A diversified economy,* which aims to 'future proof' the local economy and generate growth in employment in the local community. Strategic agenda *EG14: Renewable energy projects,* specifically outlines the ambition to support projects for renewable energy, while managing off-site impacts during both construction and operation.	The Project would align with strategic agendas EG1, EG5 and EG14 through the development of a large-scale wind farm, which would promote renewable energy generation, local and regional economic growth, and encourage travellers to stop at the wind farm which can become a landmark or visitor attraction.
Murrumbidgee Council Community Strategic Plan 2017-2027	The Murrumbidgee Council Community Strategic Plan 2017-2027 (Murrumbidgee CSP) (Murrumbidgee Council, 2017) aims to prepare a shared vision for the communities over the 10 years to 2027. The five key strategic themes of the Murrumbidgee CSP include the following specific strategies: • Protecting existing regional natural environment for future generations • Exploring and promoting alternative, sustainable energy sources and practices • Maintaining a balance between growth, development and environmental protection • Welcoming and supporting business and industries growth, diversity and productivity • Promoting and supporting a regional economy and growth.	The Project would be consistent with the strategies of the Murrumbidgee CSP, including proposed actions to continue investment into sustainable energy sources such as wind. The Project would support economic and industrial growth and diversification in the Murrumbidgee Council region and would seek to maximise environmental protection while developing new renewable energy generation.
Edward River Council Community Strategic Plan 2018-2030	The Edward River Council Community Strategic Plan 2018-2030 (Edward River CSP) (Edward River Council, 2018a) develops a shared vision underpinned by five strategic outcomes: • A great place to live • A prosperous and vibrant economy • A valued and enhanced natural environment • A region with quality and sustainable infrastructure • A community working together to achieve its potential. The Edward River CSP also identifies opportunities to enable diverse economic base and industry development opportunities, leverage natural assets, and encourage value-adding industry to location in the region.	The Project would seek to develop renewable wind energy generation, which would promote local and regional economic growth. Edward River Council is also located in the South-West REZ which would further attract investment from value-adding industries such as energy generation.

Report/Policy	Description	Relevance to Project
Riverina Murray Regional Plan 2036	The Edward River Council and Murrumbidgee Council are part of the Riverina Murray. The Riverina Murray Regional Plan 2036 (RMRP) (NSW Government, 2017) provides a 20-year blueprint for the Riverina Murray region which includes four goals as follows: • A growing and diverse economy • A healthy environment with pristine waterways • Efficient transport and infrastructure networks • Strong, connected and healthy communities. To achieve these goals, key directions have been identified, including *Direction 11: Promote the diversification of energy supplies through renewable energy generation*. Actions under this direction include to: • Encourage renewable energy projects by identifying locations with renewable energy potential and ready access to connect with the electricity network • Promote best practice community engagement and maximise community benefits from all utility-scale renewable energy projects • Promote renewable energy projects using bioenergy, solar, wind, small-scale hydro, geothermal or other innovative storage technologies.	The Project would align with Direction 11 of the RMRP where the proposed renewable wind energy development would increase the renewable generation in the region, and through this Project the community and environmental benefits would be maximised.
Western Riverina Regional Economic Development Strategy 2018-2022	Murrumbidgee Council is a member of the Western Riverina region, where the Regional Economic Development Strategy 2018-2022 (Department of Premier and Cabinet, 2018) has been developed to facilitate economic growth and opportunities across the region. A key infrastructure priority is to increase the capacity, reliability and affordability of energy supply in the Western Riverina.	The Project would be located within Murrumbidgee Council and would contribute towards the priorities of the Regional Economic Development Strategy.

2.3 Key features of the Project area and surrounds

The Project would be located on land zoned as RU1 – Primary Production under the Conargo Local Environmental Plan (LEP) and Jerilderie LEP. The Project would be located on rural land with agricultural land use including for grazing, cropping and irrigated cropping. The Project area intersects Delta Creek in the northern extent and intersects the Yanco Creek and Turn Back Jimmy Creek at its southern extent.

The closest town centre to the Project is Jerilderie, which is located about 10 kilometres south-east. The largest population centres nearby are Wagga Wagga, about 150 kilometres east of the Project, followed by Deniliquin located 70 kilometres south-west of the Project. There are five dwellings within the Project area, all owned by Project landowners and all landowners dwellings are at a minimum of two kilometres from any proposed WTGs. No turbines are placed within 3.7 kilometres of any habitable dwellings on properties neighbouring the Project area.

The Project would not be located in close proximity to any national parks, scenic or conservation areas. The South West Woodland Nature Reserve is managed by the NSW National Parks and Wildlife Service (NPWS) is located about 12 kilometres west of the Project area. The Jerilderie Nature Reserve is about 10 kilometres from the southern extent of the Project area (refer to **Figure 1-1**).

The Yanco Creek is mapped as a groundwater vulnerability region under the Jerilderie LEP and there are also mapped wetlands in the Project area. There are no mapped acid sulfate soils, or flood planning zones within the Project area. A large portion of the Project area west of Wilson Road is identified as bushfire prone land Vegetation Category 3, identifying medium bushfire risk vegetation. There are no identified subsidence risks in the Project area, however there is an active mineral exploration licence (EL9104) which intersects the Project area at its southern extent.

An existing 132 kV Deniliquin to Coleambally transmission line intersects the Project area. The Project would eventually connect to the proposed Dinawan Terminal Station via a new proposed transmission line (refer to **Section 3.3.4**). No major rail or pipeline infrastructure is located near the Project area. The closest major road corridor to the Project area is Kidman Way, and the southern extent of the Project area is about eight kilometres from the intersection of Kidman Way and Newell Highway, located 14 kilometres north of the Jerilderie township.

In addition to the proposed Dinawan Terminal Station which will be built as part of Project EnergyConnect, other proposed renewable energy developments in the regions around the Project have been announced. These are in early planning phases and have not yet been registered on the Major Projects website. Potential cumulative impacts will be assessed further in the EIS and potential future projects are outlined in **Section 6.16**.

2.4 Other agreements

Virya Energy is currently in the process of seeking to secure participation agreements with the owners of all neighbouring dwellings within eight kilometres of a WTG. It is expected that this process will be finalised well prior to the submission of the EIS, noting that two neighbouring landowners are unlikely to sign due to participation in competing projects.

Virya Energy will negotiate voluntary planning agreements with both Councils and has stated in Project presentation meetings with Council officers that the Project would make annual contributions to a community benefit fund that will be spent on community projects in the region across both LGAs.

3. Project

3.1 Project description

Virya Energy is proposing to develop the Yanco Delta Wind Farm. The Project would involve construction, operation, maintenance and decommissioning of key components as follows:

- Up to 225 WTGs with a total generating capacity of approximately 1,500 MW, each with:
  - Maximum tip height of 270 metres
  - A crane hardstand area and turbine laydown area
- A 500 MW/500 MWh BESS
- Permanent ancillary infrastructure including operation and maintenance facility, internal access tracks, underground and overhead cabling, wind monitoring masts, central primary substation and about five collector substations
- Temporary facilities including site compounds, laydown areas, stockpiles, gravel borrow pit(s) and concrete batch plants, temporary roads and temporary monitoring masts.

3.2 Project location

The Project would be located north-west of the township of Jerilderie near the localities of Moonbria and Mabins Well, within the Murrumbidgee Council and Edward River Council LGAs, as shown on **Figure 1-2.**

The Project area is zoned RU1 – Primary Production under the Conargo Local Environmental Plan 2013 and Jerilderie Local Environmental Plan 2012.

There are five rural residential dwellings within the Project area, and are all owned by Project landowners. The nearest neighbouring dwelling is 3.7 kilometres from the nearest WTG (refer to **Figure 1-2**) and Project participation agreements are being offered to all dwellings within eight kilometres of a WTG. The Jerilderie township is a minimum of 10 kilometres from any proposed WTG.

3.3 Project layout and design

3.3.1 Project area and site access

The Project area, as shown on **Figure 1-2,** is approximately 42,000 hectares. This represents the maximum Project area. The WTGs would be spread across an area of approximately 24,000 hectares with a disturbance area of approximately 230 hectares with the remaining area left clear. Temporary construction compounds or laydown areas may be required within this clear area during Project construction. Virya Energy would seek agreements to use any required vacant land with the relevant landowner. The location and indicative areas would be determined during further Project planning and design and assessed as part of the EIS for the Project.

The Project operation and maintenance facility would include office or control room and parking suitable for vehicles and equipment required to operate and maintain the Project.

Site access would be via a designated and upgraded access track from Kidman Way via the corner of Liddles Lane and Jerrys Lane (refer to **Figure 1-2**).

The WTGs are expected to land at the ports of Melbourne or Geelong and follow the Hume Freeway, the Goulbourn Valley Highway and the Newell Highway before turning onto the Kidman Way then onto the Project area via Liddles Lane. These highways are the primary truck route between Melbourne and Brisbane and are designed for high volumes of heavy transport. A detailed transport assessment will be undertaken to ascertain any intersection modifications required (refer to **Section 6.8**). These modification will be minimised by using specialist equipment such as rear-steerable trailers that allow the long loads to safely and efficiently turn corners.

3.3.2 Wind turbine generators

The Project would be generally comprised of up to 225 three-bladed WTGs of up to 270 metres in height and are each expected to have at least 6.0 MW in generation capacity. This allows for a conservative assessment of a 'worst case' impact scenario, allowing the Project design to be further refined and make use of any WTG technological developments between the time of this assessment and the commencement of construction. The final number of WTG and total generation capacity is subject to change and would be dependent on the outcomes of the environmental assessments and Project planning and design in consultation with stakeholders.

Each WTG would have a crane hardstand area and turbine laydown area. The hardstand would be used for the assembly, erection, maintenance, repowering and/or decommissioning of a WTG. The turbine laydown area would be used during construction for component laydown and equipment assembly, among other WTG construction activities including cut and fill. These areas would be rehabilitated after construction, where they do not form part of an access track.

3.3.3 Battery Energy Storage System

The Project BESS would provide firming capability for the wind energy being produced by the Project. Storage of energy can add significant benefits to renewable generation because it allows for the dispatch of energy in accordance with market demand and can overcome potential issues associated with intermittency of output. The battery technology has not yet been determined and the most commercially suitable type would be deployed for use in the Project depending on the detailed design and financial modelling process. The BESS would consist of battery modules and components, and ancillary infrastructure such as transmission lines and would connect to the substations and the grid via underground and/or overhead cables.

3.3.4 Electrical connections

A series of underground and overground transmission lines are proposed to transmit the electricity generated by the WTGs and/or the BESS to the NEM via the proposed Dinawan Terminal Station.

Due to the range of connection options emerging as a result of the announcement of the South-West REZ, the Project would seek to connect via the most efficient and least impactful option available.

The physical connection would include a new 330 kV or 500 kV transmission line either through:

- McLennons Bore Road and Cadell Road; or
- Liddles Lane and Kidman Way; or
- Along the proposed VNI West Interconnector 500 kV transmission easement; or
- Through three separate private properties between the 132 kV Deniliquin to Coleambally transmission line easement and Kidman Way (refer to **Figure 1-2**).

Electrical connections between WTGs, the BESS, the Project substations and the proposed Dinawan Terminal Station would include both underground and overhead connections.

3.3.5 Ancillary infrastructure

Ancillary infrastructure refers to all permanent wind farm infrastructure (except the WTGs) and includes:

- Substations (main and collector) – indicative locations for the main substation, substation/battery (two potential options) and a collector substation shown in **Figure 1-2**
- Operation and maintenance facility (including offices and car park) – one facility would be set up during construction (refer to **Section 3.3.6**) at a location within the Project area that would be selected once the WTG locations are finalised; it would be subsequently converted for operational purposes
- Underground electricity transmission lines and internal cabling
- Overhead or underground electricity transmission lines – dependent on final layout

- Permanent meteorological masts – the purpose of the meteorological masts is to provide necessary information on the performance monitoring of the WTGs
- Internal access tracks – to, from and in between WTGs; to be cleared land but not asphalted.

3.3.6 Temporary facilities

Temporary facilities would consist of site offices and compounds, gravel borrow pit(s) and concrete batch plants, stockpiles and materials storage compounds, temporary field laydown areas, construction access tracks and temporary meteorological masts. The location of temporary facilities would be refined and assessed as part of the EIS.

All temporary facility areas, with the exception of one to be converted into the operation and maintenance facility, would be rehabilitated once they are no longer required, in accordance with proposed mitigation measures that will be prepared as part of the EIS.

3.4 Construction activities

3.4.1 Construction work

The construction of the Project is expected to involve the following:

- Installation and maintenance of environmental controls
- Upgrade and construction of access tracks between WTGs, in connection to the BESS, substations and other parts of the Project, where required
- Clearance of vegetation
- Delivery of materials including concrete and gravel
- Cut and fill to create level areas and establishment of a crane hardstand and turbine laydown areas at each WTG
- Construction of ancillary facilities and establishment of any temporary facilities
- Delivery and installation of the WTGs
- Delivery and installation of the battery modules, substations, transformers and associated BESS infrastructure
- Installation of underground and overhead cabling
- Testing and commissioning activities
- Removal of construction equipment and rehabilitation of construction areas.

The construction methodology for the Project will be developed in more detail during the preparation of the EIS.

The following work may also be required:

- Road network upgrades, including minor intersection widening to accommodate delivery of materials
- Establishment of asset protection zones or other design solutions for bushfire protection.

3.4.2 Construction program

The construction of the Project is targeted to begin in late-2024 subject to planning approval, with an expected duration of 36 months. Commercial operations of the first commissioned WTGs would commence at the end of 2025 (subject to Project approval) in line with the completion and commissioning of the Dinawan Terminal Station and Project EnergyConnect. The Project may be completed in stages depending on the final grid connection configuration and the offtake agreements, however, it is expected that any stages required would overlap as if it were one continuous phase.

The majority of construction activities would be carried out during the following hours:

- 7am-6pm Monday to Friday
- 7am-3pm Saturdays
- No work on Sundays or Public Holidays.

Certain activities would require work to be conducted outside normal work hours to prevent damage to concrete tower bases and trenches, to reduce the safety risk of open trenches and to reduce the risk of tower self-oscillation. Some examples of these activities include concrete pours, in-ground electrical work and WTG installation. Other activities that would be carried out outside of the standard daytime construction hours may include:

- Work determined to comply with the relevant noise management level at the nearest sensitive receiver
- The delivery of materials outside approved hours as required by the NSW Police or other authorities for safety reasons
- Emergency situations where it is required to avoid the loss of lives and properties and/or to prevent environmental harm
- Situations where agreement is reached with Project landowners and neighbours.

3.4.3 Construction workforce

The construction workforce is anticipated to consist of up to 300 people per day.

The Project would involve the recruitment and training of a construction workforce and ongoing operations and maintenance workforce. Development and construction of the Project would also provide localised upskilling and training in the region in relation to the operation of wind farms. Further, major contractors would be asked to demonstrate their commitment to use State and local workforces and create indigenous and equal opportunity employment in the delivery of the Project.

3.5 Operations

The Project would operate on a 24 hour and 365 days per year basis. The Project would be monitored by both on-site staff and through remote monitoring. The operational workforce is anticipated to consist of 20 to 30 ongoing jobs.

Maintenance activities would be required, including maintenance of landscaping and asset protection zones, access tracks and inspection, testing and replacement of components on a rolling basis. It is intended to have an operation life of at least 30 years and, depending on the selected technology, components may be replaced and or upgraded to extend this timeframe.

3.6 Decommissioning and rehabilitation

Following the end of economic life, the Project would either be decommissioned or refurbished with upgrades to power generation infrastructure. If decommissioned, the Project area would be rehabilitated to its pre-construction conditions. Virya Energy will prepare a decommissioning and rehabilitation plan to be provided as part of the EIS, in consultation with relevant stakeholders and landowners.

3.7 Alternatives considered

The following alternatives were considered by the Proponent to meet Project objectives:

- Option 1 – do nothing
- Option 2 – up to 250 WTGs located in other areas within the Project area
- Option 3 – up to 250 WTGs located within the area identified in **Figure 1-2** (the Project).

Option 1 (do nothing) does not meet NSW needs for generation capacity (refer to **Section 2.2.3**) or the Project Objectives (refer to **Section 1.1.1**) and, therefore, was not considered further.

Options 2 and 3 would provide the following benefits and were considered further as a result:

- Location within the South-West REZ
- Low population density
- Landowner payments shared across most of the landowners in the Project area. i.e. good social licence
- Suitable renewable energy resource potential
- Proximity to proposed Dinawan Terminal Station and Project EnergyConnect corridor
- Compatibility with existing land uses.

The Project (Option 3) was considered as the best option as the siting of the WTGs has the following benefits over other sites considered:

- Based on preliminary ecological surveys, Project elements have been situated to avoid impacts to high integrity ecological endangered communities (EECs) where possible
- Following preliminary predictive modelling of archaeological potential within the Project area, WTGs have avoided high potential areas where possible
- Based on landowner consultation, WTG locations have been placed in locations that are more compatible with Project landowners' uses of property
- The number of WTGs have been reduced to around 225 to increase setbacks from neighbouring properties and to reduce impact on flora and fauna
- Preliminary feedback from landowner consultation has been positive.

The Project layout will be subject to further refinement during the EIS and further design development to minimise impacts on the environment and community. This will be informed by the further technical studies and the continued community and stakeholder consultation.

At time of lodgement of the EIS, the specific technology provider for the WTGs and the BESS may not have been selected and may change during future stages of development. As such, reasonable worst-case assumptions will be used to facilitate impact assessment in the EIS.

4. Statutory context

4.1 NSW planning framework

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (the EP&A Regulation) provide the framework for land use planning and development control in NSW. The EP&A Act and Regulation are supported by a number of Environmental Planning Instruments (EPIs), which include State Environmental Planning Policies (SEPPs) and LEPs.

Part 4 of the EP&A Act establishes the framework for assessing development that is permissible with consent. The Project is SSD under Section 2.6(1) in conjunction with Section 20 of Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021.

The conditions to be met in order to be specified SSD are (Planning Systems SEPP Section 2.6(1)):

- (a) Not permissible without development consent under Part 4 EP&A Act (see section 2.36(1)(b) Transport and Infrastructure SEPP); and
- (b) specified in Schedule 1 or 2 Planning Systems SEPP (see Schedule 1, Section 20 – must be electricity generating works and capital investment value of more than $30 million).

The Project is defined as electricity generating work and has a CIV estimated to exceed one billion dollars. Therefore the Project is proceeding with an application for planning approval as an SSD. Under Section 4.12(8) of the EP&A Act, the application is to be accompanied by an EIS that meets the requirements of Schedule 2 of the EP&A Regulation and any other relevant legislative requirements that relate to the EIS.

This Scoping Report has been prepared to obtain the SEARs which will facilitate the preparation of an EIS. Following the receipt of the SEARs, Virya Energy would prepare and publicly exhibit the EIS in accordance with the SEARs and relevant requirements under Part 4 of the EP&A Act and the EP&A Regulation.

4.2 Statutory requirements for the Project

4.2.1 Permissibility

The Project meets the definition of 'electricity generating works' under the Standard Instrument – Principal Local Environmental Plan (Standard Instrument), being a building or place used for the purpose of 'making or generating electricity'. The Project would be located in land zoned RU1 – Primary Production where electricity generating works are not permissible under the Conargo LEP and Jerilderie LEP.

However, Section 2.36(1) of the State Environmental Planning Policy (Transport and Infrastructure) 2021 provides that 'development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone'. Land which is zoned RU1 – Primary Production is prescribed rural zone for the purposes of 2.36(1) of the State Environmental Planning Policy (Transport and Infrastructure) 2021. Therefore the Project would be permissible with consent under Part 4 of the EP&A Act.

4.2.2 Power to grant consent

As SSD, the Project would be assessed under Part 4, Division 4.7 of the EP&A Act. Under Section 4.5(a) of the EP&A Act, the consent authority for the Project is the Independent Planning Commission or the Minister for Planning. The consent authority would evaluate the SSD application in accordance with Section 4.15 of the EP&A Act.

4.2.2.1 Considerations under the EP&A Act

The relevant mandatory provisions of the EP&A Act are identified in **Table 4-1**.

Table 4-1 EP&A Act mandatory considerations

Statutory reference	Consideration
Section 4.36 Development that is SSD	The Project is declared SSD through the application of Section 2.6(1) in conjunction with Section 20 of Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021being for the purpose of electricity generating works, and having a CIV exceeding $30 million.
Section 4.37 Staged SSD	The Project application does not seek consent for a staged development.
Section 4.38 Consent for SSD	The Independent Planning Commission or the Minister for Planning is the consent authority for SSD under Division 4.7 of the EP&A Act. The consent authority may determine the SSD application by either granting conditional consent or refusing consent.
Section 4.39 Regulations – SSD	The relevant regulations establish the form and content requirements for the EIS and the requirements for the consultation process, which would be provided in detail in the EIS.
Section 4.40 Evaluation	The application is to be determined under Section 4.15 of the EP&A Act.

Section 4.41 of the EP&A Act identifies approvals that do not apply in the case of this Project and where authorisations are not required for SSD that has been approved. Nevertheless, they have been considered below in **Table 4-2.**

Table 4-2 Relevant approvals not required under Section 4.41 of the EP&A Act

Approval	Consideration
A permit under section 201, 205 or 219 of the *Fisheries Management Act 1994* (FM Act)	The Project would not involve dredging or reclamation work or work in water ways. The Project would not impact on marine vegetation or cause blockage in fish passage. No permits under the relevant FM Act sections are required.
An approval under Part 4, or an excavation permit under section 139 of the *Heritage Act 1977*	There are no listed heritage items identified within the vicinity of the Project. No impacts to the heritage items or value are expected as a result of the Project (refer to **Section 6.4**).
An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974* (NPW Act)	No Aboriginal heritage sites or listed items are identified within the Project area or within a two km buffer. As a result, the Project will not pose an impact to any known Aboriginal objects. Further assessment will be completed during the preparation of the EIS to identify impacts to previously unidentified Aboriginal objects (refer to **Section 6.3**).
A bush fire safety authority under section 100B of the *Rural Fires Act 1997*	The Project area would be located within identified bushfire prone land. Potential risks associated with bushfires would be assessed further in the EIS (refer to **Section 6.12.7**).
A water use approval (section 89), a water management work approval (section 90) or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000* (WM Act).	The Project would not require a water use approval under section 89 of the WM Act. The Project would not involve any water management work under section 90 of the WM Act. The Project would not involve work being carried out on waterfront land which means controlled activity approval is not required under section 91(2) of the WM Act. No aquifer interference activity would occur and as such section 91(3) would not apply to the Project.

Section 4.42 of the EP&A Act identifies approvals that must be applied consistently to a Project if it is necessary for carrying out SSD that has been approved. In these instances an authorisation of the following approvals cannot be refused. Environmental approvals required under Section 4.42 of the EP&A act are outlined in **Table 4-3**.

Table 4-3 Relevant approvals required under Section 4.42 of the EP&A Act

Approval	Consideration
An aquaculture permit under section 144 of the FM Act	The Project would not involve aquaculture development and no aquaculture permit is required.
An approval under section 15 of the Mine *Subsidence Compensation Act 1961* (repealed by *Coal Mine Subsidence Compensation Act 2017*)	The Project would not be located within a mine subsidence district.
A mining lease under the *Mining Act 1992*	An exploration licence covers part of the Project area (EL9104). Since the Project would only involve sub-surface infrastructure with a limited area, potential impacts on existing or future mining activities are not anticipated. A mining lease is not required.
A production lease under the *Petroleum (Onshore) Act 1991*	The Project would not involve petroleum production and no production lease is required.
An environment protection licence (EPL) under Chapter 3 of the *Protection of the Environment Operations Act 1997* (POEO Act) (for any of the purposes referred to in section 43 of that Act)	Virya Energy would seek an EPL prior to the Project commencing.
A consent under section 138 of the *Roads Act 1993*	The Project would involve the upgrade of roads currently owned and managed by Murrumbidgee Council and Edward River Council. Approval from the relevant Council would be required.
A licence under the *Pipelines Act 1967*	No pipelines or associated licences would be required for the Project.

4.2.3 NSW environmental legislation

Based on the scope of the Project the legislation that may be applicable is identified in **Table 4-4**. The applicability would be confirmed in the EIS.

Table 4-4 NSW legislation requirements

Legislation	Requirement
Contaminated Land Management Act 1997	This Act outlines the circumstances in which notification of the NSW Environment Protection Authority (EPA) is required in relation to the contamination of land. This may become relevant during construction and/or operation of the Project and would be discussed in greater detail in the EIS.
Biodiversity Conservation Act 2016	This Act aims to conserve threatened species, populations and ecological communities through ensuring appropriate assessment, management and regulation of actions that may damage critical or other habitat for a listed threatened species, or may otherwise significantly affect a threatened species, population or ecological community. The EIS for the Project would include an assessment of biodiversity impacts (refer to **Section 6.2**) in accordance with the *Biodiversity Conservation Act 2016* and biodiversity assessment method.

Legislation	Requirement
Biosecurity Act 2015	Under this Act, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Section 22 requires that any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. The *Biosecurity Act 2015* may be applicable if listed weeds are identified within the Project area.
Crown Land Management Act 2016	This Act provides for the administration and management of Crown lands in NSW. Crown land may not be occupied, used, sold, leased, licensed, dedicated, reserved or otherwise dealt with unless authorised by the Act. There are some areas of Crown land and travelling stock reserves/routes within the Project area and should any work be proposed in these areas, approval would be sought from NSW Crown Lands.
Heritage Act 1977	Section 146 of the Heritage Act specifies that if a relic is discovered or located, the Heritage Council must be notified 'of the location of the relic, unless he or she believes on reasonable grounds that the Heritage Council is aware of the location of the relic'. There are no listed heritage items within the vicinity of the Project, however the EIS for the Project would include an assessment of potential heritage impacts (refer to **Section 6.3**).
Native Title (New South Wales) Act 1994	This Act provides for native title in relation to land or waters. The Project does not affect land subject to a native title claim or determination, or land to which an Indigenous Land Use Agreement applies.
National Parks and Wildlife Act 1974	This Act provides for the management and conservation of land declared as national parks and conservation areas, as well as regulating the management of Aboriginal objects and places. No part of the Project falls within land reserved under the *National Parks and Wildlife Act 1974* or NSW National Parks owned or managed lands. The EIS for the Project would include an assessment of potential impacts to identified Aboriginal objects and places (refer to **Section 6.3**).
Protection of the Environment Operations Act 1997	An EPL is required for scheduled activities or development work listed by the Act. Schedule 1 lists activities that require a licence and Section 17 of this Schedule applies to 'electricity works (wind farms)'. A new EPL would be sought to authorise the new scheduled activity associated with the Project. The POEO Act has a number of regulations relating to matters of pollution, waste, air quality and noise. If relevant, these specific sections would be considered as part of the impact assessments within the EIS.
Roads Act 1993	Section 138 of this Act states: *A person must not (a) erect a structure or carry out a work in, on or over a public road, or (b) dig up or disturb the surface of a public road, or (c) remove or interfere with a structure, work or tree on a public road, or (d) pump water into a public road from any land adjoining the road, or (e) connect a road (whether public or private) to a classified road, otherwise than with the consent of the appropriate roads authority.* The Project would include upgrades to public roads. As such, an approval would be required from Murrumbidgee Council and/or Edward River Council.

Legislation	Requirement
Electricity Supply Act 1995 and *Electricity Network Assets (Authorised Transactions) Act 2015*	Under these Acts, the transmission and distribution lines connecting a wind energy generating facility to the grid can be considered as a separate development from the generating facility given both the linear nature of transmission lines and the fact that they are usually owned and operated by an electricity transmission operator or distributor. If not and if they are sufficiently related to the wind energy generating facility, they should form part of the associated SSD and be governed by Part 4 of the EP&A Act. Required transmission infrastructure will be confirmed during the EIS following further stakeholder consultation.
Waste Avoidance and Resource Recovery Act 2001	This Act encourages the most efficient use of resources in order to reduce environmental harm. Waste and resource impacts associated with the Project would be considered as part of the EIS.

4.2.4 NSW environmental planning instruments

Relevant SEPPs and LEP to the Project have been considered in **Table 4-5**.

Table 4-5 Environmental planning instruments and considerations

Environmental planning instrument	Considerations
State Environmental Planning Policy (Planning Systems) 2021 (formerly State Environmental Planning Policy (State and Regional Development) 2011)	The Project is classified as SSD under Section 2.6(1) in conjunction with Section 20 of Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021.
State Environmental Planning Policy (Transport and Infrastructure) 2021 (formerly State Environmental Planning Policy (Infrastructure) 2007)	The aim of the State Environmental Planning Policy (Transport and Infrastructure) 2021 is to facilitate effective delivery of infrastructure projects across NSW. The Project area would be located in land zoned RU1 – Primary Production under the Conargo LEP and Jerilderie LEP. This land use zone is also defined as a prescribed rural zone for the purpose of electricity generating works and under Section 2.36(1) of the State Environmental Planning Policy (Transport and Infrastructure) 2021, the Project would be permissible with consent.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 (formerly State Environmental Planning Policy (Koala Habitat Protection 2021) (Koala SEPP))	Chapter 3 (Koala habitat protection 2020) and Chapter 4 (Koala habitat protection 2021) aim to encourage conservation and management of areas of natural vegetation that form koala habitats. Chapter 3 and 4 of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 apply to LGAs across NSW as listed in Schedule 2, which includes the Edward River Council LGA but not the Murrumbidgee LGA. The EIS biodiversity assessment would consider any potential koala habitat impacts and relevant koala plans of management as part of the EIS preparation and biodiversity impact assessment for the Project in accordance with applicable Koala protection policy at the time.

Environmental planning instrument	Considerations
State Environmental Planning Policy (Resilience and Hazards) 2021 (formerly State Environmental Planning Policy No. 55 – Remediation of Land)	The object of Chapter 4 (Remediation of land) of the State Environmental Planning Policy (Resilience and Hazards) 2021 is to provide for a Statewide planning approach to the remediation of contaminated land. In accordance with Section 4.6(1) of the State Environmental Planning Policy (Resilience and Hazards) 2021, a consent authority must not consent to the carrying out of development on any land unless: a) It has considered whether the land is contaminated, and b) If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and c) If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose. Investigation of potential contamination in the Project area would be carried out as part of the EIS to confirm that the Project area is suitable either in its current state, or can be made suitable through remediation.
State Environmental Planning Policy (Resilience and Hazards) 2021 (formerly State Environmental Planning Policy No. 33 – Hazardous and Offensive Development)	The object of Chapter 3 (Hazardous and offensive development) of the State Environmental Planning Policy (Resilience and Hazards) 2021 is to ensure that measures are used to reduce the impact of a development that is potentially hazardous or offensive. Section 3.12 of the State Environmental Planning Policy (Resilience and Hazards) 2021 specifies that the consent authority must consider: a) Current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development, and b) Whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and c) In the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and d) Any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and e) Any likely future use of the land surrounding the development. While lithium ion batteries do not exceed screening criteria under the State Environmental Planning Policy (Resilience and Hazards) 2021, the DPE is understood to require the preparation of a preliminary hazard analysis be undertaken during the EIS preparation in accordance with relevant Hazardous Industry Planning Advisory Papers (HIPAPs) and other guidelines such as Applying SEPP 33 (Department of Planning, 2011a) and Multi-level Risk Assessment (Department of Planning and Infrastructure, 2011a).

Environmental planning instrument	Considerations
Conargo Local Environmental Plan 2013 (Conargo LEP)	The Project would be partially located within the Edward River Council LGA and development within this LGA is regulated by the Conargo LEP. The Project area is zoned RU1 – Primary Production. Other applicable clauses of the LEP which need to be considered in relation to specific mandatory considerations prior to the issue of development consent include: • Clause 5.10 heritage conservation • Clause 5.21 flood planning • Clause 6.1 earthworks • Clause 6.3 terrestrial biodiversity • Clause 6.4 groundwater vulnerability • Clause 6.5 riparian land and watercourses • Clause 6.6 wetlands and watercourses. The majority of the Project area is mapped as 'biodiversity' on the biodiversity terrestrial maps under the relevant LEPs, meaning that Section 6.3 of the Conargo LEP applies to these biodiversity areas. However as the Project is declared SSD, the Project would be a permissible development with consent in accordance with Section 2.36(1) and Section 2.7(1) of the State Environmental Planning Policy (Transport and Infrastructure) 2021)). Regardless, the EIS for the Project would include an assessment of potential biodiversity impacts (refer to **Section 6.2**).
Jerilderie Local Environmental Plan 2012 (Jerilderie LEP)	The Project would be located within the Murrumbidgee Council LGA and development within this LGA is regulated by the Jerilderie LEP. The Project area is zoned RU1 – Primary Production. Other applicable clauses of the LEP which need to be considered in relation to specific mandatory considerations prior to the issue of development consent include: • Clause 5.10 heritage conservation • Clause 5.21 flood planning • Clause 6.1 earthworks • Clause 6.4 terrestrial biodiversity • Clause 6.5 groundwater vulnerability • Clause 6.6 riparian land and watercourses • Clause 6.7 wetlands and watercourses • Clause 6.8 essential services. The majority of the Project area is mapped as 'biodiversity' on the biodiversity terrestrial maps under the relevant LEPs, meaning that Section 6.4 of the Jerilderie LEP applies to these biodiversity areas. However as the Project is declared SSD, the Project would be a permissible development with consent in accordance with Section 2.36(1) and Section 2.7(1) of the State Environmental Planning Policy (Transport and Infrastructure) 2021)). Regardless, the EIS for the Project would include an assessment of potential biodiversity impacts (refer to **Section 6.2**).

4.2.5 Commonwealth environmental legislation

4.2.5.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides the legal framework to protect and manage Matters of National Environmental Significance (MNES), while also considering cultural values and society's economic and social needs. MNES protected by the EPBC Act includes threatened species and ecological communities, migratory species (protected under international agreements), and national heritage places (among others).

Any actions that will, or are likely to, have a significant impact on MNES require referral to, and approval from, the Commonwealth Government Minister for the Environment.

MNES have been identified as potentially occurring on or near the Project area, including listed threatened species or endangered communities. A referral has been made to the Commonwealth DAWE on 12 April 2022 to determine if the development would have a significant impact on a MNES. If so, the development would become a 'controlled action' and will be assessed under the NSW Bilateral Agreement with the Commonwealth.

4.2.5.2 Native Title Act 1993

The *Native Title Act 1993* recognises the rights and interests of Indigenous people to land and aims to provide for the recognition and protection of common law native title rights.

A search of the National Native Title Tribunal database, on 8 October 2021, found that there are no Native Title claims currently registered in the Project area.

4.2.5.3 Civil Aviation Safety Regulations 1988

Part 139 of the Civil Aviation Safety Regulations 1998 (CASR) regulates obstacles within the vicinity of certified aerodromes. Any WTG (where the height is defined to be the maximum height reached by the tip of the turbine blades), wind monitoring mast or other tall structure that penetrates an Obstacle Limitation Surface (OLS) of an aerodrome will be dealt with in accordance with the provisions of Part 139 of CASR.

A detailed assessment in accordance with the regulations and consultation with the relevant agencies such as the Civil Aviation Safety Authority (CASA) will be undertaken as part of the preparation of the EIS (refer to **Section 6.12.1**).

4.2.6 Other approvals required

The following additional approvals, permits or authorisations are required for Project:

- An EPL under the POEO Act
- Approval under Section 138 of the *Roads Act 1993*
- A construction and occupation certificate under Part 6 of the EP&A Act.

The need for a controlled activity approval is to be determined by a referral process under the EPBC Act and is being progressed separately. No other licences and permits under other legislation would be required by the Project prior to commencement of construction. Network connection agreements with Transgrid are being progressed separately.

5. Engagement

5.1 Interest groups identified

Virya Energy has completed a comprehensive stakeholder analysis and has identified a number of key interest groups including:

- Federal, State and Local government
- State and Federal politicians
- Government organisations
- Energy industry organisations and businesses
- Landowners
- Aboriginal representatives and groups
- CASA
- Air Services Australia
- NSW Rural Fires Service (RFS)
- Transport for NSW
- NSW EPA
- South-West REZ Regional Reference Group
- Royal Australian Air Force Base – Wagga and the Federal Department of Defence
- Griffith Local Aboriginal Land Council
- Cummeragunja Local Aboriginal Land Council
- Victorian Ports Corporation (Melbourne)
- Victorian Department of Transport.

5.2 Engagement carried out

A Community Consultation Strategy has been prepared for the Project based on the International Association of Public Participation (IAP2) Public Participation Spectrum. The strategy has been developed in accordance with Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021d) and consultation requirements detailed in the NSW Wind Energy Visual Assessment Bulletin (DPE, 2016c).

The Community Consultation Strategy outlines the overall approach for communication about the Project. It is anticipated that the Community Consultation Strategy will be updated periodically through the Project to reflect the evolving engagement needs of each of the approvals processes.

The Strategy identifies the stakeholders with an interest in the Project and who are likely to be impacted, including landowners, near neighbours, local community, Councils and government agencies. It outlines early engagement activities which have been undertaken to date, whilst also providing a detailed plan on how engagement be carried out into the future. The engagement activities undertaken, including community information session and face-to-face briefings, have actively sought to present stakeholders with an understanding of the Project and provide them with the opportunity to provide feedback.

The Strategy outlines mechanisms to evaluate and address feedback from key stakeholders and the community. Feedback will be monitored via the Project website, phone number and email address to maintain an understanding of the public sentiment about the Project and to ensure engagement activities are tailored in response. Data generated from engagement activates delivered throughout the communication and engagement process are recorded through the Proponent’s systems and reporting. This information will be used to demonstrate Virya Energy’s commitment to genuine engagement to key approval agencies. It will also be used to inform later stages of the Project and be used to support approval processes.

In 2020, Virya Energy commenced community and stakeholder consultation regarding their plans to develop a wind farm. Community consultation to date has included:

- Multiple face-to-face briefings and meetings with Project landowners and near neighbours within eight kilometres of a WTG
- Consultation with local Aboriginal representatives (see **Section 5.3**)
- Correspondence and Project briefings with Edward River Council LGA and Murrumbidgee Council LGA
- Project briefings with Federal Department of Agriculture, Water and Environment, NSW government departments such as DPE, Heritage NSW, NSW Biodiversity Conservation and Sciences and EnergyCo NSW
- Project briefings with Transgrid and AEMO and with licenced transmission asset owners Lumea (Transgrid) and Mondo (Ausnet)
- A community drop-in session held out the front of the IGA in Jerilderie in March 2022
- Community feedback forms were distributed in person, via email and through phone survey.

Consultation undertaken to date, issues raised and responses are summarised in **Table 5-1**.

Table 5-1 Summary of community and stakeholder consultation to date

Stakeholder	Date	Consultation Activity	Purpose	Issues, Concerns and Views Raised	Consideration of Issues
Near neighbours	November 2020 to February 2022	• Face-to face meetings • Phone calls	• Project awareness • Introduction of the Project team • Involvement in the Project • Signing of neighbour agreement	• Not concerned by the Project • Initially considered joining the Project • Would like to host turbines • Signed with another developer	• Closest turbine around 3.7 km away
Near neighbours	December 2020 to February 2022	• Face-to face meetings • Email correspondence	• Project awareness • Introduction of the Project team • Involvement in the Project • Signing of neighbour agreement	• Declined Project participation in favour of a biodiversity program • Supports the Project • Happy to host powerlines • Interested in hosting native vegetation offset	• Closest turbine around 3.8 km away
Near neighbours	February 2021 to March 2022	• Face-to face meetings • Phone calls	• Involvement in the Project • Secure transmission easement • Project awareness • Introduction of the Project team	• Interested in hosting turbines • Already signed for a solar farm • Eventually signed for turbines with another developer • Open to hosting a powerline for the Project	• Closest turbine around 4 km away
Near neighbours	February 2022	• Face-to face meetings	• Project awareness • Introduction of the Project team • Involvement in the Project • Signing of neighbour agreement	• No objections raised • House is surrounded with trees • Not concerned about seeing turbines • Not concerned about noise	• Closest turbine around 4.2 km away

Stakeholder	Date	Consultation Activity	Purpose	Issues, Concerns and Views Raised	Consideration of Issues
Near neighbours	February to March 2022	• Face-to face meetings • Phone calls	• Project awareness • Introduction of the Project team • Involvement in the Project • Signing of neighbour agreement	• Interested in finding out more about the Project • Has signed for a solar farm • Would consider wind	• Closest turbine around 4.8 km away
Near neighbours	Jan 2021 to March 2022	• Face-to face meetings • Phone calls	• Project awareness • Introduction of the Project team • Involvement in the Project • Signing of neighbour agreement	• Prefers to not have turbines but be involved in potential stewardship agreements to offset native vegetation loss	• Closest turbine around 5.3 km away
Near neighbour	February 2021 to February 2022	• Face-to face meetings • Phone calls	• Project awareness • Introduction of the Project team • Involvement in the Project	• Interested in finding out more about the Project • Invited to host turbines but happy to 'sit on the fence' for the moment	• Closest turbine around 10 km away
Near neighbours	December 2021	• Face-to face meetings • Phone calls	• Project awareness • Introduction of the Project team • Involvement in the Project	• Objected to the proposed solar farm on the northern boundary of the property and out the front of their driveway • Invited to host turbines but has decided to wait and see what happens with the REZ	• Closest turbine around 11 km away
Near Neighbours	March 2021	• Face-to face meetings • Phone calls	• Project awareness • Introduction of the Project team • Involvement in the Project • Signing of neighbour agreement	• No objections raised • House is surrounded with trees • Not concerned about seeing turbines • Not concerned about noise	• Closest turbine around 7.5 km away

Stakeholder	Date	Consultation Activity	Purpose	Issues, Concerns and Views Raised	Consideration of Issues
Near Neighbours	January 2021 February 2022	• Face-to face meetings • Phone calls	• Involvement in the Project • Secure transmission easement	• Interested in hosting turbines • Already signed for a solar farm • Eventually signed for turbines with another developer • Open to hosting a powerline for the Project	• No dwelling on the property
Mayor of Murrumbidgee Council LGA (Ruth McRae)	November 2021 to February 2022	• Briefings	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Concerned about the loss of productive land, particularly with solar • Requested Project materials to be recycled at the end of life instead of going into landfill	• Provided information which outlined that WTGs use less than 0.5% of landowners' properties.
Deputy Mayor of Murrumbidgee Council LGA (Robert Black)	February 2021 to March 2022	• Briefings	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Suggested low levels of opposition to the Project	-
Councillors of Murrumbidgee Council LGA • Faith Bryce • Christine Chirgwin • Robert Curphy • Gavin Gilbert • Troy Saxvik • Timothy Strachan	February 2022	• Email correspondence • Online presentation	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Transport routes to be used by Project vehicles • The Project team may struggle to find suitable gravel for road infrastructure • Options for a renewably energy schemes • Value of community benefit fund • How community benefit fund could be split	-

Stakeholder	Date	Consultation Activity	Purpose	Issues, Concerns and Views Raised	Consideration of Issues
General Manager of Murrumbidgee Council LGA (John Scare)	October 2021 to March 2022	• Briefings • In person presentation	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Transport routes to be used by Project vehicles • The Project team may struggle to find suitable gravel for road infrastructure • Options for a renewably energy schemes	-
Director of Planning, Community and Development, Murrumbidgee Council LGA (Gary Stoll)	March 2022	• Community drop-in session • Email correspondence	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Pointed out that he and Council were very pleased that we were planning such a significant project in the area	-
Mayor of Edwards River Council LGA (Peta Betts)	February 2022	• Email correspondence	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• None raised	-
Deputy Mayor of Edwards River Council LGA (Paul fellows)	February 2022	• Email correspondence	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Enthusiastic about the Project	-
Councillors of Edwards River Council LGA • Shirlee Burge • Harold Clapham • Peter Connell • Linda Fawns • Pat Fogarty • Tarria Moore • Marc Petersen	February 2022	• Email correspondence	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• None raised	-

Stakeholder	Date	Consultation Activity	Purpose	Issues, Concerns and Views Raised	Consideration of Issues
General Manager of River Council LGA (Phil Stone)	November 2021	• Briefings • In person presentation • emails	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Receptive to potential investment in the region	-
Director of Infrastructure of River Council LGA (Mark Darzaell)	November 2011	• Briefings • In person presentation	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council	• Positive about the Project	-
NSW Biodiversity Conservation and Sciences (BCS) – South West office	January 2022	• Briefings • Email correspondence • Phone calls	• Identify potential ecological constraints, and to determine which matters BCS would require detailed assessment and demonstrated consideration of avoidance and mitigation measures in accordance with the BAM.	• Advice on meeting survey adequacy for targeted surveys, including threatened species survey requirements • BCS provided a pre-SEARS advice for the application for the BAM to assist with future biodiversity surveys following confirmation of a refined Project footprint	• Assisted to focus resources on identification, avoidance and mitigation of the ecological constraints that are most likely to result in approval delays • Enabled exploration of alternative offsetting opportunities for the Project
NSW Department of Planning and Environment	January 2022	• Briefing • Email correspondence • Phone calls	• Scoping meeting	• Positive about preliminary investigations to date • Highlighted the need to offset from neighbouring residents • Outlines requirements and expectations for the Scoping Report	• Preliminary layout of the Project changed to remove WTGs in close proximity to non-associated dwellings

Stakeholder	Date	Consultation Activity	Purpose	Issues, Concerns and Views Raised	Consideration of Issues
Heritage NSW	February 2022	• Email correspondence	• Propose a meeting to discuss the survey methodology	• Outlined that that Heritage NSW would review the proposal during agency consultation with DPE	-
Community Member	March 2022	• Community Drop-in session	• Project awareness • Introduction to Project team • Project benefits	• “Too soon” to establish renewable energy projects in Australia. • Instead, more coal and nuclear plants should be built	-
Community Member	March 2022	• Community Drop-in session	• Project awareness • Introduction to Project team • Project benefits	• Concerned by the potential Project impacts on the fire services and the use of water bombers • Raised concern about the disparity in payments from Transgrid to landowners hosting transmission easements and those hosting wind and solar farms with other companies	• The turbines will be placed in rows 1 km apart to allow the continued use of water bombers • Project lights will be turned on during a fire and the access roads would provide fire breaks and access for fire trucks
Community Member	March 2022	• Community Drop-in session	• Project awareness • Introduction to Project team • Project benefits	• Concerned by the health impacts of wind farms	-
Federal Department of Agriculture, Water and Environment	March 2022	• Briefing	• Pre-referral scoping meeting	• Positive about field work to date • Outlines requirements and expectations as part of the EPBC referral process	-

5.3 Aboriginal consultation

Virya Energy will engage with Aboriginal people throughout the Project phases in accordance with the relevant guidelines, including:

- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011)
- The Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (DECCW, 2010b)
- The Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010a).

The process of Aboriginal community consultation has commenced in accordance with the guidelines as set out in the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010a). In order to identify, notify and register Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the area of the Project, the following consultation procedure has been implemented:

- Correspondence was sent to:
  - Heritage NSW office
  - Griffith Local Aboriginal Land Council
  - Cummeragunja Local Aboriginal Land Council
  - The Office of the Registrar, *Aboriginal Land Rights Act 1983*
  - The National Native Title Tribunal, requesting a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements
  - Native Title Services Corporation Limited (NTSCORP Limited)
  - Edward River Council
  - Murrumbidgee Council
  - Murray Local Land Services
  - Riverina Local Land Services.
- An advertisement was placed in the local newspaper (The Rural) on 2 December 2021
- Correspondence dated 1 December 2021 was issued to five Aboriginal parties listed by Heritage NSW who may have an interest in the area.

The above procedure resulted in the identification of four Registered Aboriginal Parties (RAPs):

- John Jackson
- Mark Saddler (Bundyi Cultural Tours)
- Roley Williams
- James Ingram (Bidya Marra Consultancy).

Griffith LALC and Cummeragunja LALC did not register an interest in the Project but have been consulted and have been invited to assist in cultural heritage field work. In accordance with Step 4.1.6 of the consultation requirements, the list of RAPs and a copy of the advertisement published in The Rural were forwarded to Heritage NSW, Griffith LALC and Cummeragunja LALC on 21 December 2021.

A copy of the draft Aboriginal Cultural Heritage Assessment Report (ACHAR) methodology was distributed to the RAPs on 17 January 2022 with a 28-day period for review and comment. By the end of the review period only one group (Bundyi Cultural Tours) had provided comment. Bundyi Cultural Tours noted the following points for inclusion in the ACHAR:

- The region contains innumerable artefacts, scar trees and special places.
- Wiradjuri people have utilised the land for over 60,000 years
- The landscape has been modified and is very different for the pre-contact, traditional landscape
- Wiradjuri people have and continue to come to the area, as it contains main travel routes and permanent places of living
- This Project is proposed to take place in, around and through many waterways and which have high significance to Wiradjuri people and land

- The Wiradjuri people and other local community members are concerned that the Project will disturb song lines and dreaming places
- Not all Wiradjuri things can be seen or touched, they are moulded into the landscape and in the souls of the Wiradjuri people
- RAPs should be included in any and all surveys and reports that pertain to this and other areas to provide information regarding the ways, customs and land of the Wiradjuri people
- Protection and care of Wiradjuri country is and continues to be off a high importance.

The above are a summary and not verbatim. However, the document received from Bundyi Cultural Tours will be appended to the ACHAR. Comments received by Bundyi Cultural Tours have been recorded in the consultation log and will be addressed in the ACHAR.

5.4 Engagement to be carried out

A Community Consultation Strategy has been developed outlining the activities Virya Energy will undertake to inform and consult the community and other identified stakeholders. Virya Energy will inform Project landowners, neighbours and the surrounding community of the lodgement of this Scoping Report and provide regular Project updates via a Virya Energy Project website, as well as through other engagement tools such as newsletters, factsheets, phone calls or community sessions. The Project website will include directions on how the community can review Project documents and how interested stakeholders can communicate with Virya Energy regarding the Project going forward.

In accordance with the Community Consultation Strategy, the communication and engagement approach will be carried out in four phases as follows:

- Phase 1 – key stakeholder engagement and broad community engagement, including one-on-one meetings with landowners and engaging government agencies, and informing and building support with stakeholders by giving them the opportunity to raise issues and provide feedback
- Phase 2 – post-approvals, including establishing the community consultative committee and the community benefit fund in consultation with all relevant stakeholders
- Phase 3 – construction phase, during which engagement will be aimed at managing and mitigating potential impacts through sending upcoming work alerts and providing regular information updates
- Phase 4 – operation phase, during which the community can raise any concerns or feedback through the Project website, and the community benefit fund governance will continue to benefit the local and regional communities.

Virya Energy has already begun with phase 1 and have contacted all landowners within eight kilometres of WTGs. It is expected that these meetings and the engagement activities will continue throughout the preparation of the EIS and post planning approval.

5.4.1 Engagement during EIS and anticipated community and stakeholder issues

Considering the remote location and low number of dwellings surrounding the Project, it is anticipated that the community and stakeholders may raise the following concerns:

- The limited direct renewable energy benefits for the local community
- Potential impacts to biodiversity, including to native vegetation
- Potential construction impacts related to accommodation availability
- Potential construction impacts related to road upgrades and road dilapidation
- Potential visual amenity changes across the broader landscape
- Potential impacts to heritage, including Aboriginal sites or items
- Coordination and governance of the community benefit fund.
- Consultation fatigue from multiple energy projects in the South-West REZ.

Community engagement is expected to be targeted at keeping Project landowners and neighbours and key stakeholders informed of the assessment process and anticipated Project impacts so that concerns can be addressed and managed through the design process. This is expected to be achieved through direct consultation with Project landowners and neighbours, advertising the Project and how additional information can be obtained in the local media, and general information sessions via the Community Consultation Committee prior to EIS exhibition.

Stakeholders may be interested in specific matters of the Project including:

- NSW DPE – regarding the environmental and social assessment and land use implications of the Project and full suite of environmental impacts
- Murrumbidgee Council and Edward River Council – regarding impacts to Council infrastructure such as roads, the distribution and governance of the community benefit fund, as well as a full suite of environmental impacts and rehabilitation
- NSW RFS and FRNSW – regarding bushfire and hazards related to the BESS and other Project electrical components
- Transport for NSW, the Victorian Department of Transport and the Victorian Ports Corporation (Melbourne) – regarding impacts to the road network including haulage routes as well as the use of ports in Victoria
- Transgrid – regarding connection to proposed Dinawan Terminal Station and network connection agreements
- Civil Aviation Safety Authority and AirServices Australia – regarding aviation risks
- Australian Department of Defence and Royal Australian Air Force – regarding air force and defence activities and aviation risks.

5.4.2 Further actions

Virya Energy will continue to carry out consultation activities in line with the Community Consultation Strategy in preparation of the EIS once SEARs are received. The outcomes of consultation will be included in the EIS and relevant technical studies.

6. Proposed assessment of impacts

6.1 Overview

The assessment of the likely environmental impacts of the Project has involved:

- Consideration of the construction and operational stages of development
- Desktop review of relevant databases, historic aerial photography, reports associated with the existing development of the Project and available background data
- Initial ecological field surveys and geotechnical investigations
- Development of a predictive model for areas of archaeological potential
- Review of State Significant Development Guidelines – Preparing a Scoping Report (DPIE, 2021b)
- Outcomes of stakeholder consultation to date.

Table 6-1 provides preliminary consideration of environmental matters and identifies the environmental issues that require further assessment and management. A scoping summary table is provided in **Appendix B**. From this process, environmental aspects that would require specialist assessment in the EIS as identified in **Table 6-1** are:

- Biodiversity
- Aboriginal heritage
- Non-Aboriginal heritage
- Landscape character and visual amenity
- Noise and vibration
- Traffic and transport
- Soils and contamination
- Surface water and groundwater
- Flooding
- Socio-economic impacts
- Hazards and risks.

Preliminary consideration of existing environment, potential impact mechanisms and proposed assessment and consultation for these matters, and those excluded from further assessment are provided in **Section 6.2** to **Section 6.16**.

Table 6-1 Overview and preliminary consideration of environmental matters

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
Biodiversity	The Project would involve clearing of native vegetation and threatened ecological communities (TEC).The potential biodiversity impacts are expected to be direct during construction however the placement of Project elements would only utilise less than 0.5% of the Project area. During the development of the EIS, the Project would seek to refine the Project design to further avoid native vegetation clearing where possible.	A history of livestock grazing has influenced the growth form of TECs and grassland biomass levels in the landscape, however, intact wildlife corridors are present within the Project area.	• Detailed project design to avoid and/or minimise impact where practicable • Implementation of site-specific biodiversity measures, including pre-clearance requirements, in the Construction Environmental Management Plan • Biodiversity offsets as required by the BAM	Yes	Specialist assessment
Aboriginal heritage	The Project would involve clearing and ground disturbance. The Project would not affect any sites listed on the Aboriginal Heritage Information Management System (AHIMS). However, there are Aboriginal sites throughout the regional area. Aboriginal objects may be present particularly within areas of less disturbance, native vegetation, near major/permanent waterways and in certain soil landscapes.	Any evidence of past occupation of the Project area by Aboriginal people is important.	• Detailed project design to avoid and/or minimise impact where practicable • Continued consultation with RAPs and LALCs • Implementation of construction and operational management plans	Yes	Specialist assessment
Non-Aboriginal heritage	The Project would not involve impacts to listed heritage items. Based on the long history of settlement, pastoral and agricultural activity, it is possible that unlisted historical heritage items exist within the Project area.	While largely disturbed, any remaining relics are protected and are likely to have local significance.		Yes	Specialist assessment

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
Land use and property	There are some areas of SSAL mapped within the Project area based on the current Draft SSAL map. Virya Energy has secured Option to Lease agreements with landowners for construction, operation and maintenance of the Project. Parcels of Crown land are located within the Project area. These Crown land areas are also travelling stock reserves with medium to high conservational values.	While landowners have largely shown support for the Project, continuous engagement throughout the Project development will continue as per **Section 5.4**.	• Land subject to temporary use will be rehabilitated • Continued consultation with Project landowners	Yes	EIS chapter
Landscape character and visual amenity	The preliminary assessment did not identify any non-associated dwellings (landowners that have not entered into an agreement with Virya Energy) within the black line of visual magnitude (3.6 kilometres) and five non-associated dwelling within the blue line of visual magnitude (3.6 kilometres to 5.3 kilometres). One dwelling (R06, **Figure 6-11**) is predicted to have views towards wind turbines within three or more of the 60° sectors. Further assessment and justification for placement of turbines in multiple sectors will be detailed in the EIS, along with a description of the mitigation and management measures being employed to reduce impacts.	The Project area is approximately 106 metres above sea level (+/- 5 metres) and the landform within the Project area is visually flat with the horizon line extending out at eye level in most directions from the Project area.	• Detailed site-specific assessment • Detailed project design to avoid and/or minimise impact where practicable • Site-specific mitigation measures (landscaping etc) where necessary	Yes	Specialist assessment

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
Noise and vibration	The construction and operation stages of the Project are anticipated to generate noise. Based on the Preliminary Noise Impact Assessment, five receivers (associated dwellings) are predicted to receive noise levels greater than the 35 dB(A) base criterion during operation of the Project.	Moderate, there are 13 non-associated residential receivers within eight kilometres of a WTG, with the nearest associated and non-associated dwellings being approximately two and 3.7 kilometres away, respectively.	• Detailed project design to avoid and/or minimise impact where practicable • Implementation of appropriate mitigation (if required) • Implementation of construction and operational noise management plans.	Yes	Specialist assessment
Traffic and transport	The Project would introduce additional traffic to local roads during construction, including the need for some oversize-overmass (OSOM) vehicle movements for the delivery of transformers. No material change to traffic is expected from the operation of the Project. Road upgrades are anticipated to facilitate construction and delivery of OSOM vehicles to the Project area. Private property access would be unaffected and no offsite parking would be required.	The community is anticipated to be sensitive to traffic impacts due to the rural nature of the location. The Project would involve upgrades to road utilised by the community.	• Construction Traffic Management Plan • Potential targeted road upgrades where necessary (as an outcome of traffic and transport assessment)	Yes	Specialist assessment
Soils and contamination	Contamination is not expected to present a significant impact for the Project. As part of the EIS preparation, any existing contamination would be assessed and need to be managed during construction.	Any mobilisation of existing contaminants, if present, could impact sensitive receiving environments such as waterways that traverse the Project area.	• Detailed design to avoid and/or minimise impact • Site-specific measures to manage soils, erosion and contamination (if required) in the Construction Environmental Management Plan	No	Specialist assessment

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
Surface water, groundwater and flooding	The Project area traverses the Delta Creek and Yanco Creek. The southern portion of the Project area also intersects Turn Back Jimmy Creek. Water used during construction would be sourced locally, however, it would not come from local waterways. There would be negligible impacts on water demand post construction. Multiple high-potential terrestrial Groundwater Dependent Ecosystems (GDEs) are mapped within the Project area (BOM, 2017). Depending on the local groundwater conditions, construction activities could lead to degradation of groundwater quality through infiltration processes or construction intersecting aquifers. Appropriate erosion and sediment controls would be implemented during construction of the Project. No flood studies have been conducted at the Project area and, hence, design flood level estimates are currently not available. Flooding from Yanco Creek may affect the Project area in extreme flood events. The Project would be designed and constructed in a way that would not be affected by flooding from weather events.	Waterways that traverse the Project area are considered sensitive from a water quality perspective.	• Detailed design to avoid and/or minimise impact • Site-specific measures to manage impacts to surface water, groundwater and flooding in the Construction Environmental Management Plan	No	Specialist assessment

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
Socio-economic impacts	The Project is expected to have positive social and economic impacts through the provision of jobs and local spend during construction. Adverse effects can also occur during construction as a result of construction workforce having increased demands on local accommodation services. During operation, the Project would lead to positive benefits for the local and regional communities through the community benefit fund.	Employment generation in the local area is considered beneficial from an economic perspective. The Project is located in a sparsely populated rural region which helps to minimise the number of sensitive receivers nearby.	• Community Consultation Strategy • Community Benefit Fund • Environmental and social impact mitigation measures	Yes	Specialist assessment
Hazards and risks	The following hazards and risks have been identified for the Project: • The Project would be located in proximity to a small private airport and several aircraft landing areas. Further assessment is required to avoid or minimise potential aeronautical impacts • The physical structures of the WTGs can interfere with broadcast and point to point communications. The wind farm should not cause interference with existing or proposed telecommunications and where required, mitigation measures such as refined WTG placement to avoid potential telecommunication and EMI impacts would be implemented • The voltages and currents associated with the Project produce power frequency electromagnetic fields (EMF), which can affect human health	The Project has the potential to interfere with existing flight paths. Any fire emanating from the Project, EMF shadow flicker and blade throw would have potential for impacts to sensitive rural properties. Rural properties and surrounding townships would be sensitive to the interruption of telecommunications as a result of the Project.	**Aeronautical** • Detailed project design to avoid and/or minimise impact • Installation of lighting and/or navigation aids (if required) **Telecommunications/EMI/ EMF** • Detailed project design to avoid and/or minimise impact where practicable • Development of site-specific mitigation measures **Shadow flicker/ Blade throw** • Detailed project/turbine design **Bushfire** • Implementation of appropriate controls, emergency response management and management of	No	Specialist assessment

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
	• The risk of thermal runaway events associated with BESS and battery components which can cause pollution hazards and bushfires • Shadow flicker cast by the blades of a WTG can cause a nuisance to surrounding dwellings but it is not expected to cause health impacts at these distances from dwellings • Blade throw typically involves the failure of the WTG rotor, which can result in the turbine blade becoming detached from the WTG and causing damage to the environment, property or human life. Blade throw distances generally can be up to one kilometre, however all of the dwellings within and near the Project are located more than two kilometres from the nearest WTG location • Bushfire prone land with Vegetation Category 3 (medium level) is present over most of the Project area. The design and planning of the Project would need to consider bushfire risks on-site as well as on the routes to and from the Project The Project would incorporate controls to manage hazards to as low as reasonably practical and to avoid off-site impacts.		infrastructure and surrounding land		

Matter	Scale and nature of likely impacts of the Project	Sensitivity of receiving environment	Preliminary mitigation	Potential for cumulative impacts	Level of assessment
Air quality	Localised dust emissions could occur during construction in the absence of mitigation measures. Standard management measures are available which are expected to be sufficient so as to limit off-site impacts to below acceptable concentrations.	Moderate, noting that local air quality is already deteriorated due to events such as bushfires, and that there are 13 non-associated residential receivers located within eight kilometres of a WTG	• Implementation of appropriate air quality controls, i.e. dust management (where required) as part of Construction Environmental Management Plan	Yes	EIS chapter
Greenhouse gas	The use of construction equipment and the manufacture of materials for use in the Project would consume resources and, as such, are associated with greenhouse gas emissions The operation of the windfarm and battery does not generate direct emissions. In operation, wind farms contribute to reducing greenhouse gas (GHG) emissions through clean energy generation.	Moderate sensitivity due to sensitivity to some of the climate impacts (e.g. higher bushfire risks)	• Implementation of appropriate controls as part of Construction Environmental Management Plan	Yes	EIS chapter

6.2 Biodiversity

6.2.1 Existing environment

The current biodiversity assessment has sourced information from a desktop review, landowner consultation and early field surveys to identify biodiversity values, including threatened species, populations and ecological communities, and important habitats for terrestrial and aquatic threatened species and migratory species listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), NSW *Fisheries Management Act 1994* (FM Act) and the Commonwealth EPBC Act.

The Biodiversity Assessment Method Calculator (BAM-C) was used to input potential Plant Community Types (PCTs) and identify associated species credit species and plan required targeted surveys to confirm the presence of species in the Project area in accordance with Biodiversity Assessment Method (BAM) (DPIE, 2020).

Relevant database searches encompassed a 10 kilometre buffer around the Project area. The following databases were searched:

- BioNet - Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC) (Environment, Energy and Science Group (EESG), 2021)
- The federal Department of Environment's Protected Matters Search Tool (DAWE, 2021)
- NSW Department of Primary Industries (DPI) Fisheries Spatial Data Portal
- PlantNet – (NSW Flora online - https://plantnet.rbgsyd.nsw.gov.au/floraonline.htm)
- Royal Botanic Gardens
- The federal Bureau of Meteorology's Atlas of GDEs
- Department of Environment's Directory of Important Wetlands in Australia.

Regional vegetation mapping, geology and soil mapping projects were reviewed including:

- State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (Office of Environment and Heritage, 2016b)
- Jerilderie 1:250 000 Geological Map (Tuckwell, 1976)
- Deniliquin 1:250 000 Geological Map (Brown and Stephenson, 1991)
- Australian Soil Classification (ASC) Soil Type map of NSW (State Government of NSW and Office of Environment and Heritage (OEH), 2012).

Preliminary determinations from NSW Threatened Species Scientific Committee and the Commonwealth annual final priority assessment list (FPAL) of nominated species and ecological communities were also reviewed. At the time of writing, there were no preliminary or provisional listings of relevance to the Project.

To date, the Jacobs ecology team have completed five rounds of biodiversity survey to meet the requirements of the BAM (DPIE, 2020). These have included:

- September 2021 – Targeted threatened flora survey
- October 2021 – Rapid Plant Community Type and vegetation zone mapping survey
- November 2021 – Targeted threatened flora survey
- November 2021 – Spring bird and bat survey
- January 2022 – Amphibian habitat assessment and targeted survey
- February 2022 – Targeted fauna survey - summer bird and bat survey.

The work completed to date was used to identify and assess the likelihood of key biodiversity constraints and risks in the Project area. These outputs have informed the footprint selection process and play an important role in the feasibility and design of infrastructure to avoid and or minimise impacts on conservation significant biodiversity.

A list of threatened flora and fauna species recorded within a 10 kilometre buffer of the Project area was generated. The habitat assessment compares the preferred habitat of these species with the habitats identified in the Project area. This was done to make an assessment of the likelihood of the species being present in the Project area (i.e. subject species). The criteria used in the assessment and the results of this assessment are provided in **Appendix C**.

Landscape context

The Project area would be located within the Riverina Interim Biogeographic Regionalisation for Australia (IBRA) region and the Murrumbidgee IBRA sub-region.

The Riverina bioregion lies in southwest NSW, extending into central-north Victoria. It ranges from Ivanhoe in the Murray Darling Depression Bioregion south to Bendigo, and from Narrandera in the east to Balranald in the west. The Murray and Murrumbidgee Rivers and their major tributaries, the Lachlan and Goulburn Rivers, flow from the highlands in the east, westward across the Riverina plain.

Rural and agricultural activities are the key land uses throughout this area. The entire Project area is located on private land and is about 35 kilometres south-east of Oolambeyan National Park and 70 kilometres north-east of Murray Valley National Park.

The Project area includes habitat connectivity with intact wildlife corridors in Black Box woodland along Delta Creek and River Red Gum along Yanco Creek. The landscape is naturally open with scattered woodland patches and swamp amongst natural grassland on cracking clay soils. This favours the movement of native bird flocks between nesting and foraging habitats, particularly the threatened Plains-wanderer (*Pedionomus torquatus)* listed endangered under the BC Act and critically endangered under the EPBC Act. A history of livestock grazing has influenced the growth form of Weeping Myall and grassland biomass levels in the landscape. The landscape also provides refuge for migratory birds and other fauna during large flood events.

There are no areas of outstanding biodiversity values mapped within the Project area.

Native vegetation and threatened ecological communities

The State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (DPIE, 2016) provides the most up to date native vegetation spatial data for the Project area and was used to determine the baseline vegetation classification.

A rapid PCT mapping survey was completed in the Project area by two ecologists over five days between 27-31 October 2021. This survey identified and mapped PCTs and delineated each PCT into broad condition classes to assign separate vegetation zones. Each PCT was assigned to a corresponding Threatened Ecological Community (TEC) where applicable. This map information was used to inform the severity of constraints and planning for the upcoming vegetation integrity assessment. Identified PCTs within the Project area were identified and mapped progressively during all field surveys to date and will be further refined during the upcoming vegetation integrity assessment.

The Project area predominantly comprises large areas of native grassland and open Weeping Myall (*Acacia pendula)* woodland in a flat landscape. In low lying areas there are occurrences of Lignum (*Duma florulenta)* and Nitre (*Chenopodium nitrariaceum*) swamps, River Red Gum (*Eucalyptus camaldulensis*) and Black Box (*Eucalyptus largiflorens*) along drainage lines and creeks. There are also White Cypress Pine (*Callitris glaucophylla*) sandhills with scattered paddock trees.

A total of 15 PCTs are expected to be present in the Project area. PCTs are listed in **Table 6-2** and preliminary PCT mapping is shown in **Figure 6-1**. PCTs vary in condition and patch sizes across the Project area. These biodiversity values have very high conservation significance and represent key constraints to the Project.

Four threatened ecological communities (TECs) were confirmed to be present in the Project area (refer to **Figure 6-2**):

- Natural Grasslands of the Murray Valley Plains listed critically endangered under the EPBC Act
- Weeping Myall Woodlands listed endangered under the EPBC Act
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions listed endangered under the BC Act
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions listed endangered under the BC Act.

Parts of the Project area also have potential to have the following TECs:

- *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions listed endangered under the BC Act
- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions listed endangered under the EPBC Act.

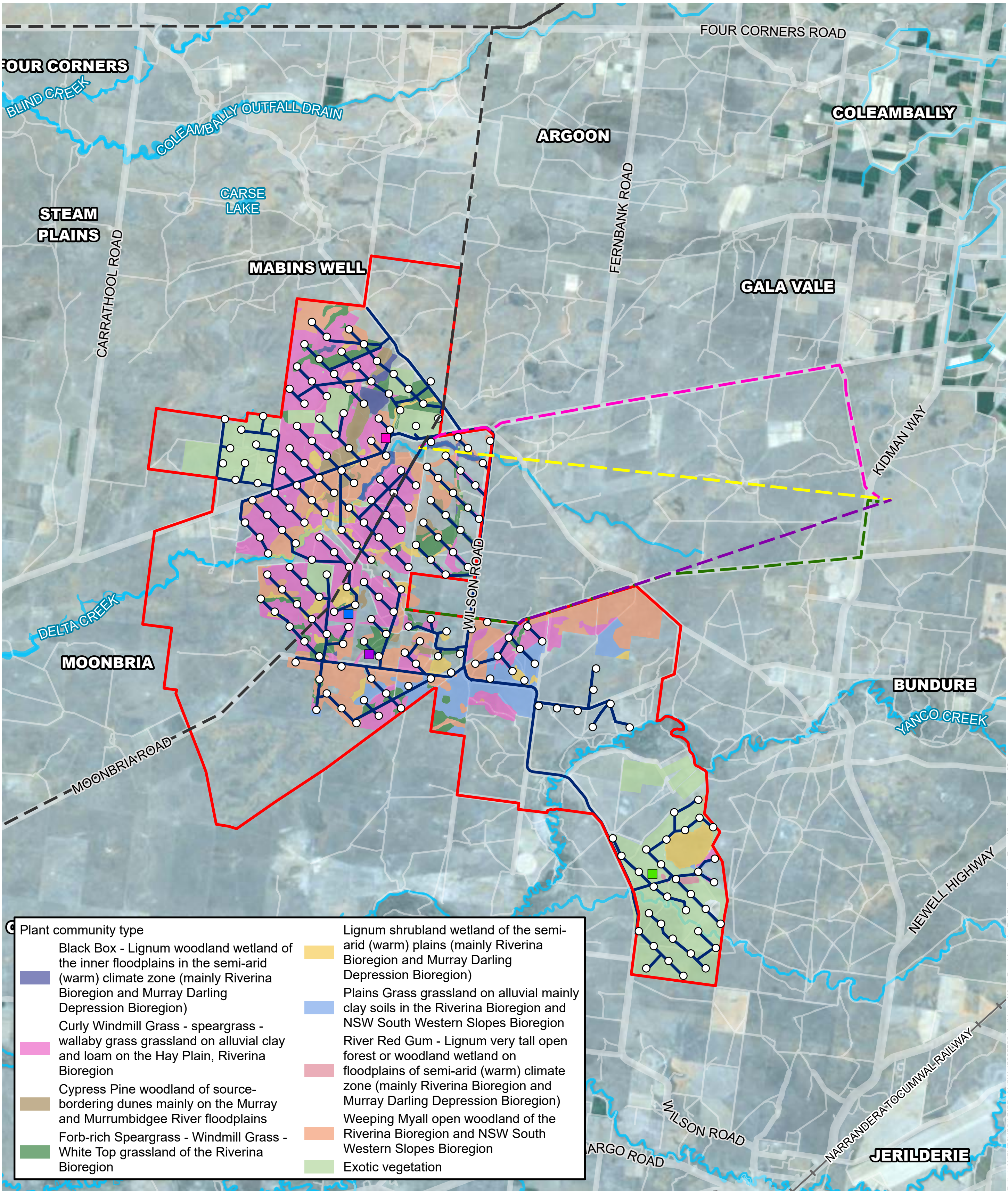
There is a low abundance of exotic vegetation in the Project area and is mostly restricted to irrigated land with crops and/or ploughed tracks. Annual exotic grasses such as Rye Grass (*Lolium* spp.), Wild Oats (*Avena* spp.) and Barley Grass (*Hordeum* spp.) dominate the landscape in spring, but dieback in early summer. The most common priority weed species in the Project area is African Boxthorn (*Lycium ferocissimum*). Many infestations are controlled by local farmers.

Table 6-2 Plant community types and threatened ecological communities

Plant Community Type (PCT) (EESG, 2020b)		EPBC Act Status	BC Act Status
9	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion (PCT 9)	-	-
11	River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 11)	-	-
12	Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 12)	-	-
13	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 13)	-	-
16	Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 16)	-	-
17	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 17)	-	-
19	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains (PCT 19)	-	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (EEC)

Plant Community Type (PCT) (EESG, 2020b)		EPBC Act Status	BC Act Status
24	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains (PCT 24)	-	-
26	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion (PCT 26)	Weeping Myall Woodland (EEC)	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (EEC)
28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone (PCT 28)	-	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (EEC)
44	Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion (PCT 44)	Natural Grasslands of the Murray Valley Plains (CEEC)	-
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion (PCT 45)	Natural Grasslands of the Murray Valley Plains (CEEC)	-
46	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion (PCT 46)	Natural Grasslands of the Murray Valley Plains (CEEC)	-
160	Nitre Goosefoot shrubland wetland on clays of the inland floodplains (PCT 160)	-	-
164	Cotton Bush open shrubland of the semi-arid (warm) zone (PCT 164)	-	-

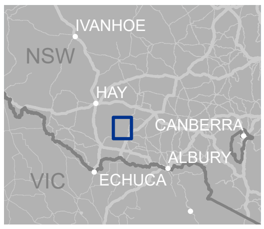
Key: CEEC = critically endangered ecological community, EEC = endangered ecological community, VEC = vulnerable ecological community



Indicative Project
Project area
Access tracks/internal cabling
Turbine locations
Main Project Substation
Option 1 Substation / Battery
Option 2 Substation / Battery
Collector / Secondary Substation
Proposed transmission line - Option 1
Proposed transmission line - Option 2
Proposed transmission line - Option 3
Proposed transmission line - Option 4

Railway
Waterways
Existing electricity transmission line
Road

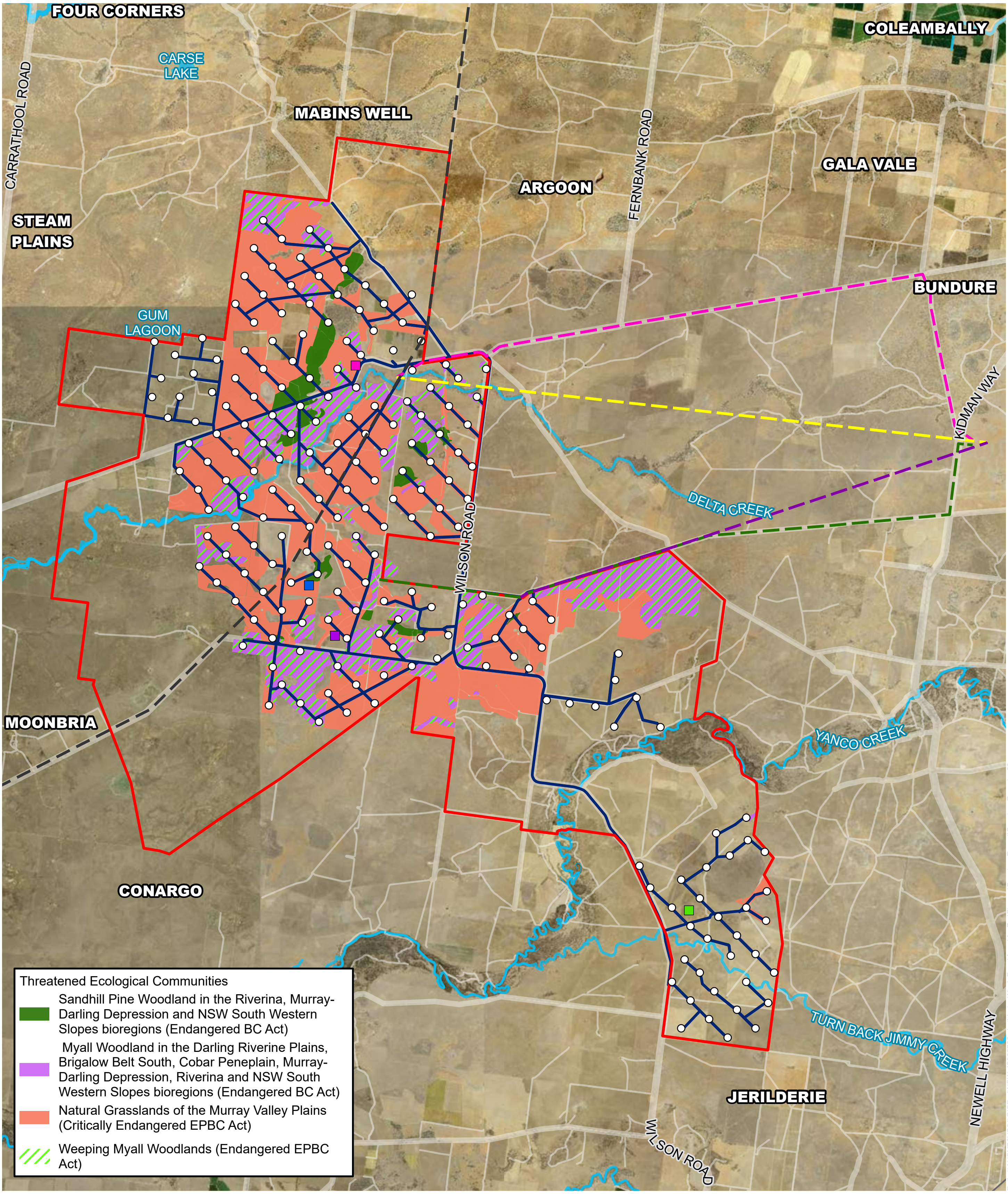
0 4 8 km
1:250,000 at A4
GDA 1994 MGA Zone 55



Data sources

Jacobs 2021
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 6-1 Preliminary PCT mapping



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:200,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Department of Regional NSW 2020
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Figure 6-2 Preliminary threatened ecological community mapping

Threatened species and habitat

The results of desktop review identified the following important biodiversity values within 10 kilometres of the Project area:

- Five listed threatened ecological communities
- 70 listed threatened species
- 10 listed migratory species
- 17 listed marine species.

Surveys undertaken in 2021 and 2022 have identified 11 threatened species within Project area (refer to **Figure 6-3**):

- Slender Darling Pea (*Swainsona murrayana*) – listed vulnerable under both BC Act and EPBC Act
- Silky Swainson-pea (*Swainsona sericea*) – listed vulnerable under BC Act
- Spotted Harrier (*Circus assimilis*) – listed vulnerable under BC Act
- White-fronted Chat (*Epthianura albifrons*) – listed vulnerable under BC Act
- Little Eagle (*Hieraaetus morphnoides*) – listed vulnerable under BC Act
- Square-tailed Kite (*Lophoictinia isura*) – listed vulnerable under BC Act
- Plains-wanderer (*Pedionomus torquatus*) – listed endangered under BC Act and critically endangered under the EPBC Act
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis)* – listed vulnerable under BC Act
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus)* – listed vulnerable under BC Act
- Southern Myotis (*Myotis macropus*) – listed vulnerable under BC Act
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) – listed vulnerable under BC Act.

Superb Parrot (*Polytelis swainsonii*) (listed vulnerable under both BC Act and EPBC Act) was recorded near the Project area.

One marine species, the Rainbow bee-eater (*Merops ornatus*), listed under the EPBC Act, has been recorded in the Project area during surveys.

The Project area has confirmed and potential habitat for a range of threatened fauna and flora species based on the following habitat features:

- Intact natural grassland supporting specialist grassland flora and fauna, including Plains Wanderer
- Irregularly flooded swamps and drainage supporting fauna during flood events
- Permanent water sources are limited to man-made farm dams and the Yanco Creek. The is a single natural water body in the north of the Project area which has marginal habitat to support the Southern Bell Frog (*Litoria raniformis)* however most waterbodies lack emergent aquatic vegetation
- Structural Weeping Myall Woodland with mixed aged trees and diversity of understorey and groundcover species
- Large patches and scattered isolated patches of *Eucalyptus* woodland and scattered White Cypress Pine woodland with an abundance of hollow-bearing trees, trees with small to large stick nests and fallen logs of various sizes.

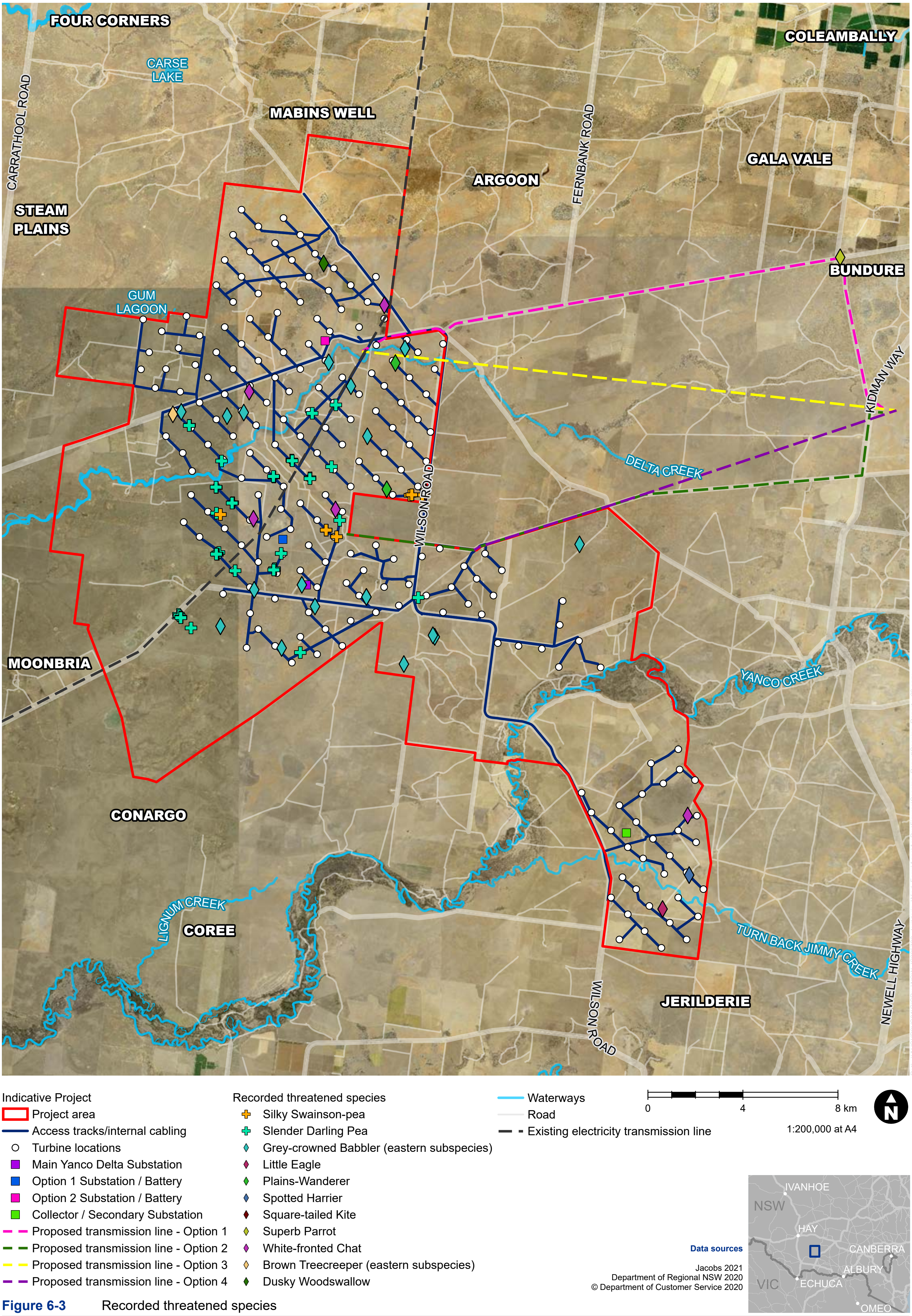


Figure 6-3 Recorded threatened species

All threatened species with a moderate to high likelihood of occurrence in the Project area based on desktop assessment and habitat features are listed in **Table 6-3**. Species recorded in or near the Project area are shaded in blue. The full list of biodiversity values with a likelihood of occurrence in the Project area is provided in **Appendix C**.

Table 6-3 Threatened species with potential to occur in the Project area

Common name	Scientific name	EPBC Act status	BC Act status	Likelihood of occurrence
Magpie Goose	*Anseranas semipalmata*	-	V	Moderate
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Moderate
Australian Bustard	*Ardeotis australis*	-	E	Moderate
Dusky Woodswallow	*Artamus cyanopterus*	-	V	High
A spear-grass	*Austrostipa wakoolica*	E	E	High
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Moderate
Claypan Daisy	*Brachyscome muelleroides*	V	V	High
Mossgiel Daisy	*Brachyscome papillosa*	V	V	High
Bush Stone-curlew	*Burhinus grallarius*	-	E	Moderate
Sand-hill Spider Orchid	*Caladenia arenaria*	E	E	Moderate
Curlew Sandpiper	*Calidris ferruginea*	CE, M	E	Moderate
Pied Honeyeater	*Certhionyx variegatus*	-	V	High
Little Pied Bat	*Chalinolobus picatus*	-	V	High
Spotted Harrier	***Circus assimilis***	**-**	**V**	**Recorded in Project area**
Brown Treecreeper (eastern subspecies)	***Climacteris picumnus***	**-**	**V**	**Recorded in Project area**
Bindweed	*Convolvulus tedmoorei*	-	E	Moderate
Small Scurf-pea	*Cullen parvum*	-	E	High
Varied Sittella	*Daphoenositta chrysoptera*	-	V	High
-	*Diuris sp. (Oaklands, D.L. Jones 5380)*	-	E	Moderate
White-fronted Chat	***Epthianura albifrons***	**-**	**V**	**Recorded in Project area**
Yellow Gum	*Eucalyptus leucoxylon subsp. pruinosa*	-	V	Moderate
Grey Falcon	*Falco hypoleucos*	V	E	Moderate
Black Falcon	*Falco subniger*	-	V	Moderate
Painted Honeyeater	*Grantiella picta*	V	V	Moderate
Brolga	*Grus rubicunda*	-	V	Moderate
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	-	V	Moderate
Little Eagle	***Hieraaetus morphnoides***	**-**	**V**	**Recorded in Project area**
White-throated Needletail	*Hirundapus caudacutus*	V	-	Moderate

Common name	Scientific name	EPBC Act status	BC Act status	Likelihood of occurrence
Swift Parrot	*Lathamus discolor*	CE	E	High
Winged Peppercress	*Lepidium monoplocoides*	E	E	Moderate
Lanky Buttons	*Leptorhynchos orientalis*	-	E	High
Southern Bell Frog	*Litoria raniformis*	V	E	Moderate
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	-	V	Moderate
Square-tailed Kite	***Lophoictinia isura***	**-**	**V**	**Recorded in Project area**
Chariot Wheels	*Maireana cheelii*	V	V	Moderate
Hooded Robin (south-eastern form)	*Melanodryas cucullata*	-	V	Moderate
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis*	-	V	Moderate
Southern Myotis	***Myotis macropus***	**-**	**V**	**Recorded in Project area**
Barking Owl	*Ninox connivens*	-	V	Moderate
Blue-billed Duck	*Oxyura australis*	-	V	Moderate
Gilbert's Whistler	*Pachycephala inornata*	-	V	Moderate
Plains-wanderer	***Pedionomus torquatus***	**CE**	**E**	**Recorded in Project area**
Scarlet Robin	*Petroica boodang*	-	V	Moderate
Koala	*Phascolarctos cinereus*	V	V	Low
Austral Pillwort	*Pilularia novae-hollandiae*	-	E	Moderate
Regent Parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	E	V	Low
Superb Parrot	***Polytelis swainsonii***	**V**	**V**	**Recorded near Project area**
Grey-crowned Babbler (eastern subspecies)	***Pomatostomus temporalis***	**-**	**V**	**Recorded in Project area**
Prasophyllum sp. Moama	*Prasophyllum sp. Moama*	-	CE	Moderate
Pterostylis despectans	*Pterostylis despectans*	E	CE	Moderate
Redthroat	*Pyrrholaemus brunneus*	-	V	High
Australian Painted Snipe	*Rostratula australis*	E	E	Moderate
Yellow-bellied Sheathtail-bat	***Saccolaimus flaviventris***	**-**	**V**	**Recorded in Project area**
Turnip Copperburr	*Sclerolaena napiformis*	E	E	High
Menindee Nightshade	*Solanum karsense*	V	V	Moderate
Diamond Firetail	*Stagonopleura guttata*	-	V	High
Freckled Duck	*Stictonetta naevosa*	-	V	Moderate

Common name	Scientific name	EPBC Act status	BC Act status	Likelihood of occurrence
Slender Darling Pea	***Swainsona murrayana***	**V**	**V**	**Recorded in Project area**
Red Darling Pea	*Swainsona plagiotropis*	V	V	High
Silky Swainson-pea	***Swainsona sericea***	**-**	**V**	**Recorded in Project area**
Masked Owl	*Tyto novaehollandiae*	-	V	Moderate
Inland Forest Bat	*Vespadelus baverstocki*	-	V	High

Groundwater dependent ecosystems

The level of water dependence of vegetation communities within and surrounding the Project area has been identified using the Atlas of GDEs (Bureau of Meteorology (BOM), 2016) and the *Risk Assessment Guidelines for Groundwater Dependant Ecosystems* released by the NSW DPI (Kuginis et al., 2012). The level of groundwater dependence and potential for interaction has been identified for ecological communities in the Project area and is listed in **Table 6-4**.

Table 6-4 Level of groundwater dependence of vegetation in Project area

Type of GDE[1] PCT code	Supplied ecosystem type	GDE potential[2]
Aquatic	Watercourse	Low potential GDE - from national assessment
	Floodplain water body	Low potential GDE - from national assessment
	Connector	Low potential GDE - from national assessment
Terrestrial	Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Low potential GDE - from regional studies
	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion	High potential GDE - from regional studies
	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Low potential GDE - from regional studies
	Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bio	Low potential GDE - from regional studies
	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression	Low potential GDE - from regional studies
	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Low potential GDE - from regional studies
	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	High potential GDE - from regional studies

Type of GDE[1] PCT code	Supplied ecosystem type	GDE potential[2]
	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Low potential GDE - from regional studies
	Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	High potential GDE - from regional studies
	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Low potential GDE - from regional studies
	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Low potential GDE - from regional studies
	River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray	High potential GDE - from regional studies
	Swamp grassland wetland of the Riverine Plain	Low potential GDE - from regional studies
	Cotton Bush open shrubland of the semi-arid (warm) zone	Low potential GDE - from regional studies
	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Low potential GDE - from regional studies

[1]GDE type determined using Risk Assessment Guidelines for Groundwater Dependant Ecosystems released by the NSW DPI (Kuginis et al., 2012).
[2]GDE potential as recognised by the Atlas of GDEs (Bureau of Meteorology, 2016)

6.2.2 Potential impacts and issues for consideration

Construction of the Project has the potential to impact biodiversity, including threatened species, populations, and ecological communities listed under the BC Act and EPBC Act. Potential impacts to biodiversity (direct and indirect) would be mostly associated with the loss of native vegetation such as native grassland and weeping myall woodland and fauna habitat. Construction impacts could potentially occur as a result of the following mechanisms:

- Vegetation clearance and disturbances associated with the construction work
- Possible injury/mortality of fauna species during vegetation clearance, trenching and/or as a result of collisions with construction plant and vehicles
- Introduction and/ or spread of weeds and other invasive species
- Disturbance from construction noise, vibration and light on fauna in vegetated areas (including threatened ecological communities outside of the Project boundary and that are suitable habitat for Threatened Species listed under the BC Act and EPBC Act)
- Indirect impacts and edge effects.

Serious and irreversible impacts (SAII) identify threatened entities that are most at risk of extinction from potential development. An approval authority can approve a proposal which is likely to have serious and irreversible impacts for State Significant Infrastructure or State Significant Development project pathways. The approval authority, however, must take those impacts into consideration and determine whether there are any additional and appropriate measures that will minimise those impacts if approval is to be granted.

Candidate entities are listed below to provide some context of the constraint associated with these entities. The potential SAII entities that may occur in the impact area of the Project include:

- *Brachyscome muelleroides*
- *Caladenia arenaria*
- *Convolvulus tedmoorei*
- *Diuris* sp. (Oaklands, D.L. Jones 5380)
- *Prasophyllum* sp. Moama
- *Pterostylis despectans*
- Curlew Sandpiper
- Plains-wanderer
- Swift Parrot.

6.2.3 Proposed assessment approach

Assessment of biodiversity impacts of the Project are underway and will continue to be assessed in accordance with Section 7.9 of the BC Act and the BAM and documented in a Biodiversity Development Assessment Report (BDAR). It will also take into account the results of consultation undertaken with the NSW Biodiversity, Conservation and Science branch of the DPE Environment, Energy and Science Group on the proposed assessment methodology.

The biodiversity assessment presented in the EIS will be based on a desktop review of database searches, regional biodiversity mapping and any relevant existing site-specific reports, as well as site inspections and detailed targeted field surveys in accordance with relevant survey guidelines. The assessment will be carried out for any threatened species, populations and ecological communities considered likely to be present within the Project area and/or within a 20 metre buffer (to enable consideration of indirect impacts such as edge effects). A 300 metre buffer of the Project area has been considered for any potential nest trees used by breeding species credit species.

The biodiversity assessment will include:

- Investigations for design to avoid and minimise impacts on threatened species and TECs and/or their habitat, including prescribed impacts, as far as practicable
- Identification and description of the flora and fauna species, habitat, populations and ecological communities that occur, or are likely to occur from field survey, including:
  - Vegetation integrity assessment
  - Targeted flora and fauna surveys
  - Bird and bat field survey
- An assessment of any direct, indirect and prescribed impacts of the Project on flora and fauna species, populations, ecological communities and their habitats, and groundwater dependent ecosystems
- Bird and bat collision risk assessment
- Assessment of the significance of the impacts of the Project on species, ecological communities and populations, and any groundwater dependent ecosystems listed under the Commonwealth EPBC Act
- Identification of mitigation and offset measures, determined in accordance with the BAM and the EPBC Act Environmental Offsets Policy, if necessary.

As discussed in **Section 1.4**, this assessment would help ensure the Project continues to have the ability to avoid, mitigate or offset any potential biodiversity impacts during EIS preparation and detailed design, through to construction and operation.

6.2.4 Any engagement required

Early consultation with the local Biodiversity Conservation and Sciences (BCS) office was undertaken to identify potential ecological constraints, and to determine which matters BCS would require detailed assessment and demonstrated consideration of avoidance and mitigation measures in accordance with the BAM. This consultation also provided advice on meeting survey adequacy for targeted surveys, including threatened species survey requirements. As a result, BCS provided a pre-SEARS advice for the application for the BAM to assist with future biodiversity surveys following confirmation of a refined Project footprint. This process has assisted to focus resources on identification, avoidance and mitigation of the ecological constraints that are most likely to result in approval delays. Consultation with BCD and the Biodiversity Conservation Trust has also enabled exploration of alternative offsetting opportunities for the Project. Communications BCS has occurred with phone liaison, emails and a teleconference meeting.

Ongoing consultation with BCS and relevant threatened species officers will continue to advise on the application of the BAM pertaining to the preparation of a BDAR, refinement of the PCT mapping with steps needed to confirm the mapping of non-native vegetation such as Category 1 – Exempt Land to avoid the need to undertake survey work in these areas.

6.3 Aboriginal heritage

6.3.1 Existing environment

A search of the AHIMS database was completed on 1 October 2021 for an area of land at datum GDA, zone 55, eastings 343764.83 - 396348.52, northings 6089153.64 - 6144064.62 (**Appendix D**). Land surrounding the Project area was included within the search parameters (about two kilometres) to gain information on the regional archaeological context and inform predictive statements regarding the archaeological potential of the Project area. The AHIMS search identified 28 Aboriginal sites within this larger search area.

One AHIMS registered site, Tooleybuc Bridge PAD (AHIMS ID 55-1-0038), is incorrectly identified as located within the Project area. A review of the site card for the potential archaeological deposit (PAD) lists the location of the site at the corner of Lea Street and Murray Street, Tooleybuc, which is 181 kilometres to the west of the Project area. Therefore, Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) is not located within the Project area and does not pose a constraint to the Project.

The results of previous archaeological investigation and the search of the AHIMS database, has identified that there are Aboriginal sites present throughout the regional area (refer to **Figure 6-4**). There is a dominance of scarred trees, especially in areas which have not been subject to historic land clearance, where there are remnant stands of native trees present. Scarred trees are particularly frequent along water courses, indicating that additional scarred trees would likely be located where remnant vegetation is located in close proximity to watercourses.

Background research has identified that siliceous sands are considered to have high potential to contain Aboriginal objects, the red-brown earth soils are considered to have low potential, and the grey, brown and red clays have moderate potential to include Aboriginal objects.

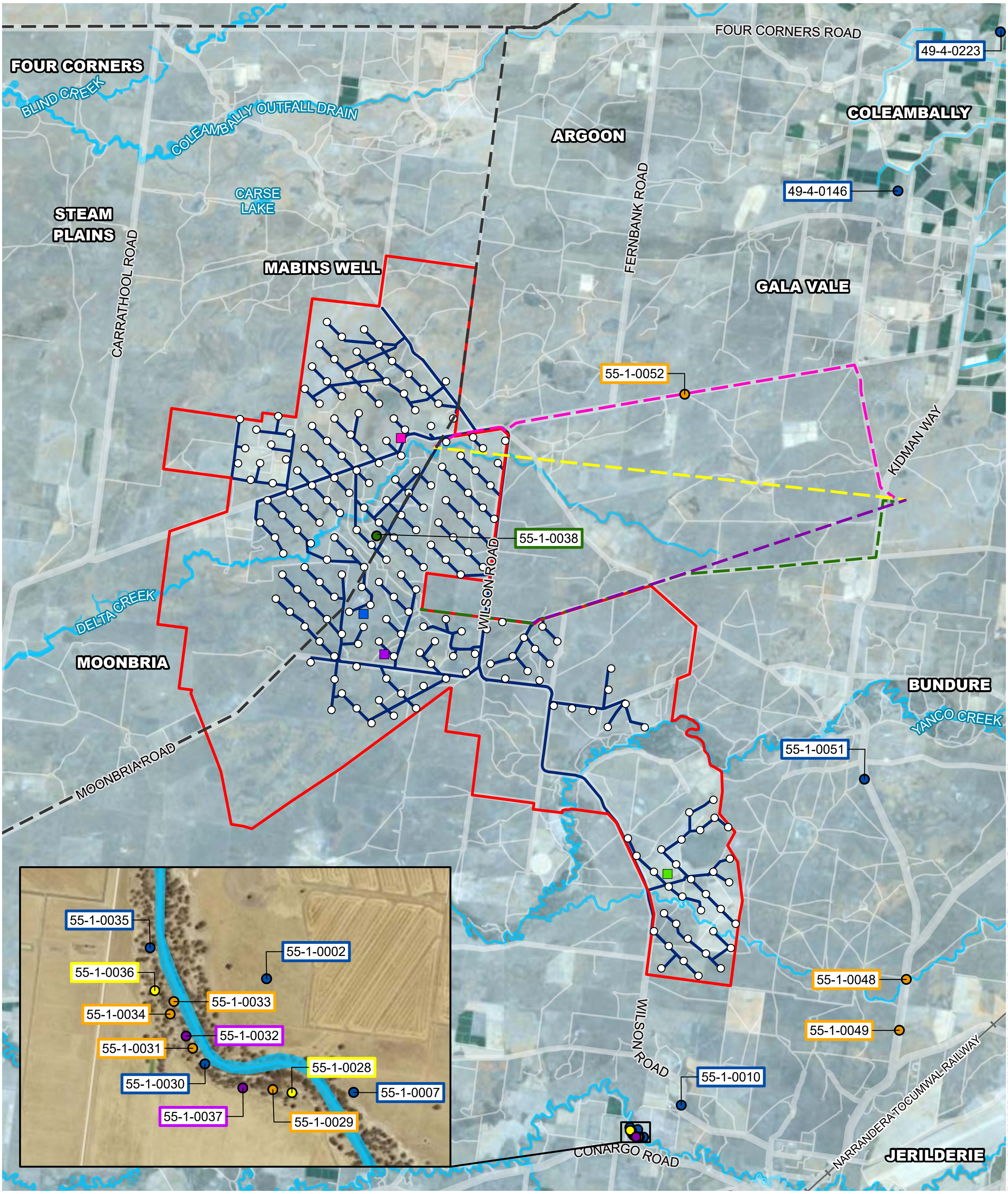
There have been several archaeological surveys focused on mounds and burials conducted across the wider Murray Valley and Murrumbidgee Region.

Previous archaeological surveys and background research completed for this assessment has resulted in the development of several predictive statements that should be verified through field investigation:

- It is likely that scarred trees would be present within the Project area at locations where native vegetation has not been subject to historic land clearance
- Stone artefacts would likely be identified within close proximity to existing roads due to increased surface visibility and exposure facilitating high survey efficiency
- Aboriginal objects would likely be located within 200 metres of major/permanent waterways
- Locations associated with the siliceous sands landscape are likely to contain deep (1.4 metres) deposits that have the potential to contain Aboriginal objects dating to the Pleistocene
- Locations associated with the grey, brown and red clays landscape are unlikely to feature subsurface artefact deposits, but are likely to feature Aboriginal objects on the ground surface.

A preliminary predictive model was prepared based on the above statements (refer to **Figure 6-5**). The model indicates that the majority of the impact area (i.e. areas subject to soil disturbance) would avoid locations that are of high predicted archaeological potential.

A search of the National Native Title Tribunal database, on 8 October 2021, found that there are no Native Title claims currently registered in the Project area.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

AHIMS
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)

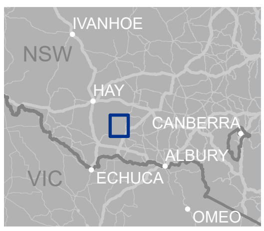
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N



Data sources

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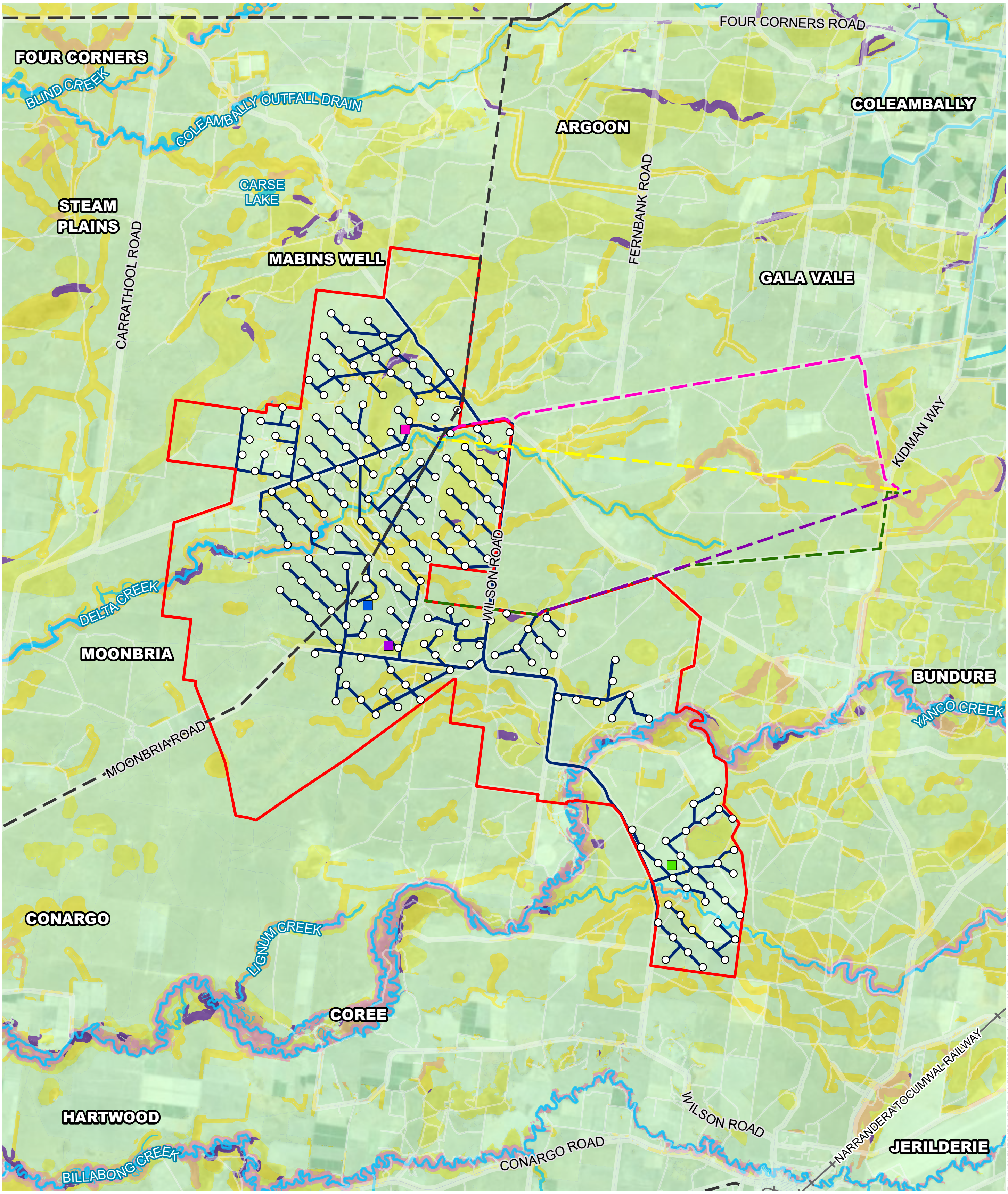
Figure 6-4 AHIMS sites within the study area



Indicative Project

- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

Predictive heritage constraints

- Low risk
- High risk

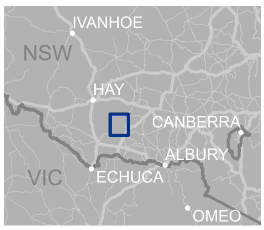
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N



Data sources

Jacobs 2022
DPE 2021
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Figure 6-5 Predictive model mapping

6.3.2 Potential impacts and issues for consideration

All Aboriginal object and places, whether recorded or not, are protected under the *National Parks and Wildlife Act 1994.* Work or activities that could potentially disturb the ground surface include earthworks, access road construction or upgrades, WTG foundation construction, associated building construction, services installation, repetitive vehicular movement, and landscaping. This work has the potential to disturb surface and in situ subsurface Aboriginal sites.

Aboriginal heritage would not be directly impacted during operation of the Project, as ground disturbance/ excavation would be restricted to the construction phase of the Project.

6.3.3 Proposed assessment approach

An ACHAR will be prepared as part of the EIS and will consider the archaeological potential of the Project area. It will also document environmental management measures that would be implemented. The ACHAR will include:

- Assessment of the Aboriginal archaeological potential within the Project area
- Identification of Aboriginal sites within, and in the vicinity of the Project area in accordance with the methods outlined in the Code of Practice
- Identification of the potential for the Project to disturb Archaeological objects, and, where this is the case, determine:
  - Assessment of significance in consultation with the RAPs
  - The extent and significance of impact to these resources
  - Recommendations for measures to avoid, manage or mitigate harm to identified Aboriginal objects
- A comprehensive field inspection with members of the local Aboriginal community to identify and record any Aboriginal objects or places both within and external to the site, specifically within areas proposed to be impacted by the Project
- Archaeological test excavation of areas of archaeological potential identified during desktop and field assessment, undertaken in partnership with the RAPs (where required)
- Identification of appropriate measures to avoid, minimise and/or mitigate potential impacts to Aboriginal heritage.

6.3.4 Any engagement required

Consultation in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010a) has already commenced. As described in **Section 5.3**, correspondence dated 1 December 2021 was issued to five Aboriginal parties listed by Heritage NSW who may have an interest in the area. There are four RAPs in the formal process of consultation. Griffith LALC and Cummeragunja LALC have been consulted and have been invited to assist in cultural heritage field work.

A draft ACHAR methodology has been sent to the RAPS for review, which included a methodology for the completion of the survey. As part of next stages, RAPs will be involved in the completion of the archaeological survey and the archaeological assessment.

6.4 Non-Aboriginal heritage

6.4.1 Existing environment

A search of relevant heritage registers and databases on 1 December 2021 identified there are no heritage items listed on the World Heritage List, National Heritage List, Commonwealth Heritage List, State Heritage Register, State Heritage Inventory, Section 170 Heritage and Conservation Register, LEPs within, or in close proximity to the Project area (refer to **Figure 6-6**). The closest listed heritage item is the Yanko Store, a local heritage item listed on the Jerilderie LEP (ID I19), located five kilometres north east of the Project, south of Yanco Creek.

The Project area intersects with (or is immediately adjacent to) several Travelling Stock Reserves (TSRs) (refer to **Figure 6-6**):

- Jukes (ID R58370)
- McLennons Bore Road (ID R2154)
- Mabins Well (ID R35786).

The travelling stock route and reserves network (TSR network) in NSW is an extensive network of public land that was established for the droving of stock during early European colonisation, often along traditional Aboriginal pathways through the landscape. The National Parks Association of NSW is working to develop an application for National heritage listing of the TSR Network, based on its historical importance and connection to a range of history, culture, values and resources, with its usage only declining in the early 1950s.

Consideration of the Aboriginal heritage potential of these items is presented in **Section 6.3.**

6.4.2 Potential impacts and issues for consideration

The Project would not impact on any listed heritage items.

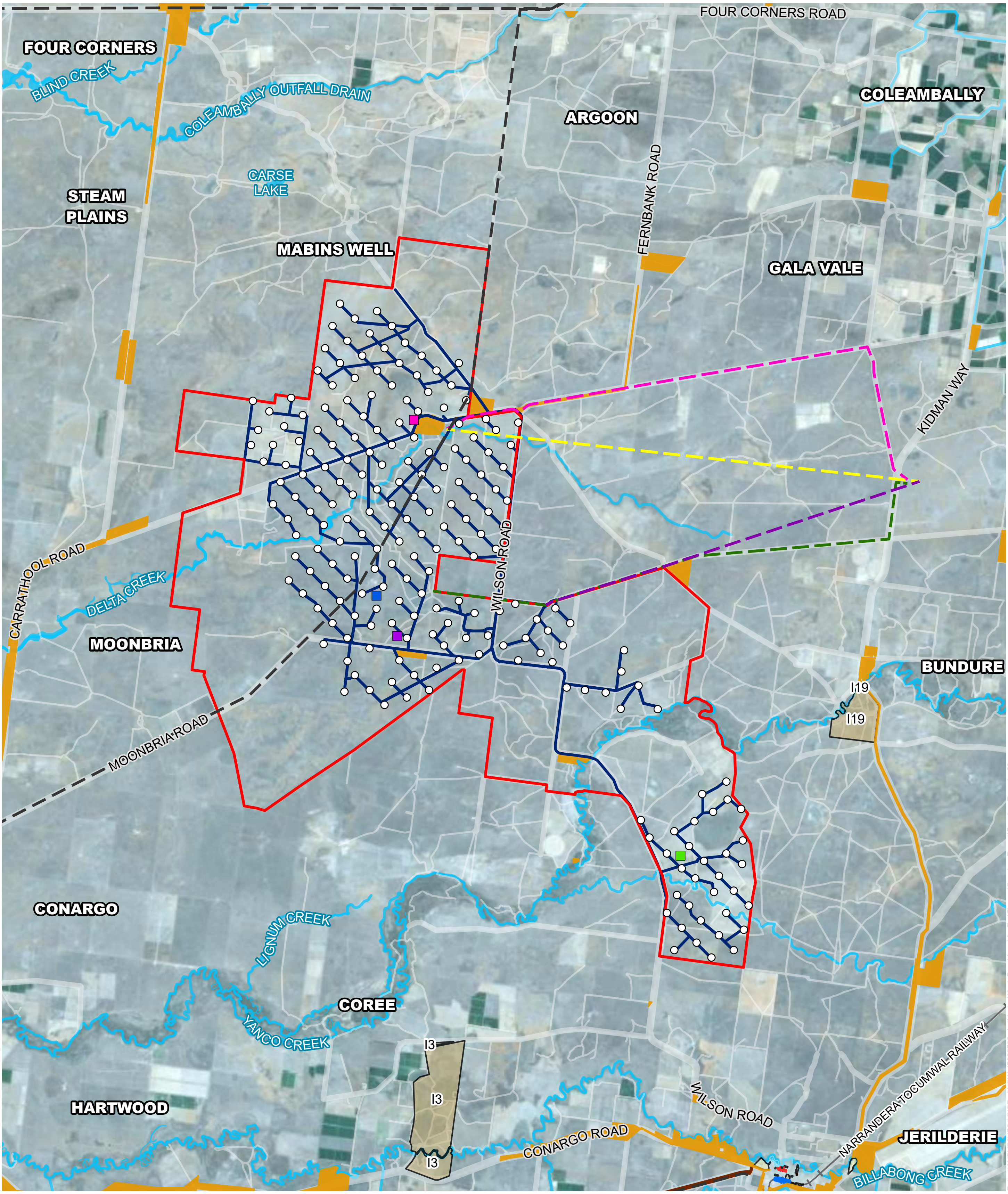
Given the dearth of previous development in the Project area and its long history of settlement, pastoral and agricultural activity, it is possible that unlisted historical heritage items exist within the Project area.

6.4.3 Proposed assessment approach

A non-Aboriginal heritage impact assessment would be prepared as part of the EIS to further identify and confirm non-Aboriginal heritage items within and immediately adjacent to the Project area, assess their heritage values and significance, and assess the potential impacts of the Project.

The non-Aboriginal heritage impact assessment will include:

- A desktop assessment to identify potential non-Aboriginal heritage items within or near the Project area and guide the scope and focus of site investigations (this may include, but may not be limited to, a literature review, archival research, review of imagery and historical maps and survey plans, consultation with local historical societies and identification of historical themes from the Australian Historic Themes Framework relevant to the Project area)
- Detailed site investigations to ground-truth the outcomes of the desktop assessment, inform significance assessments and impact assessment for the Project
- Post-fieldwork reporting including assessment of archaeological potential and assessment of significance for any potential unlisted heritage items in the Project area
- Impact assessment of the Project on identified significant heritage items and proposed mitigation and management measures.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

- Travelling stock route

Historical heritage
- Conservation Area - General
- Item - Aboriginal
- Item-General

State heritage
- State Heritage Register - Curtilage

National heritage
- Register Of The National Estate

- Railway
- Waterways
- Existing electricity transmission line
- Road

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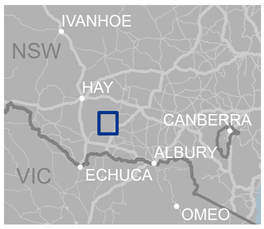

Data sources

Jacobs 2022
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Figure 6-6 Non-Aboriginal heritage within and surrounding the Project area

6.4.4 Any engagement required

If potential archaeological relics are identified during the site investigation, an assessment of their archaeological significance will be completed in order to determine if the site meets the statutory threshold for consideration as a relic (Section 4(1) of the *Heritage Act 1977*). If assessed to be an archaeological relic, Section 146 of the *Heritage Act 1977* requires that the Heritage Council of NSW be notified providing details of the location and any other information required.

6.5 Land use and property

6.5.1 Existing environment

The Project area is zoned as RU1 – Primary Production under the Conargo LEP and Jerilderie LEP, for agricultural activity (refer to **Figure 6-7**).

From 1835 the land encompassing the Project area was utilised for pastoral purposes. Initially, cattle was the primary industry in the region, with a number of squatters establishing stations or runs along Billabong Creek by 1840. By the 1860s, sheep had become more economically prominent. However, as discussed in **Section 6.2**, parts of the Project area are comprised of native vegetation.

The Project area is located on private properties owned by nine landowners. The property ownership and lot boundaries are shown on **Figure 6-8**. Virya Energy has secured Option to Lease agreements with landowners for the construction, operation and maintenance of the Project.

Parcels of Crown land are located within the Project area (refer to **Figure 6-9**). These Crown land areas are also travelling stock reserves with medium to high conservational values.

As described in **Section 2.2.3.4**, some areas within the Project area are mapped, in draft, as SSAL based on existing state-wide information where the most relevant characteristics related to the best agricultural lands are used (refer to **Figure 2-3**). Based on feedback collected during the exhibition period, the draft map is ongoing iterations and would refine the areas considered the best agricultural lands in the state.

6.5.2 Potential impacts and issues for consideration

Land use conflicts occur when one land user is perceived to infringe upon the rights, values or amenity of another (DPI, 2011). The process of identifying potential land use conflict is generally to identify potential risks by considering land use changes that may affect existing land uses in the area. Given the Project area is located on land with secured lease option agreements, and all neighbouring dwellings are expected to sign Participation Agreements with Virya Energy, land use and property impacts are considered low. The Project would be considered compatible with existing agricultural uses.

Upon cessation of any lease arrangement, easement, or other agreement, infrastructure would be decommissioned, and land would be returned to its pre-existing condition in consultation with the landowners and use would be returned to the landowner.

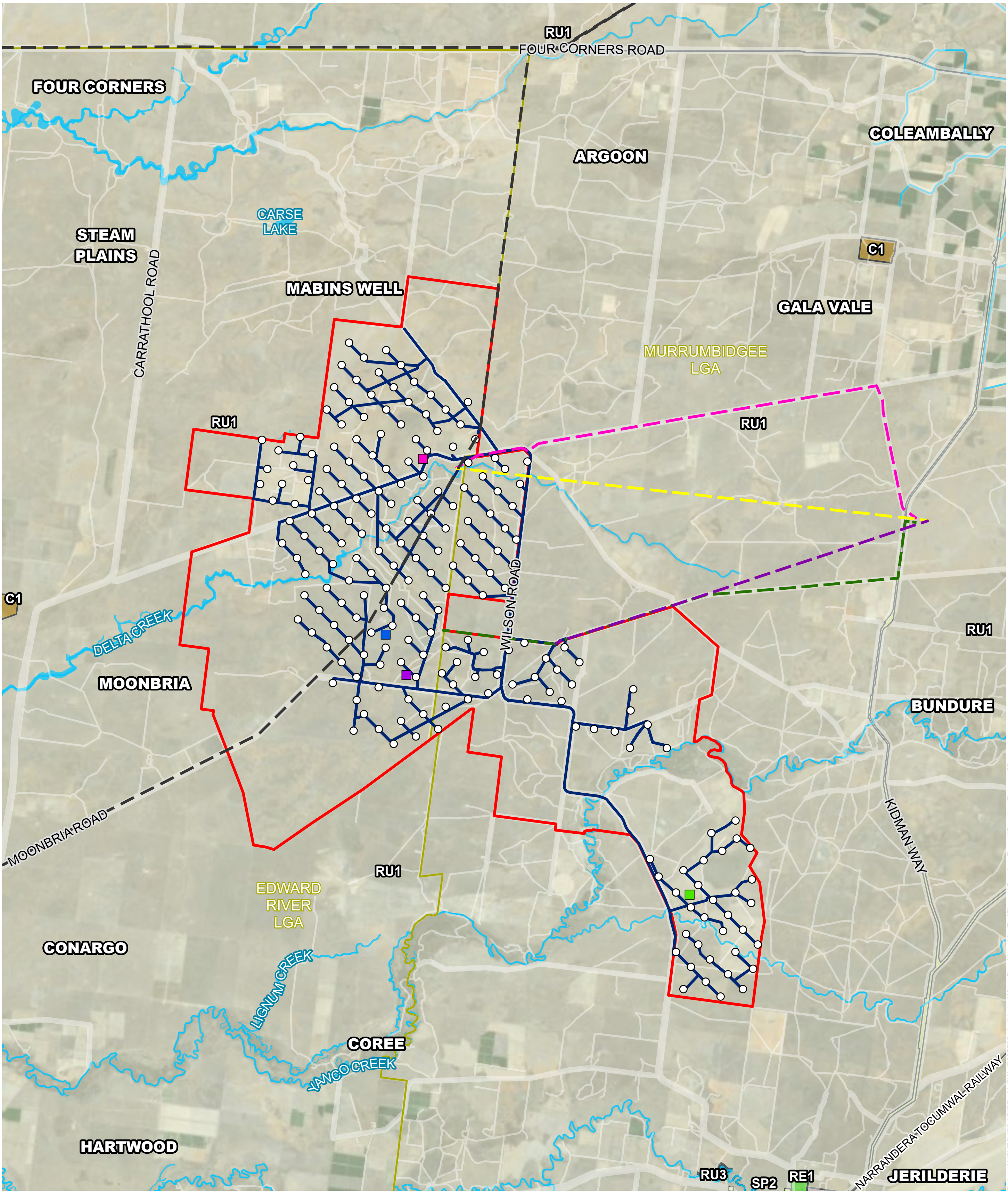
6.5.3 Proposed assessment approach

A review of land use impacts and potential conflicts will be prepared as part of the EIS and will document database and desktop searches. The review will describe:

- Land titles information, site plans and information gained from discussions with relevant landowners, the community, local Councils and regulatory authorities
- Site history including zoning, previous and present land use, building approvals and chronological list of site uses.

6.5.4 Any engagement required

Consultation with Crown Lands regarding any infrastructure on Crown land parcels within the Project will be undertaken. Consultation with landowners will continue as per **Section 5.4**.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

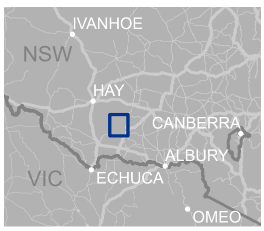
Land zoning (LEP)
- C1 National Parks and Nature Reserves
- R5 Large Lot Residential
- RE1 Public Recreation
- RU1 Primary Production
- RU3 Forestry
- SP2 Infrastructure
- W1 Natural Waterways

- Railway
- Waterways
- Existing electricity transmission line
- Road
- Local Government Area

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPE 2021
OEH 2021,
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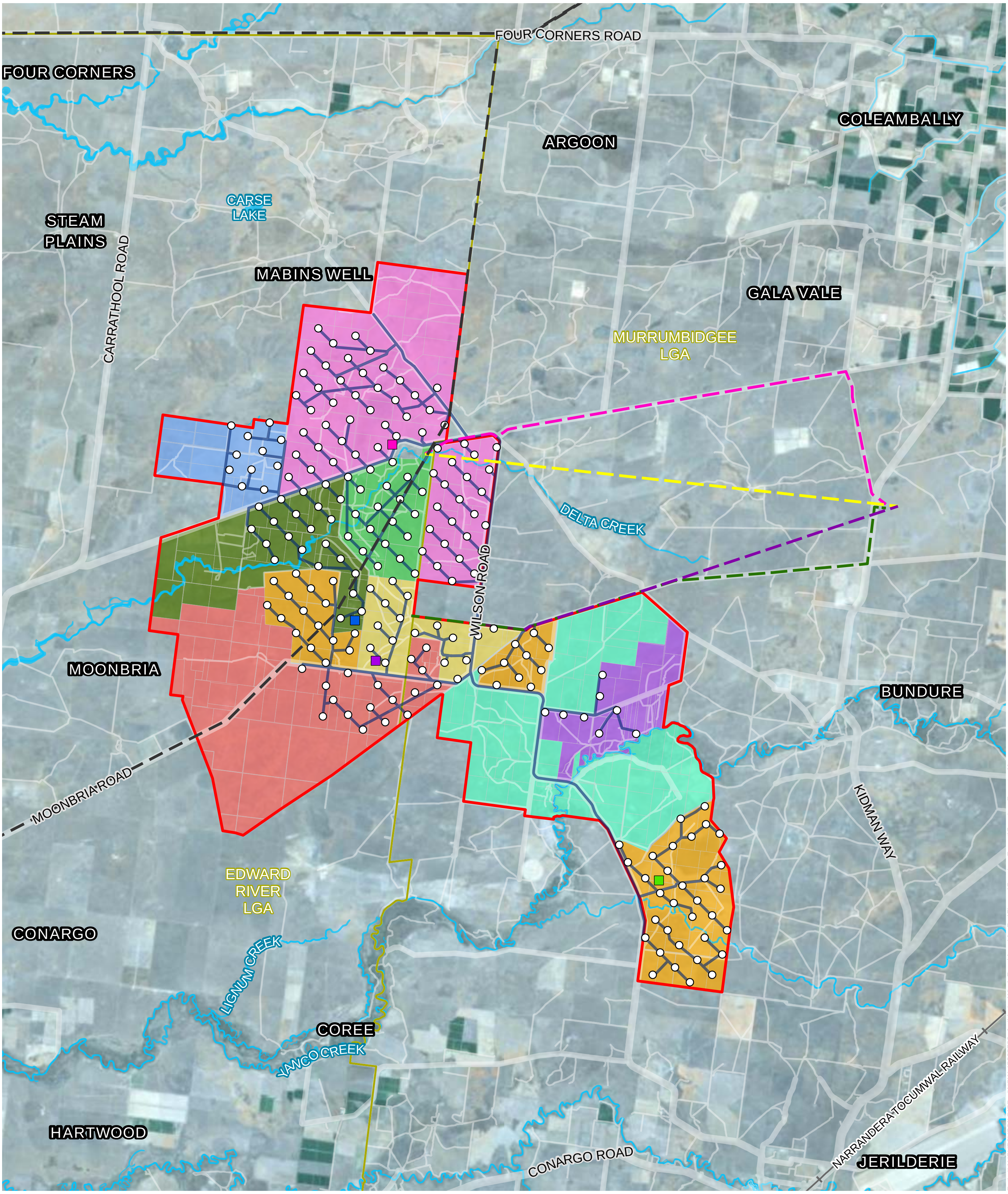
Figure 6-7 Land use within and surrounding the Project area



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

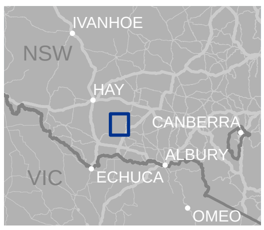
Properties
- Land owner 1
- Land owner 2
- Land owner 3
- Land owner 4
- Land owner 5
- Land owner 6
- Land owner 7
- Land owner 8
- Land owner 9

- Local Government Area
- Cadastre
- Railway
- Waterways
- Existing electricity transmission line

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPE 2021
OEH 2021,
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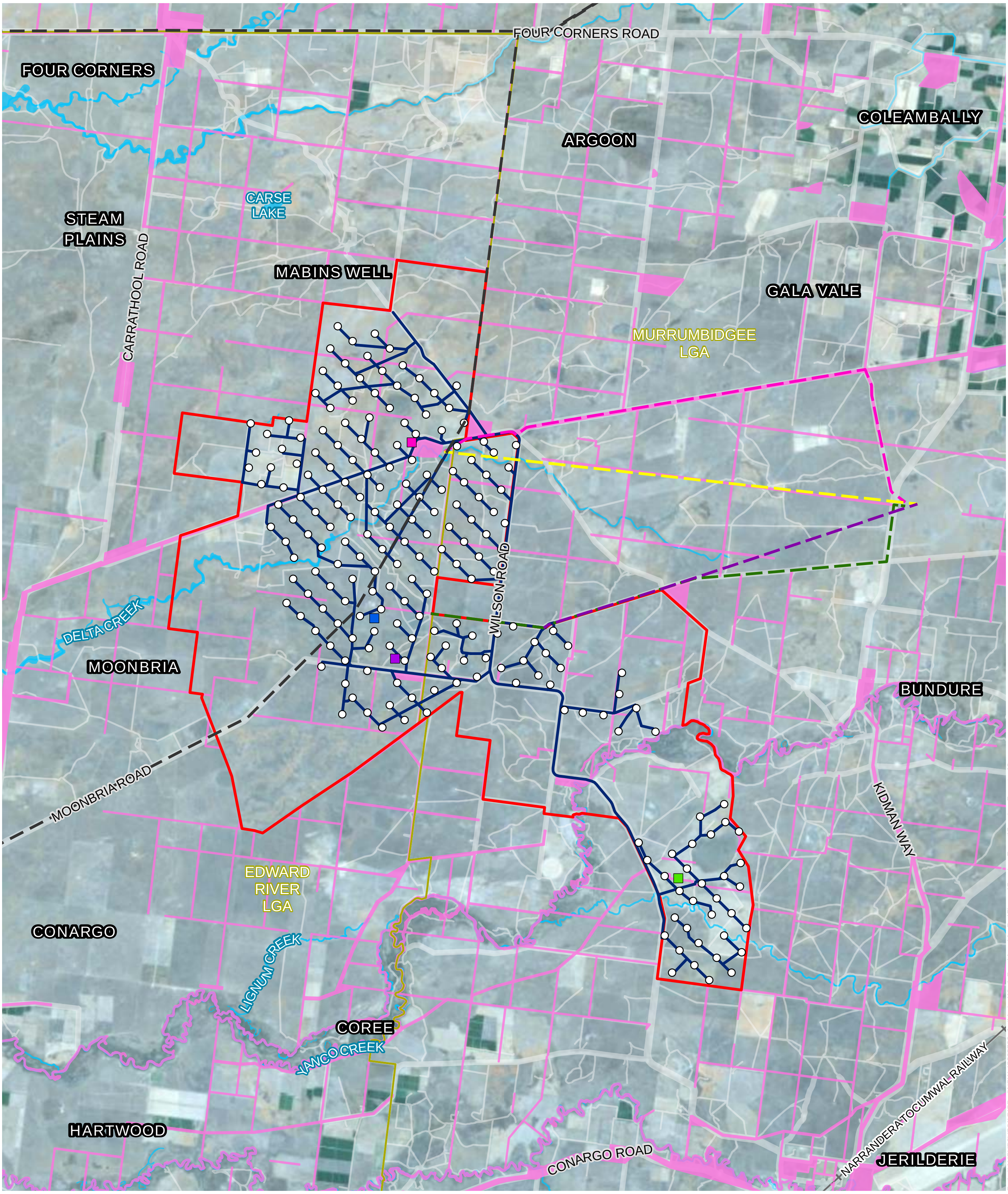
Figure 6-8 Lots and properties within the Project area



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

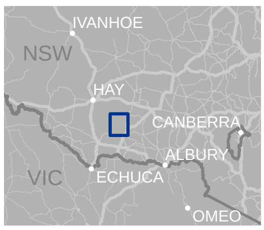
- Crown land
- Local Government Area

- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPE 2021
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Figure 6-9 Crown land within and surrounding the Project area

6.6 Landscape character and visual amenity

6.6.1 Existing environment

Green Bean Design prepared a Preliminary Landscape and Visual Assessment (PLVA) for the Project (**Appendix E**). The Preliminary LVIA has been prepared in accordance with the NSW Wind Energy: Visual Assessment Bulletin (DPE, 2016c).

The Project area is approximately 106 metres above sea level (+/- 5 metres) and the site landform is visually flat with the horizon line extending out at eye level in most directions from the Project area. As a generally flat region visibility from eye level extends to around five kilometres from a static viewpoint before the curvature of the earth interrupts visibility.

In accordance with the Visual Assessment Bulletin, the study area for the Preliminary LVIA has been defined as an eight-kilometre offset from the WTGs for the Magnitude Tool assessment. The study area extends to eight kilometres for the application of the Multiple Wind Turbine Tool. A summary of these assessments are provided in the sections below.

Site photography for the assessment was undertaken in February 2021 to capture the landscape characteristics and elements within the study area. The findings of the site inspection have been included in the PLVA and informed the preparation of material used during community consultation undertaken by the Proponent.

Public viewpoints

Public view locations within eight kilometres from the wind turbines are largely confined to a network of unsealed (or partially sealed) roads and tracks which access pastoral land and occasional dwellings and rural homesteads. A short section (around 5.5 kilometres) of the Kidman Way state rural road is located within eight kilometres from the wind turbines south of the Yanco Creek crossing and north of the Newell Highway intersection. No designated rest stops or lookouts are located along this section of the Kidman Way. Further consideration of public view locations within eight kilometres from the wind turbines will be undertaken in the EIS.

Landscape values

Community consultation has been undertaken through the scoping phase (refer to **Section 5.2**). Targeted consultation to identify community and landscape values included face-to-face meetings with nearby neighbours, drop-in session at Jerilderie, and a values survey which was available as a hardcopy, email and phone survey. Results of the community consultation (**Appendix F**) have also been utilised to gain perspective on the landscape values held by the community to inform the PLVA. Community consultation will continue through the EIS phase.

The community identified that rural landscapes and scenic beauty are important values within the local natural and built environment. Specific landscape features, lookout points and landscape values identified from eleven returned community surveys and additional resident feedback identified:

- Areas adjoining creeks
- Lake Jerilderie
- Yanco Creek
- Billabong Creek
- Historic locations and local history
- Certain unique views
- Clear and clean serenity
- Mostly unspoilt natural landscape
- Wildlife conservation areas and scenic beauty
- Pristine creek country with open riverine plains and
- Sunrise and sunset views across the plains.

These places, landscape elements and values will be further considered in an assessment of visual impact during the EIS Assessment and Determination.

The Visual Bulletin notes that ‘where a regional survey or study of landscape values has been undertaken, it must be considered. Proponents should confirm with the Department if there is any such recognised study in place’. No regional surveys or study of landscape values that have been undertaken within or surrounding the Project area have been found. This will be confirmed with DPE prior to the commencement of the detailed assessment prepared for the EIS.

6.6.2 Potential impacts and issues for consideration

Preliminary assessment – Magnitude Tool

The purpose of the Preliminary Assessment Tools in the PLVA is to identify sensitive receptors for further assessment and justification in the EIS phase. For a tip height of 270 metres, the visual magnitude thresholds based on the Visual Assessment Bulletin are 3.6 kilometres (black line in **Figure 6-10**) and 5.3 kilometres (blue line in **Figure 6-10**).

The Magnitude Tool study area within 3.6 kilometres (below the black line) of the WTGs did not identify any key public viewpoints (e.g. dedicated lookouts, public spaces, recreational areas etc.) and, accordingly, the preliminary analysis has focused on residential dwellings between the black and blue threshold lines. A further and detailed analysis of key public viewpoints surrounding the Project will be undertaken in the Stage 2 EIS report.

Dwellings located between 3.6 kilometres (black line) and 5.3 kilometres (blue line) have been identified in **Figure 6-11** to provide a greater degree of context regarding the location and number of dwellings surrounding the Project. The Visual Magnitude Tool did not identify any non-associated dwellings (landowners that have not entered into an agreement with Virya Energy) within the black line of visual magnitude (3.6 kilometres) and five non-associated dwelling within the blue line of visual magnitude (3.6 kilometres to 5.3 kilometres).

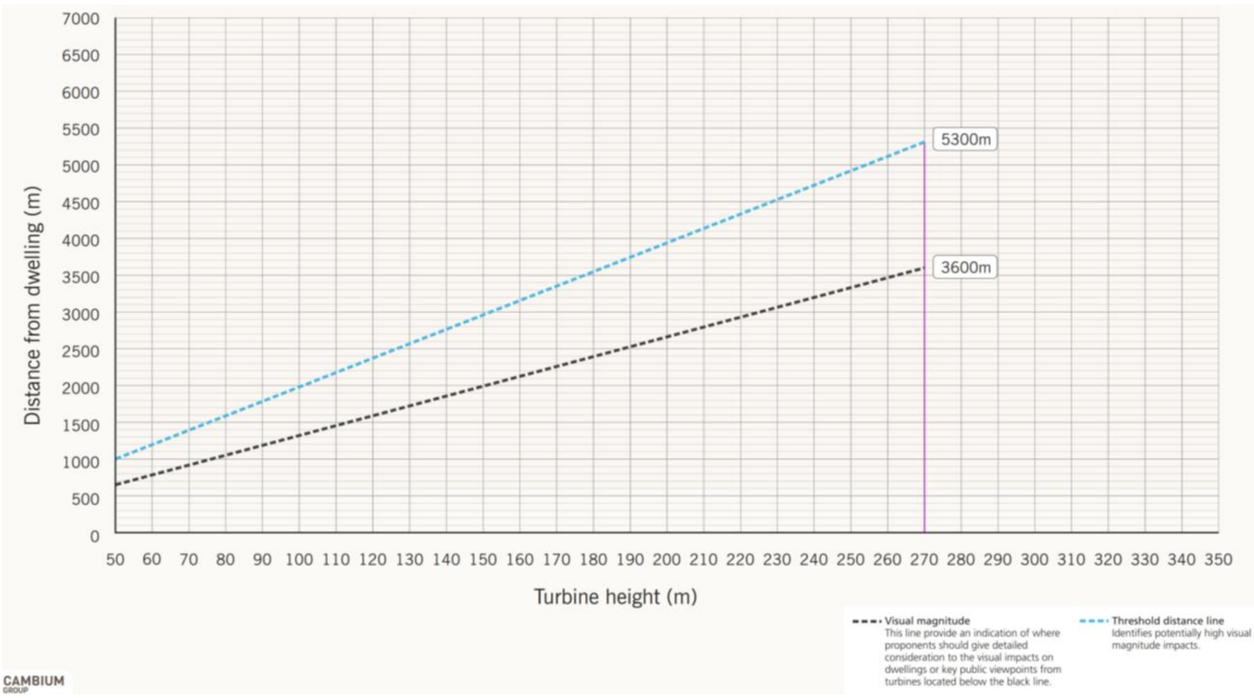
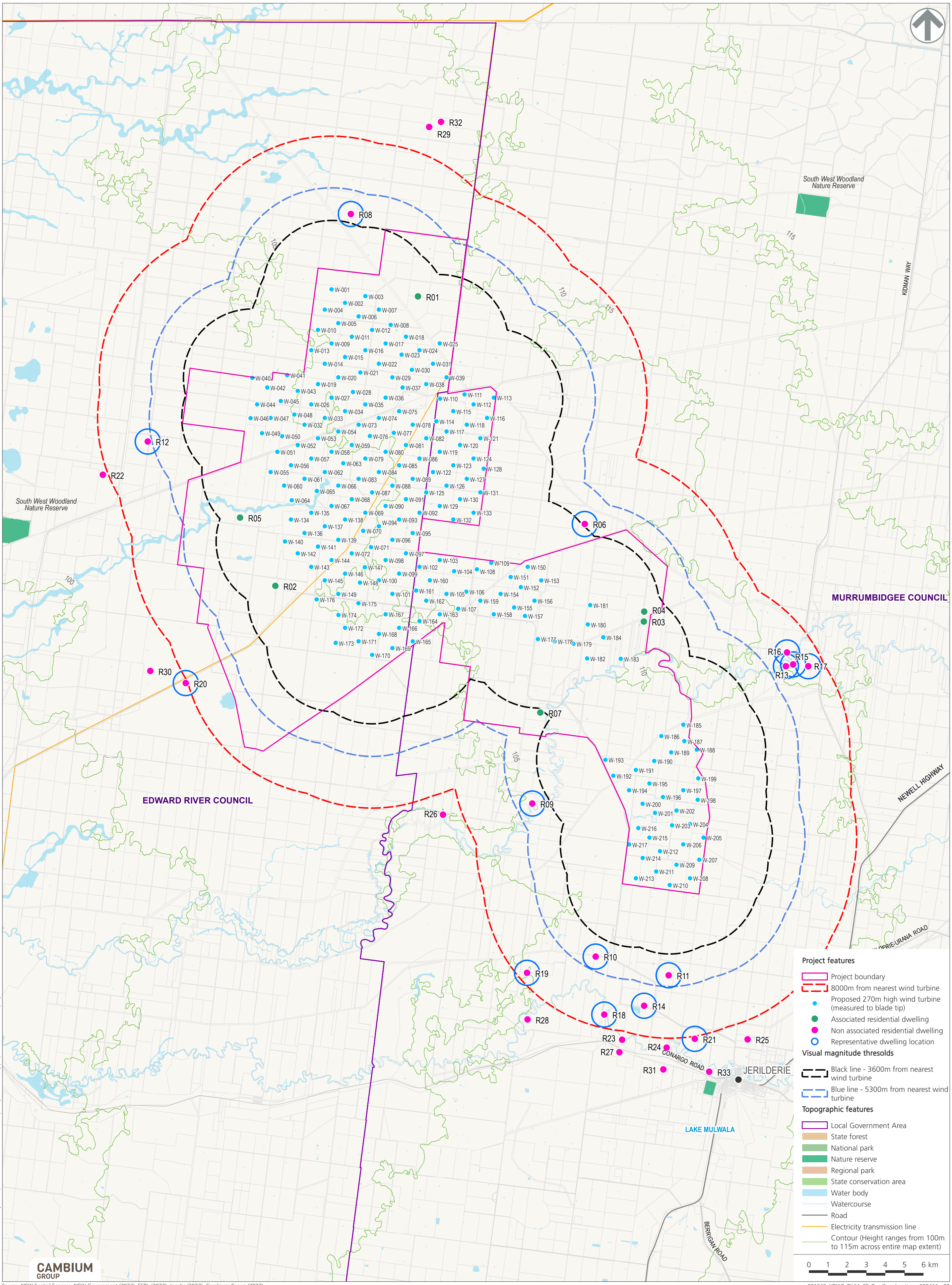


Figure 6-10 Visual magnitude thresholds for visual assessment (from NSW Wind Energy: Visual Assessment Bulletin 2016)



Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

031243_YDWF_PLVIA_F9_Dwelling_locations_220411_v02

Figure 6-11 Preliminary visual magnitude assessment

Preliminary assessment – Multiple Wind Turbine Tool

The Preliminary LVIA has identified 10 individual representative view locations which contain single or multiple viewpoints to eight kilometres from the WTGs. The Preliminary LVIA incorporated multiple residential dwellings into a single view location where dwellings occur within a 500 metre radius of each other.

Figure 6-12 illustrates a Zone of Visual Influence (ZVI) analysis, which indicates areas of the landscape from which wind turbines would not be visible, or visible toward blades only. The extent of screening illustrated in **Figure 6-12** relates to screening by landform only and does not account for vegetation (tree cover) within the landscape or surrounding residential dwellings.

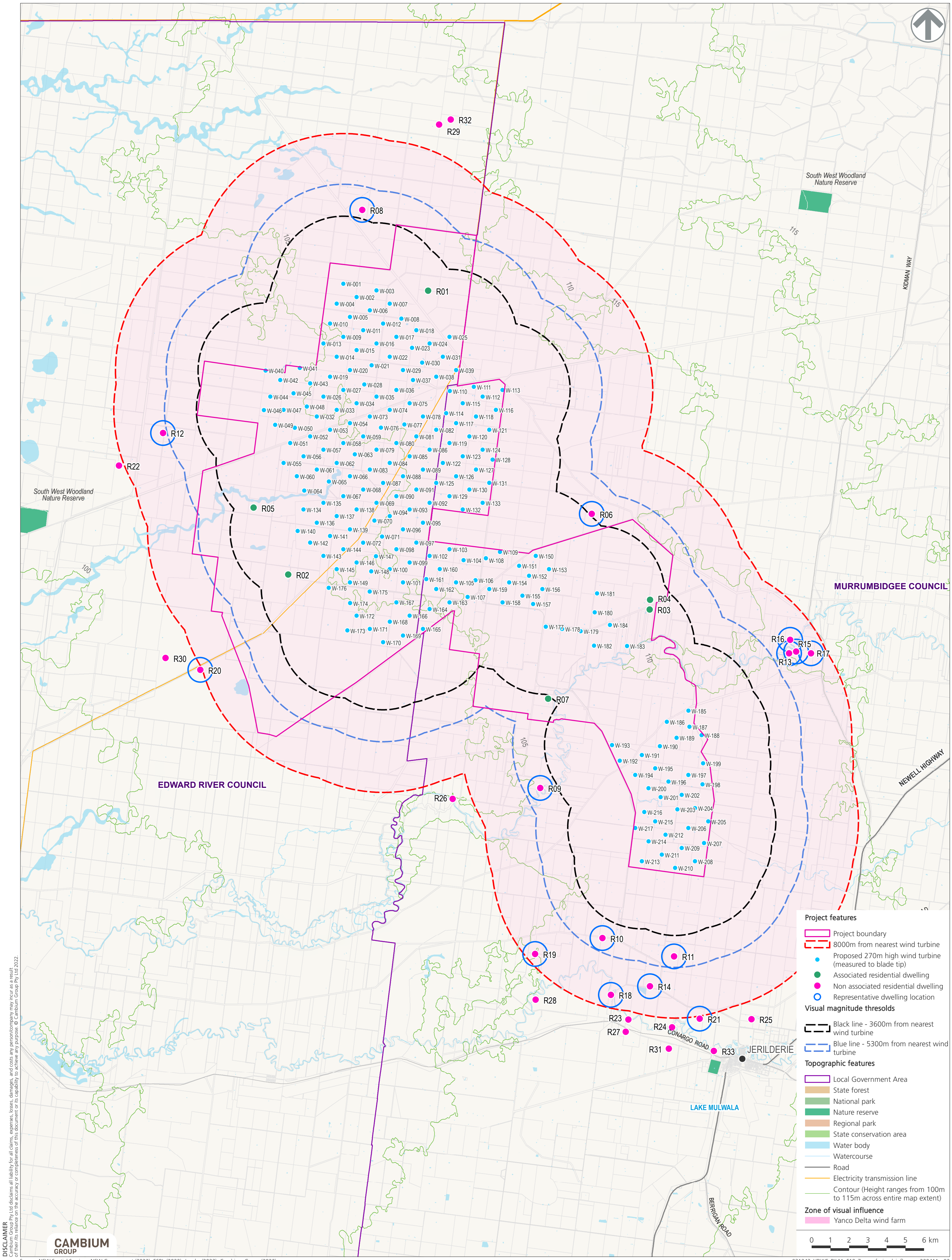
The assessment considers that views from these locations would be similar or identical in most cases. The 10 representative view locations and the multiple wind turbine analysis are presented in **Figure 6-11** and **Table 6-5**. **Table 6-5** includes:

- The identification of non-involved residential dwellings and key public view locations within eight kilometres of the wind turbines
- The distance to the closest wind turbine (and wind turbine ID)
- The number of 60° sectors the wind turbines occur within out to a distance of eight kilometres from the view location
- The number of wind turbines visible within three or more 60° sectors out to a distance of eight kilometres from the view location.

Of the 10 representative dwelling view locations, only one dwelling (R06) is predicted to have views towards wind turbines within three or more of the 60° sectors. Further assessment and justification for placement of turbines in multiple sectors will be detailed in the EIS, along with a description of the mitigation and management measures being employed to reduce impacts.

Table 6-5 Overview of preliminary assessment for dwellings within eight kilometres

Representative view location ID	Distance (km) from dwelling to closest wind turbine (and turbine ID)	Number of 60°sectors with wind turbines up to 8 km from dwelling	Number of visible wind turbines within 3 or more 60°sectors up to 8 km from dwelling
R06	3.72 km (W-153)	3	38
R08	4.06 km (W-001)	1	-
R09	4.45 km (W-193)	2	-
R10	4.59 km (W-213)	1	-
R11	4.71 km (W-210)	1	-
R12	5.51 km (W-046)	1	-
R14	6.44 km (W-210)	1	-
R15	6.54 km (W-185)	1	-
R18	7.30 km (W-213)	1	-
R19	7.53 km (W-213)	1	-



Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

031243_YDWF_PLVIA_F10_Zone_of_visual_influence_220411_v02

Figure 6-12 Zone of visual influence

Public view locations beyond eight kilometres from the wind turbines will be identified and assessed in the EIS LVIA and will include, but not be limited to:

- Surrounding roads and highways, including the Kidman Way and Newell Highway
- Local rural roads including the Conargo Road and Carrathool Road
- Jerilderie racecourse
- Jerilderie Lake and surrounding parks
- Jerilderie Sports Club/Golf Course.

6.6.3 Proposed assessment approach

A Landscape and Visual Impact Assessment (LVIA) will be prepared as part of the EIS in accordance with the Wind Energy: Visual Assessment Bulletin for State Significant Wind Energy Development (DPE, 2016c) ('the Visual Bulletin'). The LVIA will include:

- Preparation of a Visual Baseline Study as part of the EIS, which will identify, describe and map:
  - Sensitive Land Use Designations
  - Landscape Character Types
  - Key Landscape Features
  - Viewpoint locations and sensitivity levels
  - Visibility Distance Zones
- Community consultation carried out on aspects of the Visual Baseline Study and describe mitigation and management options in the EIS
- Establish Visual Influence Zones from viewpoints using inputs from the visual baseline study
- Undertake an evaluation of the Project against the Visual Performance Objectives
- Preparation of a detailed LVIA in accordance with:
  - Visual Baseline Study Factors
  - Visual Performance Evaluation
  - Visual Performance Objectives.

6.6.4 Any engagement required

Community consultation in accordance with the Wind Energy: Visual Assessment Bulletin for State Significant Wind Energy Development (DPIE, 2016c) ('the Visual Bulletin').

6.7 Noise and vibration

6.7.1 Existing environment

Key features of the existing environment as relevant to noise and vibration include the proximity, nature and density of surrounding sensitive receivers, local meteorological conditions and background noise levels, and existing traffic conditions.

Surrounding sensitive receivers

As discussed above, the Project would be located in a rural area. Sensitive receivers with regards to noise and vibration generated during construction and operations are defined in the following documents:

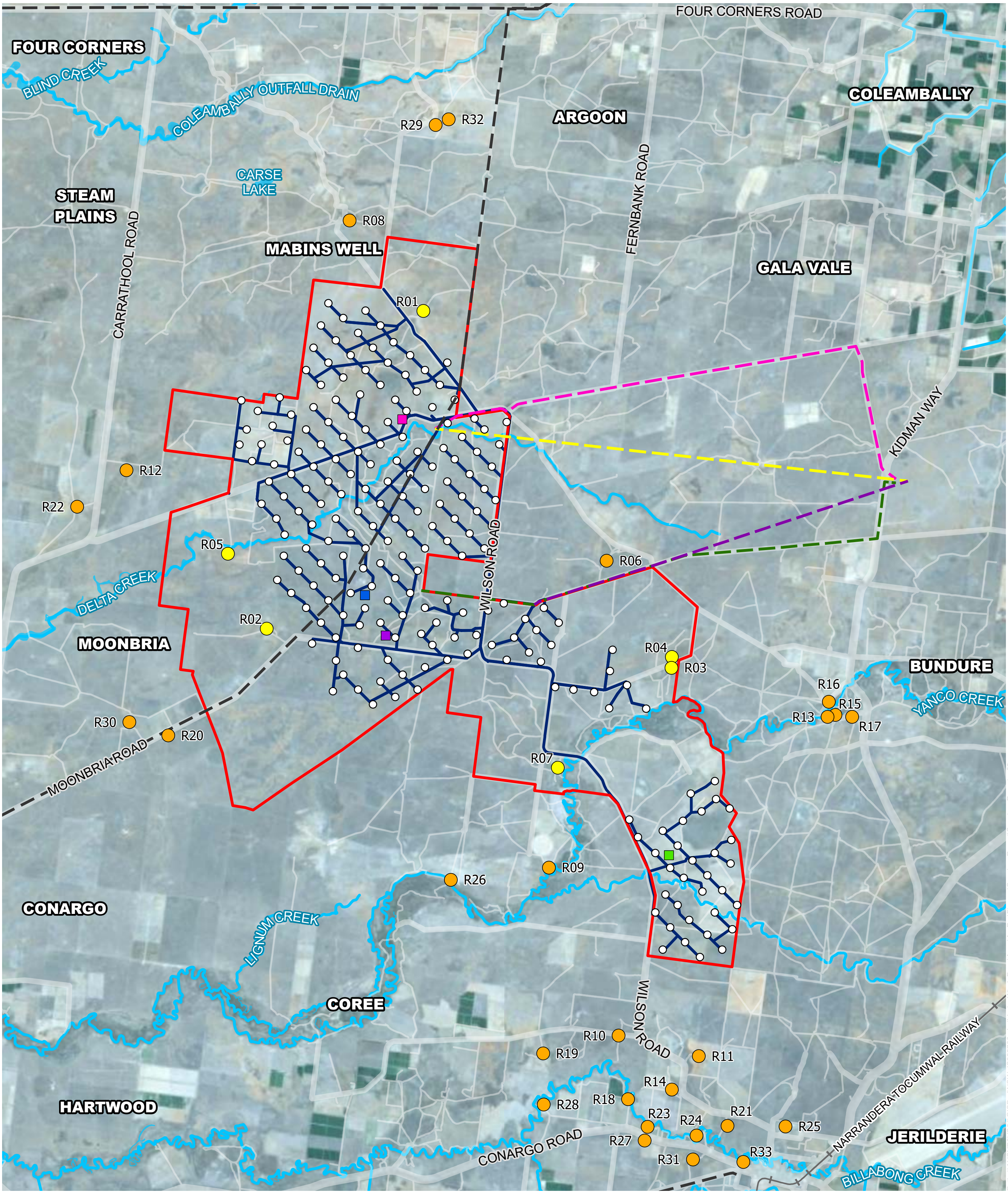
- Interim Construction Noise Guideline (ICNG) (DECC, 2009), as well as any changes to this policy, noting that updates are currently underway
- NSW Road Noise Policy (RNP) (DECCW, 2011)
- Assessing Vibration: A Technical Guideline (DEC, 2006) as well as other relevant international standards (e.g. DIN 4150-3:2016 Vibrations in buildings – Part 3: Effects on structures)
- Noise Policy for Industry (NPfI) (NSW EPA, 2017)
- Wind Energy: Noise Assessment Bulletin for State Significant Wind Energy Development (Noise Assessment Bulletin) (DPE, 2016b).

In general, the ICNG requires that noise resulting from construction activities is assessed at surrounding residential and various types of non-residential sensitive land uses. These include nearby educational, medical place of worship, office and commercial, community centres, industrial and recreational receivers. Operational noise from the WTGs is assessed in accordance with the Noise Assessment Bulletin (DPE, 2016b). The document requires the assessment of operational noise from WTGs at surrounding residential receivers, with different noise limits applied for Project landowners and neighbours. Operational noise impacts from other aspects of the Project (e.g. BESS and substation) would be assessed in accordance with the NPfI. The NPfI requires that operational noise is assessed at surrounding residential, temporary accommodation, educational, medical, place of worship, recreational, commercial and industrial receivers. Finally, all types of receivers are sensitive to vibration impacts in line with Assessing Vibration: A Technical Guideline (DEC, 2006), with additional guidance for more sensitive heritage structures adopted from the German standard DIN 4150-3:2016 Vibrations in buildings – Part 3: Effects on structures.

Identified sensitive receivers with respect to the different considerations above are displayed in **Figure 6-13**. Each of the displayed receivers co-ordinates, type, association with and distance from the Project are listed below in **Table 6-6**. Virya Energy is currently in the process of securing participation agreements with the owners of all dwellings within eight kilometres of a WTG. These locations would need to be reviewed and updated during the preparation of the Noise and Vibration Impact Assessment (NVIA) that would support the Project EIS.

Table 6-6 Surrounding sensitive receivers

Receiver ID	Receiver type	Associated	Approximate distance from nearest WTG (metres)
R01	Residential	Associated	2058
R02	Residential	Associated	2062
R03	Residential	Associated	2270
R04	Residential	Associated	2520
R05	Residential	Associated	2656
R06	Residential	Non-associated	3724
R07	Residential	Associated	3739
R08	Residential	Non-associated	4062
R09	Residential	Non-associated	4457
R10	Residential	Non-associated	4599
R11	Residential	Non-associated	4715
R12	Residential	Non-associated	5513
R13	Residential	Non-associated	6172
R14	Residential	Non-associated	6447
R15	Residential	Non-associated	6546
R16	Residential	Non-associated	6607
R17	Residential	Non-associated	7212
R18	Residential	Non-associated	7307
R19	Residential	Non-associated	7535
R20	Residential	Non-associated	8112
R21	Residential	Non-associated	8141
R22	Residential	Non-associated	8270
R23	Residential	Non-associated	8455
R24	Residential	Non-associated	8496
R25	Residential	Non-associated	8938
R26	Residential	Non-associated	8964
R27	Residential	Non-associated	9119
R28	Residential	Non-associated	9296
R29	Residential	Non-associated	9442
R30	Residential	Non-associated	9464
R31	Residential	Non-associated	9638
R32	Residential	Non-associated	9924
R33	Residential	Non-associated	9968



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

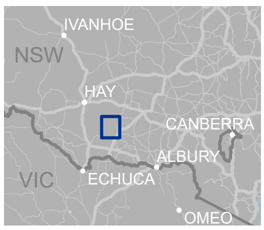
Existing Dwellings
- Associated
- Non-associated

- Electricity transmission line
- Railway
- Waterways
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
Bureau of Meterology 2021
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Figure 6-13 Surrounding sensitive receivers

Background noise and meteorology

Assessing potential noise impacts from construction and operations requires an understanding of background noise and meteorological conditions. Noise management levels (NMLs) for residential receivers developed using guidance from the ICNG to assess noise levels during construction are applied on a 'background plus allowance' basis. Project noise trigger levels for assessing noise from operational aspects of the Project excluding the WTGs also require an understanding of background noise levels. The Project amenity level is similarly developed on a 'background plus allowance' basis, with the lower of the amenity and intrusiveness noise levels applied as the Project noise trigger levels. Additionally, an understanding of local meteorology is also required to assess operational noise associated with these sources. In-line with NPfI Fact Sheet D, for settings where noise-enhancing meteorological conditions including temperature inversions and prevailing dominant wind directions apply, additional assessment is required.

Noise monitoring is required to establish noise limits for assessing operational noise from WTGs. Receiver background noise levels need to be established for all integer wind turbine hub height wind speeds up to the cut-off speed. Concurrent data from the meteorological masts are used to correlate the wind speed and measured background noise data. This process is required unless the minimum fixed values from the Noise Assessment Bulletin (DPE, 2016b) are applied.

Existing traffic conditions

The ICNG refers to the RNP for the assessment of noise from construction traffic on public roads. One of the objectives of the RNP is to apply relevant permissible noise increase criteria to protect sensitive receivers against excessive decreases in amenity as the result of a project. An increase of up to 2 dBA in road traffic noise levels represents a minor impact that is generally considered to be indiscernible to the average person.

Where road traffic noise levels increase by more than 2 dBA as a result of construction or traffic, consideration will be given to applying feasible and reasonable noise mitigation measures to reduce the potential noise impacts and preserve acoustic amenity. Consideration will also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the following road traffic noise criteria in the RNP. The same criterion applies in relation to additional traffic generated from the Project during operation.

6.7.2 Potential impacts and issues for consideration

As outlined above, the Project has the potential to result in the following noise and vibration-related effects:

- Noise impacts from construction activities
- Vibration impacts from vibration-intensive construction activities
- Operational noise impacts from WTGs and other associated infrastructure
- Noise impacts from additional traffic generated during construction and operation. Noting, operational traffic generated by the Project would be limited to vehicles associated with maintenance, which is not expected to result in noticeable impacts on the local road network.

Of these matters, the primary risk is expected to be noise during operation, owing to its potential for long-term, rather than temporal impacts.

A Preliminary Noise Impact Assessment (NIA) was prepared for the Project (**Appendix G**). The Preliminary NIA has been prepared in accordance with the NSW Wind Energy: Noise Assessment Bulletin (DPE, 2016b).

Methodology

The noise impacts from the Project were predicted using the SoundPLAN 8.2 acoustic modelling software. Within the noise modelling software, the CONCAWE noise propagation algorithm was applied for dB(A) noise calculations.

In order to comply with the requirements of the NSW Wind Energy: Noise Assessment Bulletin (DPE, 2016b), a number of conservative inputs and assumptions were adopted for assessment, producing the worst case noise propagation conditions within the model.

For the purposes of the Preliminary NIA, the base criterion of 35 dB(A) nominated in the Noise Assessment Bulletin for non-involved residences, has been adopted as the noise criteria for all residences.

Results

The indicative noise levels predicted for this Preliminary NIA are provided in **Table 6-7**. Where predicted noise levels are greater than the base 35 dB(A) criterion, the levels are shaded in blue. As shown in **Table 6-7**, five receivers are predicted to receive noise levels greater than the 35 dB(A) base criterion. These exceedances range from 1 dB(A) to 6 dB(A). It should be noted however, that due to limited 1/1 octave data provided, the influence of low-frequency noise and tonality could not be determined, and hence any penalties, if applicable, could not be applied.

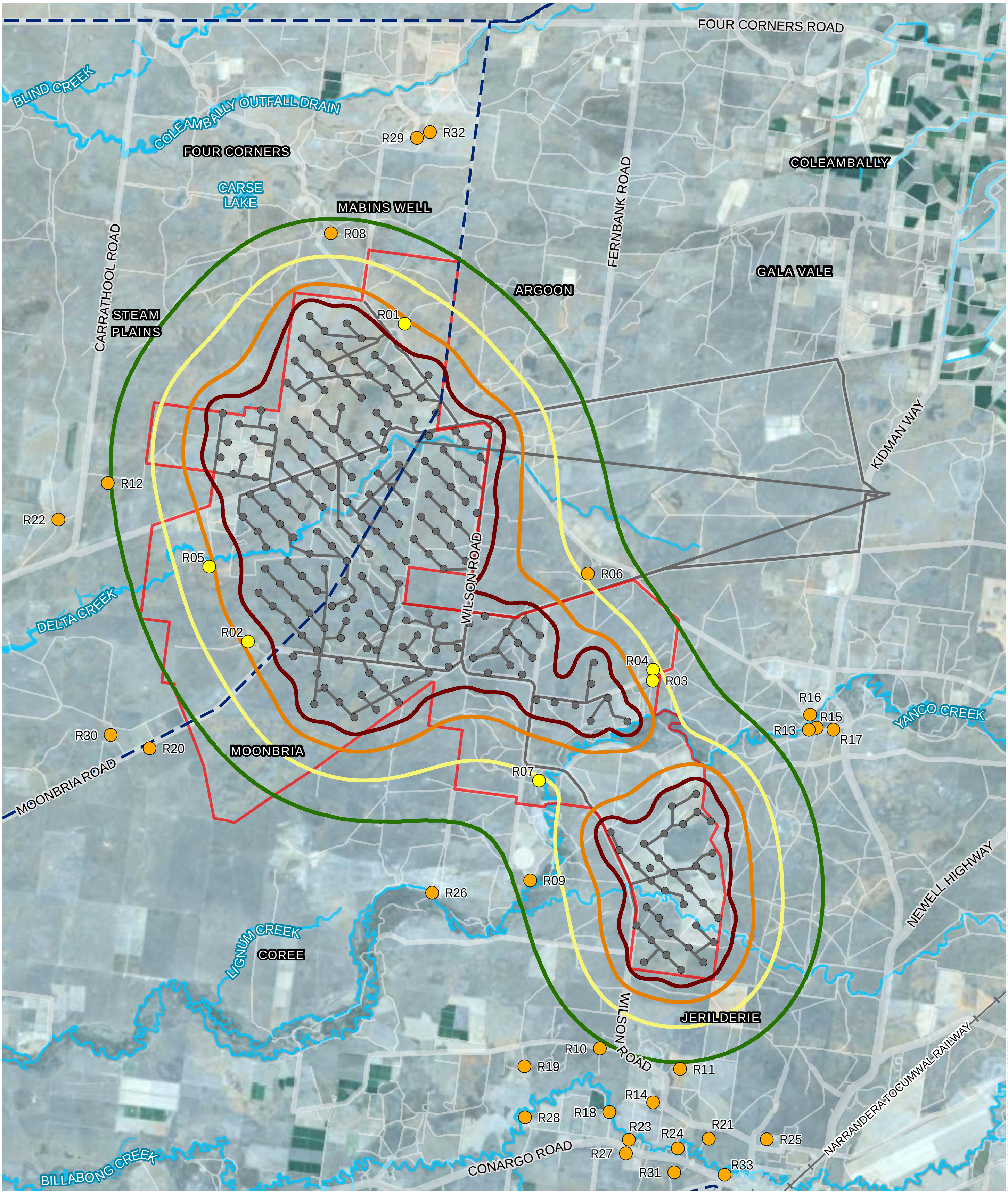
It should also be noted that all receivers where noise has been predicted to be greater than 35 dB(A) are associated receivers. The location of WTGs and other Project elements (including substations etc.) would be refined during further Project planning and design with a focus to minimise impacts to non-associated dwellings in proximity to the Project. Therefore, no further modification to the location of the wind turbines has been deemed necessary for this Scoping Report.

Noise contours displaying the predicted noise impacts are provided in **Figure 6-14**.

Table 6-7 Predicted noise levels at each identified receiver

Receiver ID	Approximate distance from nearest WTG (metres)	Noise prediction (dB(A))
R01	2058	**41**
R02	2062	**41**
R03	2270	**37**
R04	2520	**36**
R05	2656	**39**
R06	3724	34
R07	3739	34
R08	4062	32
R09	4457	31
R10	4599	29
R11	4715	29
R12	5513	30
R13	6172	26
R14	6447	25
R15	6546	27
R16	6607	25
R17	7212	24
R18	7307	23
R19	7535	23
R20	8112	24
R21	8141	22

Receiver ID	Approximate distance from nearest WTG (metres)	Noise prediction (dB(A))
R22	8270	24
R23	8455	21
R24	8496	21
R25	8938	20
R26	8964	25
R27	9119	20
R28	9296	18
R29	9442	20
R30	9464	22
R31	9638	18
R32	9924	19
R33	9968	17



Indicative Project

- Project area
- Proposed footprint

Existing environment

- Waterways
- Road
- Existing electricity transmission line

Predicted Noise Level, $L_{Aeq,15min}$

- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)

Existing Dwellings

- Associated
- Non-associated

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
DPI 2021
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 6-14 Predicted noise levels based on preliminary layout

6.7.3 Proposed assessment approach

An NVIA will be prepared as part of the EIS in accordance with the documents and guidelines referred to above. The NVIA will include:

- Key sources of noise emissions expected during construction and operations
- Key features of the existing environment including surrounding land uses and sensitive receivers, terrain features, prevailing local meteorological conditions and background noise levels
- Criteria suitable for assessing potential noise and vibration impacts from the Project during construction and operations with reference to the background noise monitoring data and policies/guidelines
- Details of the Project including plant and equipment type, sizes, locations, activities, utilisation, duration and timing to develop an inventory quantifying potential noise and vibration emissions during construction
- Review of turbine models and provided details as well as details for any other noise sources during operations
- A site noise model and predicting potential noise levels at the identified surrounding sensitive receivers
- Evaluation of predictions by comparing predicted levels against management levels and criteria determined for the Project. The potential for cumulative impacts would also be completed
- Recommendations to mitigate or otherwise effectively manage potential impacts during construction and operation of the Project, as required.

6.7.4 Any engagement required

No engagement is proposed.

6.8 Traffic and transport

6.8.1 Existing environment

Access to and from the Project area would be via Kidman Way (B87), the Newell Highway (A39) and Liddles Lane. The Newell Highway is a National road that forms part of the National Land Transport Network. It is the principal freight route between south-eastern Queensland and Victoria. Kidman Way (B87) is classified as a State road and provides north-south connectivity between the township of Bourke and the Newell Highway (A39) north of Jerilderie. Both the Newell Highway (A39) and Kidman Way (B87) form part of the approved 25/26 metre B-double network and OSOM load carrying vehicle network.

A number of local roads connect the Project to the State and National road network including Liddles Lane, Jerrys Lane and Wilsons Road. Liddles Lane and Jerrys Lane are unsealed local roads that generally extend in the east-west direction between the Project area and Kidman Way (B87). Wilsons Road is a sealed local road that provides access to the Project area from the south. The road network surrounding the Project area is shown on **Figure 1-2**.

Between the Project area and Port of Melbourne, where main Project components are expected to originate, the road network consists of motorway, National and State roads, carrying moderate volumes of traffic, including heavy vehicles. These roads form part of the approved 25/26 metre B-double network and OSOM load carrying vehicle networks and include:

- M2 from Port of Melbourne to Thomastown
- M31 from Thomastown to Seymour
- M39 from Seymour to Shepparton
- A39 from Shepparton to north of Jerilderie
- B87 from north of Jerilderie to the Project.

The Sturt Highway (A20) and Hume Highway (M31) would be used for deliveries originating from the Sydney region.

Public transport is limited near the Project, as there are no rail or local public bus services. However, two regional coach services operate on sections of Kidman Way (B87) and the Newell Highway (A39), including the Wagga Wagga to Echuca service (operated by NSW TrainLink) and the Griffith to Melbourne via Shepparton service (operated by V/Line). The nearest bus stop to the Project would be located on Jerilderie Street near Smith Street, Jerilderie. The inactive Narrandera Tocumwal Railway Line is located 9.5 kilometres to the south-east of the Project and Jerilderie Airport (YJER) is located 11 kilometres to the south. Jerilderie Airport is a small private airport. Further information on airports is provided in **Section 6.12.1**.

There are no formal pedestrian or cycling facilities provided in the vicinity of the Project area.

6.8.2 Potential impacts and issues for consideration

Construction of the Project would require the use of heavy vehicles to deliver construction plant, equipment and materials, as well as the removal of waste. OSOM vehicles would be required to transport oversized components to the Project area. Additional light vehicle movements would also occur, associated with the construction workforce. Construction parking would be provided within the Project area. Potential construction traffic and transport impacts include:

- Impacts to intersection and traffic performance on the surrounding road network
- Potential to contribute to delays and disruption to regional coach services which use Kidman Way (B87) and the Newell Highway (A39).

Operational traffic generated by the Project would be limited to vehicles associated with maintenance, which is not expected to result in noticeable impacts on the local road network.

6.8.3 Proposed assessment approach

A traffic and transport impact assessment will be prepared for the EIS to identify and assess potential impacts of the Project on road network performance during construction of the Project.

The traffic and transport impact assessment will include:

- Quantifying hourly traffic generation and route distribution (split by vehicle class) of the Project
- Quantitatively assessing the capacity of key access roads and their ability to accommodate traffic volumes generated by the Project
- Assessing the impacts of the Project on road safety
- Describing OSOM vehicle requirements, including haulage routes and site access arrangements, and assess the impacts of OSOM vehicles on the road network
- Undertake a swept path analysis to determine the suitability of key intersections on the nominated haulage route(s) to safely accommodate turning movements of oversized vehicles
- Proposing measures to mitigate and/or manage any identified adverse impacts resulting from the construction and operation of the Project on traffic and transport.

6.8.4 Any engagement required

Where required, consultation with Transport for NSW, Victorian Department of Transport (which includes Vic Roads and Ports Victoria), and other key stakeholders, including Murrumbidgee Council and Edward River Council, will be undertaken as part of the traffic and transport assessment. Details on proposed stakeholder engagement are provided in **Section 5.4**.

6.9 Soils and contamination

6.9.1 Existing environment

Soils and geology

The Project area is located across several geological formations, the larger and more extensive of these being the Shepparton Formation (Czs), deriving from sediments deposited during the Plio-Pleistocene Epoch (5,000,000 to 12,000 years ago). These deposits represent the most recent infilling of the Tertiary Murray Basin and consist of alluvial sands, silts and clays (The Geological Society of America, 2012). The sediments within the Shepparton Formation form the subsurface component to the Riverine Plain and range from poorly sorted gravels to clay. These sediments were primarily deposited by alluvial action and are mantled by a thin layer of parna (wind-blown calcareous clay). The older alluvial plains, comprising of Shepparton Formation sediments, are typically dominated by a level topography with distinct shallow drainage depressions (Pels 1971, Cupper, White et al. 2003, Stone 2006). Traces of the distributary channels that built the Riverine Plain are preserved upon the surface of the Shepparton Formation. These are leveed or prior streams that bear little resemblance to the modern drainage system.

Soil landscape mapping indicated that the Project area predominantly contains grey, brown and red clays with discreet areas of siliceous sands. The red-brown earths soil landscape may also be present within the Project area but are not mapped within the boundaries of the current Project area. Siliceous sands landform is suspectable to wind erosion but may contain deposits up to 1.4 metres deep. The siliceous sands are likely associated with former paleochannels (Czs) and the grey, brown and red clays are likely to be a shallow deposit of soil.

Land capability

Land and soil capability refers to the physical capacity of land to sustain a range of land uses and management practices. Classification of land into classes on a scale of 1 to 8 identifies the types of land use that would be appropriate in each classification. The majority of land capability and classifications of the Project is expected to be ‘Moderate to severe’, which corresponds to Land and Soil Capability of Class 4 (Moderate capability land) (OEH, 2012). Smaller areas of the Project area are expected to be ‘Very severe limitations’ which corresponds to Land and Soil Capability of Class 6 (Low capability land) (OEH, 2012). Land capability within and surrounding the Project area is shown in **Figure 6-15**.

Acid sulfate soils

Acid sulfate soils are naturally occurring sediments and soils containing iron sulfides. In an undisturbed and waterlogged state these soils are harmless, but when disturbed or exposed to air, these soils can release sulfuric acid, which may result in detrimental impact to receiving water, plants and animals. There are no areas mapped by DPE as having high probability of acid sulfate soils.

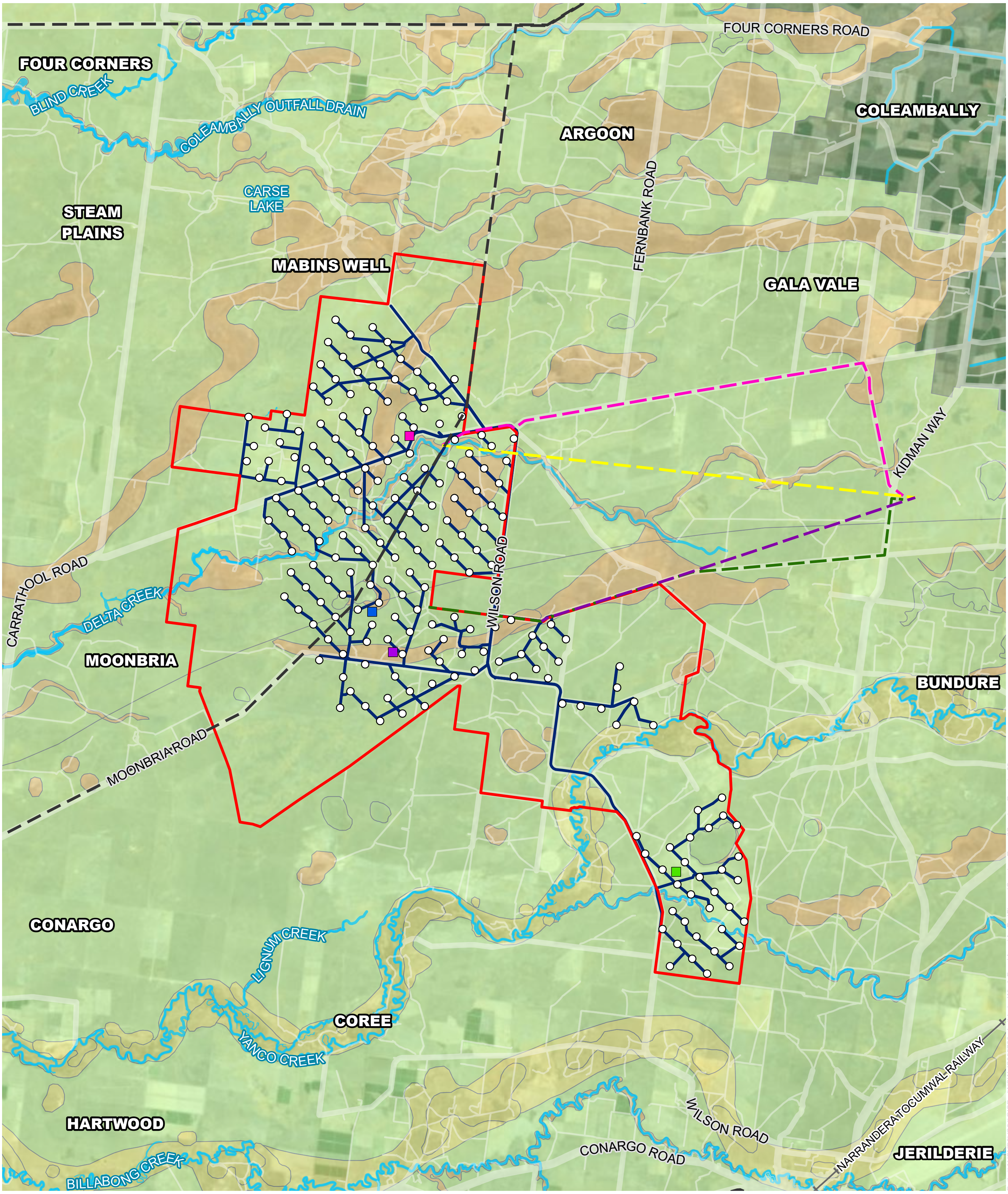
Soil salinity

The online eSPADE mapping portal indicates that soils within the Project area are considered ‘non saline’ to ‘slightly saline’ as per soil salinity class ranges (Agriculture Victoria, 2020).

Contamination

A search of the *Protection of the Environment Operations Act 1997* Public register on the 1 December 2021 identified there are no registered contamination sites within the suburb of Jerilderie.

The previous and ongoing use of the Project area for agricultural purposes, may represent a potential source of diffused herbicide and pesticide contamination associated with vegetation and pest control across the site. Agricultural land use is also a potential source of point source heavy metal and hydrocarbon contamination associated with fuel use and storage and other contaminants associated with waste disposal.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

Overall land and soil capability (OEH 2021)
- 3 - Moderate limitations
- 4 - Moderate to severe limitations
- 5 - Severe limitations
- 6 - Very severe limitations

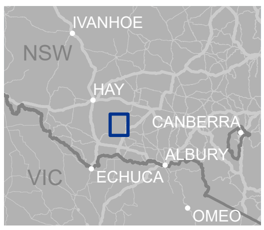
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N



Data sources

Jacobs 2022
DPE 2021
OEH 2021,
© Department of Customer Service 2020

Figure 6-15 Land capability within and surrounding the Project area

6.9.2 Potential impacts and issues for consideration

There is potential that any existing contamination in the Project area could become mobilised as a result of construction activities if unable to be avoided through design. The nature of the contamination risk is not such that remedial work to support the development is likely to be required. Contamination risks associated with the development are expected to be readily managed by the implementation standard controls during construction and design to remove future exposure pathways.

Construction of the Project would also involve the storage, treatment or handling of fuels, chemicals, building materials, wastes and other potential contaminants. Any contamination spill during construction would be managed and mitigated to prevent impacts on human health and the environment. Contamination risks would be managed through the application of Australian Standards for the storage and handling of fuels and chemicals and appropriate engineering design. In the unlikely event of significant leaks or spills of contaminants, remediation would be implemented immediately during construction.

6.9.3 Proposed assessment approach

A soils and contamination impact assessment will be prepared for the EIS to identify and assess geological conditions and potential contamination risks associated with the Project.

The soils and contamination assessment will include:

- Identifying areas of potential contamination and latent geological conditions on or adjacent to the Project area. This will be informed by a desktop review of available information and site inspection and will consider potentially historical and current contaminating activities and/or operations
- Considering the potential impacts of contamination and/or latent geological conditions to the environment or workers based on the outcomes of the risk assessment
- Providing recommended mitigation and management measures or further investigations to quantify the identified risks.

6.9.4 Any engagement required

No engagement is proposed.

6.10 Surface water, groundwater and flooding

6.10.1 Existing environment

Surface water

The Riverina Bioregion encompasses the alluvial fans of the Lachlan, Murrumbidgee and Murray Rivers to the west of the Great Diving Range. The landscape of the upper catchment area consists of a series of low gradient, overlapping alluvial fans. The lower catchment tract is primarily floodplain with overflow lakes (such as Lake Urana located 30 kilometres to the east of the Project area). The discharge from current and past streams controls patterns of sediment distribution which in turn determines the landscape including which soils and vegetation are present. The initial desktop survey indicates that the Project area has limited topographic variation and consists primarily of low relief alluvial floodplain and drainage lines (named and unnamed waterways and flood-runners).

On a regional scale, the Project would be located within the lower Murrumbidgee River Catchment in southern NSW which drains a total area of around 84,000 square kilometres (DPI, 2021b). The Murrumbidgee River Catchment flows in a south-westerly direction from its headwaters in Kosciuszko National Park to the alluvial floodplains at the western end of the valley where the Project would be situated. More locally, the Project area is situated on an alluvial floodplain between two waterways, Yanco Creek in the southern extent and Delta Creek in the northern extent. Yanco Creek is a major perennial waterway which flows south-west toward the Murray River.

Delta Creek is a minor, ephemeral waterway which also drains in a south-westerly direction during significant rainfall, although does not connect to any downstream major channel unless the area is flooded.

The Project area traverses the Delta Creek and Yanco Creek. The southern portion of the Project area also intersects Turn Back Jimmy Creek (refer to **Figure 6-16**).

The Project area is largely flat with some minor drainage depressions that hold water during rainfall and flooding, and flow in a south-westerly direction. A slope dips toward Delta Creek in the northern portion of the Project. Several minor topographic depressions on the floodplain hold water for longer, creating scattered swamp environments within the Project area.

Groundwater

Groundwater aquifers relevant to the Project area include the Murrumbidgee Alluvium and the NSW Murray Darling Basin Porous Rock aquifer within the Murray Darling Basin (MDBA, 2013). Groundwater resourcing and regulation fall under the *Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources Order 2020* and the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources Order 2020*.

Groundwater in the Project area is likely to occur within alluvial floodplain, channel and aeolian deposits and underlying Oaklands Basin Jerilderie Formation fluvial sand deposits. Deeper groundwater in the Project area occurs in Lachlan Orogen shale and granite mapped in the area (Colquhoun et al., 2021).

Registered groundwater bores in the Project area include water supply, stock and domestic, irrigation and monitoring bores (refer to **Figure 6-16**). Functioning bore depths in the Project area range from 20 metres to 396 metres below ground level. The average bore depth is approximately 70 metres below ground level. Groundwater levels in the Project area recorded from registered bores are generally 20 metres to 25 metres below ground level.

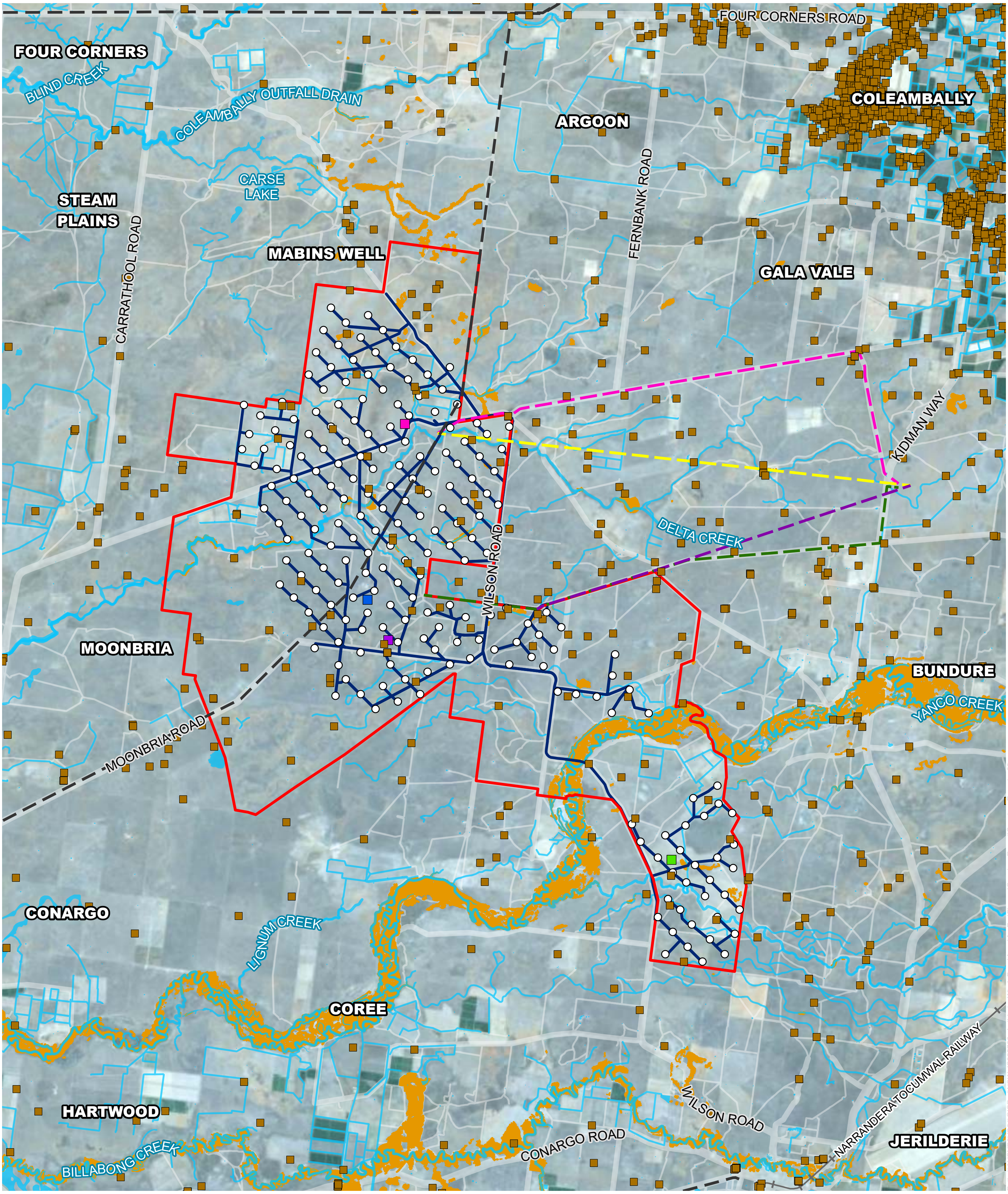
GDEs are ecosystems which rely on the subsurface presence of groundwater. Multiple high-potential terrestrial GDEs are mapped within the Project area (BOM, 2017).

Flooding

Delta Creek flows through the northern portion of the Project area, while the Yanco Creek and Turn Back Jimmy Creek flow through the southern portion. Each of these watercourses flows in a westerly to south-westerly direction in the vicinity of the Project. The Murrumbidgee River is situated 55 kilometres north of the northern portion of the Project area and flows in a westerly direction. There are a number of watercourses and irrigation channels located between the northern portion of the Project area and the Murrumbidgee River, including Colleambally Outfall Drain, Bublebundie Creek and Cooinbil Creek. Billabong Creek is situated eight kilometres south of the Project area and flows in a westerly direction.

Flooding at the Project area originates primarily from local catchment runoff and flooding in Delta Creek, Yanco Creek and Turn Back Jimmy Creek, which all flow through the Project area. Sinclair Knight and Partners (1987) indicates that flooding during the 1974 flood event in Yanco Creek did not encroach on the proposed WTG locations (refer to **Figure 6-17**). The flooding in Yanco Creek extended to within 150 metres of WTG locations on the southern side of Yanco Creek. Flooding may have affected the areas surrounding Delta Creek, Turn Back Jimmy Creek and other locations within the Project area, although the historic flood mapping does not display the flooding extent on these minor watercourses.

The 1974 event is one of the largest flood events on record in the Murrumbidgee Valley, just below the 2% annual exceedance probability (AEP) design flood level at Narrandera on the Murrumbidgee River (Lyall & Associates, 2019) and between a 2% and 1% AEP design flood level at Darlington Point on the Murrumbidgee River (BMT WBM, 2018). The 1974 flood was similar to a 1% AEP design flood at Morundah on Yanco Creek (Jacobs, 2017). Flooding from Yanco Creek may affect the proposed WTG locations in extreme flood events.



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- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

BoM (2021b) groundwater bores
- NGIS bore

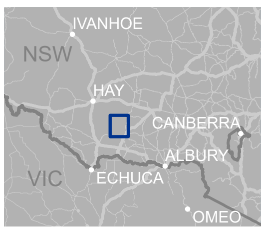
BoM (2021c) - potential groundwater dependant ecosystems
- High potential Terrestrial GDE

- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPE 2021
OEH 2021,
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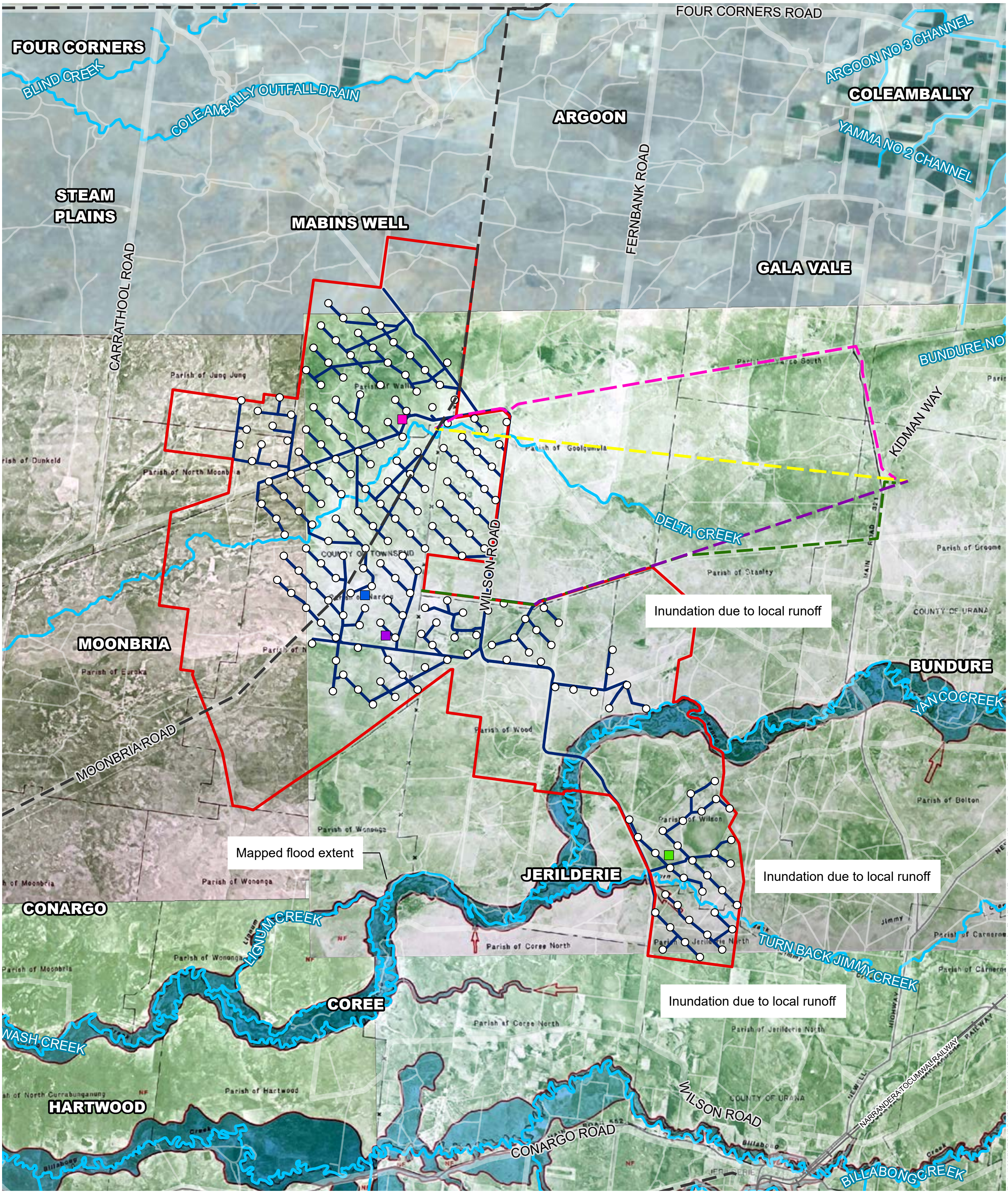
Figure 6-16 Surface water and groundwater features within and surrounding the Project area



Indicative Project

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0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2021
Department Finance, Services and Innovation 2020
© Department of Customer Service 2020
Murrumbidgee Valley Flood Plain Atlas – Yanco, Colombo and Billabong Creeks. Sinclair Knight & Partners (1987)

Figure 6-17 Mapped extent of 1974 flood event in Yanco Creek

No flood studies have been conducted at the Project area and, hence, design flood level estimates are currently not available.

6.10.2 Potential impacts and issues for consideration

Water quality

Potential surface water quality impacts during construction of the Project include:

- Soil erosion – construction would result in the exposure of the natural ground surface and subsurface through the removal of vegetation, and minor earthworks within the Project area that may increase the potential for soil erosion to occur
- Surface water quality – construction of the Project has the potential to impact surface water quality through the pollution of stormwater runoff with sediments, existing contaminants if present, fuel and other hazardous materials from the Project area.

The potential impacts on water quality are expected to be limited, given the nature and scale of the construction work. Appropriate standard environmental management measures would be implemented and would be expected to sufficiently manage any impacts. For example, water and soil controls would be employed to minimise soil erosion and discharge of sediment and other pollutants during construction.

The potential impacts from the development can be categorised as changes to surface water quantity, surface water quality, groundwater, flood passage and aquatic ecology. These potential impacts will be most prevalent during construction with a reduced potential for impact during operations.

There is the potential for degradation of surface water quality related to sediment and erosion, dust deposition, pollution from spills and contamination from waste. Depending on the local groundwater conditions this could also lead to degradation of groundwater quality through infiltration processes or construction intersecting aquifers. For water quantity and water availability (surface water and groundwater), potential impacts are altered water availability due to construction water requirements, alteration of overland flow paths and reduction in environment health from groundwater drawdown or reduced streamflow. With the requirements for access tracks traversing creek lines, riparian corridors and their connectivity may be impacted along with the ability for the movement upstream and downstream of aquatic species.

The key receivers for these impacts are groundwater aquifers, surface water streams, licenced users, aquatic fauna, riparian vegetation, downstream users and the community.

Water use

Water would be required for construction purposes (e.g. standard dust suppression measures) and would be able to be sourced sufficiently by external water suppliers under contract to the Project. It is anticipated that the Project would not require additional water from the nearby waterway. There would be negligible water use post construction of the Project.

Flooding

In general, impacts to flooding may occur as a result of obstruction of flood flows by structures and filled areas or by loss of floodplain storage due to filling of the floodplain. Impacts may include increases in flood levels, depths, flow velocities and flood hazard.

The WTGs would consist of about five metre diameter posts with spacing of about one kilometre between WTGs. At this spacing it is not expected that there would be observable flooding impacts due to the WTG array as a whole. Where WTGs remain situated in or in close proximity to the watercourses, these may result in localised impacts to flooding and flood flows. There may also be localised scour around the WTGs due to interaction with flood flows. It is assumed the WTGs would be constructed on existing ground level and would not be on substantial filled pads.

Filling may be required for substations, batteries, access tracks and other ancillary facilities to achieve a required degree of flood immunity. Details of these are to be confirmed. The spatial extent and location of these filled areas dictate the magnitude and extent of flood impacts.

The nature and scale of Project components would not affect the hydrology of the local or regional catchments. There would be minimal paved areas and some hardstand areas, but these would have negligible impact on broader catchment infiltration and runoff processes.

6.10.3 Proposed assessment approach

A surface water and groundwater impact assessment will be prepared for the EIS to identify and assess potential surface water and groundwater risks associated with the Project. The assessment will include:

- Collation and review of documentation and information on the proposed Project area relevant to surface water
- Determination of existing water quality of applicable waterways using available water quality data
- Identification of sensitive receiving environments within the Project area (waterways and groundwater systems adjacent to the Project and downstream)
- Based on available data and Project activities, a qualitative assessment of potential impacts to surface water during the construction and operational phases of the Project will be undertaken
- A high level assessment of water demands will be undertaken during construction and operation
- A qualitative assessment of potential cumulative impacts during construction and operation on surface water and groundwater in the Project area will be considered, if applicable
- High level conceptual strategies and protection measures will be recommended to prevent, minimise and offset the potential impacts of the construction and operation of the Project on surface water and groundwater
- Recommendation of measures to mitigate or otherwise effectively manage potential water quality related impacts during the Project, including a groundwater monitoring program will be recommended for implementation prior to and during construction of the Project and for early stages of the operation of the Project.

A flooding impact assessment will also be prepared for the EIS to characterise potential impacts to flood behaviour on sensitive receivers. The assessment will include:

- Review of data from Virya Energy and external sources, identify any outstanding data gaps
- Available flood study reports and modelling will be obtained from the relevant local councils. Flood studies are available for Murrumbidgee River at Darlington Point, Murrumbidgee River at Narrandera, Yanco Creek at Morundah, Billabong Creek at Conargo, Billabong Creek at Jerilderie
- Hydrographic and hydrologic data, including design rainfall and streamflow data will be collated from Water Infrastructure NSW and BOM
- Hydrologic and hydraulic modelling will be developed to define flooding conditions for the existing case
- The Project operational scenario will be represented in the model to estimate any flooding impacts and define design flood levels to set flood protection levels for substations, batteries and ancillary facilities
- Assessment of impacts will be with consideration of existing sensitive receivers, infrastructure and the land/watercourses
- Qualitative assessment of potential construction phase and cumulative impacts
- Provide recommended mitigation and management measures if required.

6.10.4 Any engagement required

No engagement is proposed.

6.11 Socio-economic impacts

6.11.1 Existing environment

The Project would be located in Edward River Council LGA and Murrumbidgee Council LGA in southern NSW. The closest townships include Jerilderie located 10 kilometres to the south-east, and Deniliquin about 60 kilometres south-west of the Project.

The Edward River Council LGA and Murrumbidgee Council LGA are part of the Riverina Murray Region, and combined they have a population of 12,687 persons as at the 2016 Census (ABS, 2016a; ABS, 2016b). The population of the Riverina Murray Region is projected to grow slowly over the next 20 years and is also home to an ageing population.

The Riverina Murray Region is one of Australia's main food producing regions with rich natural resources and a diverse regional economy. The major regional cities near the Project include Albury, Griffith and Wagga Wagga and other centres such as Deniliquin, Leeton and Tumut which provide services to many other smaller rural communities. The region has many large river systems including the Murrumbidgee and Murray Rivers. The Project area intersects the Delta Creek, Yanco Creek and the Turn Back Jimmy Creek, all of which provide ecological corridors and support the productivity, scenic quality and the socio-economic values of the rural communities in the region (NSW Government, 2021c).

The Riverina Murray Region is home to agricultural, manufacturing, health care and social assistance industries. The main growth area anticipated in the regional economy is expected to stem from advancements in agricultural technology, new freight and transport connections and changes in government regulations including for water trading and renewable energy.

6.11.2 Potential impacts and issues for consideration

A Social Impact Assessment Scoping Worksheet has been developed for the Project in accordance with the Social Impact Assessment Guideline for State Significant Projects (DPIE, 2021b) to identify potential social and economic impacts and define the assessment approach for the EIS (**Appendix H**). The Project would generate potential social and economic effects on the local and regional community. These can include positive and negative effects, as outlined in **Table 6-8**.

Table 6-8 Preliminary scoping of potential social and economic impacts based on the Social Impact Assessment Scoping Worksheet

Category of social impact	Potential impacts on people	Nature
Livelihoods	Regular non-agricultural income will improve the financial wellbeing of landowners making it easier for them to remain on their property into the future if they choose to do so	Positive
	Local businesses experience increased demand for services including hospitality, retail, trade services and accommodation	Positive
	Use of regional labour and materials would have a positive economic effect on the regional economy	Positive
Way of life	There may be a perception that the combined visual and landscape changes could diminish the ability of people to enjoy their dwellings, particularly where the WTGs are within view	Negative
	Construction noise, dust and other amenity impacts may adversely impact on the amenity of dwellings and could diminish the ability of people to enjoy their dwellings	Negative

Category of social impact	Potential impacts on people	Nature
	Construction workforce creating increased demand on accommodation services in the region may affect local providers and impact tourism by displacing visitors	Negative
Surroundings	WTGs could be perceived to adversely impact on the landscape by residents and visitors to the region	Negative
	WTGs could be perceived to positively impact on the landscape by residents and visitors to the region	Positive
Health and wellbeing	Construction activities could create a perception that safety of public road network is reduced	Negative
Community	Non-associated landowners may perceive the Project to deliver a large injection of community funding that is not currently available to them	Positive
	Non-associated landowners may perceive there to be an uneven distribution of benefits to the local community. Conflicting views as to the desirability of the Project could create conflict between neighbours or within the community	Negative

6.11.3 Proposed assessment approach

A Socio-Economic Impact Assessment (SEIA) would be prepared for the EIS to assess social and economic impacts and proposed mitigation measures in accordance with the Social Impact Assessment Guideline for State Significant Projects (DPIE, 2021b). Both beneficial and adverse impacts could occur for the local community, regional area, Project landowners and neighbours to the Project during construction and operation stages. In general, the Project would contribute to employment during the construction phase, promote economic opportunities in the long-term and would result in lower cost electricity prices in the NEM for consumers and businesses.

Stakeholder consultation commenced prior to the preparation of the Scoping Report and will continue throughout the preparation of the EIS to contribute to the SEIA. The community and stakeholder consultation will be carried out in accordance with the Community Consultation Strategy. This process will support a consistent approach to assessing social and economic impacts of the Project, as required by the Social Impact Assessment Guideline for State Significant Projects (DPIE, 2021b).

The SEIA will involve stakeholder and community consultation and document the outcomes of the consultation, implementation of the Community Consultation Strategy, and the findings of database searches and literature reviews where relevant. The SEIA will include:

- Preparation of a socio-economic baseline for the SEIA study area (that will include the Edward River Council LGA and Murrumbidgee Council LGA), including collation and analysis of socio-economic data relevant to local and regional communities
- Review of outcomes of consultation undertaken by Virya Energy for the Project
- Primary research with stakeholders
- Assessment of potential impacts (both positive and negative) on local and regional communities associated with the design, construction, and operation of the Project, including consideration of any increase in demand for accommodation and community infrastructure services
- Assessment of potential cumulative impacts on local and regional communities due to the combined effects of similar actions by multiple projects
- Evaluation of the level of significance of identified impacts
- Identification of measures to manage potential socio-economic impacts and maximise benefits.

6.11.4 Any engagement required

The SEIA will be informed both by the broader consultation program and targeted research. This will involve interviews with landowners, State agencies, local government and local stakeholders.

6.12 Hazards and risks

6.12.1 Aeronautical impacts

The Project will need to consider the potential for the interaction of the proposed WTGs with air services. WTG height and placement will consider potential safety hazards for aircraft through intrusion of the airspace and the potential effects on the associated navigation instruments.

No Aircraft Landing Areas (ALAs) are located within the Project area. Jerilderie Airport (YJER) is a small private airport located 11 kilometres to south of the Project. There are also approximately 30 to 40 ALAs within 50 kilometres of the Project area, which include small aerodromes and runways. The closest two ALAs are about three kilometres north of the Project area boundary, and nine kilometres west of the Project area (refer to **Figure 6-18**).

There is also potential for other aviation activities such as unlicensed private air strips to be within proximity to the Project area. Agricultural aerial spraying, pest management, pasture top dressing and emergency helicopter landing facilities may be present within 50 kilometres of the Project area.

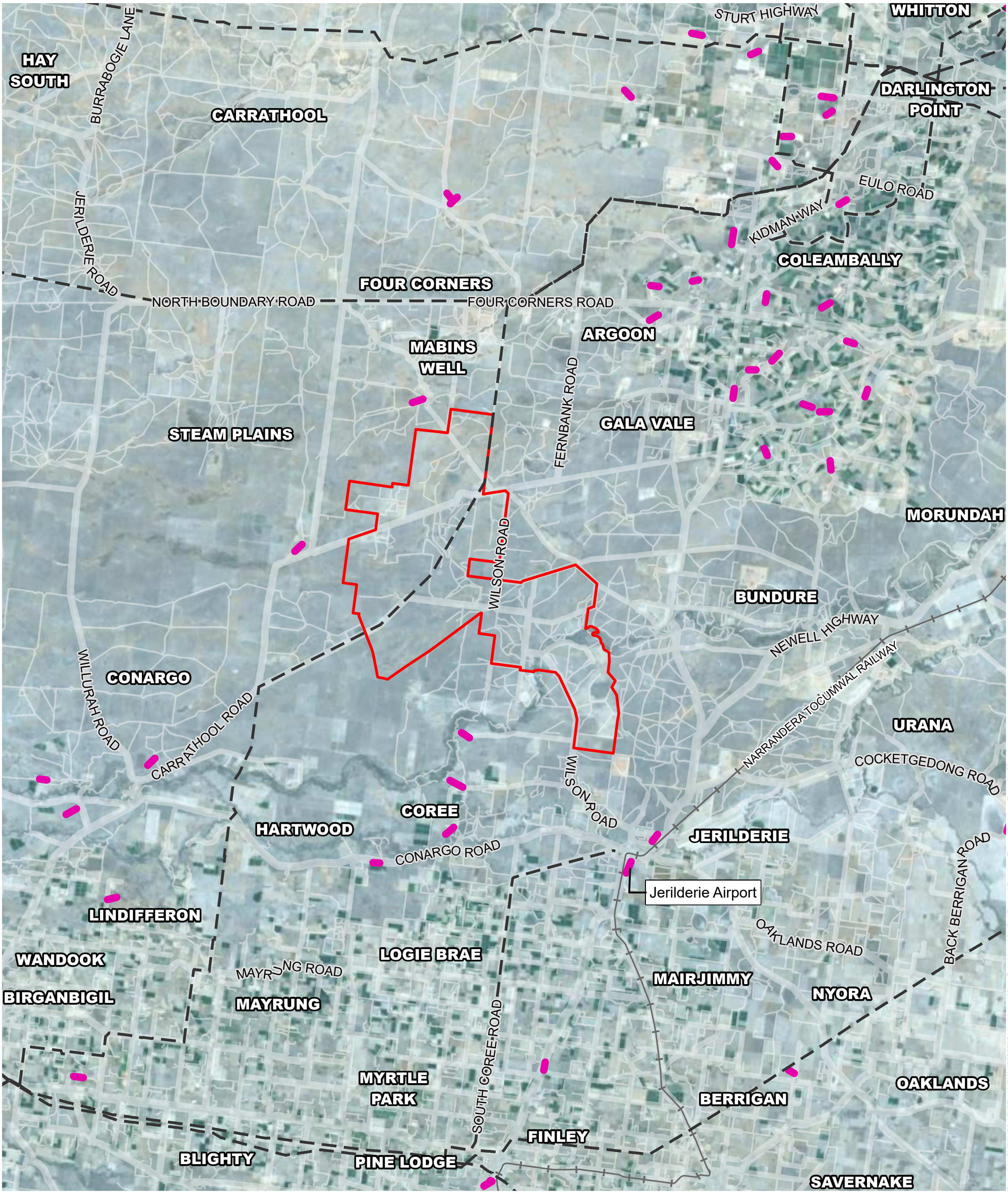
Potential risks posed to aircraft from the proposed wind farm that require consideration include:

- Physical obstruction – this is most notable for aircraft that are closest to the ground such as those during take-off
- Interference with safe flight – the presence of excessively tall structures may present a hazard
- Reduction of areas available for pilots to use in the event of forced landing, such as engine failure after take-off
- Impact on use of emergency helicopter access
- Additional wind turbulence – the effect of WTG-induced turbulence may affect aircraft that are smaller or lighter
- Electrical transmissions interfering with technical equipment – the electromagnetic field generated by the transmission line and wind farm may cause interference with technical equipment
- Impact on nearby farmers that use aerial spraying to manage their agricultural businesses.

6.12.1.1 Proposed assessment approach

An Aeronautical Impact Assessment will be prepared for the EIS to assess the likely impact of the Project WTGs on safety and regularity of flight operations, including aerial agricultural applications, aerial firefighting, aerial emergency services, and any relevant RAAF activities. This assessment will identify existing aviation activity in the locality of the Project area, identify potential impacts to aviation safety based on the final proposed layout and recommend mitigation measures to address those impacts.

The Aeronautical Impact Assessment will assess the potential aviation risks and impacts with consideration of requirements in the Civil Aviation Regulation 1988, CASR, and National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation (DITRDC, 2012) and any other relevant guides and standards.



Project area | Aircraft landing areas | Railway | Existing electricity transmission line | Road

0 8 16 km

1:530,000 at A4

GDA 1994 MGA Zone 55

IVANHOE
NSW
HAY
CANBERRA
ALBURY
VIC
ECHUCA
OMEO

Data sources

Jacobs 2022
DPE 2021
OEH 2021,
© Department of Customer Service 2020

Figure 6-18 Aircraft landing areas within and surrounding the Project area

6.12.1.2 Any engagement required

Consultation would be carried out with CASA and Air Services Australia in relation to aviation safety night lighting, WTGs and wind monitoring towers and overhead transmission lines and poles. Consultation would also be carried out with the Australian Department of Defence and RAAF where required, in relation to defence and air force activities, including the Defence Communications Facility Buffer Land at Morundah, and the RAAF Wagga Wagga base.

6.12.2 Telecommunications and EMI

Electromagnetic signals (or radio waves) are transmitted throughout the country as part of telecommunication systems by a wide range of operators. Telecommunication services include television, radio broadcast, radio communications, mobile phone services, aircraft navigation services. Large structures such as WTGs that are located within or close to the telecommunication signal path may interfere with broadcast and point to point communications and any services that rely on these signals. It is necessary to ensure the operational wind farm does not cause interference with existing or proposed communications and that mitigation measures to minimise potential impacts would be implemented.

A search of the Australian Communication and Media Authority (ACMA) database carried out in February 2022 has identified 48 registered sites associated with licences and point to point links within 50 kilometres of the Project area, with the closest site located about 2.6 kilometres west of the western boundary of the Project area, held by SST Development Group Australia. Other nearby sites are held by NSW RFS, Murrumbidgee Council, Telstra Corporation Limited and others.

Electromagnetic emissions from generators and other machinery also have the potential to affect signals; however, with modern WTGs and strict international regulations for manufacturers, there are now minimal electromagnetic emissions from WTGs (Clean Energy Council, 2018).

6.12.2.1 Proposed assessment approach

A Telecommunications and Electromagnetic Interference Assessment will be prepared for the EIS to assess potential electromagnetic interference impacts to existing services. The assessment will include:

- Querying the ACMA Register of Radiocommunications Licences (RRL) database and relevant literature to identify existing telecommunications systems already operating within the region
- Analysing each communication link or transmitter to determine potential impacts and interference effects that may be caused by the Project to determine impact on telecommunication services
- Developing mitigation measures for identified interference effects resulting from the Project
- Where required, recommending suitable options to avoid potential disruptions to telecommunication services, which may include the installation and maintenance of alternative sites.

6.12.2.2 Any engagement required

Where necessary, organisations with relevant telecommunication sites or links near the Project will be contacted if further information on existing telecommunication services and systems are required.

6.12.3 Electromagnetic fields and human health

EMFs are invisible, physical fields that surround electrical charges and exert forces on all charged particles and objects in the field. The electric charge supplied to or generated by electrical and electronic equipment produces EMFs at a 50 hertz (Hz) power frequency and harmonics thereof. Transmission lines, substations, electrical wiring, household appliances and electrical equipment all produce power frequency EMFs. The electrical components found within the WTGs also produce power frequency EMFs.

Power frequency EMFs induce internal electric fields and currents in a human body, which at high field strengths (well above 100 microtesla (μT)) can cause nerve and muscle stimulation and changes in nerve cell excitability in the central nervous system. The effects of EMF on the human body depend on the intensity of the fields during which exposure occurs. Power frequency EMFs can also interfere with active implantable medical devices such as pacemakers and other electromagnetically sensitive equipment (termed 'sensitive receivers').

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) provides guidelines that define safe exposure limits with regards to power frequency EMFs. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is the regulatory agency under the national Commonwealth government of Australia that is tasked with protecting Australian citizens from both ionizing and non-ionizing radiation. ARPANSA has endorsed the Guidelines for Limiting Exposure to Time-varying Electric, Magnetic and Electromagnetic Fields (ICNIRP, 2010) as international best practice.

The typical strategy for reducing EMFs is applying an adequate distance between the source and sensitive receivers. Other strategies also include burying cables and placing cables together to cancel the emitted fields. As most of the WTG electrical equipment is encased within the WTG structure or in housing at the base of the tower, this is expected to decrease the potential EMF impacts from emitting sources. EMFs can have the highest recorded levels at substations, however the implementation of appropriate fencing and remote placement of the substation within the landscape can greatly reduce any exposure to EMF.

6.12.3.1 Proposed assessment approach

An assessment of the potential impact of EMF from the wind farm on human health and sensitive receivers will be prepared as part of the EIS. The assessment will include:

- Analysing possible EMF exposure health impacts (for workers and the public)
- Recommending mitigation measures for areas where EMF levels exceed applicable limits (if required). Considering and documenting any health issues having regard to the latest advice of the National Health and Medical Research Council, and identify potential hazards and risks associated with EMF and demonstrate the application of the principles of prudent avoidance.

The calculation of potential EMF exposure will involve undertaking a desktop assessment of the:

- Windfarm collection system cable (worst case)
- Windfarm substation, including battery installation.

The analysis will be carried out using modelling software CDEGS HIFREQ Ver. 17 and SESEnviroPlus Ver. 16.1.

6.12.3.2 Any engagement required

No engagement is proposed.

6.12.4 Preliminary Hazard Analysis

The Project would not involve the storage or handling of hazardous substances in excess of SEPP 33 screening criteria. The detailed design of the Project would consider hazards, determine risks and adopt prevention and mitigation strategies in accordance with applicable guidelines.

It is expected that the Project BESS would use lithium-ion batteries, which carry the risk of thermal runaway. Thermal runaway occurs when a battery cell reaches a high temperature (typically around 160 degrees Celsius), and the chemical reactions inside the cell in turn generates even more heat, leading to cell failure. A worst-case scenario for the operation of the BESS would be a fire event associated with the BESS that is initiated through a thermal runaway or an electrical fault inside the battery. This would generate risks and hazards including heat, toxic gas and combustion products.

A major fire associated with the BESS has the potential to propagate to areas outside of the Project area and initiate a grass/bushfire. Provided sufficient separation distances, such as through asset protection zones (APZs),are established between the Project infrastructure and the surrounding land, the risk is low and can be managed so that hazards are kept As Low As Reasonably Practicable (ALARP).

The battery enclosures and components of the BESS are subject to detailed design and would depend on the technical specifications of the technology provider when chosen. The chosen technology would comply with international and Australian best practice industry standards and guidelines. Detailed design would ensure that a hazardous event in one battery enclosure would not propagate to other enclosures and the established APZs would ensure potential hazardous incidents would not lead to significant environmental or social risk of harm outside the Project area.

6.12.4.1 Proposed assessment approach

The EIS will include a preliminary analysis of the Project to assess potentially selected BESS technology and the risks of thermal runaway events. The analysis will also provide recommended mitigation measures for potential thermal runaway risks and impacts.

6.12.4.2 Any engagement required

No engagement is proposed.

6.12.5 Shadow flicker

Shadow flicker is a moving shadow cast by the blades of a WTG from the sun which can cause a nuisance to surrounding landowners in close proximity to a WTG and in rare cases can cause health impacts such as photosensitive epilepsy or motion sickness. This is not expected to be an issue with the current setbacks.

6.12.5.1 Proposed assessment approach

An assessment of shadow flicker impacts on nearby dwellings will be prepared as part of the EIS. The assessment will include:

- Undertaking a ‘modelled’ shadow flicker assessment, considering a worst-case scenario of no cloud cover and WTG rotors always facing the sun, to assess the wind farm’s shadow flicker impact on nearby dwellings
- Should shadow flicker limits be exceeded at any relevant dwellings (those where the relevant landowner has not entered into an agreement to waive any such maximum shadow flicker requirement), a ‘measured’ shadow flicker assessment will be undertaken for those specific dwellings, considering measured wind and cloud cover data
- Recommending potential mitigation measures in the event that ‘measured’ shadow flicker limits are exceeded at any nearby dwellings.

6.12.5.2 Any engagement required

Consultation will be undertaken with Project landowners and neighbours where shadow flicker is anticipated to be exceeded at any dwellings.

6.12.6 Blade throw

Blade throw typically involves the failure of the WTG rotor, which has the potential to result in the turbine blade becoming detached from the WTG. This risk is addressed by the turbine design; however, an assessment will be undertaken for the Project.

6.12.6.1 Proposed assessment approach

A review of blade throw risks will be prepared as part of the EIS in accordance with Wind Energy Guideline for State Significant Wind Energy Development (DPE, 2016a) and the NSW Planning Guideline: Wind Farms (draft for consultation) (Department of Planning and Infrastructure, 2011). The assessment will consider the following:

- Problem Statement – a loss of partial or complete blade stemming from a structural failure of a WTG causing a risk
- Literature on the Topic – although blade throw from WTGs is seldom in the literature, some guidance can still be gained, including previous assessments for specific WTGs. Previous work has been conducted concerning wind-borne debris. However, the typical object studied does not share similar blade characteristics (they are more about flat plates). A simplified hypothesis based on point mechanics (ballistic) can estimate some travel distances
- Estimate taking – depending on the recent advances in the subject, a high-level estimate taking into account the landscape will be performed. For instance, the local wind topographic multiplier can be taken into account to mitigate the simplified ballistic assumption
- Risk Assessment – the risks need to consider physical harm, properties, roads, railways and waterways, industrial areas and power networks.

6.12.6.2 Any engagement required

No engagement is proposed.

6.12.7 Bushfire risk

The Project area contains bushfire prone land as mapped by NSW Rural Fire Service (NSW RFS, 2020). As there are mapped Vegetation Category 3 across most of the Project area, it is considered a medium level of bushfire risk due to existing vegetation and agricultural practices (refer to **Figure 6-19**). Note there is no bushfire risk mapping for Murrumbidgee LGA, only for the Murrumbidgee Irrigation Area.

The Project has the potential to be exposed to bushfire risk from grasslands and nearby areas of dense vegetation. It also carries the risk of a potential fire starting within the Project area. Bushfire protection measures such as asset protection zones, fire breaks and access tracks will be recommended to control these risks, and may contribute to bushfire resilience in the broader landscape.

Consultation with landowners has identified a concern regarding potential for grass fires. All surveys related to the Project will carry out an appropriate bushfire risk analysis prior to investigation activities and appropriate management strategies will be undertaken.

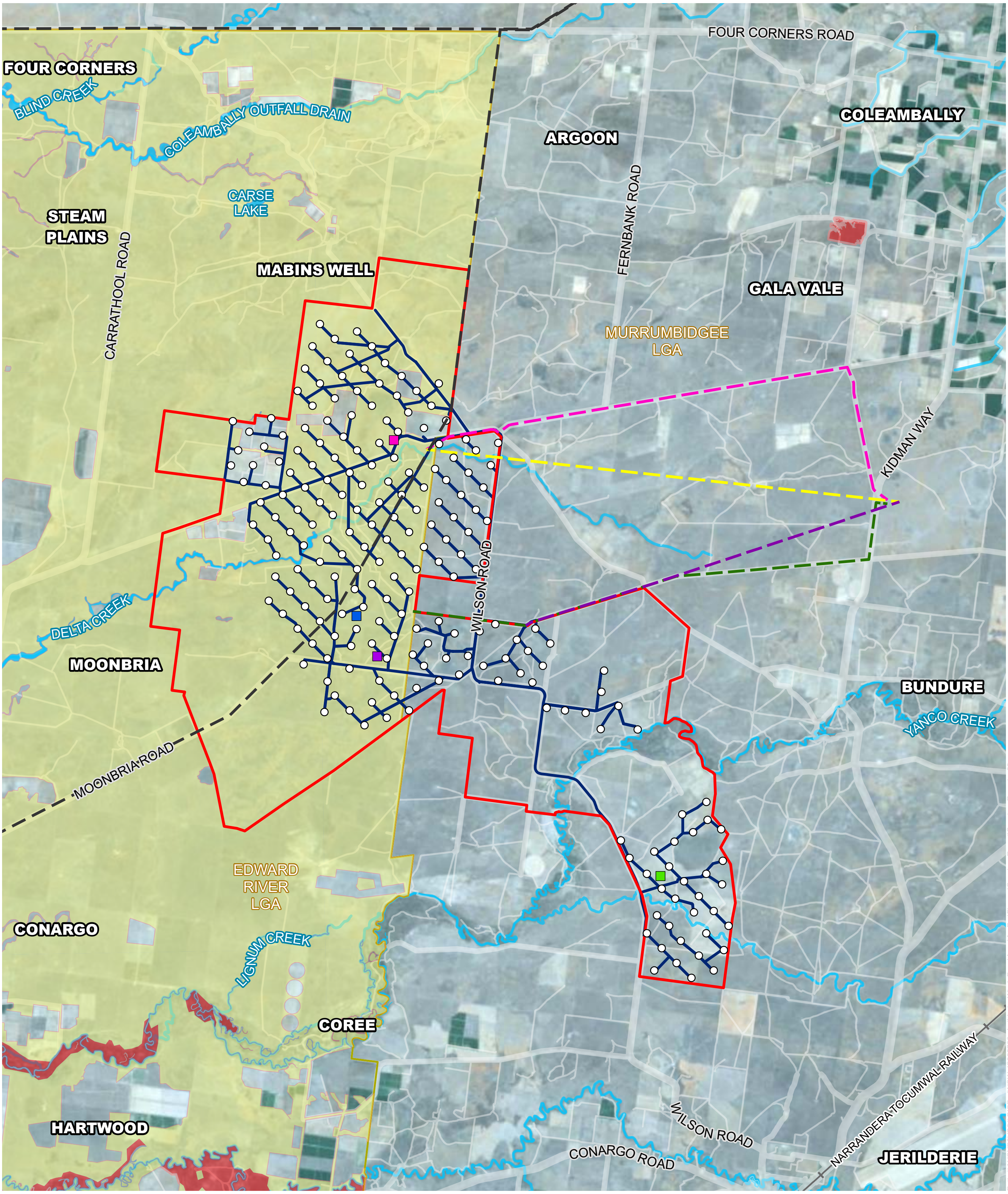
6.12.7.1 Proposed assessment approach

A Bushfire Technical Working Paper will be prepared for the EIS to investigate bushfire hazard and risks and the potential impacts of the Project related to such risks. The assessment will include:

- A review of relevant legislation, regulations, standards and guidance to identify applicable requirements for the bushfire assessment and appropriate bushfire risk protection measures
- A desktop analysis of bushfire risk factors including fire weather conditions, topography, vegetation, access, fire history, ignition sources and failure modes that might lead to fire ignitions during the Project's construction and operation
- The fire weather analysis will consider the implications of climate change over the anticipated life of the Project
- Bushfire protection measures will be developed for construction and operational phases of the Project. These will be based on published guidance and consultation with the RFS and other relevant authorities
- Emergency management arrangements will be developed for construction of the Project and its subsequent operation. These will be discussed with RFS and other relevant authorities. Emergency management arrangements will address applicable safety management requirements for ground and aerial fire-fighting.

6.12.7.2 Any engagement required

Consultation with Project landowners about the siting of Project elements in firebreaks to minimise land use impacts and native vegetation removal. Consultation with RFS regarding bushfire risk within the Project area and surrounds.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

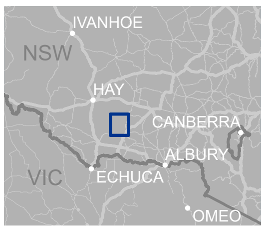
Bushfire Prone Land (RFS 2019)
- Vegetation category 1
- Vegetation category 3
- Buffer

- Railway
- Waterways
- Existing electricity transmission line
- Road
- Local Government Area

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPE 2021
RFS 2021
© Department of Customer Service 2020

Figure 6-19 Bushfire risk within and surrounding the Project area

6.13 Air quality

6.13.1 Existing environment

Key features of the existing environment as relevant to air quality include the proximity, nature and density of surrounding sensitive receivers, prevailing local meteorological conditions and background air quality conditions.

Surrounding sensitive receivers

As discussed in the previous sub-sections the Project would be located in a semi-rural area. The NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (Approved Methods) (NSW EPA, 2016) identifies locations being sensitive to changes in air quality resulting from projects and developments. These include locations where people are likely to work or reside, including dwellings, schools, hospitals, offices and public recreational areas. The nearest air quality sensitive receivers in relation to the Project are shown on **Figure 6-13**, with their co-ordinates, type, association with and distance from the Project listed above in **Table 6-6**.

As shown in **Figure 6-13**, there are a number of scattered rural residential properties located within the vicinity of and having the potential to be impacted by the Project.

Local meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements of air dispersion models are, typically, hourly records of wind speed, wind direction, temperature, atmospheric stability class and mixing layer height. For air quality assessments, a minimum one year of hourly data is usually required, which means that almost all possible meteorological conditions, including seasonal variations, are considered in the model simulations.

The nearest automatic weather station (AWS) operated by the BOM is located approximately 70 kilometres to the south-west at Deniliquin Airport (Station number 074258) near Deniliquin, NSW. **Figure 6-20** below displays wind roses (including seasonal results) from data collected at this station from 2013 to 2015. As **Figure 6-20** shows, winds blowing from the south occurred most frequently during summer, with winds from the north, east, south and west taking place around the same frequency during autumn. Winds from the north, west and south-west were measured as occurring most often in winter, with winds blowing from the south clockwise to the west and from the north taking place most often in spring. Across the three years calm conditions where wind speeds less than 0.5 metres per second were measured occurred around 2.5% of the time.

Noting that there are no significant terrain features between the Project and Deniliquin Airport AWS, the conditions at the AWS are considered to be representative of conditions around the Project.

Figure 6-20 Deniliquin Airport AWS wind roses

Background air quality

In assessing potential air quality impacts from an activity or proposed development, an understanding of existing background conditions is required. The DPE operates an ambient air quality monitoring network across NSW. The nearest station in relation to the Project is located in Wagga Wagga approximately 170 kilometres to the east. Particulate matter as PM_{10} (with equivalent aerodynamic diameter of 10 microns or less) and as $PM_{2.5}$ (with equivalent aerodynamic diameter of 2.5 microns or less) is monitored at the Wagga Wagga air quality monitoring station. Key statistics measured over the last five calendar years as relevant to the NSW EPA impact assessment criteria have been reproduced below in **Table 6-9**.

Table 6-9 Background air quality conditions

Pollutant	Averaging time	NSW EPA impact assessment criteria	Measured concentration (µg/m^3)				
			2016	2017	2018	2019	2020
Particulate matter as PM_{10}	24-hour	50 µg/m^3	114.7	171.6	127.2	251.7	295.3
	Days above criteria		16	10	34	63	25
	Annual	25 µg/m^3	20.6	20.6	27.4	35.3	23.2
Particulate matter as $PM_{2.5}$	24-hour	25 µg/m^3	28.1	32.5	21.6	239.6	219.5
	Days above criteria		2	4	0	17	12
	Annual	8 µg/m^3	7.4	8.1	8.4	11.3	10.7

As **Table 6-9** shows, measured annually averaged PM_{10} concentrations exceeded the NSW EPA's 25 µg/m^3 impact assessment criterion in 2018 and 2019. The annually averaged 8 µg/m^3 impact assessment criterion for $PM_{2.5}$ was also exceeded from 2017 to 2020. Daily concentrations of PM_{10} and $PM_{2.5}$ also exceeded the relevant impact assessment criteria on more than one occasion from 2016 to 2020 with the exception of $PM_{2.5}$ in 2018. The higher concentrations and frequency of daily exceedances recorded in 2019 are a result of an unprecedented fire season, causing a significant deterioration in air quality throughout Central and Eastern Australia.

Collectively, these data indicate that the existing air quality environment around the Project would be already moderately affected by dust. This indicates that the receiving environment would be sensitive to any additional deterioration resulting from the Project and confirms that actions would be required to minimise or otherwise effectively mitigate associated emissions.

6.13.2 Potential impacts and issues for consideration

Air quality issues can arise when emissions from an industry or activity lead to a deterioration in the ambient air quality. During construction, the primary air quality risk would be dust generated from materials excavation, handling, transport and placement, from wind erosion of stored materials and exposed surfaces, and from rock crushing and concrete batching resulting in impacts at surrounding sensitive receivers.

Exhaust emissions from the combustion of fossil fuels in construction plant and equipment represent another air quality risk during construction. The primary pollutants associated with plant exhaust emissions include carbon monoxide (CO), oxides of nitrogen (NO_x) including nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), volatile organic compounds (VOCs) and sulfur dioxide (SO_2) (depending on fuel sulfur content). Odours and airborne hazards may also arise should there be any potentially contaminated materials and groundwater encountered during construction.

Considering the nature of the Project, there is limited potential for air quality impacts during operations.

6.13.3 Proposed assessment approach

An Air Quality Impact Assessment (AQIA) will be prepared for the EIS, consistent with the requirements of the NSW EPA Approved Methods (NSW EPA, 2016). In achieving this, the AQIA will:

- Identify key sources of emissions to air from the Project, with a particular focus on dust (as total suspended particles, PM10 and PM2.5) from quarrying, pad and track construction, concrete batching, materials storage, transport-related activities and exposed surfaces
- Characterise key features of the existing environment including surrounding land uses and sensitive receivers, terrain features, buildings and features that may affect plume dispersion, and local meteorological and ambient air quality conditions
- Establish criteria suitable for assessing potential air quality impacts from the Project using guidance from the EPA Approved Methods, with reference to the *Protection of the Environment Operations Act 1997* and *Protection of the Environment Operations (Clear Air) Regulation* 2010
- Review details of the Project including plant and equipment type, sizes, locations, activities, utilisation, duration and timing to develop an inventory quantifying potential emissions from the identified key sources and activities
- The potential for impacts would be evaluated at the identified sensitive receivers against the criteria established for the Project
- Evaluate the potential for any cumulative air quality impacts
- Develop measures to mitigate or otherwise effectively manage potential changes in air quality resulting from the Project.

6.13.4 Any engagement required

No engagement is proposed.

6.14 Greenhouse gas

6.14.1 Existing environment

Based on a review of the CSIRO Climate Change in Australia Projections for Australia's National Resource Management (NRM) regions (CSIRO, 2021), the Project sits within the Murray Basin NRM cluster where key climate projections include:

- Average temperatures will continue to increase in all seasons (very high confidence)
- More hot days and warm spells are projected with very high confidence. Fewer frosts are projected with high confidence
- By late in the century, less rainfall is projected during the cool season, with high confidence. There is medium confidence that rainfall will remain unchanged in the warm season
- Even though mean annual rainfall is projected to decline, heavy rainfall intensity is projected to increase, with high confidence
- Mean sea level will continue to rise and height of extreme sea-level events will also increase (very high confidence)
- A harsher fire-weather climate in the future (high confidence)
- On annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall
- The Murray Basin cluster is relatively dry and temperate, with a warm and dry grassland climate in the north-west ranging to temperate with hot summers further east.

6.14.2 Potential impacts and issues for consideration

GHG emissions can be categorised as either Scope 1, 2 or 3 (Clean Energy Regulator, 2021). Scope 1 emissions are the direct result of an activity, for example, the burning of fuel in vehicles used in construction or vegetation clearing. Scope 2 emissions are indirect emissions from the use of electricity that is generated outside of the Project area and Scope 3 are indirect emissions which are generated upstream/downstream in the wider economy as a result of third party supply chains, for example, emissions associated with the production and transport of materials used during construction.

GHG emissions from infrastructure projects can be categorised into construction and operational emissions. The primary emissions from general infrastructure construction which need to be considered include:

- Fossil fuels consumed for the operation of construction equipment and plant
- Embedded emissions within construction materials, including emissions from the manufacturing process
- Land/vegetation clearing
- Electricity purchased for Project offices, batch plants and other construction purposes
- Transport of construction materials
- Transport and breakdown of construction waste.

Projected emissions from the operation of a wind farm are generally minimal, with little to no sources for scope 1 and scope 2 emissions. Understanding energy market projections and marginal energy rates would assist in determining the benefits and paybacks of windfarm development. Operation of the Project would facilitate the use of additional renewable energy resources within the NEM. The Project BESS would allow for greater penetration of renewables into the grid, reducing GHG emissions in comparison to non-renewable energy input into the grid.

In general, during operation, wind farms contribute to reducing GHG emissions through clean energy generation. During manufacture and construction, GHG emissions would be generated, but it is estimated that the GHG emissions would be recovered from the savings in a period of approximately seven months, depending on the technology and its origin (Denmark Wind Energy Advisory, 2021).

Potential impacts as a result of climate change may affect the construction and operation of the Project, such as extreme rainfall events, extreme heat causing higher bushfire risk and more extreme storms. Further assessment of potential GHG and climate change impacts will be carried out as part of the EIS.

Assessment will include identification of feasible and reasonable management measure that may be implemented to reduce GHG emissions during construction and operation. The review of standard construction environment management plans would ensure that impacts from emissions generated during excavation, road work, transport of machinery would be adequately avoided or mitigated.

6.14.3 Proposed assessment approach

A GHG assessment will be prepared for the EIS to assess the potential GHG emissions from the construction of the Project and provide estimated emission savings from the operation of the development.

The GHG assessment will include:

- Identifying key sources of GHG emissions from the construction of the development, with a particular focus on embedded emissions in construction materials, construction waste management, the transport of construction materials and waste, and vegetation clearance
- Building a GHG model to determine projected emissions from the construction of the development
- Establishing criteria suitable for assessing GHG emission impacts from the construction of the Project, based on a project-specific risk assessment

- Undertaking a literature review to identify the accepted benefits and paybacks of windfarm developments in terms of GHG emissions from the energy sector, on state and federal scales
- Determining GHG emission offsets as a result of the development. This will be based on energy market projections at state and federal levels, and an assessment of marginal energy rates.

6.14.4 Any engagement required

No engagement is proposed.

6.15 Minor issues

Additional consideration will be given to the following potential impacts within the EIS:

- Resource requirements and waste
- Sustainability
- Decommissioning and rehabilitation.

6.16 Cumulative impacts

Cumulative impacts are a result of incremental, sustained and combined effects of human action and natural variations over time and can be both positive and negative. They can be compounded when the potential impacts of a project are combined with past, current, planned, or reasonably anticipated future impacts (DPIE, 2021a). Cumulative effects can result in a greater extent, magnitude or duration of impacts and may also arise where multiple or consecutive construction for development impact the same receivers.

The Wind Energy Guideline identifies the requirement to address cumulative impacts in relation to any other proposed, approved or operating wind energy projects in the vicinity, particularly with regard to landscape, noise, biodiversity and traffic impacts.

As discussed in **Section 1.1**, the Project area is located within a REZ and, therefore, there are a number of other existing and proposed renewable energy projects within the region (refer to **Figure 1-1**). The list of projects that will be assessed to determine any cumulative impacts will be compiled during the EIS phase to ensure it is up to date. The relevant detailed environmental assessments will include an assessment of the potential cumulative impacts associated with these other projects.

7. Conclusion

This report has described the proposed Yanco Delta Wind Farm and established the planning context of the Project, which is currently in the early planning stage. The Project would be assessed under Part 4 of the EP&A Act and classed as SSD under State Environmental Planning Policy (Planning Systems) 2021.

Based on the preliminary assessment carried out for this Scoping Report, an indicative scope for the EIS has been developed, focusing on the following key issues:

- Biodiversity
- Aboriginal heritage
- Non-Aboriginal heritage
- Landscape character and visual amenity
- Noise and vibration
- Traffic and transport
- Soils and contamination
- Surface water and groundwater
- Flooding
- Socio-economic impacts
- Hazards and risks.

Other issues will also be investigated, commensurate with risk, through desktop investigation for assessment and inclusion within the EIS.

The EIS would be prepared in accordance with the Project-specific SEARs, once received. Mitigation measures will be developed for inclusion in the EIS and will address the management of key issues and other issues identified in the assessment process.

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Appendix A. Lots/Deposited Plans for the Project area

Project area – freehold lots	
Plan Number	**Lot Number**
541494	1
756455	125, 149
1026614	7001
1026617	7001
1052588	7004
1142010	7300
1245394	2
1252143	1
1252675	1, 2
23356	B, A
23528	C, B, A
33915	1, 2
48568	1
111772	4, 6, 1, 2, 7, 5, 3
116085	1, 2
134583	4, 1, 2, 3
183078	B, A
229367	1, 2
252520	4, 1, 2, 7, 5, 3, 8
377237	1
378053	1, 2
394274	4, 2, 3
455036	83
455037	82
455038	4, 6, 1, 2, 7, 5, 3, 8
541494	2
545147	1
576960	1, 2
578656	1, 2
581776	4, 5, 3
585343	1, 2
585725	1, 2

Project area – freehold lots	
Plan Number	**Lot Number**
653113	1
659335	1
722079	4, 5
756281	4, 6, 1, 11, 61, 2, 59, 7, 5, 12, 36, 73, 69, 60, 3, 74, 58
756291	13, 18, 24, 19, 25, 11, 21, 23, 12, 20
756304	76, 18, 4, 71, 19, 93, 9, 1, 21, 17, 2, 96, 7, 23, 15, 97, 98, 16, 75, 73, 72, 86, 26, 8, 92, 85, 64, 99, 78, 20, 87, 63, 103, 89, 108, 79, 110, 27, 29, 81, 111, 33, 88, 28, 104, 102, 101, 105, 90, 112, 113, 34, 22, 94, 107, 106, 116, 77, 80, 109, 100, 114
756311	13, 14, 4, 24, 9, 6, 1, 11, 17, 2, 5, 23, 12, 16, 10, 3
756334	13, 52, 14, 18, 4, 41, 71, 19, 57, 49, 55, 9, 6, 11, 61, 17, 44, 59, 48, 7, 5, 53, 15, 51, 12, 65, 16, 75, 73, 69, 68, 72, 56, 60, 70, 10, 3, 8, 74, 40, 64, 50, 39, 20, 54, 58, 62, 63, 42, 46, 45, 47, 43
756349	41, 40
756418	52, 4, 57, 55, 66, 61, 59, 5, 53, 98, 51, 65, 36, 69, 56, 60, 67, 64, 99, 50, 54, 58, 62, 252, 63, 251
756425	86, 85, 131, 84, 132, 31, 30, 87, 32, 89, 88, 143
756444	76, 4, 71, 57, 55, 6, 1, 66, 2, 7, 5, 53, 65, 75, 73, 69, 68, 72, 86, 56, 70, 67, 3, 8, 74, 85, 64, 78, 77
756454	13, 52, 14, 18, 4, 24, 19, 25, 93, 49, 55, 6, 61, 17, 44, 2, 96, 59, 48, 7, 37, 5, 23, 53, 15, 97, 98, 51, 65, 16, 36, 26, 60, 95, 92, 64, 99, 38, 50, 39, 54, 58, 62
756455	13, 52, 76, 14, 41, 25, 93, 57, 49, 55, 9, 6, 1, 11, 44, 59, 48, 7, 23, 53, 15, 51, 12, 75, 72, 86, 56, 10, 8, 92, 40, 85, 38, 50, 78, 39, 54, 58, 87, 82, 83, 118, 42, 89, 79, 81, 111, 123, 150, 119, 88, 90, 112, 113, 45, 94, 47, 77, 80, 43, 152, 120, 114, 185, 91
820142	1
1081785	1,2,3
1096136	1
1115053	1,2
1127723	1
1180553	1
1207796	3
Project area – Crown land	
Plan Number	**Lot Number**
541494	1
756455	125, 149
1026614	7001
1026617	7001
1052588	7004

Project area – freehold lots	
Plan Number	**Lot Number**
1142010	7300
1245394	2
1252143	1
1252675	1,2

Appendix B. Scoping summary table

Table B-1 Scoping summary table

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping Report reference
Specialist assessment	Biodiversity	Yes	General	• Commonwealth EPBC 1.1 Significant Impact Guidelines – Matters of National Environmental Significance • Commonwealth Department of the Environment – Nationally Threatened Ecological Communities and Threatened Species Guidelines (various) • Threatened Species Survey and Assessment Guidelines at http://www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm • Biodiversity Assessment Method (Department of Planning, Industry and Environment, 2020) • Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (Clean Energy Council, 2018).	**Section 6.2**
Specialist assessment	Aboriginal heritage	Yes	Specific	• Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (Department of Environment, Climate Change and Water, 2011) • Aboriginal Cultural Heritage Consultation requirements for proponents (Department of Environment, Climate Change and Water, 2010) • Code of practice for archaeological investigation of Aboriginal objects in NSW (Department of Environment, Climate Change and Water, 2010).	**Section 6.3**
Specialist assessment	Non-Aboriginal heritage	Yes	General	• NSW Heritage Manual (NSW Heritage Office and Department of Urban Affairs and Planning, 1996) • Assessing Heritage Significance (NSW Heritage Office, 2001) • Statement of Heritage Impact (NSW Heritage Office, 2002) • Criteria for the assessment of excavation directors (NSW Heritage Council, 2011) • Assessing significance for historical archaeological sites and relics (NSW Heritage Branch, 2009).	**Section 6.4**
EIS chapter	Land use and property	Yes	Specific	• Refer to Scoping Report for further discussion on approach to assessment.	**Section 6.5**

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping Report reference
Specialist assessment	Landscape character and visual amenity	Yes	Specific	• Wind Energy: Visual Assessment Bulletin for State Significant Wind Energy Development (DPIE, 2016).	**Section 6.6**
Specialist assessment	Noise and vibration	Yes	General	• Draft Construction Noise Guideline (NSW EPA, 2021) at https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20p2281-draft-construction-noise-guideline.pdf?la=en&hash=08B7AFCA1EABA290F78D720722E14F1F239FE6F8 • Construction Noise Strategy (Transport for NSW, 2012) • NSW Noise Policy for Industry (NSW EPA, 2017) • Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006) • German Standard DIN 4150-3: Structural Vibration – Effects of Vibration on Structures • NSW Road Noise Policy (DECCW, 2011) • Interim Construction Noise Guidelines (DECC, 2009) • Environmental Noise Management Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006) • Wind Energy: Noise Assessment Bulletin for State Significant Wind Energy Development (DPIE, 2016).	**Section 6.7**
Specialist assessment	Traffic and transport	Yes	General	• Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2017) • Guide to Traffic Generating Developments Version 2.2 (Roads and Traffic Authority, 2002).	**Section 6.8**

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping Report reference
Specialist assessment	Soils and contamination	No	General	• Acid Sulfate Soils Assessment Guidelines (Department of Planning, 2008) • Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) • National Environment Protection (Assessment of Site Contamination) Measure (National Environment Protection Council, 2013) • Guidelines for Consultants reporting on contaminated Land: Contaminated land guidelines (NSW EPA, 2020) • Guidelines on the duty to Report Contamination under the Contaminated Land Management Act 1997 (NSW EPA, 2015).	**Section 6.9**
Specialist assessment	Surface water, groundwater and flooding	No	General	• Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volume 2 (Department of Environment and Climate Change, 2008) • Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (Department of Environment and Conservation, 2004) • Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2018) • Using the ANZECC Guidelines and Water Quality Objectives in NSW (Department of Environment and Conservation, 2006b) • Guidelines for Controlled Activities (Department of Industry, 2012).	**Section 6.10**
Specialist assessment	Socio-economic	Yes	Specific	• Social Impact Assessment Guidelines for State Significant Projects (DPIE, 2021b) • Community Consultative Committee Guidelines for State Significant Projects (NSW Government, 2019) • Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021d).	**Section 6.11**
Specialist assessment	Hazards and risks – aeronautical impacts	No	General	• Advisory Circular AC 139.E-05 v1.0 Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome • Advisory Circular AC 139-08 v2.0 Reporting of tall structures and hazardous plume sources • National Airports Safeguarding Framework Guideline D: Managing the Risk to Aviation Safety of Wind Turbine Installations (DITRDC, 2012).	**Section 6.12.1**

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping Report reference
Specialist assessment	Hazards and risks – telecommunications and electromagnetic interference	No	General	• Australian Radio and Communications Act 1992 • Wind Energy Guideline for State Significant Wind Energy Development (DPE, 2016a) • Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (Clean Energy Council, 2018).	**Section 6.12.1.2**
Specialist assessment	Hazards and risks – electromagnetic fields and human health (wind farm)	No	General	• National Health and Medical Research Council Statement: Evidence on Wind Farms and Human Health (NHMRC, 2015).	**Section 6.12.3**
Specialist assessment	Hazards and risks - PHA (battery)	No	General	• Electromagnetic Fields Management Handbook (Energy Networks Australia, 2016) • Guidelines for limiting exposure to Time-varying Electric, magnetic and Electromagnetic Fields (ICNIRP, 2010) • Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines (Department of Planning, 2011a) • Assessment Guideline: Multi-Level Risk Assessment (Department of Planning and Infrastructure, 2011) • Hazardous Industry Planning Advisory Paper No. 4 Risk Criteria for Land Use Safety Planning (DPE, 2011) • Hazardous Industry Planning Advisory Paper No. 6 Guidelines of Hazard Analysis (DPE, 2011) • Hazardous Industry Planning Advisory Paper No. 10 Land Use Safety Planning (DPE, 2011).	**Section 6.12.4**
Specialist assessment	Hazards and risks – shadow flicker	No	General	• Refer to Scoping Report for further discussion on approach to assessment.	**Section 6.12.5**
Specialist assessment	Hazards and risks – blade throw	No	General	• Refer to Scoping Report for further discussion on approach to assessment.	**Section 6.12.6**

Level of assessment	Matter	Cumulative Impact Assessment	Engagement	Relevant government plans, policies and guidelines	Scoping Report reference
Specialist assessment	Hazards and risks – bushfire	No	General	• Planning for Bush Fire Protection 2019 (NSW RFS, 2019) • Australian Standard 3959-2018 Construction of Buildings in Bushfire Prone Areas • NSW Rural Fire Service Guideline for Bushfire Prone Land Mapping (NSW RFS, 2015).	**Section 6.12.7**
EIS chapter	Hazards and risks - waste	No	General	• Waste Classification Guidelines Part 1: Classifying Waste (NSW Environment Protection Authority, 2014) • NSW Waste Avoidance and Resource Recovery Strategy 2014-21 (NSW EPA, 2014).	**Section 6.15**
EIS chapter	Air quality	Yes	General	• National Environment Protection (Ambient Air Quality) Measure (National Environment Protection Council, 1998) • Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2016).	**Section 6.13**
EIS chapter	Greenhouse gas	Yes	General	• ISO 14064-2:2019(en) Greenhouse gases - Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission.	**Section 6.14**
EIS chapter	Cumulative impacts	Yes	General	• Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2021a).	**Section 6.16**

Appendix C. Ecological constraints assessment

Jacobs

Memorandum

Yanco Delta Wind Farm
Biodiversity Constraints
Memorandum

Subject	**Yanco Delta Wind Farm Biodiversity Constraints Memorandum**	**Project Name**	Yanco Delta Wind Farm
Attention	Virya Energy	**Project No.**	IS408300
From	Jonathan Carr		
Date	18 February 2022		
Copies to	Nikki Wallace, Melissa Laginha, Chris Thomson		

1. Introduction

1.1 Purpose

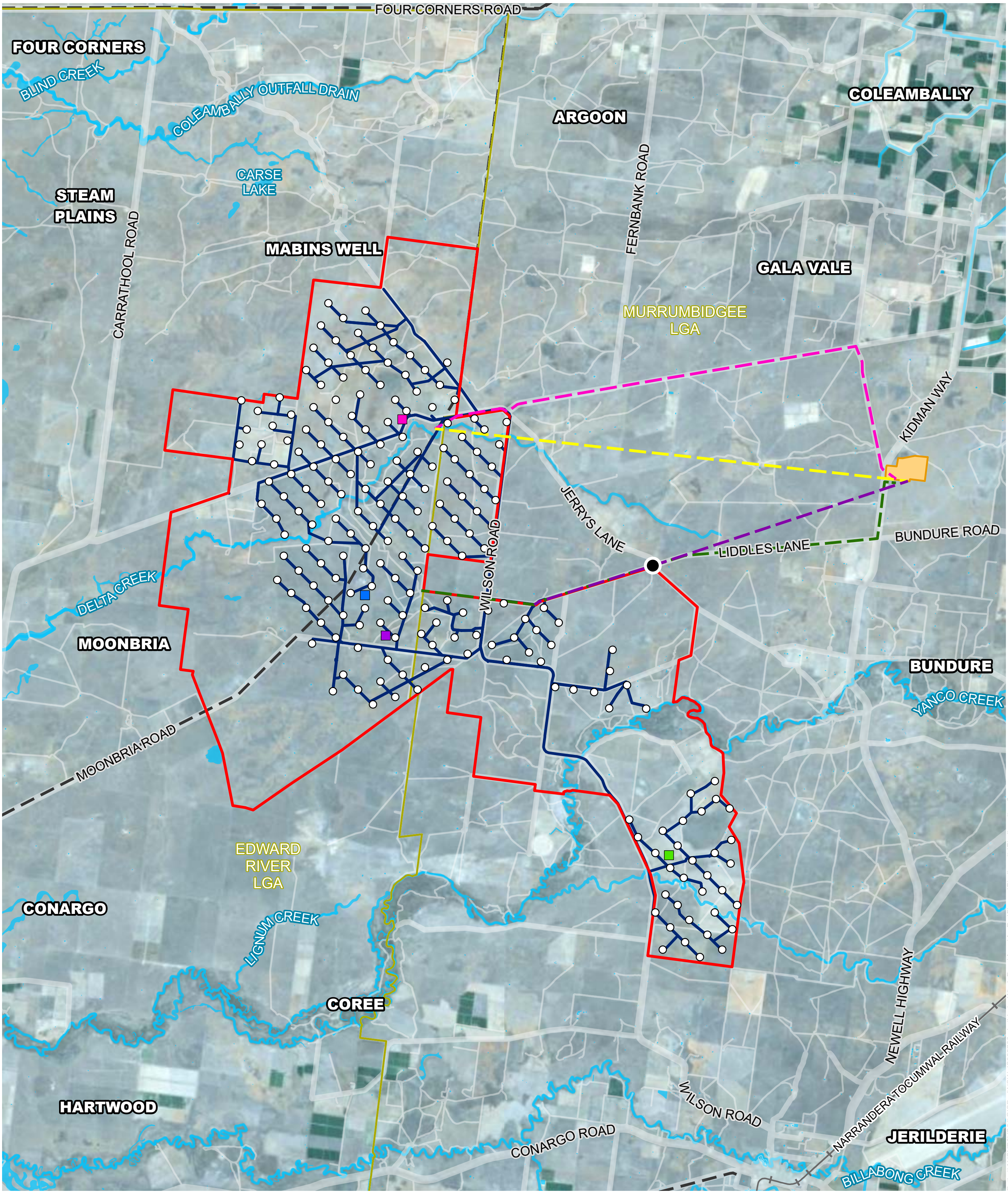
Jacobs Group (Australia) Pty Ltd (Jacobs) has been engaged by Virya Energy Pty Ltd (Virya Energy) to investigate the biodiversity constraints of a proposed wind farm located in the suburbs of Moonbria, Jerilderie and Mabins Well, within the South-West Renewable Energy Zone (REZ), New South Wales (hereafter known as the 'project').

This assessment was undertaken using information from both a desktop review and field surveys to identify biodiversity values, including threatened species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This was used to inform development of a biodiversity offset constraints analysis and map to assist with decisions around selective avoidance of key biodiversity constraints and subsequently minimise the potential offset costs.

These outputs aid in the footprint selection process and play an important role in the feasibility and design of infrastructure to avoid and or minimise impacts on conservation significant biodiversity. An estimate of relative offset costs was undertaken to determine a worst case cost for offset obligations by the project and is discussed in **Section 4**. Offset estimates are indicative only, based on the absence of a vegetation integrity assessment and a preliminary footprint that is subject to modification.

The project would include (refer to **Figure 1-1**):

- Up to 225 wind turbine generators (WTGs) to maximum tip height of 270 metres with a generating capacity of approximately 1500 Megawatt (MW)
- Provision for a Battery Energy Storage System with a storage capacity of 500 megawatt hours (MWH) (type yet to be determined)
- Permanent ancillary infrastructure including operation and maintenance facility, internal access tracks, underground and overhead cabling, wind monitoring masts, central primary substation and about five collector substations
- Temporary facilities including site compounds, laydown areas, stockpiles, gravel borrow pit(s) and concrete batch plants, temporary roads and temporary monitoring masts.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Project Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4
- Proposed Dinawan substation
- Local Government Area
- Site access
- Waterways
- Road
- Existing electricity transmission line
- Railway

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N

Data sources

Jacobs 2022
Department of Regional NSW 2020
© Department of Customer Service 2020

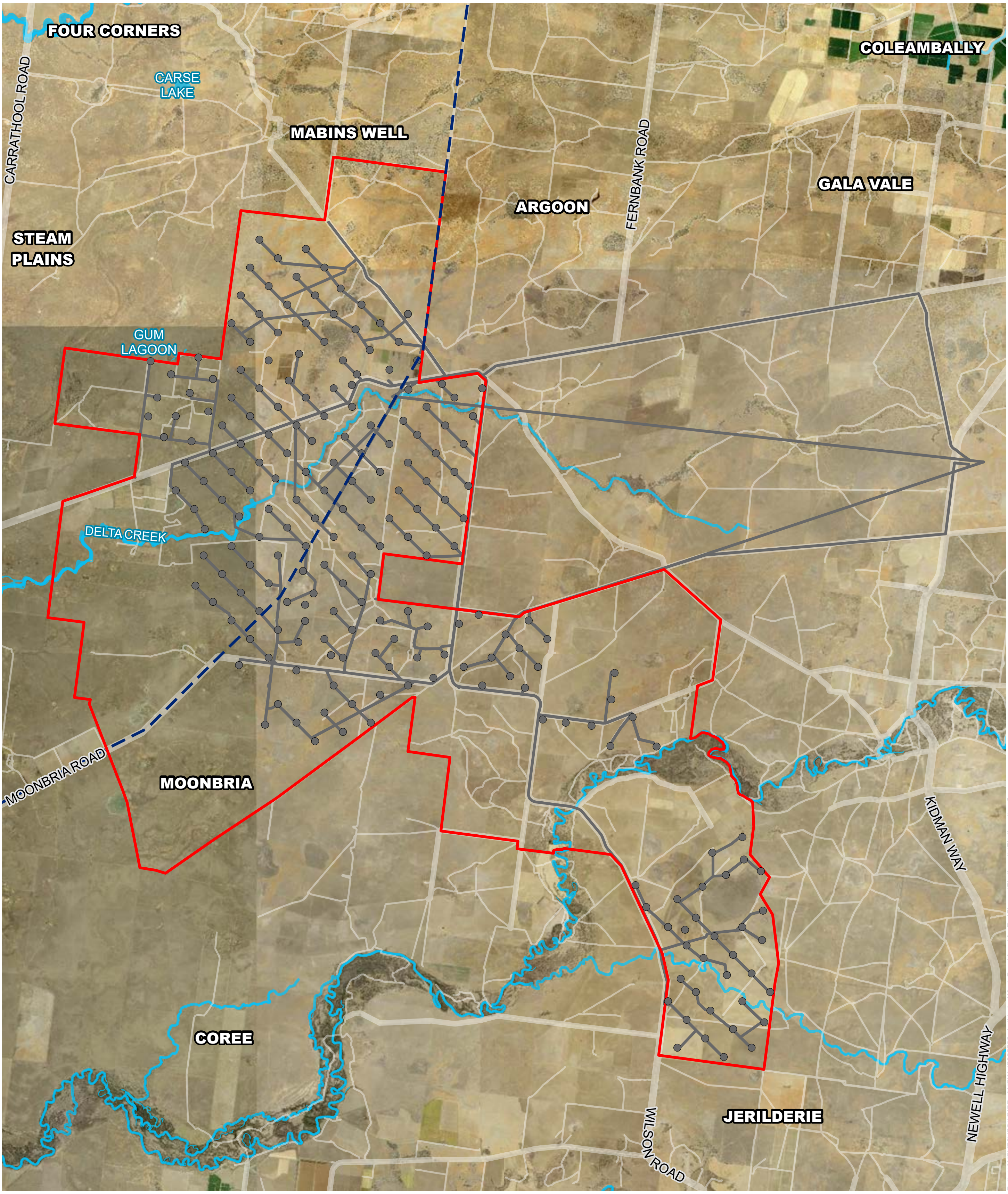
Figure 1-1 Preliminary project layout

1.2 Project area and proposed footprint

The Project area is located approximately 10 kilometres north-west of the Jerilderie township within the Murrumbidgee Council Local Government Area (LGA) and the Edward River Council LGA, encompassing approximately 42,000 hectares. This area is discussed throughout the report and defined as the 'Project area'. The Project area is defined as the property boundaries of associated landowners. The Project area would span over 420 lots, owned by nine landowners.

The proposed footprint includes land that is subject to development, activity and/or clearing and is consistent with the term 'subject land' defined in the Biodiversity Assessment Method (BAM) (DPIE, 2020). This land represents the limits of where disturbance may occur during construction and currently includes indicative locations for WTGs, internal access roads, substations and proposed transmission line options.

The Project area and proposed footprint are illustrated in **Figure 1-2**.



Indicative Project
- Project area
- Proposed footprint

Existing environment
- Waterways
- Road
- Existing electricity transmission line

0 4 8 km

1:200,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 1-2 Location of Project area and proposed footprint

2. Methods

2.1 Literature and database review

A background review of existing information was undertaken to identify the existing environment. The review focussed on database searches, relevant ecological reports and relevant spatial data pertaining to the Project area. The review was used to assess the likelihood of occurrence of threatened species, threatened ecological communities (TECs) and important habitats for terrestrial and aquatic threatened species and migratory species listed under the NSW BC Act, NSW *Fisheries Management Act 1994* (FM Act) and EPBC Act in the Project area.

The Biodiversity Assessment Method Calculator (BAM-C) was used to input likely Plant Community Types (PCTs) and identify associated species credit species which require targeted surveys or an expert report to confirm the presence of species in the proposed footprint.

Relevant database searches encompassed a 10-kilometre radius from the Project area. This information was used to inform and target areas for the field investigations.

The following databases were searched:

- BioNet - Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC) (Environment, Energy and Science Group (EESG), 2021)
- The federal Department of Environment's Protected Matters Search Tool (DAWE, 2021)
- NSW Department of Primary Industries (DPI) Fisheries Spatial Data Portal
- PlantNet – (NSW Flora online - https://plantnet.rbgsyd.nsw.gov.au/floraonline.htm).
- Royal Botanic Gardens
- The federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE)
- Department of Environment's Directory of Important Wetlands in Australia.

Regional vegetation mapping, geology and soil mapping projects were reviewed including:

- State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (Office of Environment and Heritage, 2016b)
- Jerilderie 1:250 000 Geological Map (Tuckwell, 1976)
- Deniliquin 1:250 000 Geological Map (Brown and Stephenson, 1991)
- Australian Soil Classification (ASC) Soil Type map of NSW (State Government of NSW and Office of Environment and Heritage (OEH), 2012).

Preliminary determinations from NSW Threatened Species Scientific Committee and the Commonwealth annual final priority assessment list (FPAL) of nominated species and ecological communities were also reviewed. At the time of writing, there are no preliminary or provisional listings of relevance to the project.

The mapping provided in the State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (Office of Environment and Heritage, 2016b) was found to be unreliable in terms of providing accurate polygon boundaries. However, it was referred to as a resource to gather a list potential PCTs within the Project area. This dataset was used initially to allocate PCTs and associated species credit species to plan targeted flora surveys but was not used extensively during other field work such as the rapid PCT mapping survey.

2.2 Threatened biodiversity likelihood of occurrence assessment

A habitat desktop assessment was conducted prior to site surveys to identify whether the Project area contains any habitat constraints specific to certain species credit species. Broadly, some of the habitat constraints that would be investigated include tree hollows, fallen logs, bush rock, culverts and bridges, escarpments and outcrops, creeks and soaks as well as foraging resources including mistletoe, termite mounds, flowering plants and host plant species. The habitat assessment is also important for understanding important indicators of habitat condition, quality and complexity with consideration afforded to understanding historic and recent disturbances and abiotic influencers such as geology, altitude and soil type.

Where habitat constraints are identified in the Threatened Biodiversity Data Collection (TBDC) (EESG, 2020a) or have been defined in species specific survey guidelines, these will be used to refine survey areas for target species, or, if determined to be absent, discount the presence of important habitat for these species on site through the likelihood of occurrence assessment process.

The following assessment identifies the list of threatened flora and fauna species recorded within a 10-kilometre radius of the Project area and compares the preferred habitat of these species with the habitats identified in the Project area. This was done to assess the likelihood of the species being present in the Project area (i.e. subject species). The criteria used in the assessment are detailed **Table 2-1**. The results of this assessment are provided in **Appendix A**.

Table 2-1 Likelihood of occurrence includes one or more of the following criteria

Likelihood of Occurrence	Criteria
Unlikely	▪ Species highly restricted to certain geographical areas not within the proposal footprint ▪ Species that have specific habitat requirements are not present in the Project area.
Low	Species that fit into one or more of the following criteria: ▪ Have not been recorded previously in the Project area/surrounds and for which the Project area is beyond the current distribution range ▪ Use specific habitats or resources not present in the Project area ▪ Are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
Moderate	Species that fit one or more of the following criteria: ▪ Have infrequently been recorded previously in the Project area/surrounds ▪ Use specific habitats or resources present in the Project area but in a poor or modified condition ▪ Are unlikely to maintain sedentary populations, however, may seasonally use resources within the Project area opportunistically or during migration ▪ Are cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.

Likelihood of Occurrence	Criteria
High	Species that fit one or more of the following criteria: ▪ Have frequently been recorded previously in the Project area/surrounds ▪ Use habitat types or resources that are present in the Project area that are abundance and/or in good condition within the Project area ▪ Are known or likely to maintain resident populations surrounding the Project area ▪ Are known or likely to visit the site during regular seasonal movements or migration.

2.3 Field surveys

To date, the Jacobs ecology team have completed six rounds of biodiversity survey to meet the requirements of the BAM. These have included:

- September 2021 - Targeted threatened flora survey – early spring
- October 2021- Rapid PCT mapping survey
- November 2021 - Targeted threatened flora survey – late spring
- November 2021 – Targeted fauna survey - spring bird and bat survey
- January 2022 – Targeted threatened flora survey - summer
- January 2022 – Targeted fauna survey – Targeted amphibian survey and habitat assessment
- February 2022 – Targeted fauna survey - summer bird and bat survey.

A description of the each of the above surveys are provided in the sections below.

2.3.1 Rapid Plant Community Type Mapping

A rapid PCT mapping survey was completed in the Project area by two ecologists over five days between 27-31 October 2021. This survey identified and mapped PCTs and delineated each PCT into broad condition classes to assign separate vegetation zones. Each PCT was assigned to the relevant corresponding Threatened Ecological Community (TEC) where applicable. This map information was used to inform the severity of constraints and planning for the upcoming the vegetation integrity assessment. This survey primarily focused on mapping indicative locations of all WTGs, internal access roads and 4 proposed transmission line options in the proposed footprint. Our method was based on the BAM (DPIE, 2020b) and was utilised as part of the vegetation mapping process. This process included:

- Transects and traverses using a hand-held tablet containing ArcGIS Field Maps to record boundaries of, and variation within stratification units not apparent from aerial imagery
- Collection of data from rapid data points (RDPs) to obtain information on vegetation community structure, composition and landscape position, soil, and past land uses/disturbance history, to accurately assign stratification units to PCTs and vegetation zones.

The types and distributions of indicative PCTs within the Project area were identified and mapped progressively during all field surveys to date and will be further refined during the upcoming vegetation integrity assessment.

The assessment of broad condition states was used to stratify areas of the same PCT into a vegetation zone for the purpose of predicting the level of constraint where different vegetation integrity scores are likely to influence the biodiversity offset liability for the project. Different condition class criteria were used for each vegetation structure type such as grassland, Acacia woodland and Eucalypt/Cypress Pine woodland, these generally comprised of Low, Low to moderate and Moderate to High condition classes.

Further breakdown of condition classes was undertaken if there was a noticeable variation of a vegetation zone such as:

- Grassland with a dominate cover of Cottonbush (*Maireana aphylla*)
- Acacia woodland with a dominated grassy understorey (typically more open canopy structure)
- Acacia woodland with a dominated shrub understorey (typically less open canopy structure)
- Eucalypt/Cypress pine woodland with vegetation that no longer retains a native canopy but the canopy cover is showing a sign of regeneration often with an intact understorey and groundcover.

This approach was used to also inform potential presence of the critically endangered Natural Grasslands of the Murray Valley Plains listed under the EPBC Act. This TEC is considered present if it meets the key diagnostic characteristics and condition thresholds in the listing advice (Threatened Species Scientific Committee, 2012). A landscape scale assessment determined that any areas of grassland with cracking clay is likely to meet the key diagnostic characteristics of this TEC. In grassland, RDPs collected information on the number of native plant species frequently found in the TEC to delineate condition classes and likely condition threshold. These criteria are outlined in **Table 2-2**.

Table 2-2 Criteria used to determine grassland broad condition state and potential listing status

Grassland criteria	Broad condition state	Potential listing status
Native grass dominated, with more than one native grass species typically dense tussocks of *Austrostipa* spp., *Rytidosperma* spp., *Enteropogon ramosus*, *Walwhalleya proluta* supporting a moderate to high diversity of native forbs. Exotic annual species may be present. Low to high grazing intensity. Number of native plant species ≥ 15, and one or more indicator species from Table 2 of listing advice	Moderate to High	Yes
Native grass dominated, with more than one native grass species typically dense tussocks of *Austrostipa* spp., *Rytidosperma* spp., *Enteropogon ramosus*, *Walwhalleya proluta* supporting a low to moderate diversity of native forbs. Exotic annual species may be present. moderate to high grazing intensity. Number of native plant species 11-14	Low-moderate	Yes
Native grass dominated, with at least one native grass species typically dominated by *Austrostipa* spp., *Rytidosperma* spp. with no to sparse tussocks supporting a low diversity of native forbs. Exotic annual species may be present. High grazing intensity. Number of native plant species <10	Low	No

The extent of native vegetation in the Project area was mapped as a preliminary constraints map using aerial imagery. Polygons were digitised in a GIS (ArcGIS 10.8.1) at a scale of between 1:5,000 and 1:10,000. The vegetation extent within the Project area has been mapped in detail although some boundary errors may still exist.

Some previously cleared areas within the Project area contain native trees, understorey plants, and groundcover species, such as PCT 19 Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains. While these areas are heavily disturbed, they do contain native vegetation. As such, these areas have been assigned to the most likely original PCT, which can be determined with reasonable confidence based on adjacent PCTs, soil type and position in the landscape.

2.3.2 Targeted threatened flora surveys

The preliminary BAM-C identified PCT associated threatened flora to inform the candidate species list that requires seasonal targeted searches to be undertaken at the time of flowering to maximise detection. The candidate species list below was generated from the BAM-C and require targeted searches in suitable habitat within the project footprint. Based on this list, the Jacobs ecology team undertook targeted surveys September 2021, November 2021 and December 2021.

Targeted surveys were carried out over 9 days (team of 8 ecologists) between 21-30 September 2021 and included the following species:

- *Caladenia arenaria* – September
- *Convolvulus tedmoorei* – June- September
- *Swainsona murrayana* – September
- *Swainsona plagiotropis* – September
- *Swainsona sericea* – September -November
- *Sclerolaena napiformis* – September -December
- *Leptorhynchos orientalis* – September -November
- *Prasophyllum* sp. *Moama* – Sep (not in the candidate list but recommended by NSW Biodiversity Conservation and Science (BCS)).

Targeted surveys were carried out over 11 days (team of 8 ecologists) between 15-20 and 25-26 November 2021 and included the following species:

- *Austrostipa wakoolica* – October- December
- *Pilularia novae-hollandiae* – October- December
- *Solanum karsense* – September -November
- *Brachyscome muelleroides* – September -November
- *Brachyscome papillosa* – September -November
- *Maireana cheelii* – September -December
- *Lepidium monoplocoides* – November-February
- *Pterostylis despectans* – July, October-November (not in the candidate list but recommended by BCS)
- *Diuris sp "Oaklands"* – November (not in the candidate list but recommended by BCS).

Targeted surveys planned for January 2022 include the following species:

- *Cullen parvum* – December-January
- *Eucalyptus leucoxylon* subsp. *pruinosa* – all year.

A minimum of 10 metre parallel walked transects was used for the grass and forb growth forms present in list above, in areas of open vegetation. Up to five species from the same strata can be surveyed per traverse in the same area of suitable habitat. The two-phase grid-based systematic survey approach for large areas specified in the BAM survey guide (DPIE, 2020) was introduced to the project. However, given the narrow linear nature of the project footprint, walked transects (10-wide transects) were undertaken to sample the whole area.

A combination of aerial photographs, broad-scale soil and vegetation mapping, and contour data was used to stratify vegetation in the Project area. Ground truthing validated regional vegetation mapping (DPIE, 2016) using a handheld GPS and georeferenced maps which was later converted into polygons as Plant Community Types (PCTs) in line with the vegetation classification database (VCD) (EESG, 2021b).

2.3.3 Targeted fauna surveys

Targeted threatened fauna surveys were undertaken according to the relevant State and Commonwealth survey guidelines as applicable to each species. These documents are guidelines and it may not be possible to exactly meet the required effort for a species due to impediments such as site constraints. To date, Jacobs has undertaken the following surveys:

- Spring bird and bat survey – November 2021
- Amphibian habitat assessment and targeted survey – January 2022.

Spring bird and bat survey

The targeted surveys for birds and microbats aim to gather data on species present, their distribution and abundance within the proposed Project area and surrounding habitats, inclusive of flight activity to assess the risk of collision with turbine blades. Jacobs plans to undertake seasonal bird and bat surveys (a total of 4 survey events) across the Project area. This information will be used to assess prescribed impacts on threatened and protected animals from turbine strikes from a wind farm. The survey results will be used in conjunction with turbine specific information to predict the number of bird and bat collisions that might be caused by the proposal.

A background review was undertaken of all threatened and protected bird and bat species records within 20 kilometres of the Project area. Information from relevant literature and incidental species sightings during other surveys was used to inform surveys.

The targeted fauna surveys include techniques and equipment specifically designed for the species in focus. We propose the use of standard fauna survey involving, harp traps and ultrasonic call recording (Anabat) for microbats and sound meters and call playback and spotlighting for nocturnal birds.

For determining habitat and density of sampling sites, an assessment area was established with a 200 metre buffer on the current footprint, including turbines, tracks, trenching and other associated infrastructure.

Bird utilisation survey

A bird utilisation survey was undertaken to focus on key species of concern and record data for all species:

- All threatened species
- Species which are rarely recorded
- Species which exist naturally at relatively low densities
- Waders
- Nocturnal birds
- All bats
- Larger birds such as eagles, hawks, kites, herons, pelicans
- Migratory birds.

A total of 46 fixed survey points were selected in the different vegetation formations (surrogate for habitat types) habitat types across the Project area. Most bird sites are placed on the fringes of woodlands, particularly sandhills where there is a continuum of habitats (woodland to grassland and/or sandhills and swamp shrublands). Therefore some sites may sample multiple habitat types. There are also sites adjacent to cropped areas. Bird sites are illustrated on **Figure 2-1**.

The search area radius of fixed points is standardised, at least 100 metres for small birds and up to 800 metres for large birds. The duration of the fixed point counts will be 20 minutes. The height at which each bird flies when passing through the survey area will be estimated and classified in three height band categories (0-20 metres, 20-50 metres, >50 metres) based on the Rotor Sweep Area (RSA), below, within and above the RSA. Start time will be recorded, into early morning, late morning, early evening, late evening. Multiple survey replicates of the same site will be completed over four seasons and surveyed a different time periods (e.g. alternating morning and afternoon surveys).

Bird roaming survey

Roaming surveys were completed to complement the bird utilisation surveys. These surveys are done between the bird utilisation survey periods while moving from one site to the next. The roaming survey are useful for recording possible occurrence of rare or threatened species. A record of each species and habitat usage will be taken. All records of raptor species, any large stick nests and hollow nesting observed will also be taken.

All bird surveys are adequate for detecting the species identified in the BAM-C candidate species list and Matters of National Environmental Significance (MNES) (including target list of breeding species credit species):

- Curlew Sandpiper
- Bush Stone-curlew
- Australian Bustard
- Regent Honeyeater
- Painted Honeyeater
- Swift Parrot.

Nest tree survey

Bird surveys also included a nest tree survey to assist in the detection of breeding activity by raptors, large cockatoos and parrots.

This included mapping of hollow bearing trees and large stick nests and checking suitability for species credit species. Dedicated habitat assessments were undertaken to determine evidence of breeding habitat. This mapping is limited to a 300m buffer on the footprint to capture potential nest trees, depending on the target species and species polygon buffer shown in the TBDC.

The target list of species credit species (based on PCT associations) breeding comprises:

- Major Mitchell's Cockatoo (200 metre radius buffer)
- Black-breasted Buzzard (buffer TBC)
- Square-tailed Kite (300 metre radius buffer)
- Superb Parrot (100 metre radius buffer)
- Regent Parrot (buffer TBC)
- White-bellied Sea-Eagle (250 metre radius buffer)
- Little Eagle (300 metre radius buffer)
- Masked Owl (100 metre radius buffer)
- Barking Owl (100 metre radius buffer).

Nocturnal bird survey

A nocturnal bird survey was undertaken over two nights during the same survey event as bird utilisation surveys. This comprised call playback and spotlighting, as well as sound meters to record all bird calls at night. Further survey effort will be undertaken during winter to target potential breeding habitat for threatened owls such as Barking Owl and Masked Owl.

Microbat survey

The microbat survey focussed on acoustic call recording at vertical heights to record species present, distribution of bat activity in the Project area. Up to five acoustic recorders were deployed over three to four nights comprising 19 trap nights. Anabat devices were attached to windmills near farm dams to increase the height of detectors.

The threatened bat species Southern Myotis (*Myotis macropus*) was also targeted as a species credit species in suitable habitat within the Project area. Bat surveys were conducted in accordance with methods described in the Survey Guidelines for Australia's Threatened Bats (Commonwealth of Australia, 2010) and the Species credit threatened bats and their habitats (OEH, 2018). Anabat units were placed in suitable breeding and foraging habitat within 200 metres from watercourses, culverts, caves and artificial structures. Survey guidelines require a minimum of 16 trap nights across a minimum of four nights for areas of suitable habitat (i.e. less than or equal to 50 hectares). Any culverts and artificial structures in the landscape were inspected for roosting bats.

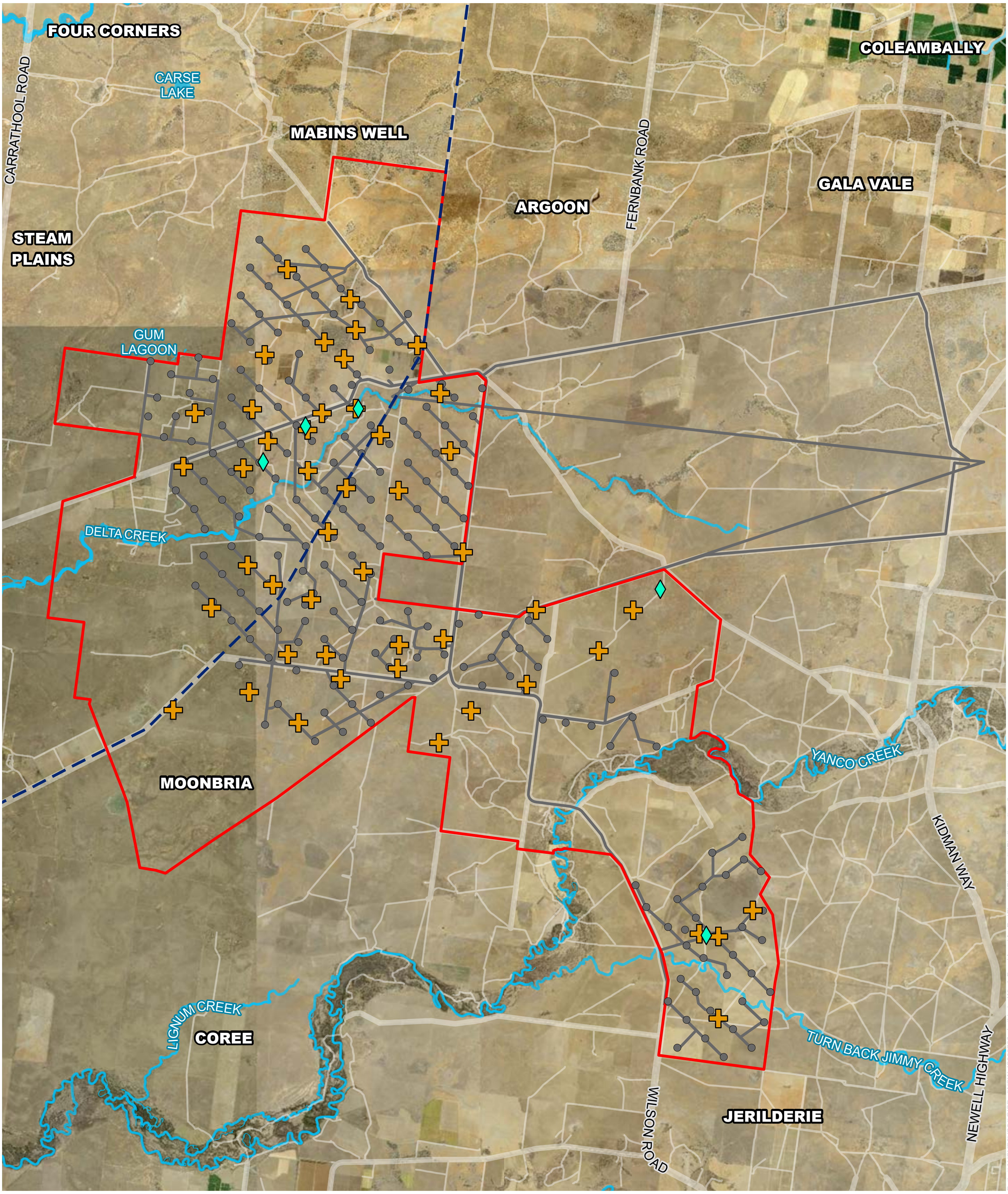
Southern Bell Frog

The Project area has potential habitat for the Southern Bell Frog (*Litoria reniformis*) associated with the tributaries of the Murray and Murrumbidgee Rivers. This species can be found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, River Red Gum swamps or billabongs along floodplains and river valleys. They also have potential to occur in irrigated crops, particularly where there is no available natural habitat.

Frog surveys were conducted in accordance with methods described in the Survey Guidelines for Australia's Threatened Frogs (Commonwealth of Australia, 2010) and the *NSW Survey Guide for Threatened Frogs, A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE 2020). Habitat assessments were completed to identify suitable habitat in the Project area. Three nights targeted frog survey was undertaken at locations with potential habitat for Southern Bell Frog, this included habitats with permanent water at wetlands, farm dams, creeks and irrigated areas with emergent wetland vegetation if available.

2.4 Limitations

The field survey provides a limited view into the whole Project area which comprises around 42,000 hectares and was generally focused on vegetation and habitat within the indicative footprint. On the contrary the bird and bat survey has taken a landscape approach to capture information about the full occurrence bird and bat species diversity, distribution, movement and behaviour. The diversity of flora and fauna species recorded from this Project area should not be seen to be comprehensive, but rather an early indication of the species present at the time of the survey. A period of several seasons or years is often needed to identify all the species present in an area, especially as some species are only apparent at certain times of the year (e.g. orchids or migratory birds) and require specific weather conditions for optimum detection (e.g. frogs). The conclusions of this report are therefore based upon available data and field survey and are therefore indicative of the environmental condition of the Project area at the time of the survey. It should be recognised that site conditions, including the presence of threatened species, can change with time. To address this limitation, the assessment has aimed to identify the presence and suitability of the habitat for threatened species for the purposes of a preliminary assessment of biodiversity constraints.



Indicative Project
Project area
Proposed footprint
Existing environment
Waterways
Road
Existing electricity transmission line

Bird site locations - November 2021
Bat call detector sites - November 2021

0 4 8 km

1:200,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Department of Regional NSW 2020
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Figure 2-1 Bird utilisation sites and bat call detector sites

3. Biodiversity Constraints

3.1 Existing environment

3.1.1 Landscape context

The Project area is located within the Riverina Interim Biogeographic Regionalisation for Australia (IBRA) region and the Murrumbidgee IBRA sub-region.

The Riverina bioregion lies in southwest NSW, extending into central-north Victoria. It ranges from Ivanhoe in the Murray Darling Depression Bioregion south to Bendigo, and from Narrandera in the east to Balranald in the west. The Murray and Murrumbidgee Rivers and their major tributaries, the Lachlan and Goulburn Rivers, flow from the highlands in the east, westward across the Riverina plain.

Characteristic landforms of the Murrumbidgee IBRA sub-region include alluvial fan with distributary channels and floodplains and undulating plains with depressions. The Riverina covers the alluvial fans of the Lachlan, Murrumbidgee and Murray Rivers west of the Great Dividing Range and extends down the Murray. The region is relatively constrained by sediments from northern Victorian rivers, the Murrumbidgee fan and the Cadell fault. Soils are typically red brown earths, grey clays and deep siliceous sands on dunes. The red-brown and grey clays in the bioregion support grassland communities that are nationally significant (NSW NPWS, 2003).

Rural and agricultural activities are the key land uses throughout this area. The majority of the Project area is located on private land and is about 35 kilometres south-east of Oolambeyan National Park and 70 kilometres north-east of Murray Valley National Park.

The Project area includes habitat connectivity with intact wildlife corridors in Black Box woodland along Delta Creek and River Red Gum along Yanco Creek. The landscape is naturally open with scattered woodland patches and swamp amongst natural grassland on cracking clay soils. This favours the movement of native bird flocks between nesting and foraging habitats, particularly the threatened Plains-wanderer (*Pedionomus torquatus)* listed endangered under the BC Act and critically endangered under the EPBC Act. A history of livestock grazing has influenced the growth form of Weeping Myall and grassland biomass levels in the landscape. The landscape also provides refuge for migratory birds and other fauna during large flood events.

There are no areas of outstanding biodiversity values mapped within the Project area.

3.1.2 Native vegetation and threatened ecological communities

The State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (DPIE, 2016) provides the most up to date native vegetation spatial data for the Project area and was used to determine the baseline vegetation classification for allocating PCTs. It was not used to provide accurate polygon boundaries.

The Project area predominantly comprises large areas of native grassland and open Weeping Myall (*Acacia pendula)* woodland in a flat landscape. In low lying areas there are occurrences of Lignum (*Duma florulenta)* and Nitre (*Chenopodium nitrariaceum*) swamps, River Red Gum (*Eucalyptus camaldulensis*) and Black Box (*Eucalyptus largiflorens*) along drainage lines and creeks. There are also White Cypress Pine (*Callitris glaucophylla*) sandhills with scattered paddock trees.

A total of 15 PCTs are expected to be present in the Project area. PCTs are listed in **Table 3-1** and preliminary PCT mapping is shown in **Figure 3-1**. PCTs vary in condition and patch sizes across the Project area. These biodiversity values have very high conservation significance and represent key constraints to the Project.

Four threatened ecological communities (TECs) were confirmed to be present in the Project area (refer to **Figure 3-2**) and include the following:

- Natural Grasslands of the Murray Valley Plains listed critically endangered under the EPBC Act
- Weeping Myall Woodlands listed endangered under the EPBC Act
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions listed endangered under the BC Act
- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions listed endangered under the BC Act.

Parts of the Project area also have potential to have the following TECs:

- *Acacia melvillei* Shrubland in the Riverina and Murray-Darling Depression bioregions listed endangered under the BC Act
- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions listed endangered under the EPBC Act.

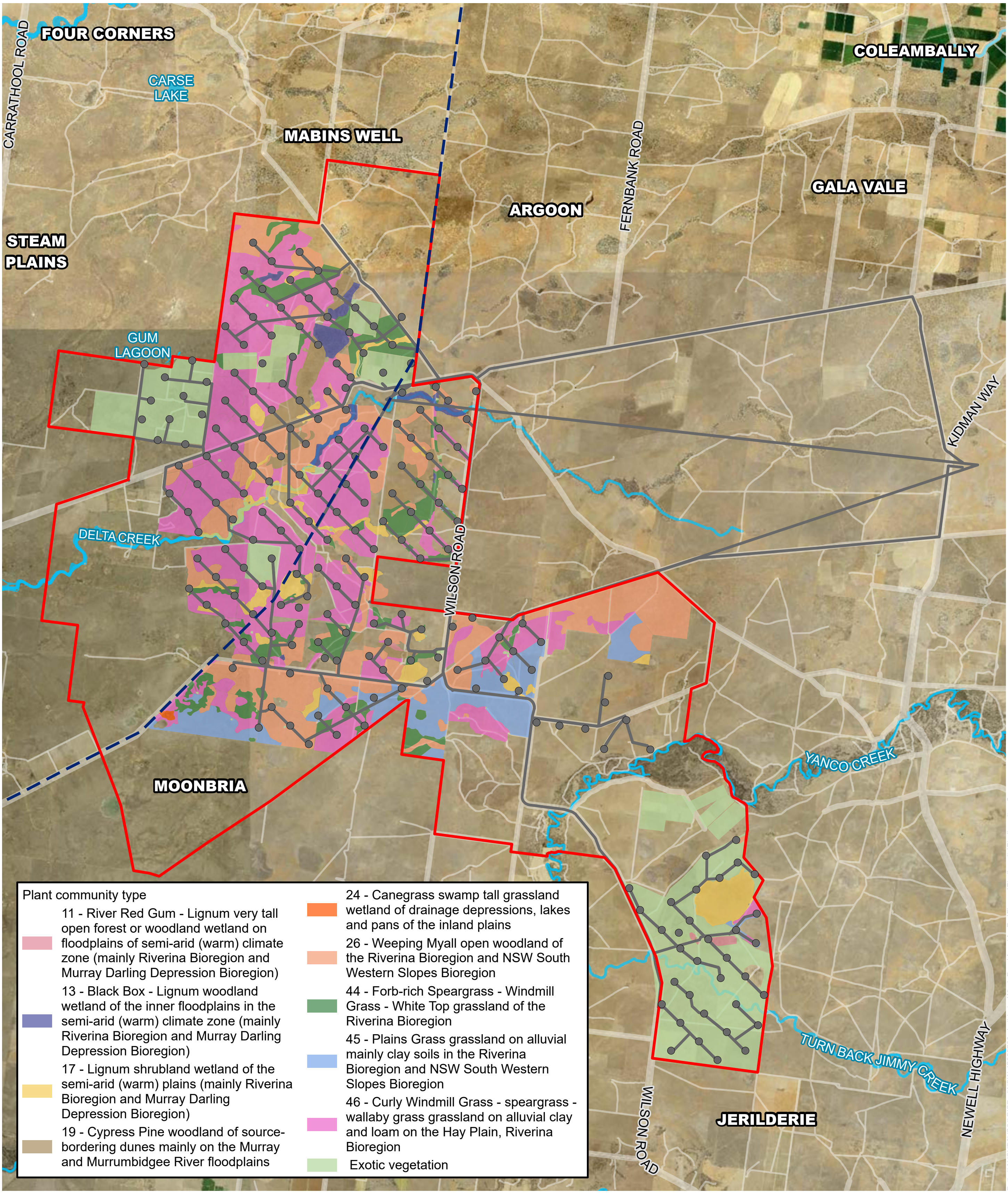
There is a low abundance of exotic vegetation in the Project area and is mostly restricted to irrigated land with crops and/or ploughed tracks. Annual exotic grasses such as Rye Grass (*Lolium* spp.), Wild Oats (*Avena* spp.) and Barley Grass (*Hordeum* spp.) dominate the landscape in spring, but dieback in early summer. The most common priority weed species in the Project area is African Boxthorn (*Lycium ferocissimum*). Many infestations are controlled by local farmers.

Table 3-1 Plant community types and threatened ecological communities

Plant Community Type (PCT) (EESG, 2020b)	EPBC Act Status	BC Act Status
River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion (PCT 9)	-	-
River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 11)	-	-
Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 12)	-	-
Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 13)	-	-
Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 16)	-	-

Plant Community Type (PCT) (EESG, 2020b)	EPBC Act Status	BC Act Status
Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 17)	-	-
Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains (PCT 19)	-	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (EEC)
Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains (PCT 24)	-	-
Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion (PCT 26)	Weeping Myall Woodland (EEC)	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (EEC)
White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone (PCT 28)	-	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (EEC)
Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion (PCT 44)	Natural Grasslands of the Murray Valley Plains (CEEC)	-
Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion (PCT 45)	Natural Grasslands of the Murray Valley Plains (CEEC)	-
Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion (PCT 46)	Natural Grasslands of the Murray Valley Plains (CEEC)	-
Nitre Goosefoot shrubland wetland on clays of the inland floodplains (PCT 160)	-	-
Cotton Bush open shrubland of the semi-arid (warm) zone (PCT 164)	-	-

Key: CEEC = critically endangered ecological community, EEC = endangered ecological community, VEC = vulnerable ecological community



Indicative Project

Project area

Proposed footprint

Existing environment

Waterways

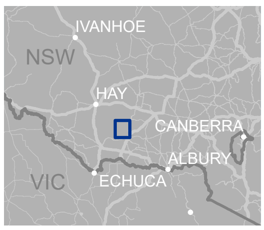
Road

Existing electricity transmission line

0 4 8 km

1:200,000 at A4

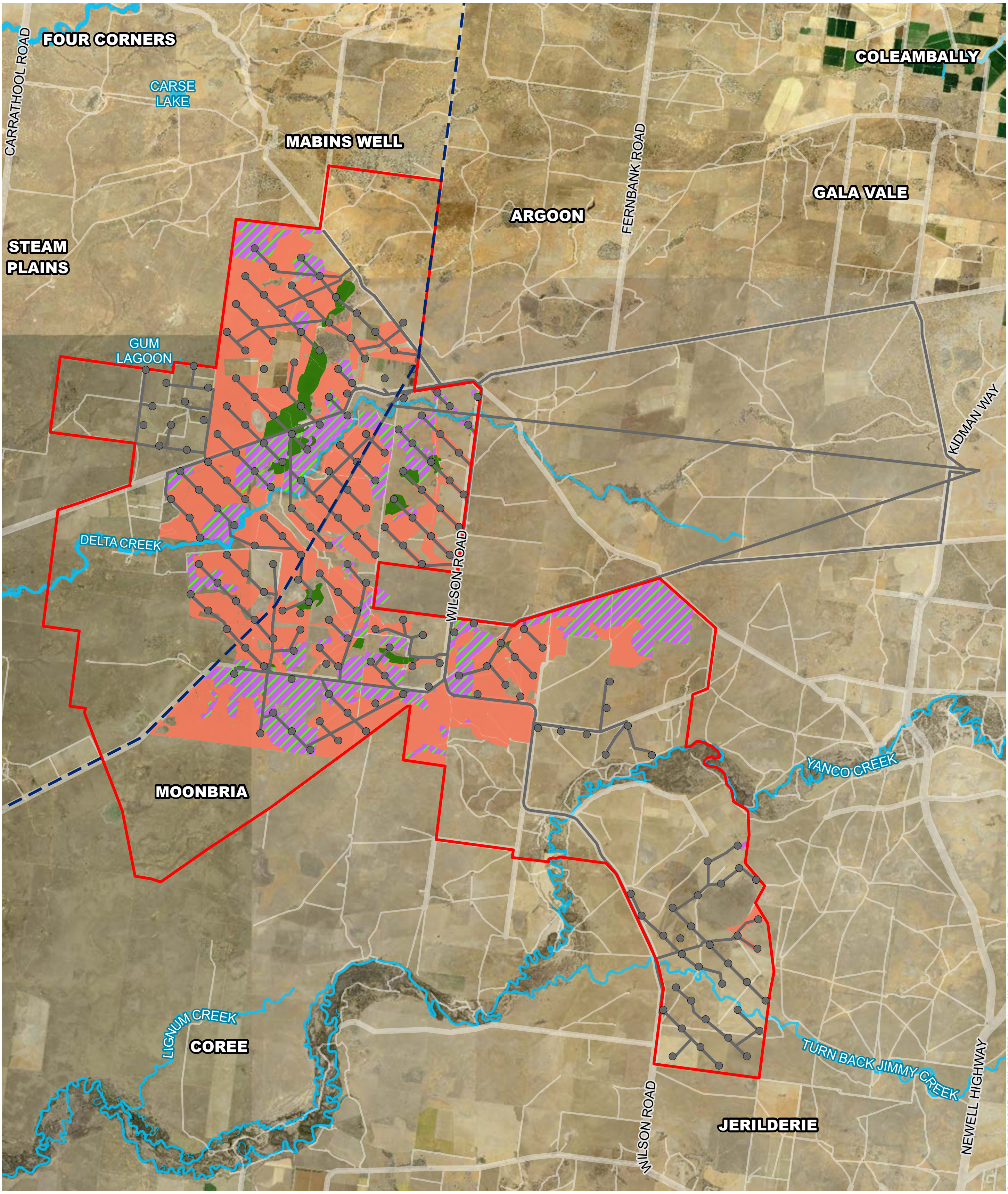
GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 3-1 Preliminary PCT mapping



Indicative Project

- Project area
- Proposed footprint

Existing environment

- Waterways
- Road
- Existing electricity transmission line

Threatened Ecological Communities

- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (Endangered BC Act)
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (Endangered BC Act)
- Natural Grasslands of the Murray Valley Plains (Critically Endangered EPBC Act)
- Weeping Myall Woodlands (Endangered EPBC Act)

0 4 8 km

N

1:200,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 3-2 Preliminary threatened ecological community mapping

3.1.3 Threatened species and habitat

The Project area has confirmed and potential habitat for a range of threatened fauna and flora species based on the following habitat features:

- Intact natural grassland supporting specialist grassland flora and fauna, including threatened Plains Wanderer (*Pedionomus torquatus*) and Swainsona spp.
- Irregularly flooded swamps and drainage supporting a range of fauna species, particularly during flood events
- Permanent water sources are limited to man-made farm dams and the Yanco Creek. A natural water body in the north of the Project area has marginal habitat to support the Southern Bell Frog (*Litoria raniformis*), however most waterbodies lack emergent aquatic vegetation
- Weeping Myall Woodland with mixed aged trees, coarse woody debris and a diversity of understorey and groundcover species
- Large patches and scattered isolated patches of Eucalypt woodland and scattered White Cypress Pine woodland with an abundance of hollow-bearing trees, trees with small to large stick nests and fallen logs of various sizes.

The results of desktop review identified the following number important biodiversity values within 10 kilometres of the Project area (primarily sourced from BAM-C, Bionet records and the Protected Matters Search Tool, and threatened fish maps):

- Five listed threatened ecological communities
- 70 listed threatened species
- 10 listed migratory species
- 17 listed marine species
- 5 listed fish species.

All threatened species with a likelihood of occurrence in the Project area based on desktop assessment and habitat features are listed in **Appendix A.** Threatened species recorded in the NSW Wildlife Atlas from Bionet are illustrated in **Figure 3-3**.

Ecosystem credit species

Threatened species with a likelihood of occurrence of the species or a species' habitat features can be predicted by vegetation surrogates and landscape features are identified in the TBDC as ecosystem credit species. These species are assumed present in associated PCTs, and offset obligations are met through retirement of ecosystem credits in the appropriate classes. Therefore, no species specific credits requiring offsetting are generated for these species. These species are listed in **Table 3-2**. Species recorded in the Project area are shaded in grey.

Species credit species

The BAM calculator predicts species credit species that may occur in a particular area based on PCT associations. These are species with specific survey requirement as part of a development assessment process (unless their presence is assumed) and species specific credits would be generated. These predictions are generally broad (i.e. a conservative list) and include more species than will typically be found on the site.

A list of candidate species-credit species for the project was compiled in the BAM calculator as stated in Section 2.3.2. Additional threatened species were produced from database searches (i.e. BioNet and the Protected Matters Search Tool) where suitable habitat was considered relevant in the Project area (**Appendix A**). Each species credit species is listed in **Table 3-2**. Species recorded in the Project area are shaded in grey. A total of 34 candidate species credit species were identified.

Some species in the TBDC can occur as both ecosystem credits and species credits (a dual credit species). This occurs where part of the habitat is assessed as a species credit (e.g. breeding habitat, or mapped locations identified as important area that is used by a species). The remaining part of the habitat is assessed as an ecosystem credit (e.g. foraging habitat, unmapped locations used by a species). This is why some species are listed as both credit classes in **Table 3-2**.

The Project area is known to have important area mapping for Plains Wanderer. Important habitat maps identify areas that are considered essential to support critical life stages of the species, e.g. breeding areas or locations important for foraging/over-wintering for migratory species. No further survey is required if the subject land is on an important habitat map for a species unless the species profile in the TBDC states otherwise. The species is considered present and the part of the subject land that is within the important habitat map forms the species polygon used to generate species credits.

Mapping of potential constraints for threatened flora and fauna is presented as past and present (field survey) records in **Figure 3-3** and **Figure 3-4**.

Summary of survey results

Surveys and incidental observations undertaken in 2021 and 2022 and have recorded 86 native bird species, 13 microbats, 2 mammals, 5 frogs and 4 reptiles.

These surveys identified 12 threatened species within Project area (refer to **Figure 3-4**):

- Slender Darling Pea (*Swainsona murrayana*) (listed vulnerable under both BC Act and EPBC Act)
- Silky Swainson-pea (*Swainsona sericea*) (listed vulnerable under BC Act)
- Spotted Harrier (*Circus assimilis*) (listed vulnerable under BC Act)
- White-fronted Chat (*Epthianura albifrons*) (listed vulnerable under BC Act)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) (listed vulnerable under BC Act)
- Little Eagle (*Hieraaetus morphnoides*) (listed vulnerable under BC Act)
- Square-tailed Kite (*Lophoictinia isura*) (listed vulnerable under BC Act)
- Plains-wanderer (*Pedionomus torquatus*) (listed endangered under BC Act and critically endangered under the EPBC Act)
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) (listed vulnerable under BC Act)
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*) (listed vulnerable under BC Act)
- Southern Myotis (*Myotis macropus*) (listed vulnerable under BC Act)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) (listed vulnerable under BC Act).

Superb Parrot (*Polytelis swainsonii*) (listed vulnerable under both BC Act and EPBC Act) was recorded near the Project area.

One marine species Rainbow bee-eater (*Merops ornatus*) listed under the EPBC Act has been recorded in the Project area during surveys.

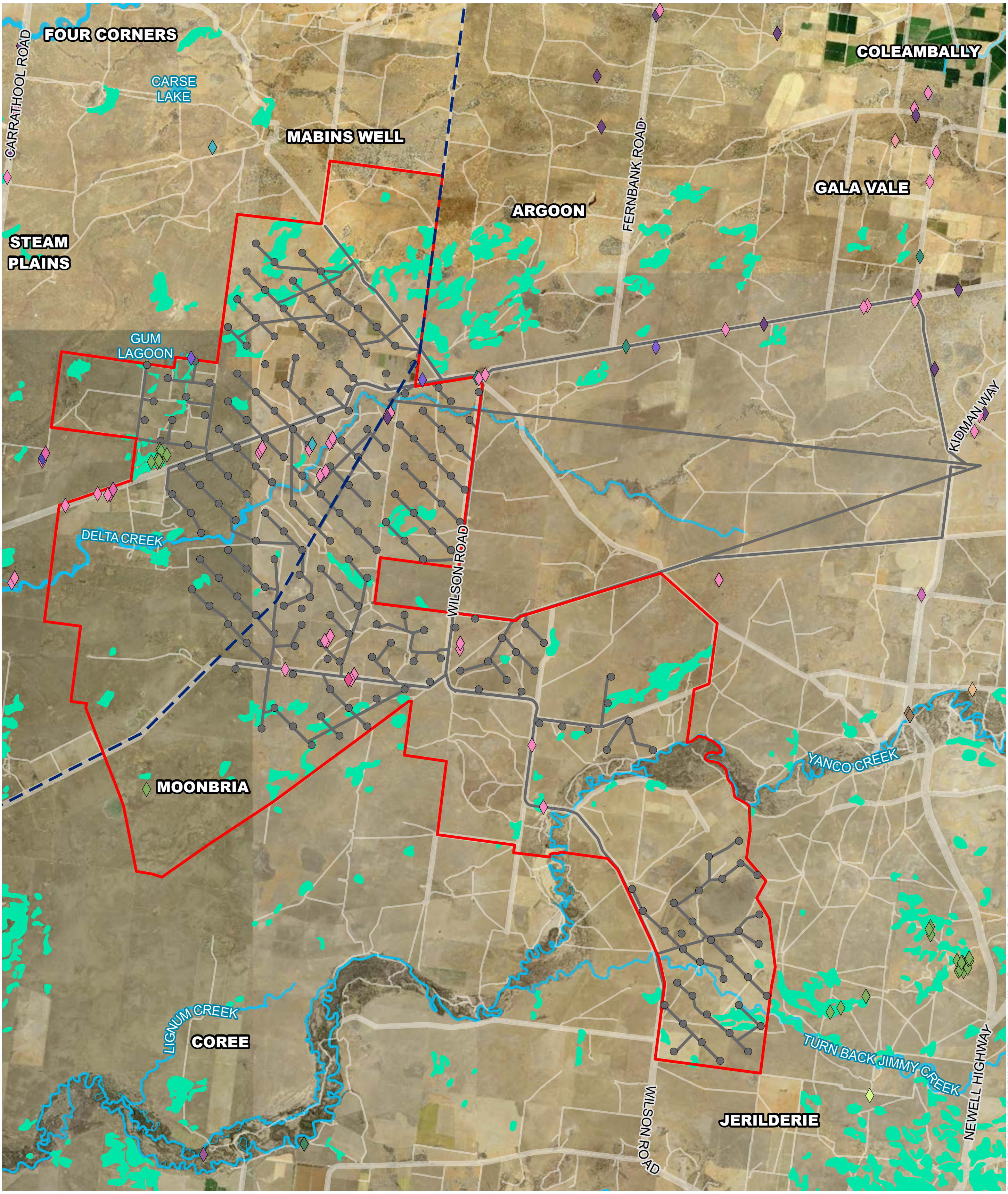
A total of 213 hollow bearing trees and stick nests have been identified within the Project area. Some of these are known to be active with birds of prey such as Wedge-tailed Eagle (*Aquila audax*). All nest trees are mapped in **Figure 3-5**.

Table 3-2 Threatened species with potential to occur in the Project area

Common name	Scientific name	EPBC Act status	BC Act status	Credit class	Likelihood of occurrence
Magpie Goose	*Anseranas semipalmata*	-	V	Ecosystem	Moderate
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Species and ecosystem	Moderate
Australian Bustard	*Ardeotis australis*	-	E	Species	Moderate
Dusky Woodswallow	***Artamus cyanopterus cyanopterus***	**-**	**V**	**Ecosystem**	**Recorded in Project area**
A spear-grass	*Austrostipa wakoolica*	E	E	Species	High
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Ecosystem	Moderate
Claypan Daisy	*Brachyscome muelleroides*	V	V	Species	High
Mossgiel Daisy	*Brachyscome papillosa*	V	V	Species	High
Bush Stone-curlew	*Burhinus grallarius*	-	E	Species	Moderate
Sand-hill Spider Orchid	*Caladenia arenaria*	E	E	Species	Moderate
Curlew Sandpiper	*Calidris ferruginea*	CE, M	E	Species and ecosystem	Moderate
Pied Honeyeater	*Certhionyx variegatus*	-	V	Ecosystem	High
Little Pied Bat	*Chalinolobus picatus*	-	V	Ecosystem	High
Spotted Harrier	***Circus assimilis***	**-**	**V**	**Ecosystem**	**Recorded in Project area**
Brown Treecreeper (eastern subspecies)	***Climacteris picumnus***	**-**	**V**	**Ecosystem**	**Recorded in Project area**
Bindweed	*Convolvulus tedmoorei*	-	E	Species	Moderate
Small Scurf-pea	*Cullen parvum*	-	E	Species	High
Varied Sittella	*Daphoenositta chrysoptera*	-	V	Ecosystem	High
-	*Diuris sp. (Oaklands, D.L. Jones 5380)*	-	E	Species	Moderate
White-fronted Chat	***Epthianura albifrons***	**-**	**V**	**Ecosystem**	**Recorded in Project area**

Common name	Scientific name	EPBC Act status	BC Act status	Credit class	Likelihood of occurrence
Yellow Gum	*Eucalyptus leucoxylon subsp. pruinosa*	-	V	Species	Moderate
Grey Falcon	*Falco hypoleucos*	V	E	Ecosystem	Moderate
Black Falcon	*Falco subniger*	-	V	Ecosystem	Moderate
Painted Honeyeater	*Grantiella picta*	V	V	Ecosystem	Moderate
Brolga	*Grus rubicunda*	-	V	Ecosystem	Moderate
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	-	V	Species and ecosystem	Moderate
Little Eagle	***Hieraaetus morphnoides***	**-**	**V**	**Species and ecosystem**	**Recorded in Project area**
White-throated Needletail	*Hirundapus caudacutus*	V	-	Ecosystem	Moderate
Swift Parrot	*Lathamus discolor*	CE	E	Species and ecosystem	High
Winged Peppercress	*Lepidium monoplocoides*	E	E	Species	Moderate
Lanky Buttons	*Leptorhynchos orientalis*	-	E	Species	High
Black-tailed Godwit	*Limosa limosa*	-	V	Species and ecosystem	Moderate
Southern Bell Frog	*Litoria raniformis*	V	E	Species	Moderate
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	-	V	Species and ecosystem	Moderate
Square-tailed Kite	***Lophoictinia isura***	**-**	**V**	**Species and ecosystem**	**Recorded in Project area**
Chariot Wheels	*Maireana cheelii*	V	V	Species	Moderate
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	-	V	Ecosystem	Moderate
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	-	V	Ecosystem	Moderate
Southern Myotis	***Myotis macropus***	**-**	**V**	**Species**	**Recorded in Project area**
Barking Owl	*Ninox connivens*	-	V	Species and ecosystem	Moderate
Blue-billed Duck	*Oxyura australis*	-	V	Ecosystem	Moderate

Common name	Scientific name	EPBC Act status	BC Act status	Credit class	Likelihood of occurrence
Gilbert's Whistler	*Pachycephala inornata*	-	V	Ecosystem	Moderate
Plains-wanderer	***Pedionomus torquatus***	**CE**	**E**	**Species and ecosystem**	**Recorded in Project area**
Scarlet Robin	*Petroica boodang*	-	V	Ecosystem	Moderate
Koala	*Phascolarctos cinereus*	E	V	Species and ecosystem	Low
Austral Pillwort	*Pilularia novae-hollandiae*	-	E	Species	Moderate
Regent Parrot (eastern subspecies)	*Polytelis anthopeplus monarchoides*	E	V	Species and ecosystem	Low
Superb Parrot	***Polytelis swainsonii***	**V**	**V**	**Species and ecosystem**	**Recorded near Project area**
Grey-crowned Babbler (eastern subspecies)	***Pomatostomus temporalis temporalis***	**-**	**V**	**Ecosystem**	**Recorded in Project area**
Prasophyllum sp. Moama	*Prasophyllum sp. Moama*	-	CE	Species	Moderate
Pterostylis despectans	*Pterostylis despectans*	E	CE	Species	Moderate
Redthroat	*Pyrrholaemus brunneus*	-	V	Ecosystem	High
Australian Painted Snipe	*Rostratula australis*	E	E	Ecosystem	Moderate
Yellow-bellied Sheathtail-bat	***Saccolaimus flaviventris***	**-**	**V**	Ecosystem	**Recorded in Project area**
Turnip Copperburr	*Sclerolaena napiformis*	E	E	Species	High
Menindee Nightshade	*Solanum karsense*	V	V	Species	Moderate
Diamond Firetail	*Stagonopleura guttata*	-	V	Ecosystem	High
Freckled Duck	*Stictonetta naevosa*	-	V	Ecosystem	Moderate
Slender Darling Pea	***Swainsona murrayana***	**V**	**V**	**Species**	**Recorded in Project area**
Red Darling Pea	*Swainsona plagiotropis*	V	V	Species	High
Silky Swainson-pea	***Swainsona sericea***	**-**	**V**	**Species**	**Recorded in Project area**
Masked Owl	*Tyto novaehollandiae*	-	V	Species and ecosystem	Moderate
Inland Forest Bat	*Vespadelus baverstocki*	-	V	Ecosystem	High



Indicative Project
- Project area
- Proposed footprint

Existing environment
- Waterways
- Road
- Existing electricity transmission line

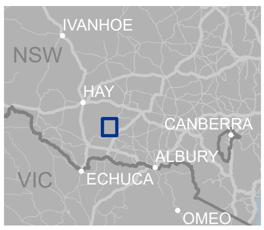
Threatened species
- Plains Wanderer important habitat - April 2021

BIONET NSW wildlife atlas records
- Black Falcon
- Black-chinned Honeyeater (eastern subspecies)
- Blue-billed Duck
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Dusky Woodswallow
- Flame Robin
- Grey-crowned Babbler (eastern subspecies)
- Koala

0 4 8 km

1:200,000 at A4

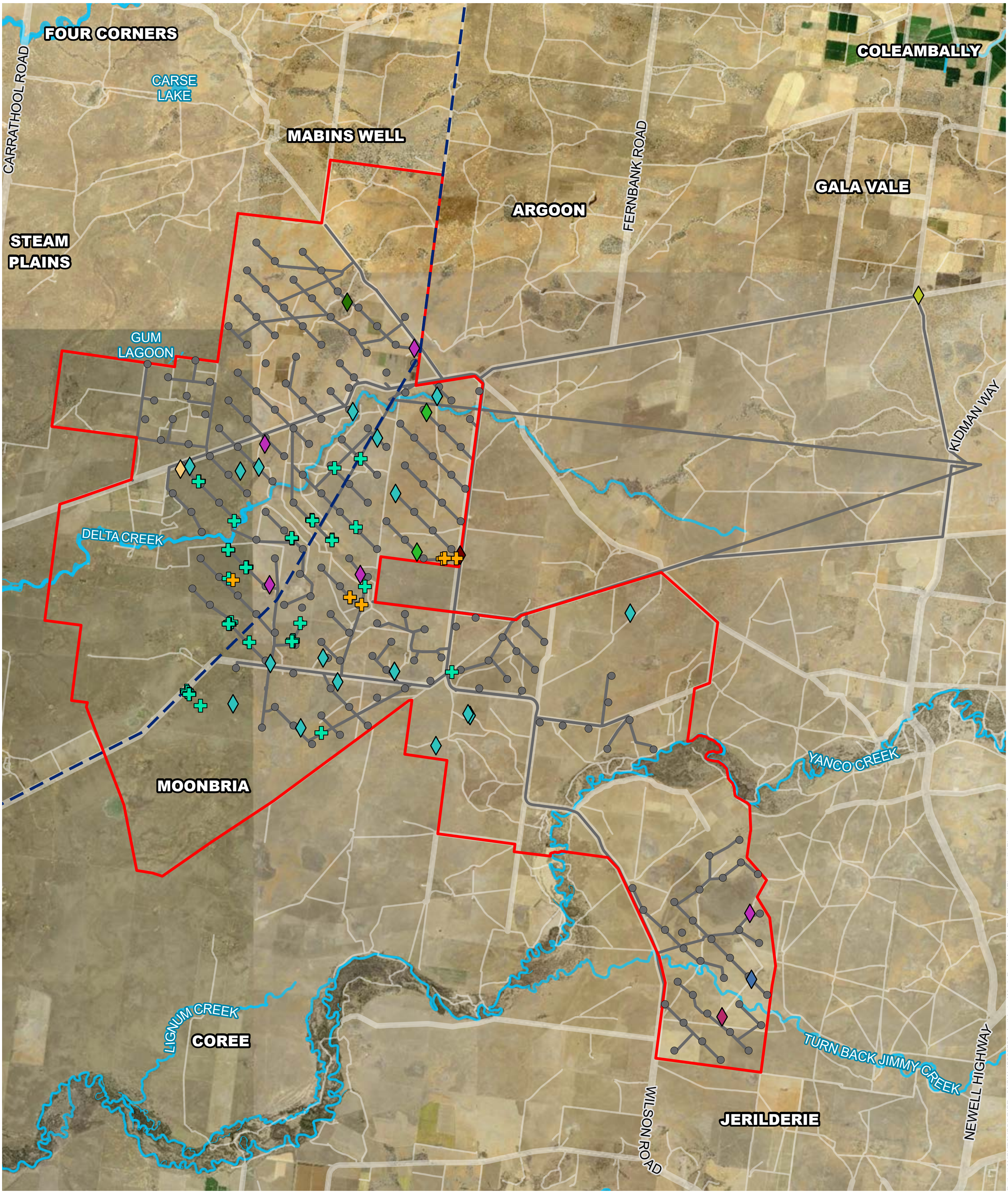
GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPIE 2021
Department of Regional NSW 2020
© Department of Customer Service 2020

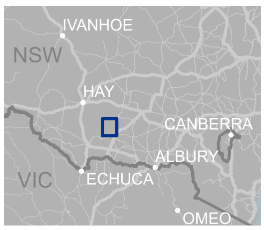
Figure 3-3 Threatened species records (NSW Bionet)



Indicative Project
Project area
Proposed footprint
Existing environment
Waterways
Road
Existing electricity transmission line

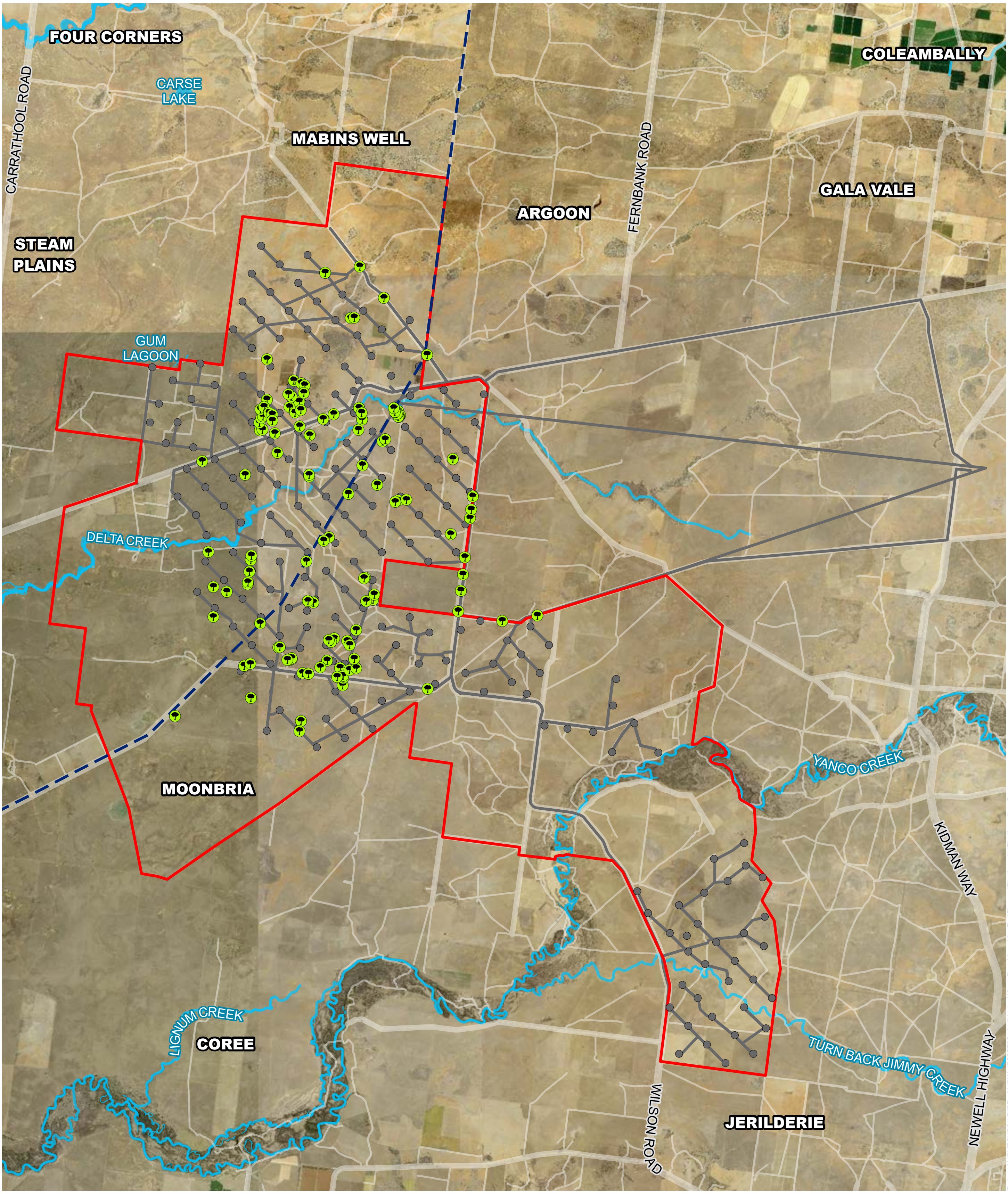
Recorded threatened species
Threatened flora
Silky Swainson-pea
Slender Darling Pea
Threatened fauna
Grey-crowned Babbler (eastern subspecies)
Little Eagle
Plains-Wanderer
Spotted Harrier
Square-tailed Kite
Superb Parrot
White-fronted Chat
Brown Treecreeper (eastern subspecies)
Dusky Woodswallow

0 4 8 km
N
1:200,000 at A4
GDA 1994 MGA Zone 55



Data sources
Jacobs 2022
Department of Regional NSW 2020

Figure 3-4 Threatened species recorded in field survey



Indicative Project
Project area
Proposed footprint
Existing environment
Waterways
Road
Existing electricity transmission line

Nest trees - February 2022

0 4 8 km

1:200,000 at A4

GDA 1994 MGA Zone 55

Data sources

Jacobs 2022
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 3-5 Hollow bearing trees and Stick nests recorded during field surveys

3.1.4 Aquatic ecological communities, key fish habitat and threatened fish

Key aquatic habitats and threatened fish populations are mapped in **Figure 3-6**.

The Murrumbidgee River, Edward River, Yanco Creek, Billabong Creek systems and associated tributaries form part of the Lower Murray River aquatic ecological community listed as an endangered ecological community under the *Fisheries Management Act 1994* (FM Act). This community provides habitat for a range of native fish, wetland birds and aquatic invertebrates, including five threatened species with potential to occur within the River Basin.

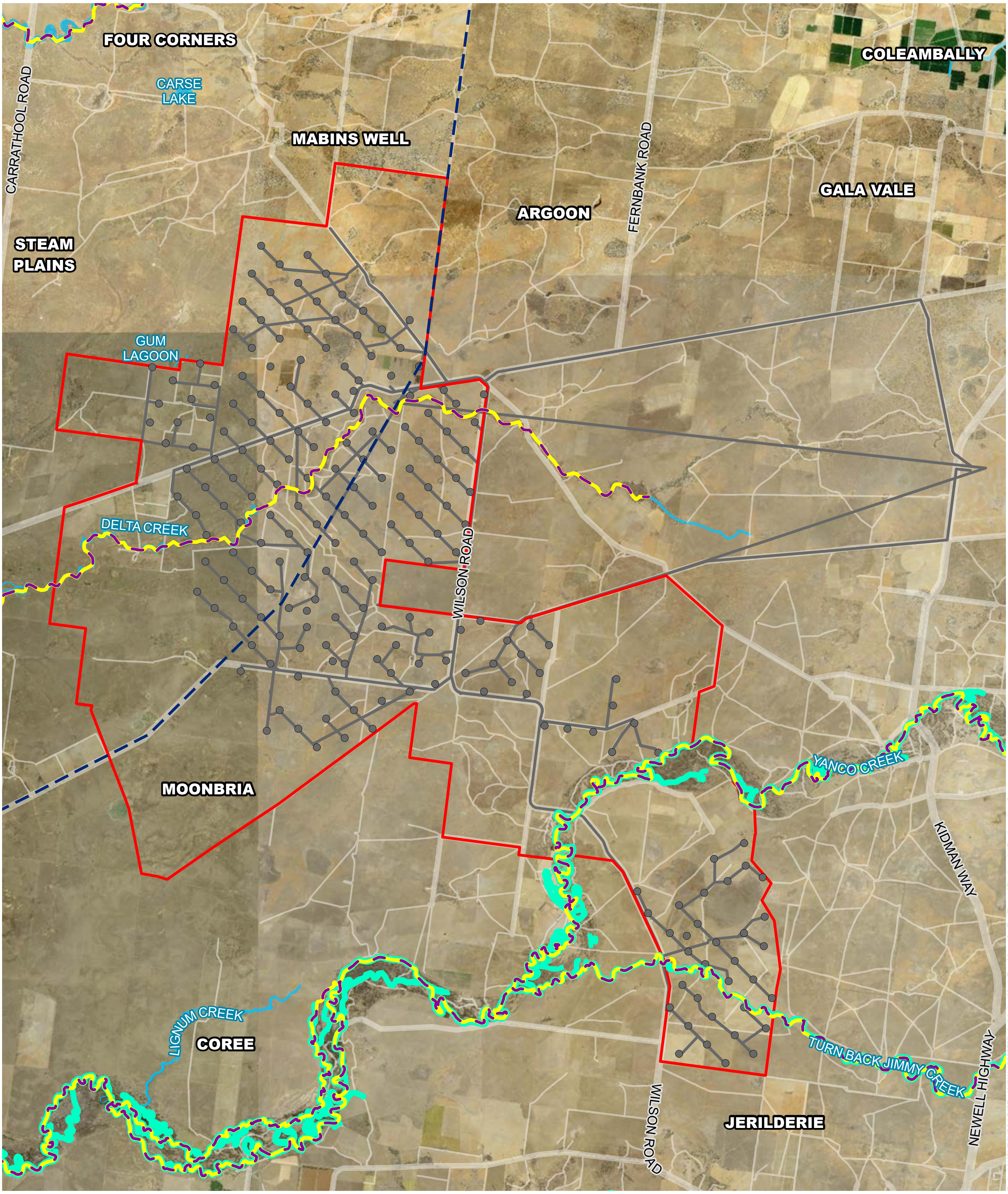
Three fish are considered to have a moderate likelihood of occurring in the Project area associated with parts of Delta Creek, Yanco Creek and Turn Back Jimmy Creek. These include the following:

- Silver Perch (*Bidyanus bidyanus*) is listed vulnerable under the FM Act
- Flathead Galaxias (*Galaxias rostratus*) is listed critically endangered under the FM Act and EPBC Act
- Murray Cod (*Maccullochella peelii)* is listed vulnerable under the EPBC Act.

Murray Cod and Silver Perch area considered to have a high potential to occur in Yanco Creek near the Project area. The Delta Creek and Turn Back Jimmy Creek do not have permanent water within the Project area and may only flow during large flood events.

Key fish habitats are aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. One of the key objectives of the FM Act is to conserve key fish habitats, which have been mapped within NSW by DPI (2013). Yanco Creek and Turn Back Jimmy Creek within the Project area are mapped as key fish habitat.

Potential impacts on threatened fish populations and key fish habitats would be addressed during detailed impact assessment.



Indicative Project
Project area
Proposed footprint
Existing environment
Waterways
Road
Existing electricity transmission line

Key Fish Habitat
Threatened fish populations
Sliver Perch (listed vulnerable under FM Act)
Flathead Galazias

0 4 8 km
1:200,000 at A4
GDA 1994 MGA Zone 55

Data sources
Jacobs 2022
DPI 2021
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 3-6 Key aquatic habitats and threatened fish populations

3.1.5 Wildlife corridors

No formal government biodiversity corridors were identified in the Project area. The landscape itself has locally significant biodiversity links in a large mosaic of natural habitats comprising grasslands, open myall woodland, partly wooded sandhills, Eucalypt woodland and lignum swamps. These habitats provide dependable links for birds, microbats, and large macropods within existing sheep and cattle grazing practices. The woodland patches provide very important stepping stones for native fauna between open natural grassland. Old drainage lines and large swamps with lignum and nitre goosefoot also provide important linkages for wildlife movement in the landscape.

3.1.6 Groundwater dependant ecosystems

Groundwater dependent ecosystems

The level of water dependence of vegetation communities in the study area has been identified using the Atlas of GDE (Bureau of Meteorology (BOM), 2016) and the *Risk Assessment Guidelines for Groundwater Dependant Ecosystems* released by the NSW DPI (Kuginis et al., 2012). The level of groundwater dependence and potential for interaction has been identified for ecological communities in the study area and is listed in **Table 3-3**.

Table 3-3 Level of groundwater dependence of vegetation in Project area

Type of GDE[1] PCT code	Supplied ecosystem type	GDE potential[2]
Aquatic	Watercourse	Low potential GDE - from national assessment
	Floodplain water body	Low potential GDE - from national assessment
	Connector	Low potential GDE - from national assessment
Terrestrial	Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Low potential GDE - from regional studies
	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion	High potential GDE - from regional studies
	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Low potential GDE - from regional studies
	Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Low potential GDE - from regional studies
	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression	Low potential GDE - from regional studies
	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	Low potential GDE - from regional studies

Type of GDE[1] PCT code	Supplied ecosystem type	GDE potential[2]
	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Low potential GDE - from regional studies
	Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	High potential GDE - from regional studies
	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Low potential GDE - from regional studies
	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains	Low potential GDE - from regional studies
	River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	High potential GDE - from regional studies
	Cotton Bush open shrubland of the semi-arid (warm) zone	Low potential GDE - from regional studies
	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	Low potential GDE - from regional studies

[1]GDE type determined using Risk Assessment Guidelines for Groundwater Dependant Ecosystems released by the NSW DPI (Kuginis et al., 2012).
[2]GDE potential as recognised by the Atlas of GDEs (Bureau of Meteorology, 2016)

3.2 Serious and irreversible impact entities

Serious and irreversible impacts (SAII) identifies threatened entities that are most at risk of extinction from potential development. An approval authority can approve a proposal which is likely to have serious and irreversible impacts for State Significant Infrastructure or State Significant Development project pathways, however the approval authority must take those impacts into consideration and determine whether there are any additional and appropriate measures that will minimise those impacts if approval is to be granted. Candidate entities are listed below to provide some context of the constraint associated with these entities. The following potential SAII entities may occur in the impact area the project include:

- *Brachyscome muelleroides*
- *Caladenia arenaria*
- *Convolvulus tedmoorei*
- *Diuris* sp. (Oaklands, D.L. Jones 5380)
- *Prasophyllum* sp. Moama
- *Pterostylis despectans*
- Curlew Sandpiper

- Plains-wanderer
- Swift Parrot.

3.3 Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The BV Map is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal. The BV Map has been prepared by DPIE under Part 7 of the BC Act.

The Biodiversity Values Map and Threshold Tool spatial data (DPIE, 2021) identified biodiversity values that occur within the Project area specified as Protected Riparian Land (which likely coincides with the key fish habitat mapping) and threatened species or communities with the potential for serious and irreversible impacts.

3.4 Matters of national environmental significance

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined as Matters of National Environmental Significance (MNES). There are no world heritage places or wetlands of international importance within proximity of the Project area.

MNES that are of relevance to the project, due to being known within the Project area (shown in **bold**) or with the likelihood of occurrence assessment (**Appendix A**) as having a moderate or high likelihood to occur, include:

- One critically endangered ecological community:
  - **Natural Grasslands of the Murray Valley Plains**
- Two endangered ecological community:
  - **Weeping Myall Woodlands**
  - Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions
- Three endangered flora:
  - *Austrostipa wakoolica*
  - *Lepidium monoplocoides*
  - *Sclerolaena napiformis*
- Eight vulnerable flora:
  - *Brachyscome muelleroides*
  - *Brachyscome papillosa*
  - *Caladenia arenaria*
  - *Maireana cheelii*
  - *Pterostylis despectans*
  - *Solanum karsense*
  - ***Swainsona murrayana***
  - *Swainsona plagiotropis*

- Five critically endangered fauna:
  - Regent Honeyeater
  - Curlew Sandpiper
  - Swift Parrot
  - **Plains-wanderer**
  - Flathead Galaxias
- Two endangered fauna:
  - Australasian Bittern
  - Australian Painted Snipe.
- Six vulnerable fauna:
  - Grey Falcon
  - Painted Honeyeater
  - White-throated Needletail
  - Southern Bell Frog
  - **Superb Parrot**
  - Murray Cod
- Twelve migratory and/or marine species:
  - Fork-tailed Swift
  - White-throated Needletail
  - Common Sandpiper
  - Sharp-tailed Sandpiper
  - Curlew Sandpiper
  - Pectoral Sandpiper
  - Cattle Egret
  - Black-eared Cuckoo
  - White-bellied Sea-Eagle
  - **Rainbow Bee-eater**
  - Blue-winged Parrot
  - Latham's Snipe.

3.5 Prescribed impacts

Only areas of native vegetation need to be assessed to determine vegetation integrity of biodiversity values under the BAM. However, prescribed impacts must be assessed under the biodiversity offset scheme as per clause 6.1 of the Biodiversity Conservation Regulation 2017, which includes:

a) on the habitat of threatened species or ecological communities associated with:
   i. karst, caves, crevices, cliffs, and other geological features of significance, or
   ii. rocks, or
   iii. human made structures, or
   iv. non-native vegetation

b) on areas connecting threatened species habitat, such as movement corridors

c) that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence resulting from underground mining)

d) on threatened and protected animals from turbine strikes from a wind farm

e) on threatened species or fauna that are part of a TEC from vehicle strikes.

3.6 Land categorisations

Land categories in the Project area are currently unmapped in the Native Vegetation Regulated map. A reasonable approximation is required to determine land categories in the Project area. The preferred approach is to first identify whether land meets criteria for Category 2 - Regulated Land, prior to Category 1 - Exempt Land. In some circumstances, land may meet multiple map criteria i.e. criteria for Category 2 - Regulated Land, AND Category 1 - Exempt Land. In most circumstances' Category 2 - Regulated Land criteria will determine the categorisation of the land, rather than Category 1 - Exempt Land criteria.

Mapping of exotic vegetation (non-native vegetation), farm dams and some existing tracks have been included in the preliminary constraints mapping as Category 1 - Exempt Land to identify options for design of infrastructure that avoid impacts on biodiversity. These mapped areas will continue to be revised and a proposed land categorisation method will be developed and provided to BCS for validation.

3.6.1 Category 2 - Regulated Land

Section 60I of the LLS Act defines the criteria in which land can be classified as Category 2 Regulated Land, this includes land which:

- Was not cleared of native vegetation as at 1 January 1990
- Was unlawfully cleared of native vegetation between 1 January 1990 and 25 August 2017
- Contains native vegetation that was grown or preserved with the assistance of public funds (other than funds for forestry purposes)
- Contains grasslands that are not low conservation grasslands is subject to a private land conservation agreement
- Is a 'set aside' under a Land Management (Native Vegetation) Code
- Is an offset under a property vegetation plan or a set aside under the former native vegetation laws

- Is subject to an approved conservation measure that was the basis for other land being biocertified
- Is identified as coastal wetlands or littoral rainforest
- Is identified as koala habitat
- Is a declared RAMSAR wetland
- Is mapped as containing critically endangered species of plants or a critically endangered ecological community.

The above criteria are inclusive of both Category 2 Vulnerable Regulated Land and Sensitive Regulated Land categories.

3.6.2 Category 1 - Exempt Land

Under section 6.8(3) of the BC Act, the BAM can exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on Category 1 - Exempt Land. Category 1 - Exempt Land is not currently mapped for public view. Category 1 - Exempt Land is land where, due to historical land use and detectable clearing or significant modification/disturbance since 1 January 1990, clearing on the land is not regulated (that is, it does not require approval) (OEH, 2017).

Section 60F Local Land Services Act 2013 (LLS Act) Act provides the transitional arrangements that are in place until a comprehensive NVR Map with all the land categories is published. During the 'transitional period' assessors can make a reasonable approximation of land categorisation for unpublished layers, in consultation with the landholder. Preliminary mapping of Category 1 - Exempt Land has been undertaken to identify locations in the Project area that would not require approval by DPIE.

Mapping is still being developed and is not provided in this memo. Due to the long history of agriculture in the Project area, much of the landscape has been disturbed or modified over the course of 150 years, mainly from grazing and fire wood collection during drought periods. However, the lack of 'perennial' weeds/exotic plants make the detection of Category 1 - Exempt Land difficult. There are obvious locations in the landscape where track and farm dam construction, ploughing and cropping are evident. Indicative areas of Category 1 - Exempt Land have been preliminarily mapped in the Project area based on the observations and analysis of:

- Historical and current aerial imagery
- Ploughed tracks around the boundary of properties
- Large scale ploughing of paddocks for cropping
- Existing vehicle tracks
- Location of farm dams
- Anecdotal dialogue from landholders.

4. Preliminary Offset Constraint Analysis

4.1 Background to the NSW biodiversity offset scheme

As the NSW Biodiversity Offsets Scheme will apply to the project, where native vegetation is impacted, this will have an offset obligation which would be determined through targeted surveys and preparation of a Biodiversity Development Assessment Report (BDAR). The number of biodiversity offset credits generated (both ecosystem credits and species credits) will depend on a range of factors, including:

- Landscape context
- The extent of each PCT being removed or disturbed
- The extent of species polygons or number of individuals (of flora species) for each species credit species being removed or disturbed
- The vegetation integrity of PCTs being removed or disturbed
- The loss of threatened fauna habitat assessed as a prescribed impact (e.g. windfarm blade strike, human structures and non-native vegetation) if the loss cannot be avoided or minimised (DPIE, 2020)
- Whether impacts comprise total removal or partial disturbance of values (e.g. clearance of canopy but retention of a native understorey within parts of the project).

Accurate calculation of impacts and hence the credit requirements would be completed as part of the BDAR.

There are several ways that Virya Energy can meet their offset obligation and these are governed by a set of offset rules established through the Biodiversity Conservation Regulation 2017. The offset rules permit proponents to meet their offset obligation by one or more of the following actions:

- Making a payment to the Biodiversity Conservation Fund (managed by the Biodiversity Conservation Trust) calculated using the offset payments calculator. Note, administration fees are charged by the BCT, and in many cases this may be more costly than the alternative methods
- Retiring credits based on the like-for-like rules or variation rules (where applicable) by purchasing credits from the open market – this is only feasible if required biodiversity credits are already available for purchase on the market. Public registers can be viewed here: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/offset-obligations-and-credit-trading/biodiversity-offsets-scheme-public-registers
- Funding a biodiversity conservation action, such as generating credits through establishment of a Biodiversity Stewardship Agreement (BSA), that benefits the threatened entity impacted by the development. The action must be listed in the Ancillary rules: Biodiversity conservation actions and meet the other requirements set out by these rules.

For large projects requiring retirement of a large number of credits, clients establishing their own offsets, or entering into agreements with landowners to establish offsets on their behalf, tend to be more cost effective then payment in the Fund. This could be further investigated by Virya Energy as the project progresses.

4.2 Estimation of relative offsetting constraints

Potential 'worst case' offset constraints for PCTs and species in the Project area has been calculated on a per hectare basis. Given the unknown number of species credits per PCT, an indicative offset guide has been based on prices per hectare for each species, rather than the sum of species credits per PCT.

This approach has been taken to enable comparison of the potential level of constraint associated with each of the PCTs identified in the Project area, and are likely to be substantially greater than the actual cost of credits per area.

The BAM calculator and Biodiversity Offsets Payment Calculator was used to estimate a baseline price per credit, for example, PCTs (ecosystem credit price) in this bioregional area range from $2,782.19 to $19,864.47 per credit. All prices include market coefficient, risk premium and administration costs assuming payment into the Biodiversity Conservation Fund, and do not consider potential cost efficiencies that may be achieved through other offset strategies. The prices are subject to change over time.

To estimate the worst-case offset costs for each PCT, the following assumptions were made:

- All PCTs are at benchmark condition – not all PCTs would realistically meet benchmark, however observations from field survey indicate much of the native vegetation is in good condition
- Total vegetation clearing in areas required for infrastructure
- Total native vegetation cover (in the landscape) is at 80%
- Vegetation patch size is greater than 100 hectares - this also increases the number of predicted species (ecosystem credits)
- The offset trading groups were selected based on the most extensively cleared or TECs associated with PCTs - in some cases, PCTs may not meet criteria for associated TECs, and broader offset trading groups may apply
- A confidence in the level of PCT classification and mapping – PCTs vary in classification confidence level depending on past sampling and effort of vegetation mapping
- All areas mapped as non-native vegetation and or Category 1 land have been excluded.

These attributes described above influence the number and type of biodiversity credits in the BAM calculator output and maximise the highest credit yield to determine a worst case offset obligation for the project.

The indicative offset cost (prices per credit and prices per hectare) are outlined for ecosystem credits and species credits in **Table 4-1**.

The estimate of species credit cost per hectare is based on the assumption that all species credit species associated with a PCT are present. Some flora species credits can only be calculated based on the number of individuals impacted. In this case, the cost per credit has been calculated based on one (1) individual plant. One flora species credit species, *Eucalyptus leucoxylon* subsp. *pruinosa* has a unit of measurement as a count of individuals rather than area and are shown in **Table 4-1**, as number of credit per individual.

The biodiversity risk weighting (scale from 1-3) for each biodiversity value is used as a risk multiplier to account for ecological risk and uncertainty of biodiversity sensitivity. This considers the increased threat posed to an entity from offsetting the loss of habitat or population and influences the number of credits.

Information from the indicative prices of ecosystem credits (**Table 4-1**) was used to develop an ecosystem credit offset cost constraints map (**Figure 4-1**) that shows the relative costs used to plan for avoidance of high value biodiversity values and minimisation of the ecosystem credit offset obligation. Given the unknown presence and distribution of many species credit species in the Project area, these were not included in an offset cost constraints map.

Table 4-1 Biodiversity credits, biodiversity risk rating and relative offset cost per ha

Biodiversity Value	Biodiversity risk weighting	No. of credits per ha (Benchmark)	Price / credit ($)	Indicative Price / ha (Benchmark)
Ecosystem credits				
PCT 9	1.75	43	$8,188.19	$352,092.34
PCT 11	1.5	37	$7,377.62	$272,971.89
PCT 12	1.5	38	$7,999.44	$303,978.89
PCT13	1.75	43	$2,782.19	$119,634.24
PCT 17	1.75	43	$13,332.01	$573,276.51
PCT 19	2	23	$4,975.54	$114,437.43
PCT 24	1.5	38	$7,999.44	$303,978.89
PCT 26	2	49	$5,998.05	$293,904.41
PCT 28	2	49	$5,831.98	$285,767.07
PCT 44	2	46	$10,829.33	$498,149.38
PCT 45	1.75	44	$12,340.26	$542,971.38
PCT 46	1.5	37	$19,864.47	$734,985.49
PCT 160	1.5	37	$7,999.44	$295,979.44
Species credits				
Anthochaera phrygia (Regent Honeyeater)		74	$432.54	$44,550.41
Ardeotis australis (Australian Bustard)		49	$309.97	$22,251.04
Austrostipa wakoolica (A spear-grass)		49	$173.02	$14,152.07
Brachyscome muelleroides (Claypan Daisy)		75	$17.30	$7,565.95
Brachyscome papillosa (Mossgiel Daisy)		50	$173.02	$14,440.89
Burhinus grallarius (Bush Stone-curlew)		50	$309.97	$22,705.14
Caladenia arenaria (Sand-hill Spider Orchid)		74	$865.08	$83,180.81
Calidris ferruginea (Curlew Sandpiper)		148	$309.97	$67,207.21
Convolvulus tedmoorei (Bindweed)		74	$865.08	$83,180.81
Cullen parvum (Small Scurf-pea)		49	$865.08	$55,079.19
**Eucalyptus leucoxylon* subsp. *pruinosa* (Yellow Gum)		2 / individual	$865.08	$2,248.13 / individual

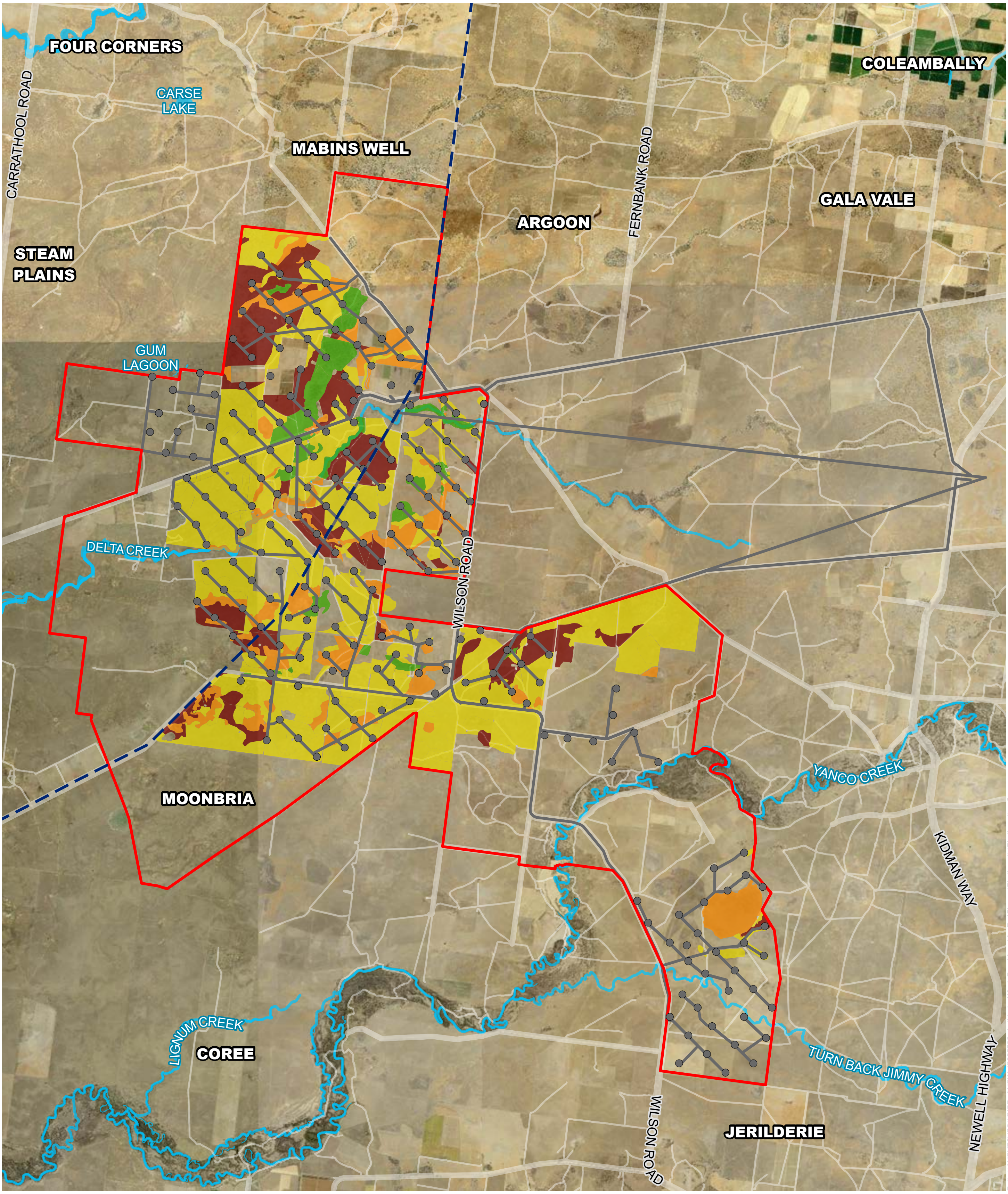
Biodiversity Value	Biodiversity risk weighting	No. of credits per ha (Benchmark)	Price / credit ($)	Indicative Price / ha (Benchmark)
Haliaeetus leucogaster (White-bellied Sea-Eagle)		49	$173.02	$14,152.07
Hieraaetus morphnoides (Little Eagle)		37	$463.67	$23,665.32
Lathamus discolor (Swift Parrot)		74	$309.97	$33,603.61
Lepidium monoplocoides (Winged Peppercress)		49	$173.02	$14,152.07
Leptorhynchos orientalis (Lanky Buttons)		49	$865.08	$55,079.19
Limosa limosa (Black-tailed Godwit)		49	$463.67	$31,340.56
Litoria raniformis (Southern Bell Frog)		49	$309.97	$22,251.04
Lophochroa leadbeateri (Major Mitchell's Cockatoo)		49	$463.67	$31,340.56
Lophoictinia isura (Square-tailed Kite)		37	$463.67	$23,665.32
Maireana cheelii (Chariot Wheels)		49	$158.64	$13,301.67
Myotis macropus (Southern Myotis)		49	$741.31	$47,759.66
Ninox connivens (Barking Owl)		50	$173.02	$14,440.89
Pedionomus torquatus (Plains-wanderer)		74	$309.97	$33,603.61
Phascolarctos cinereus (Koala)		49	$495.24	$33,207.55
Pilularia novae-hollandiae (Austral Pillwort)		74	$173.02	$21,372.52
Polytelis anthopeplus monarchoides (Regent Parrot (eastern subspecies))		50	$309.97	$22,705.14
Polytelis swainsonii (Superb Parrot)		49	$741.31	$47,759.66
Sclerolaena napiformis (Turnip Copperburr)		46	$147.57	$11,872.70
Solanum karsense (Menindee Nightshade)		37	$173.02	$10,686.26

Biodiversity Value	Biodiversity risk weighting	No. of credits per ha (Benchmark)	Price / credit ($)	Indicative Price / ha (Benchmark)
Swainsona murrayana (Slender Darling Pea)		50	$173.02	$14,440.89
Swainsona plagiotropis (Red Darling Pea)		50	$158.64	$13,573.13
Swainsona sericea (Silky Swainson-pea)		49	$158.64	$13,301.67
Tyto novaehollandiae (Masked Owl)		49	$463.67	$31,340.56

*denotes flora species credit species with a unit of measurement as a count of individuals

4.3 Offset constraint map

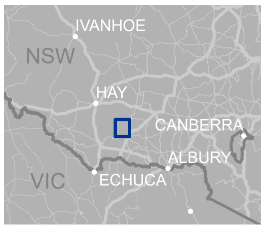
The potential ecosystem credit costs generated have been applied to the PCT map to develop an indicative offset constraint map (presented in **Figure 4-1**). Each PCT is categorised in one of four price brackets (low, medium, high and very high) showing the likely worst case cost per hectare to assist in avoidance of high value / offset generating areas and minimisation of the ecosystem credit offset obligation. This provides a guide only, and the actual cost of ecosystem credits per hectare would be determined following detailed assessment of the landscape context and vegetation condition. Species credits are unable to be mapped at this stage.



Indicative Project
Project area
Proposed footprint
Existing environment
Waterways
Road
Existing electricity transmission line

Ecosystem credits (Price/ha)
Low ($100,000-$200,000)
Medium ($200,000-$400,000)
High ($400,000-$600,000)
Very High ($600,000-$800,000)

0 4 8 km
1:200,000 at A4
GDA 1994 MGA Zone 55



Data sources
Jacobs 2022
Department of Regional NSW 2020
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Figure 4-1 Ecosystem credit offset cost constraints (worst case approach)

5. Summary and recommendations

The constraints assessment identifies the following key biodiversity constraints within the Project area:

- Likely or confirmed occurrence of two endangered ecological communities listed under the BC Act, and potential occurrence of an additional one endangered ecological community listed under the EPBC Act
- Likely or confirmed of one critically endangered ecological community and one endangered ecological community listed under the EPBC Act and potential occurrence of an additional one endangered ecological community listed under the EPBC Act
- Known and potential habitat for a range of BC Act listed threatened plant species and threatened fauna, including vegetation associated with habitat for 34 candidate species credit species
- Known and potential occurrence of eleven threatened flora species, eleven threatened fauna and twelve migratory and/or marine fauna species listed under the EPBC Act
- Riparian areas (including drainage lines), buffer zones, an endangered aquatic ecological community, GDEs and key fish habitat and threatened fish populations
- Locally significant fauna habitat and biodiversity links for maintaining landscape connectivity
- Important nesting areas for birds of prey, including presence of confirmed nest sites.

A worst case approach was applied to estimate credit costs per hectare to allow comparison and mapping of relative offset scale associated with different areas of the Project site. The assessment isn't intended to estimate total offset costs of the project, rather provide analysis that can be used to refine the project design to avoid and minimise significant offset costs.

The constraints analysis has highlighted that large areas of natural grassland and woodland in high condition occur in the Project area and represent a risk in terms of offset costs, however there are opportunities to avoid and reduce the project footprint in these key areas to lower the offset costs and this is recommended. Further recommendations are as follows:

- Further field verification of the State Vegetation Type Mapping, the vegetation integrity assessment and particularly categorisation of land is required to better inform impact on native vegetation and threatened species habitat
- Continued consultation with the BCS of DPIE is recommended regarding the approach to refinement of the State Vegetation Type Mapping, and specifically confirming areas requiring further assessment. This should include the steps needed to confirm the mapping of non-native vegetation such as Category 1 – Exempt Land to avoid the need to undertake survey work in these areas without later questions from BCD at assessment phase
- Final project specific offsetting requirements under the EIS will need to be refined through application of the BAM and preparation of a BDAR. This would include further field-based habitat assessment and targeted surveys to refine the extent of species habitat polygons for species credit species. Preparation of the BDAR will enable finalisation of offset credit obligation, taking into consideration vegetation condition, species credit species polygons and the extent and nature of impacts
- Once offsets are determined and locked into the approval, there is very little flexibility to change the design to reduce the project offset obligation and avoidance is best done at the planning and design stage and will be informed by further targeted species surveys and the constraints map presented.

- Typically, the NSW planning approval will require that biodiversity offsets are met prior to construction commencing. Therefore development of an offset strategy early in the project planning is recommended and may include a combination of actions, such as:
  - Sourcing credits for sale and retiring these through direct negotiation with credit owners,
  - Paying into the Biodiversity Conservation Fund or
  - Progressing Stewardship Site Agreements on suitable properties to generate credits, or a combination of these.
- Where large scale retiring of credits is required, it is in our experience that retiring credits through direct negotiation with credit owners where available, or progressing stewardship site agreements to generate credits, is more cost effective then paying into the Biodiversity Conservation Fund.

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Appendix A Threatened and migratory species likelihood of occurrence

Table A-1 Known or potentially occurring threatened ecological communities

Name	EPBC Act	BC Act	Data Source	Likelihood of Occurrence in the Project area
Threatened Ecological Communities				
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions Endangered Ecological Community	Endangered	Endangered	EESG, PMST	High (known) This TEC has been recorded within areas of PCT26 within the Project area.
Natural Grasslands of the Murray Valley Plains Critically Endangered Ecological Community	Critically Endangered	-	EESG, PMST	High (known) This TEC has been recorded within areas of PCT44, 45 and 46 within the Project area
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	-	Endangered	EESG, PMST	High (known) This TEC has been recorded within areas of PCT 19 within the Project area.
Allocasuarina luehmannii (Buloke)Woodland in the Riverina and Murray-Darling Depression Bioregions	Endangered	Endangered	PMST	Moderate No PCTs associated with the TEC are mapped on the site, however vegetation types would be confirmed following vegetation surveys. Suitable habitat is present.
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	-	Endangered	EESG, PMST	High It is possible that parts of the Project area comprise this TEC as an associated PCT (PCT 28) is mapped within the site. This will require vegetation survey to determine its presence.

PMST = Identified from the Protected Matters Search Tool (PMST) (DAWE, 2021)

BAM-C= Biodiversity Assessment Method Calculator tool (DPIE, 2020)

BioNet= NSW BioNet (DPIE, 2021)

Table A-2 Likelihood of occurring threatened species and migratory species in the Project area

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Flora						
Amphibromus fluitans (River Swamp Wallaby-grass)	V	V	River Swamp Wallaby-grass occurs in southern NSW, Victoria, South Australia and Tasmania. Amphibromus fluitans grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Flowering time is from spring to autumn or November to March. Disturbance regimes are not known, although the species requires periodic flooding of its habitat to maintain wet conditions.	PMST	Periodically inundated sites (including table drains and farm dams), notably wetlands on riverine floodplain.	Low Suitable habitat for the species was not recorded and species has not been recorded within the locality. There are some records located south west in Deniliquin.
Austrostipa wakoolica	E	E	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South-West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise.	PMST, BAM-C	Alluvial plains and plains. South of the Murrumbidgee River	High Suitable habitat for the species is present, however no records within the locality. There are some records located south of Jerilderie.
Brachyscome muelleroides Mueller Daisy)	V	V	The Mueller Daisy occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with Pycnosorus globosus, Agrostis avenacea and Austrodanthonia duttoniana. Also recorded from the margins of lagoons in mud or water, and in association with Calotis anthemoides.	PMST	Floodplains on grey-brown or red-brown clays and claypans. Wetland-grassland communities on grey-brown or red-brown clays and claypans. East of the Cobb Highway and south of Griffith	High Suitable habitat for the species is present, however the species has not been recorded within the locality. There are records located east near Wagga Wagga and south within the Murray Valley National Park.
Brachyscome papillosa (Mossgiel Daisy)	V	V	The Mossgiel Daisy is endemic to NSW and chiefly occurs within the Riverina Bioregion, from Mossgiel in the north, Murrumbidgee Valley (Yanga) National Park in the south west to Urana in the south east. Sites are scattered across this Bioregion including the Jerilderie area, the Hay Plain (Maude and Oxley) and around Darlington Point. In addition, there are a number of records from the Willandra Lakes World Heritage Area (including Mungo National Park) with a north-western outlier at Byrnedale Station, north of Menindee. The only known site on South Western Slopes	BioNet PMST	-	High Suitable habitat for the species is present in the Cypress Pine forests, with records within the locality of the Project area. Suitable chenopod

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			is Ganmain Reserve. Recorded primarily in clay soils on Bladder Saltbush (Atriplex vesicaria) and Leafless Bluebush (Maireana aphylla) plains, but also in grassland and in Inland Grey Box (Eucalyptus microcarpa) - Cypress Pine (Callitris spp.) woodland.			shrubland and grassland habitat occurs in the Project area.
Caladenia arenaria (Sand-hill Spider Orchid)	E	E	Caladenia arenaria is found mostly on the south west plains and western south west slopes. The original description is of a plant from Nangus, west of Gundagai. Occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (Callitris glaucophylla).	BAM-C	Geographic – East of Jerilderie	Moderate Suitable habitat for the species is present in the Cypress Pine forests, however no records are within the Project area. However, the site is marginally west of Jerilderie.
Convolvulus tedmoorei Bindweed)	-	E	This species has been recorded from northern inland areas of South Australia, south-western Queensland and western NSW. There are few known records from NSW. Grows in self-mulching grey clay soils on the floodplains of the Darling and Murrumbidgee Rivers. Flowering specimens of Convolvulus tedmoorei were collected in late winter (August) and early spring (September). Disturbance regimes are not known, although the species may require periodic flooding of its habitat to maintain the wet conditions suitable for seed set and germination.	BAM-C	-	Moderate Possible suitable habitat within the Project area, however no records within the locality.
Cullen parvum (Small Scurf-pea)	-	E	The Small Scurf-pea is known in NSW from only two herbarium collections; one from Wagga Wagga in 1884 and the other from Jindera (near Albury) in 1967. A small population was recently reported from near Jerilderie (although it has not been relocated). Plants are found in grassland, River Red Gum (Eucalyptus camaldulensis) Woodland or Box-Gum Woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses, in areas with rainfall of between 450 and 700 mm. Plants tend to die back in dry seasons and resprout with rain in winter or spring; in dry years, plants apparently do not always produce shoots but survive below the ground.	BAM-C	Geographic – Hay Plains and to east	High Suitable habitat is present and the site is within about 30km of the only known population.
Diuris sp. (Oaklands, D.L. Jones 5380)	-	E	Currently known only from the Oaklands-Urana region of southern NSW. Grows in White Cypress Pine (Callitris glaucophylla) Woodland, either among dense grasses in flat areas with associated eucalypts, or amongst sparse grasses and forbs on low sandhills. Grows mostly on sandy loam soils	BAM-C	-	Moderate Some suitable habitat is present in the White Cypress Pine forests. No records are within the Project area and the closest records are about 50k to the east.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Eucalyptus leucoxylon subsp. Pruinose (Yellow Gum)	-	V	Restricted to several small areas between Barham and Euston. This species is not known from any protected area within NSW, Eucalyptus leucoxylon subsp. pruinosa is a tree species which, in New South Wales, occurs at the bases of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina Bioregion.	BAM-C		Moderate There is possible habitat present in the Project area, however no records are present. The closest records are about 80km to the south near the Murry River.
Lepidium monoplocoides (Winged Pepper-cress)	E	E	Widespread in the semi-arid western plains regions of NSW. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by Allocasuarina luehmannii (Bulloak) and/or eucalypts, particularly Eucalyptus largiflorens (Black Box) or Eucalyptus populnea (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising Eragrostis australasicus, Agrostis avenacea, Austrodanthonia duttoniana, Homopholis proluta, Myriophyllum crispatum, Utricularia dichotoma and Pycnosorus globosus, on waterlogged grey-brown clay. Also recorded from a Maireana pyramidata shrubland.	PMST, BAM-C	-	Moderate Suitable habitat possible in waterlogged area, no records within the Project area. There are some records located near Lake Urana, about 40km east of the Project area
Leptorhynchos orientalis (Lanky Buttons)	-	E	Recorded from several Hay Plain and southern Riverina localities. Grows in woodland or grassland, sometimes on the margins of swamps. Communities include a Bimble Box plain in red-brown soil, dense Acacia pendula woodland with herbaceous understorey on red clay to clay-loam, open grassland areas on red soils, and red clay plains at the edge of a Canegrass swamp. Associated species include Eucalyptus populnea subsp. bimbil, Acacia pendula, Eragrostis australasica, Lepidium monoplocoides, Enchylaena tomentosa, Minuria leptophylla, Rhodanthe floribunda, R. pygmaea and Ptilotus spathulatus.	BAM-C	-	High Suitable vegetation is present on site within the forested and grassland communities. No records within the Project area, however Lake Urana and Buckingbong State Forest, from about 40km east of the Project area.
Maireana cheelii (Chariot Wheels)	V	V	Restricted to the southern Riverina region of NSW, mainly in the area between Deniliquin and Hay. Usually found on heavier, grey clay soils with Atriplex vesicaria (Bladder Saltbush). Recorded on the Hay Plain in Atriplex vesicaria, Maireana aphylla and Acacia homalophylla shrublands. Soils include heavy brown to red-brown clay-loams, hard cracking red clay, other heavy texture-contrast soils. Tends to grow in shallow depressions, often on eroded or scalded surfaces, and does not extend to the higher soils in the habitat. It has been found on the edges of bare,	BAM-C	Heavy grey clay soils and claypans or shallow depressions West of Darlington Point, west of Jerilderie	Moderate Some suitable habitats present, however no records within the Project area. The species is known population starting about 30km east of the Project area.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			windswept claypans, in shallow depressions of eroded surfaces where rainwater collects and on a "shelf" in the crabhole complex of heavy grey soils.			
Pilularia novae-hollandiae (Austral Pillwort)	-	E	Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Most of the records in the Albury-Urana area were from table drains on the sides of roads.	BAM-C	East of Deniliquin	Moderate Some suitable habitat is present in wetland areas. There are no records within the Project area, however there are several scattered around the region. The closest record is near Jerilderie.
Prasophyllum sp. Moama	-	CE	Prasophyllum sp. Moama is known in NSW from only one locality, discovered in 2005, near Moama. Occurs in forb-rich natural grasslands on flat alluvial plains. Occurs on reddish calcareous clay-loam soils.	BioNet	-	Moderate There is suitable habitat present in alluvial grasslands of the Project area, however the only records of the species are about 100km to the south-west near Moama.
Pterostylis despectans	-	CE	In New South Wales the species is known only from a single population discovered in 2005 near Moama. The species also occurs as very small fragmented populations in central Victoria and in South Australia. The total estimated number of individuals in the Victorian and South Australian populations is less than 1500. The Moama population has been assessed as comprising between 20 and 60 individual plants.	BioNet	-	Moderate There is suitable habitat present in alluvial grasslands of the Project area, however the only records of the species are about 100km to the south-west near Moama.
Sclerolaena napiformis (Turnip Copperburr)	E	E	Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of Austrostipa nodosa and Chloris truncata, in grey cracking clay to red-brown loamy clay. Sites are roadside travelling stock routes and reserves subject to sheep grazing. Associated species include Austrodanthonia duttoniana, Enteropogon acicularis, Austrostipa nodosa, Chloris truncata, Lolium rigidum, Swainsona murrayana, S. plagiotropis, S. procumbens, Rhodanthe corymbiflora, Calotis scabiosifolia, Microseris lanceolata, Acacia pendula and various chenopods.	BioNet PMST, BAM-C	Hay plain	High Several records located within the locality of the Project area along Billabong Creek near Jerilderie. Suitable chenopod shrubland and grassland habitat may occur in the Project area.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Swainsona murrayana (Slender Darling Pea)	V	V	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated.	BioNet PMST	-	High (known) Species has historical records within the Project area and was recorded during the 2021/22 surveys. Occurs in variety of habitats including Black Box woodlands.
Swainsona plagiotropis (Red Darling Pea)	V	V	Occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria. Most NSW records are from the Jerilderie area, with possible collections from the Louth-Bourke area and a disjunct record in the north-western plains from Buttabone Stud Park 35 km NW of Warren. Grows on flat grassland and in heavy red soil, often on roadsides and especially in table drains. Soils are derived from quaternary sediments and are usually red-brown clay-loams. The species is absent from black low-lying soils. Recorded from roadsides, rail reserves, stock routes and areas of lightly grazed unimproved pasture comprising Austrodanthonia, Enteropogon acicularis and Austrostipa grassland communities.	BioNet PMST	-	High Species was previously recorded within the Project area, however not during the 2021/22 surveys. Suitable habitat present.
Swainsona sericea (Silky Swainson-pea)	-	V	Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum Eucalyptus pauciflora Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South-West Slopes. Sometimes found in association with cypress-pines Callitris spp. Habitat on plains unknown.	BioNet	-	High (known) Recorded during the 2021/22 surveys. Records located within the locality of the Project area. Suitable habitat present.
Birds						
Anthochaera phrygia (Regent Honeyeater)	CE	CE	The Regent Honeyeater that has a patchy distribution between south-east Queensland and central Victoria. It mostly inhabits inland slopes of the Great Dividing Range, in areas of low to moderate relief with moist, fertile soils. It is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest, but also inhabits riparian vegetation such as Sheoak (Casuarina spp) where it feeds on needle-leaved mistletoe and sometimes breeds. It sometimes utilises lowland coastal forest,	PMST	Breeding - as per mapped areas.	Moderate Suitable habitat for the species was not recorded and species has not been recorded within the locality. There are some records located south west in Deniliquin.

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			which may act as a refuge when its usual habitat is affected by drought. It also uses a range of disturbed habitats within these landscapes including remnant patches in farmland and urban areas and roadside vegetation. It feeds primarily on the nectar of eucalypts and mistletoes and, to a lesser extent, lerps and honeydew; it prefers taller and larger diameter trees for foraging. It is nomadic and partly migratory with its movement through the landscape being governed by the flowering of select eucalypt species. There are four known key breeding areas: three in NSW and one in Victoria. Breeding varies between regions and corresponds with flowering of key eucalypt and mistletoe species. It usually nests in horizontal branches or forks in tall mature Eucalypts and Sheoaks.			
Anseranas semipalmata (Magpie Goose)	-	V	The Magpie Goose is still relatively common in the Australian northern tropics, but had disappeared from south-east Australia by 1920 due to drainage and overgrazing of reed swamps used for breeding. Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes.	BAM-C	-	Moderate No records in the Project area, but several in the broader locality. Some suitable habitat in the wetland areas.
Ardeotis australis (Australian Bustard)		E	The Australian Bustard mainly occurs in inland Australia and is now scarce or absent from southern and south-eastern Australia. Mainly inhabits tussock and hummock grasslands, though prefers tussock grasses to hummock grasses; also occurs in low shrublands and low open grassy woodlands; occasionally seen in pastoral and cropping country, golf courses and near dams. Breeds on bare ground on low sandy ridges or stony rises in ecotones between grassland and protective shrubland cover; roosts on ground among shrubs and long grasses or under trees.	BAM-C	-	Moderate Some suitable habitat present on site, however no records within the locality. Few records near Deniliquin prior to 2005.
Artamus cyanopterus cyanopterus (Dusky Woodswallow)	-	V	Dusky Woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Found in open forests and woodlands, and may be seen along roadsides and on golf courses. Nomadic; south-eastern population migrates north in autumn.	BioNet, BAM-C	-	High (known) One sighting has been recorded within the locality, and suitable habitat is present

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Botaurus poiciloptilus (Australasian Bittern)	E	E	Occurs from south-east Queensland to south-east South Australia, Tasmania and the southwest of Western Australia. The Australasian Bittern's preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate.	PMST, BAM-C	Brackish or freshwater wetlands.	Moderate Suitable habitat is present in areas of freshwater wetlands. However, the species has not been recorded within the locality. There are, however, multiple records located surrounding the Project area to the north, east, south and west.
Burhinus grallarius (Bush Stone-curlew)	-	E	Open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	BioNet, BAM-C	Fallen/standing dead timber including logs	Moderate Suitable habitat for the species is present, however the species has not been recorded within the locality. There is one local record from 1977 to the east of the Project area.
Calidris ferruginea (Curlew Sandpiper)	M, CE	E	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. t generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	BAM-C	Foraging – As per mapped areas	Moderate Suitable habitat present in wetlands areas for temporary migration. No records in the Project area, and not within 100km. closest records are near Leeton in the Fivebough wetlands.
Certhionyx variegatus (Pied Honeyeater)	-	V	Widespread throughout Acacia, Mallee and Spinifex scrubs of arid and semi-arid Australia. Occasionally occurs further east, on the slopes and plains and the Hunter Valley, typically during periods of drought. Inhabits wattle shrub, primarily Mulga (Acacia aneura), Mallee, Spinifex and Eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (Eremophila spp.); also from mistletoes and various other shrubs (e.g. Grevillea spp.); also eats saltbush fruit, berries, seed, flowers and insects.	BioNet BAM-C	-	High Suitable habitat for the species is present in Eucalypt and Acacia woodlands, however there are no records within the locality. There are some records located to the west of the Project area.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Circus assimilis (Spotted Harrier)	-	V	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months.	BioNet, BAM-C	-	High (known) Some previous records within the Project area and recorded during 2021/22 surveys. Suitable shrubland, grassland and woodland habitats.
Climacteris picumnus victoriae (Brown Treecreeper (eastern subspecies))	-	V	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (Eucalyptus camaldulensis) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Hollows in standing dead or live trees and tree stumps are essential for nesting.	BioNet	-	High (known) Species recorded during 2021/22 surveys. Some historical records within the Project area. May provide suitable Semi-arid woodlands and Wetland habitats.
Daphoenositta chrysoptera (Varied Sittella)	-	V	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	BAM-C	-	High Suitable habitat is present in eucalypt and Acaia woodlands. No records in the Project area, however numerous within the surrounding National Parks.
Epthianura albifrons (White-fronted Chat)	-	V	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and	BioNet	-	High (known) Some historical records within the Project area and recorded during 2021/22 surveys. Suitable Semi-arid woodlands, Grasslands, Arid Shrublands and Wetland habitats.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			sometimes in low shrubs bordering wetland areas. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs.			
Falco hypoleucos (Grey Falcon)	V	E	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	PMST, BAM-C	-	Moderate Some records within the Project area. May provide suitable Semi-arid woodlands, Grasslands and Arid Shrubland habitats.
Falco subniger (Black Falcon)	-	V	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referrable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres. The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	BioNet, BAM-C	-	Moderate Some records within the Project area. May provide suitable Semi-arid woodlands, Grasslands and Arid Shrublands and Wetland habitats.
Grantiella picta (Painted Honeyeater)	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	BioNet PMST, BAM-C	Mistletoes present at a density of greater than five mistletoes per hectare.	Moderate Some records within the Project area. May provide suitable Semi-arid woodland habitat.
Grus rubicunda (Brolga)	-	V	The Brolga was formerly found across Australia, except for the south-east corner, Tasmania and the south-western third of the country. It is still abundant in the northern tropics, but very sparse across the southern part of its range. Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. They feed using their heavy straight bill as a 'crowbar' to probe the ground or turn it over, primarily on sedge roots and tubers. They will also take large insects, crustaceans, molluscs and frogs.	BioNet, BAM-C	-	Moderate Suitable habitat is present in wetlands areas, however the species has not been recorded within the locality. Records outside of the locality to the north, east, south and west.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Haliaeetus leucogaster (White-bellied Sea-Eagle)	-	V	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.	BAM-C	Breeding - Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Moderate Some terrestrial habitat exists, however no records are in the Project area. the Project area does not provide key habitat due to the lack of major waterways.
Hieraaetus morphnoides (Little Eagle)	-	V	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. It occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	BAM-C	Breeding -Nest trees - live (occasionally dead) large old trees within vegetation)	High (known) The species was recorded in the 2021/22 surveys. No historical records in the Project area, however there are several in the broader region.
Hirundapus caudacutus (White-throated Needletail)	V, M	-	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Penninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. More common in coastal areas than inland.	BioNet, BAM-C	-	Moderate Potential aerial habitat present. No records within the Project area, however some in the surrounding region and near Jerilderie.
Lathamus discolor (Swift Parrot)	CE	E	The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter. Whilst on the mainland the swift parrot disperses widely to forage on flowers and psyllid lerps in eucalypt species, with the majority being found in Victoria and NSW. In NSW they forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (E. robusta) and spotted gum (Corymbia maculata) woodland when in flower; otherwise often in coastal forests. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon, and E. albens. Commonly used lerp infested trees include E. microcarpa, E. moluccana and E. pilularis.	PMST, BAM-C	Breeding - as per mapped areas.	High Foraging habitat present, however no records within the Project area. Several recent records within the surrounding 100km including Berrigan.

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Leipoa ocellata (Malleefowl)	V	E	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary, and is part of a larger population north of the Murray River in South Australia. The population in central NSW has been significantly reduced through land clearance and fox predation and now occurs chiefly in Yathong, Nombinnie and Round Hill NRs and surrounding areas, though birds continue to survive in Loughnan NR. To the south of this area the species is probably locally extinct in such reserves as Pulletop NR (last recorded 1989), Ingalba NR (1982) and Buddigower NR (1990) and the intensely studied population at Yalgogrin was still known to have at lest one active mound in 2017. Further east, a population continues to persist in the Goonoo forest near Dubbo, though the size of this population is unknown. Outside these areas, occasional records have been made in the Pilliga forests (most recently 1999), around Cobar (1991) and Goulburn River NP (1989) though the extent and status of populations in these areas are unknown. Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.	PMST, BioNet	-	Low Suitable habitat for the species was not recorded and species has not been recorded within the locality. Only one record within 100km locality from 1994.
Limosa limosa (Black-tailed Godwit)	-	V	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps.	BAM-C	Foraging- As per mapped areas	Moderate There is minimal suitable habitat for the species in wetland areas. There are no records within the study area. There are numerous records at Fivebough Wetlands near Leeton. All mapped areas are coastal and over 400km to the east.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Lophochroa leadbeateri (Major Mitchell's Cockatoo)	-	V	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres.	BAM-C	Breeding – Hollow bearing trees, Living or dead tree with hollows greater than 10cm diameter	Moderate Some suitable habitats present. However, no records present in the Project area and few historic records nearby Deniliquin and Leeton.
Lophoictinia isura (Square-tailed Kite)	-	V	In NSW, the species has scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100km2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	BAM-C	Breeding – nest trees	High (known) The species was recorded in the 2021/22 surveys. No historical records in the Project area, however there are several in the broader region.
Melanodryas cucullata cucullata (Hooded Robin (south-eastern form))	-	V	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	BAM-C	-	Moderate Some suitable habitat is present, however no records are present within the Project area. Several records are near Oaklands and Buckingbong State Forest over 100km to the east, few of which are recent.
Melithreptus gularis gularis (Black-chinned Honeyeater) (eastern subspecies)	-	V	The Black-chinned Honeyeater has two subspecies, with only the nominate (gularis) occurring in NSW. The other subspecies (laetior) was formerly considered a separate species (Golden-backed Honeyeater) and is found in northern Australia between central Queensland west to the Pilbara in Western Australia. The eastern subspecies extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence	BioNet, BAM-C	-	Moderate Some suitable habitat for the species is present, however no records within the Project area. The closest records are over 100km away, mostly near the Murray River.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (Eucalyptus sideroxylon), White Box (E. albens), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora), Blakely's Red Gum (E. blakelyi) and Forest Red Gum (E. tereticornis). Also inhabits open forests of Smooth-barked Gums, Stringybarks, Ironbarks, River Sheoaks (nesting habitat) and Tea-trees.			
Ninox connivens (Barking Owl)	-	V	The Barking Owl is found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance.	BAM-C	Breeding - Hollow bearing trees, Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	Moderate Some suitable habitat present, however no records within the Project area. Few historical records in the region.
Oxyura australis (Blue-billed Duck)	-	V	The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. The species prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	BAM-C	-	Moderate Marginal suitable habitat present on site. The wetland communities are likely not open and deep to be preferred habitat. No records within the Project area. Closest records mostly at Fivebough Wetlands near Leeton.
Pachycephala inornata (Gilbert's Whistler)	-	V	The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheatbelt. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers.	BAM-C	-	Moderate Suitable habitat present in several woodland PCTs, particularly White Cypress Pine forests. No records within the Project area. Closest records are within the Murray River National Park about 80km to the south-west.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Pedionomus torquatus (Plains-wanderer)	CE	E	The vast majority (>99%) of records of Plains-wanderers in NSW over the past 30 years come from an area of the western Riverina bounded by Hay and Narrandera on the Murrumbidgee River in the north, the Cobb Highway in the west, the Billabong Creek in the south, and Urana in the east. Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses.	BioNet PMST, BAM-C	Breeding - as per mapped areas.	High (known) Multiple records within the Project area and was recorded in the 2021/22 surveys. May provide suitable Grassland and Arid Shrubland habitats.
Petroica boodang (Scarlet Robin)	-	V	The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.	BAM-C	-	Moderate Some suitable habitats may be present in woodland area, however no records are within the Project area. Additionally, extensive fragmentation between wooded areas may limit the movement of the species. Nevertheless, there are numerous records about 80km south-west in the Murray River National Park.
Petroica phoenicea (Flame Robin)	-	V	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes.	BioNet	-	Low Suitable habitat for the species was not recorded and species has not been recorded within the locality. Multiple records outside of the locality to the north, east, south and west.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Pezoporus occidentalis (Night Parrot)	E	Extinct	The distribution of the Night Parrot has not been well documented, but it is known to be restricted to arid and semi-arid Australia. The Night Parrot is known to occur within Spinifex grasslands in stony or sandy areas and samphire and chenopod associations on floodplains, salt lakes and clay pans. Suitable habitat is characterized by the presence of large and dense clumps of Spinifex, and it may prefer mature spinifex that is long and unburnt.	PMST	-	Unlikely – species is considered extinct in the area, no recent records, no suitable preferred habitat present.
Polytelis anthopeplus monarchoides (Regent Parrot (eastern subspecies)	V	E	The eastern subspecies is restricted to areas around the Murray River in South Australia, Victoria and NSW. The species nests within River Red Gum forests along the Murray, Wakool and lower Murrumbidgee Rivers, and possibly the Darling River downstream of Pooncarie. Typical nest trees are large, mature healthy trees with many spouts (though dead trees are used) and are usually located close to a watercourse. Principal foraging habitat is mallee woodlands, though foraging also occurs in riverine forests and woodlands. Mallee woodland within 20 kilometres of nesting sites is critical foraging habitat for breeding birds.	BAM-C	Breeding - Hollow bearing trees, living or dead E. camaldulensis with hollows greater than 5 cm diameter, greater than 5 m above the ground OR trees with DBH of greater than 40cm, within 1 km of watercourses or billabongs. Trees can be isolated but within 20 km of mallee	Low The Project area is over 50km from the Rivers the species is know to inhabit and the Project area is generally beyond the eastern extent of the known population. No records of the species are in 80knm of the site.
Polytelis swainsonii (Superb Parrot)	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South-West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.	BioNet PMST, BAM-C	Breeding - Living or dead E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.	High (known) Multiple records within the Project area and recorded near the Project area in 2021/22 surveys. Suitable Woodland habitats.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Pomatostomus temporalis temporalis (Grey-crowned Babbler) (eastern subspecies)	-	V	The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. West of here the subspecies rubeculus, formerly considered a separate species (Red-breasted Babbler) is still widespread and common. The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions.	BioNet, BAM-C	-	High (known) Multiple records within the Project area and was recorded in the 2021/22 surveys Suitable Woodland habitats are present within the Project area.
Pyrrholaemus brunneus (Redthroat)	-	V	In NSW, the species is confined to the far west of the state, with populations known from four main areas, though the species is probably under-recorded due to its shy habits and low observer numbers within its distribution. In NSW the species has been recorded mainly in chenopod shrublands including Old Man Saltbush, Black Bluebush and Dillon Bush shrublands. Around Broken Hill it appears to be associated with the denser vegetation, particularly Acacias, found in drainage lines that run from the rocky hills. In other locations it is known from Canegrass and Lignum swamps and depressions, particularly on floodplains.	BAM-C	-	High There is suitable habitat for the species in shrublnads, from Canegrass and Lignum swamps. However, there are no records of the species within 100km and it is on the eastern extent of its known range.
Rostratula australis (Australian Painted Snipe)	E	E	Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	PMST, BAM-C	-	Moderate There is possible suitable habitat for the species in its migratory route, however there are no records within the Project area. Most recent records are in the Fivebough wetlands near Leeton about 100km to the north-east.
Stagonopleura guttata (Diamond Firetail)	-	V	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Cental and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near	BioNet, BAM-C	-	High Suitable habitat is present for the species in wooded areas. There are no records in the study area, however numerous within the

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, Mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.			surrounding 100km, the closest of which is about 5km to the west.
Stictonetta naevosa (Freckled Duck)	-	V	The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	BAM-C	-	Moderate Some suitable habitat is present for the species in wetlands areas, however habitat is limited. There are no records in the study area, however numerous within the surrounding 100km, nevertheless, the closest is about 55km to the north-west.
Tyto novaehollandiae (Masked Owl)	-	V	Extends from the coast where it is most abundant to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides.	BAM-C	-	Moderate Some suitable habitat present on edges of woodland areas, however is limited. No records in study area and only 2 two in 100km locality, most recent of which is from 1982.
Mammals						
Chalinolobus picatus (Little Pied Bat)	-	V	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Can tolerate high temperatures and dryness but need access to nearby open water.	BAM-C	-	High Suitable foraging habitat present in forested areas, however no records in the locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Myotis macropus (Southern Myotis)	-	V	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface	BAM-C	Hollow bearing trees Within 200 m of riparian zone, Bridges, caves or artificial structures within 200 m of riparian zone, Waterbodies including rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site	High (known) This species was recorded on site during targeted surveys. There is some potential habitat along Yanco Creek within the Project area, however there are no records. The closest records are along the Murrumbidgee River and Murray River.
Nyctophilus corbeni (Corben's Long-eared Bat)	V	V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke Allocasuarina leuhmanni and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST, BioNet	-	Low Suitable habitat for the species was not recorded. Only one record within 100km near Deniliquin in 1988.
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) (Koala)	E	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	BioNet PMST, BAM-C	Areas identified via survey as important habitat. 'Important' habitat (however this is not a mapped important habitat area) is defined by the density of koalas and quality of habitat determined by on-site survey.	Low Suitable habitat for the species was not recorded and species has not been recorded within the locality. Habitat is degraded / not suitable for this species.
Pteropus poliocephalus (Grey-headed Flying Fox)	V	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in	PMST	Breeding camps	Low Suitable habitat for the species was not recorded and species has not been recorded within the locality. This species may occur based on the presence of suitable foraging habitat

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			vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.			and the proximity of records in the locality. There are no camps within the Project area.
Saccolaimus flaviventris (Yellow-bellied Sheathtail-bat)	-	V	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	BAM-C	-	High (known) This species was recorded during targeted surveys on site. Suitable foraging and roosting habitat is present. Historic records are numerous in the 100km locality, particularly in Murray National Park and along the Murray River.
Vespadelus baverstocki (Inland Forest Bat)	-	V	Believed to occur widely in all the mainland states, generally in areas with annual rainfall less than 400 millimetres. Roosts in tree hollows and abandoned buildings. Known to roost in very small hollows in stunted trees only a few metres high. The habitat requirements of this species are poorly known but it has been recorded from a variety of woodland formations, including Mallee, Mulga and River Red Gum. Most records are from drier woodland habitats with riparian areas inhabited by the Little Forest Bat. However, other habitats may be used for foraging and/or drinking.	BAM-C	-	High Suitable foraging and roosting habitat on site in woodland areas with preferable species. No records in study area, however there are three recent records within the 100km locality.
Amphibians						
Litoria raniformis (Growling Grass Frog/ Southern Bell Frog)	V	E	The Growling Grass Frog's range has declined over time with the most pronounced decline evident in NSW. In NSW and the ACT, the range of the species was centred on the Murray and Murrumbidgee River valleys and their tributaries. The species is currently widespread throughout the Murray River valley and has been recorded from six Catchment Management Areas in NSW: Lower Murray Darling, Murrumbidgee, Murray, Lachlan, Central West and South East. This species is found mostly amongst emergent vegetation (Robinson 1993), including Typha sp. (bullrush), Phragmites sp. (reeds) and Eleocharis sp. (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. This species occurs in clays or well-watered sandy soils; open grassland, open forest, and ephemeral and permanent non-saline marshes and swamps; montane eucalypt forest, dry schlerophyll forest in coastal Victoria; steep-banked water edges (like ditches and	PMST, BAM-C	-	Moderate Suitable habitat for the species is present in some of the forested wetlands, particularly where emergent vegetation is present. No records within the Project area, however there are numerous about 40km to the north-east, near Coleambally.

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			drains) and gently graded edges containing fringing plants; and formerly, areas of high altitudes.			
Fish						
Bidyanus bidyanus (Silver Perch)		V (FM Act)	The Silver Perch is a moderate to large, oval-shaped freshwater fish which inhabits the Murray-Darling river system. They are generally found in faster-flowing water including rapids and races and more open sections of river.	DPI Fisheries	-	Moderate Yanco Creek traverses the south of the Project area and provides suitable habitat for the species. However, as the species is aquatic, it does not inhabit area of direct impact of the proposal.
Galaxias rostratus (Flathead Galaxias)	CE	CE, CE (FM Act)	Flathead Galaxias, also known as Murray jollytail are a small native fish that are known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee and River Murrays in NSW. Despite extensive scientific sampling over the past 15 years there have been very few recorded sightings of Flathead Galaxias. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan Rivers. The species is now only known from the upper River Murray near Tintaldra and wetland areas near Howlong. Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.	PMST, DPI Fisheries	-	Yanco Creek traverses the south of the Project area and provides suitable habitat for the species. However, as the species is aquatic, it does not inhabit area of direct impact of the proposal. Additionally, the species is now only known from the upper Murray River near Tintaldra and wetland areas near Howlong.
Maccullochella macquariensis (Trout Cod)	E	E, E (FM Act)	The Trout Cod is a riverine species, inhabiting a variety of flowing waters in the mid to upper reaches of rivers and streams. Trout Cod use river positions where large cover, in the form of woody debris and boulders, is present in high quantity, close to deeper water and high surface velocity, further from the river bank. At present only two potentially sustainable populations are known; a naturally occurring population in the River Murray (NSW) downstream of the Yarrawonga Weir between Yarrawonga and Barmah and the translocated population in Seven Creeks below Polly McQuinns Weir (Vic). There have been no recent records in the River Murray downstream from Echuca (NSW, SA), Macquarie River (NSW), Murrumbidgee River (NSW, ACT), and the Goulburn, Broken, Campaspe, Ovens, King, Buffalo and Mitta Mitta Rivers (Vic). The wild populations formerly occurring in these rivers are now probably extinct. Trout	PMST, DPI Fisheries	-	Moderate Yanco Creek traverses the south of the Project area and provides suitable habitat for the species. However, as the species is aquatic, it does not inhabit area of direct impact of the proposal.

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			Cod and Murray Cod translocated into Cataract Dam (Nepean River NSW) have hybridised, and the cod population existing there is composed largely of hybrids. Known to occur in the Ramsar Wetland area of the project site (TLM surveys) and critical to the Ecological character of the site (Hale and Butcher 2011).			
Maccullochella peelii (Murray Cod)	V	-	The Murray Cod occurs naturally in the waterways of the Murray-Darling Basin (ACT, SA, NSW and Vic) and is known to live in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat. Some translocated populations exist outside the species' natural distribution in impoundments and waterways in NSW and Vic which are maintained by the release of hatchery bred fish. Known to occur in the Ramsar Wetland area of the project site (TLM surveys) and critical to the Ecological character of the site (Hale and Butcher 2011).	PMST, DPI Fisheries	-	Moderate Yanco Creek traverses the south of the Project area and provides suitable habitat for the species. However, as the species is aquatic, it does not inhabit area of direct impact of the proposal.
Macquaria australasica (Macquarie Perch)	E	E, E (FM Act)	The Macquarie Perch is a riverine species that prefers clear water and deep, rocky holes with abundant cover such as aquatic vegetation, large boulders, debris and overhanging banks. In Victorian parts of the Murray-Darling, only small natural populations remain in the upper reaches of the Mitta Mitta, Ovens, Broken, Campaspe and Goulburn Rivers; translocated populations occur in the Yarra River and Lake Eildon. In NSW, natural inland populations are isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers. Populations of the eastern form are confined to the Hawkesbury-Nepean and Shoalhaven river systems. Translocated populations in NSW are found in the Mongarlowe River, Queanbeyan River upstream of the Googong Reservoir and in Cataract Dam. In the ACT, it is restricted to the Murrumbidgee, Paddys and Cotter Rivers. Historical records, considered to be locally extinct in the Ramsar section of the Project area (Hale and Butcher 2011).	PMST, DPI Fisheries	-	Moderate Yanco Creek traverses the south of the Project area and provides suitable habitat for the species. However, as the species is aquatic, it does not inhabit area of direct impact of the proposal.
Migratory species						
Actitis hypoleucos (Common Sandpiper)	M	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper is wader / shorebird migrating to Australia in summer for its non-breeding period. the species breeds in a variety of habitats near water in Eurasia. When in Australia, the species is more common in the northern half of Australia	PMST	-	Low No preferred habitat within the Project area. No records within 100km locality.

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			(Geering et al. 2008), this species is widespread in small numbers and has been recorded in a variety of habitats including steep sided sewage ponds and dams, feeding in the shallow edges of inland wetlands, farm dams and lakes. With a preference for environments with standing water, it is noted that the proposed inundation regime will potentially improve and extend suitable foraging habitat for this species.			
Apus pacificus (Fork-tailed Swift)	M	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 metres to at least 1000 metres above ground and probably much higher, seldom recorded on the ground. The species occurs aerially over a wide range of habitats, which vary from rainforests to treeless plains (Menkhorst et al. 2017).	PMST	-	Low May occur over the Project area intermittently during seasonal migration movements but unlikely to use terrestrial habitats. No records within 100km locality.
Calidris acuminata (Sharp-tailed Sandpiper)	M	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Calidris ferruginea (Curlew Sandpiper)	M, CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often,	PMST, BAM-C	Foraging – as per mapped areas	Moderate Suitable habitat present in wetlands areas for temporary migration. No records in the Project area, and not within 100km. closest records are near Leeton in the Fivebough wetlands.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.			
Calidris melanotos (Pectoral Sandpiper)	M	-	Breeds in northern North America and Siberia and migrates (from late June) to South America and to a lesser extent Australasia (Menkhorst et al 2017). In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Gallinago hardwickii (Latham's Snipe)	M	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 metres above sea-level. Non-breeding visitor to south-eastern Australia. Prefers permanent and ephemeral wetlands, usually open, freshwater wetlands with low, dense vegetation. Sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers, although usually only during migration (Menkhorst et al. 2017).	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Hirundapus caudacutus (White-throated Needletail)	V, M	-	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Penninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. More common in coastal areas than inland.	BioNet, BAM-C	-	Moderate Potential aerial habitat present. No records within the Project area, however some in the surrounding region and near Jerilderie.
Motacilla flava (Yellow Wagtail)	M	-	Rare but regular visitor around Australian coast, especially in the NW coast Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground; occasionally on drier inland plains. Uncommon migratory wagtail. Nearly all Australia records are coastal, with a few widely scattered inland records. Typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Myiagra cyanoleuca (Satin Flycatcher)	M	-	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Numenius madagascariensis (Eastern Curlew)	CE, M	-	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass.	PMST	Foraging – as per mapped areas	Low No preferred habitat within the Project area. No records within the 100km locality.
Pandion haliaetus (Osprey)	M	-	The Osprey has a global distribution with four subspecies previously recognised throughout its range. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Mostly occur in coastal habitats but will occasionally travel inland along major rivers. Require extensive areas of open fresh or saline water for foraging. Occasionally construct nests on artificial structures such as towers, but primarily near water habitats. Fish eating raptor typically feeds and nests near open water, primarily coastal.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Marine Species						
Actitis hypoleucos (Common Sandpiper)	M	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper is wader / shorebird migrating to Australia in summer for its non-breeding period. the species breeds in a variety of habitats near water in Eurasia. When in Australia, the species is more common in the northern half of Australia (Geering et al. 2008), this species is widespread in small numbers and has been recorded in a variety of habitats including steep sided sewage ponds and dams, feeding in the shallow edges of inland wetlands, farm dams and lakes. With a preference for environments with standing water, it is noted that the proposed inundation regime will potentially improve and extend suitable foraging habitat for this species.	PMST	-	Low No preferred habitat within the Project area. No records within 100km locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Apus pacificus (Fork-tailed Swift)	M	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 metres to at least 1000 metres above ground and probably much higher, seldom recorded on the ground. The species occurs aerially over a wide range of habitats, which vary from rainforests to treeless plains (Menkhorst et al. 2017).	PMST	-	Low May occur over the Project area intermittently during seasonal migration movements but unlikely to use terrestrial habitats. No records within 100km locality.
Bubulcus ibis (Cattle Egret)	M		The Cattle Egret is widespread and common according to migration movements and breeding localities surveys. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare.	PMST	-	Low No preferred habitat within the Project area. No records within 100km locality.
Calidris acuminata (Sharp-tailed Sandpiper)	M	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Calidris ferruginea (Curlew Sandpiper)	M, CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle,	PMST, BAM-C	Foraging – as per mapped areas	Moderate Suitable habitat present in wetlands areas for temporary migration. No records in the Project area, and not within 100km. closest records are near Leeton in the Fivebough wetlands.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
			shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.			
Calidris melanotos (Pectoral Sandpiper)	M	-	Breeds in northern North America and Siberia and migrates (from late June) to South America and to a lesser extent Australasia (Menkhorst et al 2017). In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Chalcites osculans (Black-eared Cuckoo)	M	-	The Black-eared Cuckoo is widespread on mainland Australia, but avoids the wet, heavily forested areas on the east coast and the south-west corner of Western Australia. It is found in drier country where species such as mulga and mallee form open woodlands and shrublands	PMST	-	Moderate Suitable habitat is present, however there are no records of the species within the 100km locality.
Gallinago hardwickii (Latham's Snipe)	M	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 metres above sea-level. Non-breeding visitor to south-eastern Australia. Prefers permanent and ephemeral wetlands, usually open, freshwater wetlands with low, dense vegetation. Sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers, although usually only during migration (Menkhorst et al. 2017).	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Haliaeetus leucogaster (White-bellied Sea-Eagle)	-	V	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.	BAM-C	Breeding - Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Moderate Some terrestrial habitat exists, however no records are in the Project area. the Project area does not provide key habitat due to the lack of major waterways.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Hirundapus caudacutus (White-throated Needletail)	V, M	-	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Penninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. More common in coastal areas than inland.	BioNet, BAM-C	-	Moderate Potential aerial habitat present. No records within the Project area, however some in the surrounding region and near Jerilderie.
Lathamus discolor (Swift Parrot)	CE	E	The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter. Whilst on the mainland the swift parrot disperses widely to forage on flowers and psyllid lerps in eucalypt species, with the majority being found in Victoria and NSW. In NSW they forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (E. robusta) and spotted gum (Corymbia maculata) woodland when in flower; otherwise often in coastal forests. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon, and E. albens. Commonly used lerp infested trees include E. microcarpa, E. moluccana and E. pilularis.	PMST, BAM-C	Breeding - as per mapped areas.	High Foraging habitat present, however no records within the Project area. Several recent records within the surrounding 100km including Berrigan.
Merops ornatus (Rainbow-bee eater)	M	-	The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. The species mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation.	PMST	-	High (known) Species recorded on site during 2021/22 surveys. Suitable habitat present.
Motacilla flava (Yellow Wagtail)	M	-	Rare but regular visitor around Australian coast, especially in the NW coast Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground; occasionally on drier inland plains. Uncommon migratory wagtail. Nearly all Australia records are coastal, with a few widely scattered inland records. Typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations (BAM-C)	Likelihood of occurrence
Myiagra cyanoleuca (Satin Flycatcher)	M	-	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Neophema chrysostoma (Blue-winged Parrot)	M		The Blue-winged Parrot is very similar to the Elegant Parrot, and to a lesser extent to the Rock and Orange-bellied Parrots. The Blue-winged Parrot inhabits a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones	PMST	-	Low No preferred habitat within the Project area. No records within the 100km locality.
Numenius madagascariensis (Eastern Curlew)	CE, M	-	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass.	PMST	Foraging – as per mapped areas	Low No preferred habitat within the Project area. No records within the 100km locality.
Rostratula australis (Australian Painted Snipe)	E	E	Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	PMST, BAM-C	-	Moderate There is possible suitable habitat for the species in its migratory route, however there are no records within the Project area. Most recent records are in the Fivebough wetlands near Leeton about 100km to the north-east.

PMST = Identified from the Protected Matters Search Tool (PMST) (DAWE, 2021)

BAM-C= Biodiversity Assessment Method Calculator tool (DPIE, 2020)

BioNet= NSW BioNet (DPIE, 2021)

Appendix D. Aboriginal heritage constraints memo

Yanco-Delta Windfarm Project

Aboriginal Heritage Constraints Assessment

REV 2

10 February 2022

Virya Energy Pty Ltd

IS395700

Contents

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List of tables

Executive Summary

Virya Energy Pty Ltd (Virya Energy) is proposing to construct a wind farm (the Yanco Delta Wind Farm project) within the north-west of Jerilderie. It is anticipated that the project will be classified as State Significant Development (SSD) under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979*.

Virya Energy requires a preliminary environmental constraints assessment to inform project design and development. This Aboriginal Heritage Constraints Assessment is designed to provide preliminary constraints and opportunities advice as well as guidance on the need for any further Aboriginal cultural heritage assessment and compliance obligations. This report does not meet the statutory requirements under the *National Parks and Wildlife Act 1974* (NPW Act). No detailed site survey or comprehensive Aboriginal stakeholder consultation was completed during the preparation of this report.

A search of the AHIMS database (Appendix A), completed on 1 October 2021, resulted in the identification of 28 recorded Aboriginal sites. Only one recorded Aboriginal site was identified as being located within the boundaries of the study area, Tooleybuc Bridge PAD (AHIMS ID 55-1-0038). Review of the site information (Appendix B) for Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) identified that an error had occurred during the registration of the site, and that Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) is located 181 kilometres west of the study area. As result, there are no registered Aboriginal sites within or adjacent to the study area that pose a constraint to the proposal.

Background research completed for this assessment resulted in the development of several predictive statements:

- It is likely that scarred trees will be present within the study area at locations where native vegetation has not been subject to historic land clearance
- Stone artefacts will likely be identified within close proximity to existing roads due to increased surface visibility and exposure facilitating high survey efficiency
- Aboriginal objects will likely be located within 200 metres of major/permanent waterways
- Locations associated with the siliceous sands landscape are likely to contain deep (1.4 metres) deposits that have the potential to contain Aboriginal objects dating to the Pleistocene
- Locations associated with the grey, brown and red clays landscape are unlikely to feutre subsurface artefact deposits, but are likely to feature Aboriginal objects on the ground surface.

As the results of this assessment have not identified any Aboriginal objects within the study area, it is recommended that field investigations are completed to test the predictive statements and confirm if Aborgiinal objects are present. It is recommended that an archaeological survey is compelted in accordance with the requirement of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). Test excavations may be required based on the findings of the archaeological survey. Where it is identified that Aboriginal objects will likely be harmed by the proposed works, an Aboriginal Cultural Heritage Assessment Report (ACHAR) will be required. An ACHAR may also be required by the Secretary’s Environmental Assessment Requirements (SEARs) regardless of the findings of the archaeological investigations.

1. Introduction

1.1 Introduction

Virya Energy is seeking approval for the proposed Yanco Delta Wind Farm (the Project). The Project would involve the construction, operation and maintenance of a wind farm with up to 225 wind turbine generators (WTGs), a battery energy storage system (BESS), and associated electrical infrastructure. The generating capacity of the wind farm is approximately 1,500 megawatts (MW). The Project would be located within the Murrumbidgee Council and Edward River Council local Government Areas (LGA).

Virya Energy requires a preliminary environmental constraints assessment to inform project design and development. The preliminary environmental constraints assessment will include key issues investigation of biodiversity, Aboriginal cultural heritage and geotechnical properties. It is anticipated that the project will be classified as State Significant Development (SSD) under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 Study area

The study area is located within an area that will be rezoned for renewable energy, the South-West Renewable Energy Zone (REZ). The Project would be located within the Murrumbidgee Council and Edward River Council local Government Areas (LGA), 10 kilometres north-west from Jerilderie (**Figure 1-1**). The study area is predominantly located across the boundaries of the Griffith Local Aboriginal Land Council (LALC), with a small portion overlapping the Cummeragunja LALC area.

1.3 Limitation and constraints

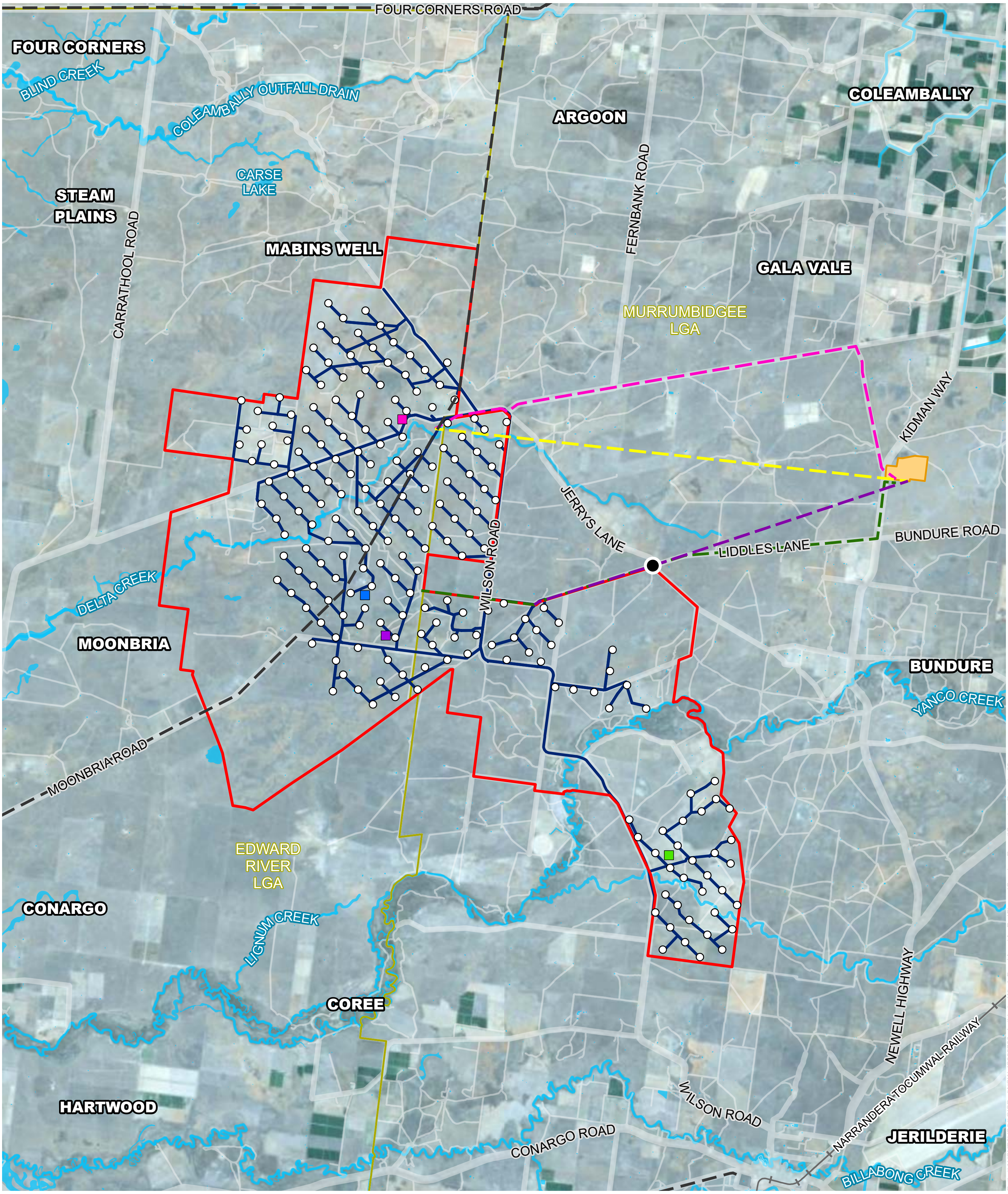
This Aboriginal Heritage Constraints Assessment is only designed to provide preliminary constraints and opportunities advice as well as guidance on the need for any further Aboriginal cultural heritage assessment and compliance obligations.

This report does not meet the statutory requirements under the *National Parks and Wildlife Act 1974* (NPW Act) to support an application for an Aboriginal Heritage Impact Permit (AHIP). Furthermore, this report does not consider historical archaeological heritage and is not sufficient to support an application for a permit under Section 60 or 140 of the *Heritage Act 1977*.

No detailed site survey or comprehensive Aboriginal stakeholder consultation was completed during the preparation of this report. This report is based on existing and publicly available environmental and archaeological information. It did not include any independent verification of the results or interpretations of externally sourced reports (except where archaeological investigation indicated inconsistencies). The AHIMS data was provided to by Heritage NSW. Information in the archaeological assessment report reflects the scope and the accuracy of the AHIMS site data, which in some instances is limited.

1.4 Authorship and contributors

This report was authored by Ryan Taddeucci (Senior Archaeologist, Jacobs) with review by Fran Scully (Principal Archaeologist, Jacobs). Table 1 below outlines the full list of contributors and their role in the completion of this report. Background research was completed by Meaghan Aitchison (Project Archaeologist, Jacobs) and mapping was produced by Sarah Ryan (Graduate Spatial Consultant, Jacobs).



Indicative Project

- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Project Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4
- Proposed Dinawan substation
- Local Government Area
- Site access
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

IVANHOE
NSW
HAY
CANBERRA
ALBURY
VIC
ECHUCA

Data sources

Jacobs 2022
© Department of Customer Service 2020

Figure 1-1 Study area

2. Legislative context

2.1 Commonwealth legislation

2.1.1 *Environment Protection and Biodiversity Conservation Act* 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) provides for the protection of the environment, especially in matters of national environmental significance (MNES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the MNES without approval from the Commonwealth Minister for the Environment. The definition of the environment under the EPBC Act includes both natural and cultural elements. Under the EPBC Act, heritage items can be listed on the National Heritage List (NHL) (for items of National heritage significance) or the Commonwealth Heritage List (CHL) (for items of heritage significance on land owned or managed by the Commonwealth). The EPBC Act also enhances the management and protection of Australia's heritage places, including World Heritage properties listed on the World Heritage List (WHL).

The NHL is a list of places with outstanding heritage value to Australia, including places overseas. Any proposed actions on NHL places must be assessed for their impact on the heritage values of the place in accordance with *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (Department of Sustainability, Environment, Water, Population and Communities 2013). The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on a Matter of National Environmental Significance, including the national heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the Minister for approval.

The CHL is established under the EPBC Act. The CHL is a list of properties owned by the Commonwealth that have been assessed as having significant heritage value. Any proposed actions on CHL places must be assessed for their impact on the heritage values of the place in accordance with *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* (Department of Sustainability, Environment, Water, Population and Communities 2013). The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on the environment, including the heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the Minister for approval.

There are no Aboriginal places or items within or near the study area that are listed on the NHL, the CHL or the WHL.

2.1.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act), deals with Aboriginal cultural property (intangible heritage) in a wider sense. Such cultural property intangible heritage includes any places, objects and folklore that "are of particular significance to Aboriginals in accordance with Aboriginal tradition". These values are not currently protected under the NPW Act. In most cases, archaeological sites and objects registered under the State Act will also be Aboriginal places subject to the provisions of the Commonwealth Act. There is no cut-off date and the ATSIHP Act may apply to contemporary Aboriginal cultural property as well as ancient sites. The ATSIHP Act takes precedence over state cultural heritage legislation where there is conflict. The Commonwealth Minister who is responsible for administering the ATSIHP Act can make declarations to protect these areas and objects from specific threats of injury or desecration. The responsible Minister may make a declaration under Section 10 of the Commonwealth Act in situations where state or territory laws do not provide adequate protection of intangible heritage places.

2.2 State legislation

2.2.1 *Environmental Planning and Assessment Act* 1979

The EP&A Act regulates environmental planning and assessment for NSW. Land use planning requires that environmental impacts are considered as part of the assessment of development, including impacts on Aboriginal cultural heritage.

Division 4.7 of Part 4 of the EP&A Act applies to development declared to be SSD. If the project is declared to be SSD, the consent authority for will be the Minister for Planning (Minister). An Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NPW Act is not required for development for which an SSD development consent has been granted (Section 4.41 (d) of the EP&A Act). However, an EIS is required for SSD projects and the Secretary's Environmental Assessment Requirements (SEARs) issued for the project include may requiring the assessment of Aboriginal heritage.

2.2.2 National Parks and Wildlife Act 1974

The NPW Act protects Aboriginal heritage within NSW. Protection of Aboriginal heritage is outlined in Section 86 of the NPW Act, as follows:

- "a person must not harm or desecrate an object that the person knows is an Aboriginal object" (Section 86(1))
- "a person must not harm an Aboriginal object" (Section 86(2)), and
- "a person must not harm or desecrate an Aboriginal place" (Section 86(4)).

Section 87(1) of the NPW Act provides that it is a defence to these provisions if the harm or desecration is authorised by an AHIP.

Harm is defined under the NPW Act as 'any act or omission that destroys, defaces or damages the object including moving the object from the land on which it has been situated or causes or permits the object to be harmed'.

As outlined in Section 2.2.1, an AHIP is not required for development for which an SSD development consent has been granted and the provisions of the NPW Act that prohibit an activity without such an authority do not apply (Section 4.41 (d) of the EP&A Act).

2.2.3 Native Title Act 1994

The *Native Title Act 1994* was introduced to work in conjunction with the Commonwealth *Native Title Act 1993*. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

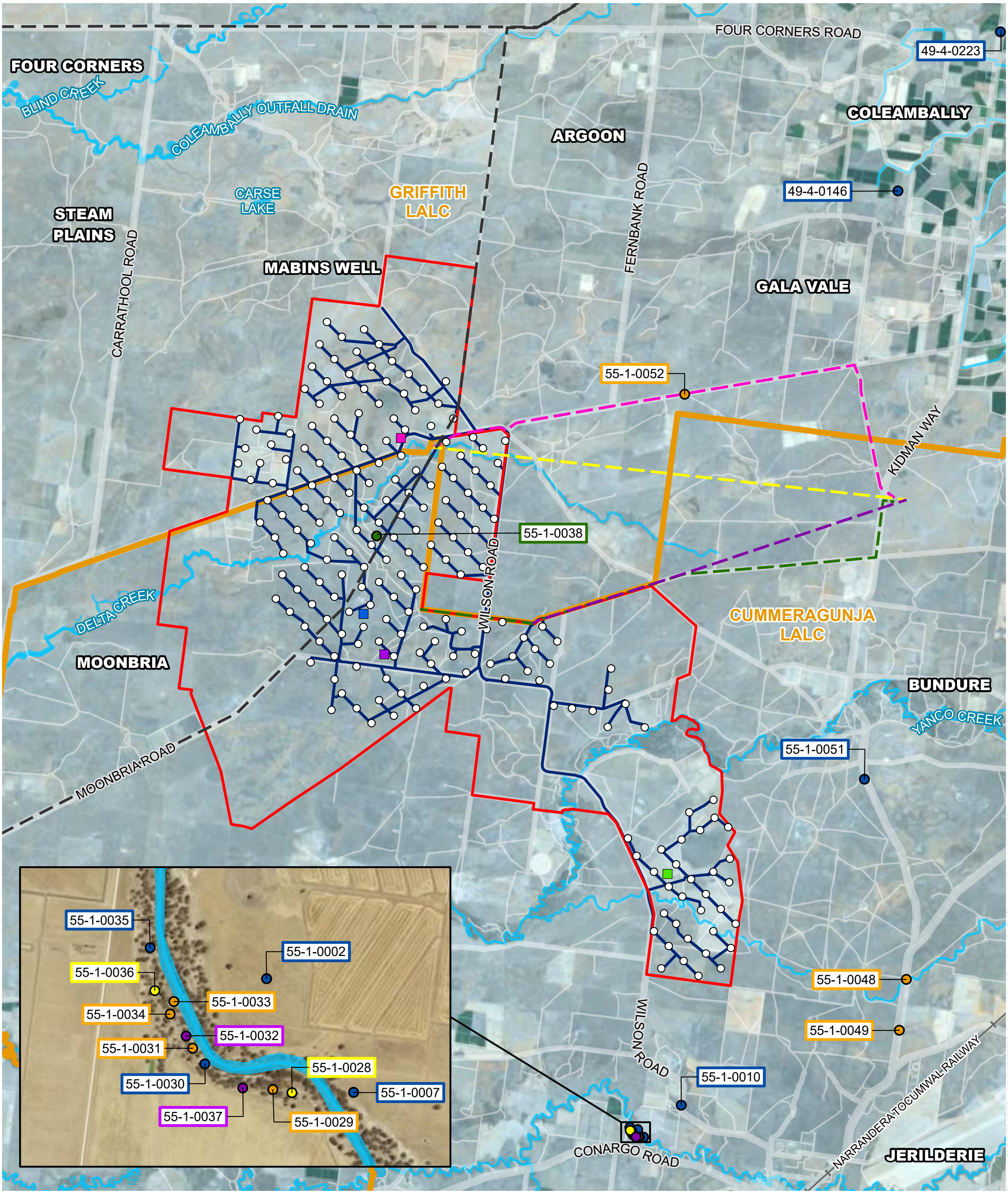
A search of the National Native Title Tribunal database, on 8 October 2021, found that there are no Native Title claims currently registered in the study area.

2.2.4 Aboriginal Lands Right Act 1983

The *Aboriginal Land Rights Act 1983* (ALR Act) established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the ALR Act to:

> *(a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and*
>
> *(b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.*

The study area is predominantly located across the boundaries of the Griffith Local Aboriginal Land Council (LALC), with a small portion overlapping the Cummeragunja LALC area (Figure 2-1).



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- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

AHIMS

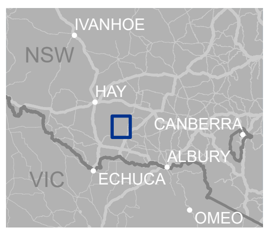
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)

- Local Aboriginal Land Council
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
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Figure 2-1 Boundaries of Griffith LALC and Cummeragunja LALC

3. Environmental context

3.1 Landscape

The study area is located within the NSW Riverina Bioregion. Bioregions are extensive, geographically distinct areas within the landscape that exhibit similar characteristics such as climate, landform patterns, underlaying geology, ecological features and floral and faunal communities. The Riverina Bioregion extends from the Murray Darling Depression at Ivanhoe in the north to Bendigo, Victoria in the south and from east to west between Narrandera and Balranald. Its boundaries encompass townships of Colleambally, 35 kilometres north-west of the study area and Jerilderie, 10 kilometres south-east of the study area. The study area sits within the stagnant, level, alluvial Riverine Plains of this bioregion.

The Riverina Bioregion encompasses the alluvial fans of the Lachlan, Murrumbidgee and Murray Rivers to the west of the Great Diving Range. The landscape of the upper catchment area consists of a series of low gradient, overlapping alluvial fans. The lower catchment tract is primarily floodplain with overflow lakes (such as the Salt Lake, Lake Urana, 30 kilometres to the east of the study area). The discharge from current and past streams controls patterns of sediment distribution which in turn determines the landscape including which soils and vegetation are present. The initial desktop survey indicates that the study area has limited topographic variation and consists primarily of low relief alluvial floodplain and drainage lines (named and unnamed waterways and flood-runners). Aboriginal sites are expected to be identified largely in close association with water sources and along the edges of drainage lines, particularly on areas of elevated ground.

The study area is located across several geological formations (Figure 3-1), the larger and more extensive of these being the Shepparton Formation (Czs), deriving from sediments deposited during the Plio-Pleistocene Epoch (5,000,000 to12,000 years ago). These deposits represent the most recent infilling of the Tertiary Murray Basin and consist of alluvial sands, silts and clays (The Geological Society of America 2012). The sediments within the Shepparton Formation form the subsurface component to the Riverine Plain and range from poorly sorted gravels to clay. These sediments were primarily deposited by alluvial action and are mantled by a thin layer of parna (wind-blown calcareous clay). The older alluvial plains, comprising of Shepparton Formation sediments, are typically dominated by a level topography with distinct shallow drainage depressions (Pels 1971, Cupper, White et al. 2003, Stone 2006, p. 772). Traces of the distributary channels that built the Riverine Plain are preserved upon the surface of the Shepparton Formation. These are leveed or prior streams that bear little resemblance to the modern drainage system.

Soil landscape mapping (Figure 3-2) indicated that the study area predominantly contains grey, brown and red clays with discreet areas of siliceous sands. The red-brown earths soil landscape may also be present within the study area but are not mapped within the boundaries of the current study area. Siliceous sands landform is suspectable to wind erosion but may contain deposits up to 1.4 metres deep. The siliceous sands are likely associated with former paleochannels (Czs) and has the potential to contain Aboriginal objects dating to the Pleistocene period. The grey, brown and red clays are likely to be a shallow deposit of soil and are likely to be of low potential to contain subsurface Aboriginal material. However, the grey, brown and red clays are likely to feature surface artefacts.

3.2 Climate

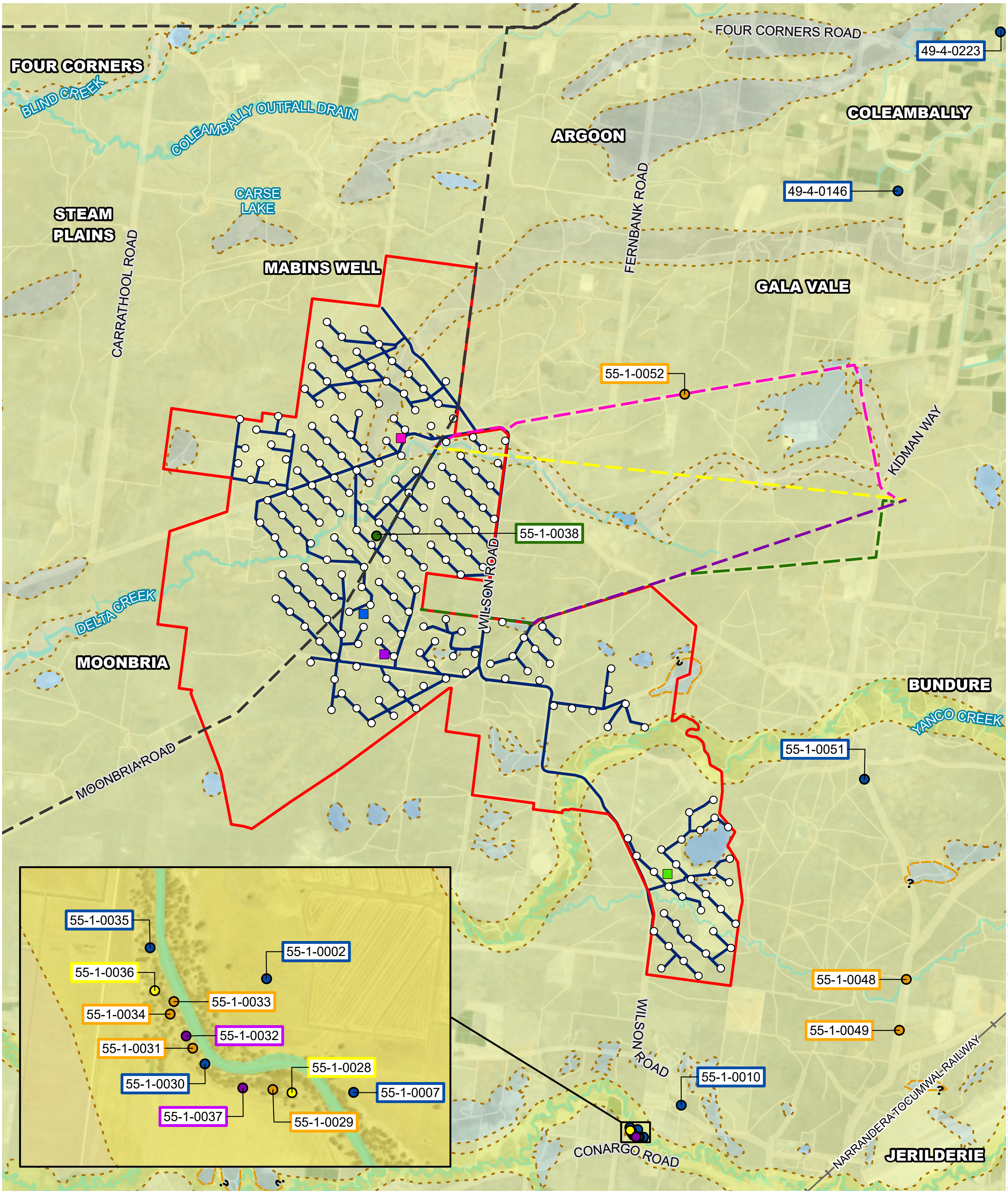
The Riverina Bioregion is dominated by a persistently dry, semi-arid climate with hot summers and cool winters. The mean annual temperature is between 15 and 18 degrees Celsius, the minimum monthly temperature between 2.2 and 4.6 degrees. Maximum monthly temperatures range between 30.6 and 33.7 degrees.

During the Pleistocene/Early Holocene the climate was significantly different, and the area was less arid, which is indicated by the extensive paleochannels throughout the region. Over time, these watercourses have morphed and changed. These paleochannels are associated with the Siliceous Sands illustrated in Figure 3-2. Changes to associated resources influenced the mobility of past Aboriginal patterns which is reflected in the distribution and location of cultural remains in the landscape (Watson and Anderson 2014).

3.3 Historic land disturbance

From 1835 the land encompassing the study area was utilised for pastoral purposes. Initially, cattle the primary industry in the region, with a number of squatters establishing stations or runs along Billabong Creek by 1840. By the 1860s, sheep had become more economically prominent. Consequently, vegetation clearance would have occurred which would have resulted in ground disturbance that would likely compromise the archaeological integrity of any Aboriginal objects. This is unlikely to have impacted the survivability of Aboriginal objects made of stone but would have resulted in the destruction of scarred trees.

As indicated by the land zoning map (Figure 3-3), the entire study area has been zoned as RU1 – Primary Production under the Conargo Local Environmental Plan 2013 and Jerilderie Local Environmental Plan 2012, for agricultural activity and is likely to have been subject to vegetation clearance which would have destroyed scarred trees and compromised the archaeological integrity of surviving Aboriginal objects. However, vegetation mapping (Figure 3-4) indicated that the northern portion of the study area is predominantly comprised on riverine plain grasslands and riverine sandhill woodlands (native vegetation). This may be the result of regrowth following vegetation clearing activities. Field investigations would be required to verify if this is old growth that has potential to contain scarred trees and other Aboriginal objects of high archaeological integrity.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

AHIMS
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)
- Railway
- Waterways
- Existing electricity transmission line
- Road

NSW surface geology
Cenozoic Sedimetary Province
- Geological boundary, inferred
- Geological boundary, position approximate
- CZ_af
- Q_a
- Q_acm
- Q_af
- Q_dds
- Q_ds
- Q_l
- Q_lp

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N

Data sources

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*NOTE: Only showing Cenozoic sediments and volcanics (0 Ma to 65 Ma) - Cenozoic sedimentary province. Not included in this figure is Cenozoic sedimentary province - Murray Basin, Cenozoic Igneous Province, sedimentary basins and related volcanics (65 Ma to 418 Ma), and basement orogenic belts and cratons (210 Ma to ~1800 Ma)

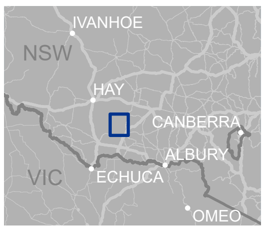
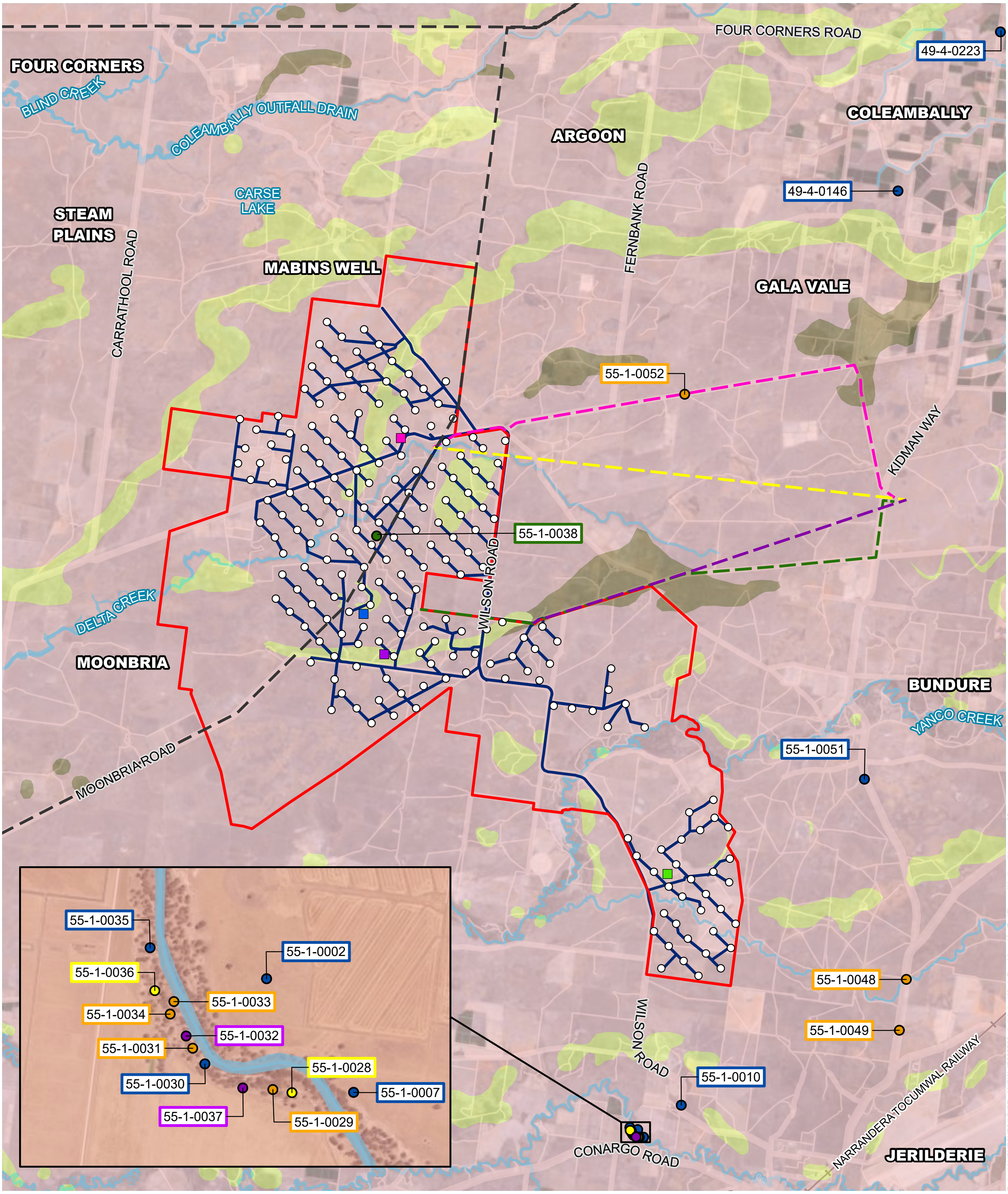


Figure 3-1 Geology



Indicative Project

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- Option 2 Substation / Battery
- Collector / Secondary Substation
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- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

AHIMS

- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)
- Railway
- Waterways
- Existing electricity transmission line
- Road

Dominant Great Soil Group (GSG)

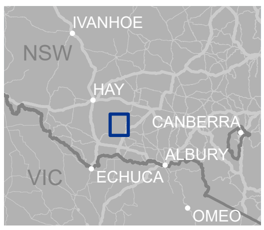
- Grey, Brown and Red Clays (GC, BC & RC)
- Red-brown Earths (RBE)
- Siliceous Sands (SS)

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N



Data sources

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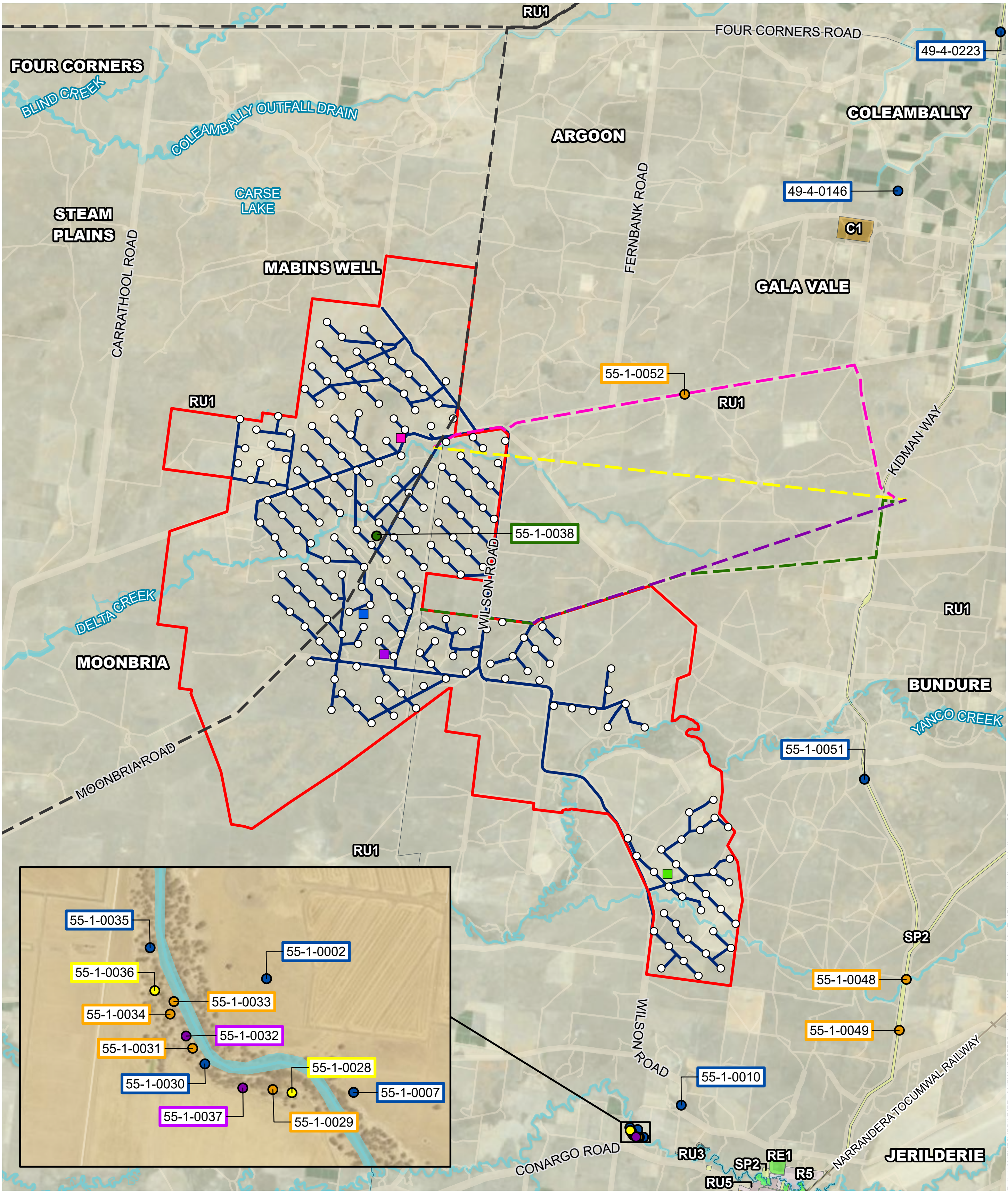
Figure 3-2 Soil landscape



Indicative Project
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- Collector / Secondary Substation
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- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

Land zoning (LEP)
- C1 National Parks and Nature Reserves
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU3 Forestry
- RU5 Village
- SP2 Infrastructure
- W1 Natural Waterways

AHIMS
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

IVANHOE
NSW
HAY
CANBERRA
ALBURY
VIC
ECHUCA
OMEO

Data sources

Jacobs 2022
DPE 2021
OEH 2021,
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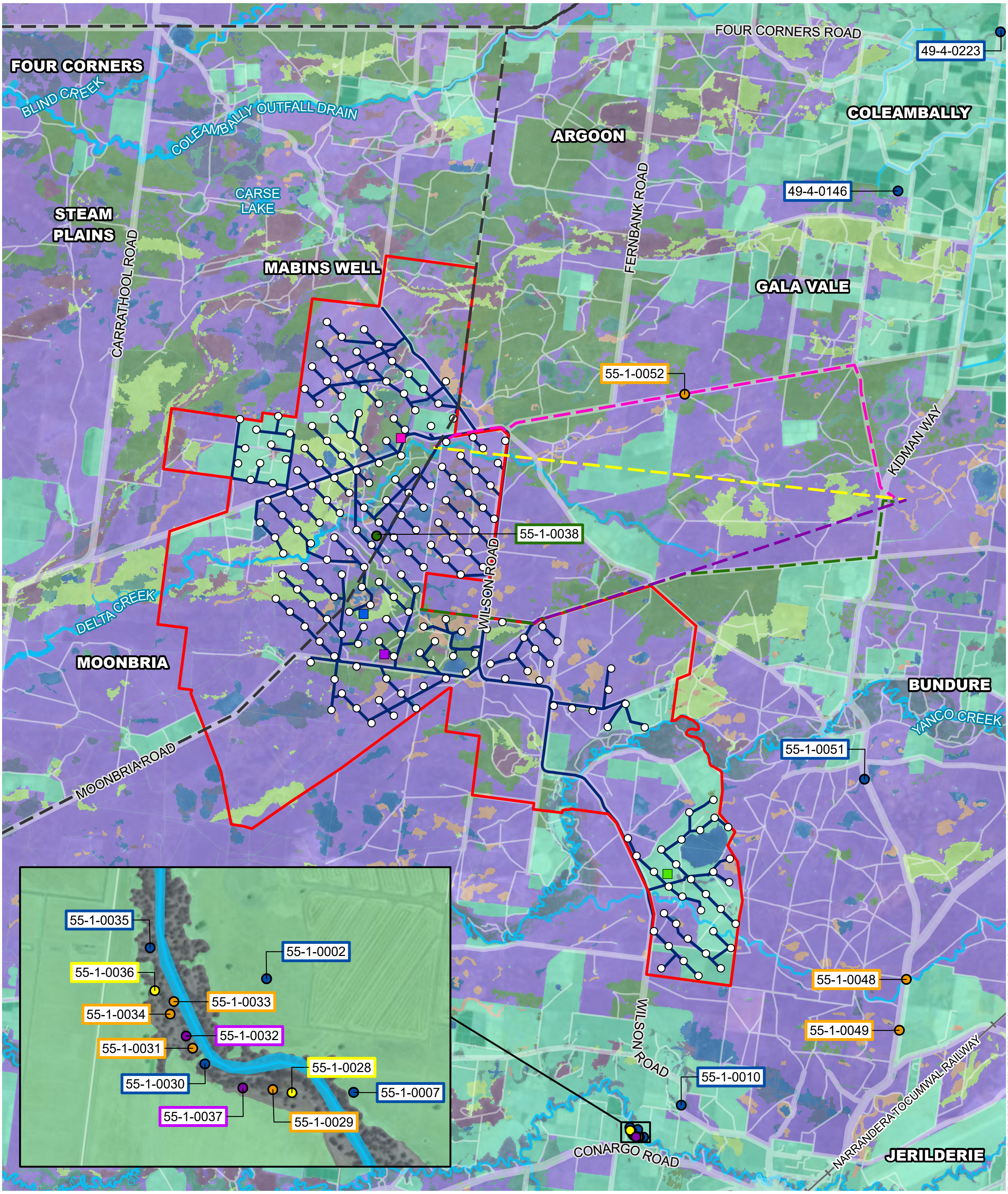
Figure 3-3 Land zoning



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- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)
- Railway
- Waterways
- Existing electricity transmission line
- Road

Vegetation (DPIE)
- Floodplain Transition Woodlands
- Inland Floodplain Shrublands
- Inland Floodplain Swamps
- Inland Floodplain Woodlands
- Inland Riverine Forests
- Non Native
- Riverine Chenopod Shrublands
- Riverine Plain Grasslands
- Riverine Plain Woodlands
- Riverine Sandhill Woodlands

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N

IVANHOE
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ALBURY
VIC
ECHUCA
OMEO

Data sources

Jacobs 2022
DPIE 2016
OEH 2021,
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Figure 3-4 Vegetation

4. Archaeological background

4.1 Historical descriptions of Aboriginal material culture

Early mapping of Aboriginal tribal boundaries by Tindale (1940) identified the study area as being occupied by the Pangerang (Bpangerang) peoples. Subsequent mapping by Tindale (1974), however placed the boundaries of the Pangerang to the south of the Murray and the study area within the boundaries of the Jethi language group, bordered to the south-west by the Wiradjuri. Later mapping removed the Pangerang peoples from the region altogether (Horton 1994). There remains some conjecture regarding the accuracy of tribal boundary mapping with some suggestion that Bpangerang country extends across the Murray River, from Albury in the east, to Moama in the west and as far north as Colleambally (to the north-east of the study area).

Many small clans and bands speaking a number of similar dialects lived in close proximity to each other, the Yorta Yorta language group is bordered by the Wiradjuri, Waveroo, Ngurraiillam and Baraba Baraba peoples (Horton 1994). This likely resulted in people speaking multiple languages and dialects through contact and movement across the landscape associated with seasonal droughts and resource abundance (Howitt 1904; Tindale 1940; MacDonald 1983; Horton 1994).

The small clans would have been highly mobile, moving across the landscape and engaging in resource utilisation. Evidence of these activities may be present within the study area and would likely take the form of stone artefacts in various densities. High concentrations of stone artefacts located near former resource zones may be interpreted as evidence of camping, while low density or isolated artefact may be interpreted as evidence of transient land use. Locations that were visited repeatedly would likely contain extremely high numbers of stone artefacts which would likely be broken due to trampling associated with repeated occupation by larger numbers of people.

In 1836, Mitchell documented mounds in the Murray River system that were used to cook Typha in the lower Lachlan and Murrumbidgee Rivers (Mitchell 1839). Beveridge also recorded mound use in the Murray River area below Swan Hill from the 1850s (Beveridge 1883). Beveridge noted that the continued use of these ovens resulted in the build-up of debris and the formation of the mounds, with new clay being introduced each use due to crumbling of the clay heat retainers (Martin 2006, 2010). Mitchell also observed the way Aboriginal people of the Murrumbidgee and Murray buried the dead noting that a small, thatched hut was erected over a burial and the huts were enclosed by two or three low ridges of dirt in the shape of an ellipse with pointed ends (Mitchell 1839). As a result, the study area has the potential to contain mounds, hearths and burial huts.

Historic observations identified that Aboriginal people carried wooden weapons and tools such as spears, spear throwers, clubs, shields, boomerangs, digging sticks, bark vessels and canoes (Bennet 1834; Beveridge 1889; Oxley 1820; White 1986). Digging sticks were used by women to collect vegetable foods while small wooden spades were used to dig up grubs, ants and Mallee (Eyre 1845). Wooden troughs were placed over coals and used for cooking (Beverage 1883) while flint blades, mussel shells, kangaroo bones and split reeds were used for cutting and skinning animals during food preparation (Lawrence 1967). Water was carried in bark troughs or bags made of animal hide (Beveridge 1889; Lawrence 1967). These items are unlikely to be identified within an archaeological context due to the vulnerability of organic materials to decay in an open environment. However, evidence of timber sourcing, such as modified trees, may be identified where remnant native vegetation has not been impacted by historic land clearance.

European people began arriving in the area in the 1840s which resulted in conflict with Aboriginal people. The 1843 flood resulted in Aboriginal people abandoning the river flats and relocating to higher ground that had been occupied by European people (AECOM Australia Pty Ltd 2015). As a result, there may be evidence of contact archaeological or conflict sites within the study area. Aboriginal people were relocated to missions like Warangesda (60 kilometres north-east of the study area), the Brungle Reserve between Gundagai and Tumut (230 km east of the study area), or Moonahcullah (70 kilometres south-west of the study area) (AECOM Australia Pty Ltd 2015).

4.2 Aboriginal Heritage Information Management System data

The AHIMS database is managed by Heritage NSW and includes spatial and compositional information of Aboriginal sites recorded through academic and compliance-based cultural resource management projects associated with modern various developments. The nature and location of the registered sites reflects the past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources, was a significant factor in repeated and long-term occupation of specific areas within the landscape. Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient.

A search of the AHIMS database was completed on 1 October 2021 for an area of land at datum GDA, zone 55, eastings 343764.83 - 396348.52, northings 6089153.64 - 6144064.62 with a buffer of 0 meters (Appendix A). Land surrounding the study area (about two kilometres) was included within the search parameters to gain information on the regional archaeological context and inform predictive statements regarding the archaeological potential of the study area.

The AHIMS search identified 28 Aboriginal sites. There are three sites which have been recorded as D D #6, all with the same co-ordinates and site feature, and it is assumed that they are duplicate recordings of a single site. Four sites have been recorded as Billabong Creek. However, there are two sets of coordinates and three site features associated with Billabong Creek (see Table 4-1). Therefore, it is assumed that there is only one duplicate co-ordinate.

There is one AHIMS registered site, Tooleybuc Bridge PAD (AHIMS ID 55-1-0038), located within the study area (Figure 4-3). The site card (Appendix B) for Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) lists the location of the site at the corner of Lea Street and Murray Street, Tooleybuc, which is 181 kilometres to the west of the study area. The coordinated listed on the AHIMS data (Appendix A) for Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) is different to the coordinates on the site card, and it is likely that the site coordinates were incorrectly entered into the AHIMS database. Therefore, Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) is not located within the study area and does not pose a constraint to the project. As a result, the revised number of AHIMS sites would be 24 in total.

Table 4-1: Summary of duplicated AHIMS data

<table>
<tr><th>Site name</th><th>Site feature</th><th>Easting</th><th>Northing</th><th>AHIMS ID</th></tr>
<tr><td rowspan="3">D D #6</td><td rowspan="3">Modified Tree (Carved or Scarred)</td><td rowspan="3">344100</td><td rowspan="3">6089900</td><td>54-3-0010</td></tr>
<tr><td>54-3-0012</td></tr>
<tr><td>54-3-0013</td></tr>
<tr><td rowspan="4">Billabong Creek</td><td rowspan="2">Modified Tree (Carved or Scarred)</td><td rowspan="2">377947</td><td rowspan="2">6089347</td><td>55-1-0002</td></tr>
<tr><td>55-1-0003</td></tr>
<tr><td>Artefact</td><td rowspan="2">378225</td><td rowspan="2">6088984</td><td>55-1-0007</td></tr>
<tr><td>Modified Tree (Carved or Scarred)</td><td>55-1-0009</td></tr>
</table>

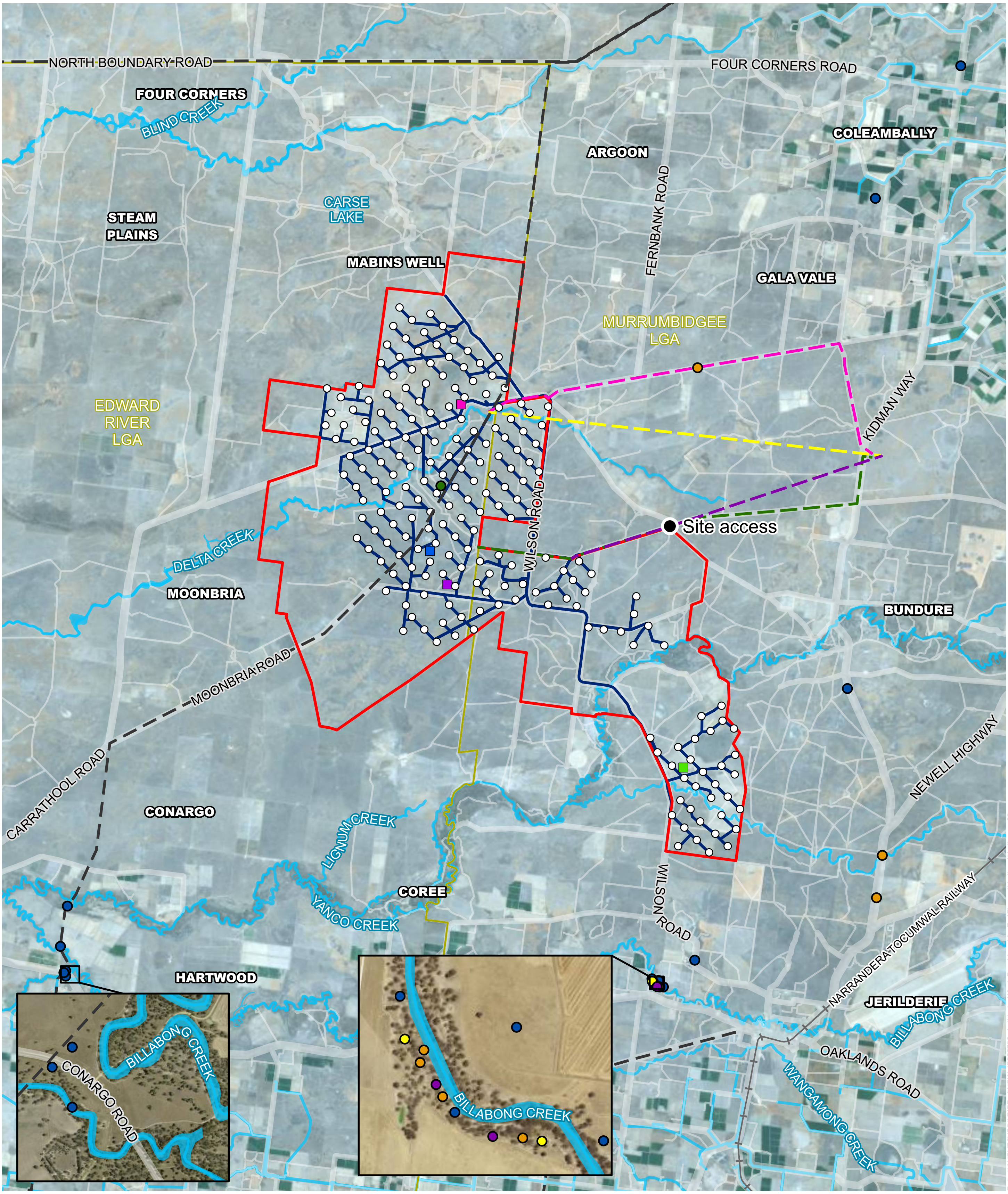
In NSW, there are 20 standard AHIMS site features and a site can include more than one feature. The breakdown of AHIMS site features is included in Table 4-2 below. The majority of the AHIMS sites (n=14) are located in the southern portion of the search area, associated with Billabong Creek (Figure 4-1). The remaining sites appear to be associated with existing roads and were likely identified due to the ease of access and the high visible and exposure that is associated with roads. As a result, the AHIMS data indicates that Aboriginal objects will likely be identified near the roads located within the study area due to increased survey efficiency. However, additional

Aboriginal objects may also be present, likely associated with major waterways such as Delta Creek and its associated tributaries as well as the wetlands identified in Figure 4-2.

Table 4-2: Summary of AHIMS site features

Site feature	Number of occurrences	Percentage (%)
Artefact	8	33.33
Modified Tree (Carved or Scarred)	12	50.00
Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell	2	8.33
Artefact, Earth Mound	2	8.33
Total	**24**	**100.00**

As discussed in Section 4.1 historic observations of Aboriginal people identified that wooden objects such as spears, spear throwers, clubs, shields, boomerangs, digging sticks, bark vessels and canoes were prominently utilized by Aboriginal people (Bennet 1834; Beveridge 1889; Oxley 1820; White 1986). However, these items had not been identified within an archaeological context due to the vulnerability of organic materials to decay in an open environment. However, the majority of the site types within the parameters of the AHIMS search are modified trees, supporting early observations of Aboriginal people utilising timber. As a result, areas of remnant native vegetation have the potential to include modified trees which will provide information of Aboriginal timber utilisation.



Indicative Project
- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4

AHIMS
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)

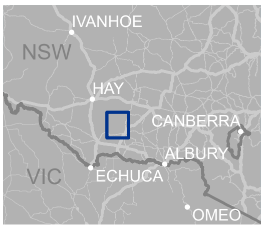
- Local Government Area
- Site access
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:300,000 at A4

GDA 1994 MGA Zone 55

N



Data sources

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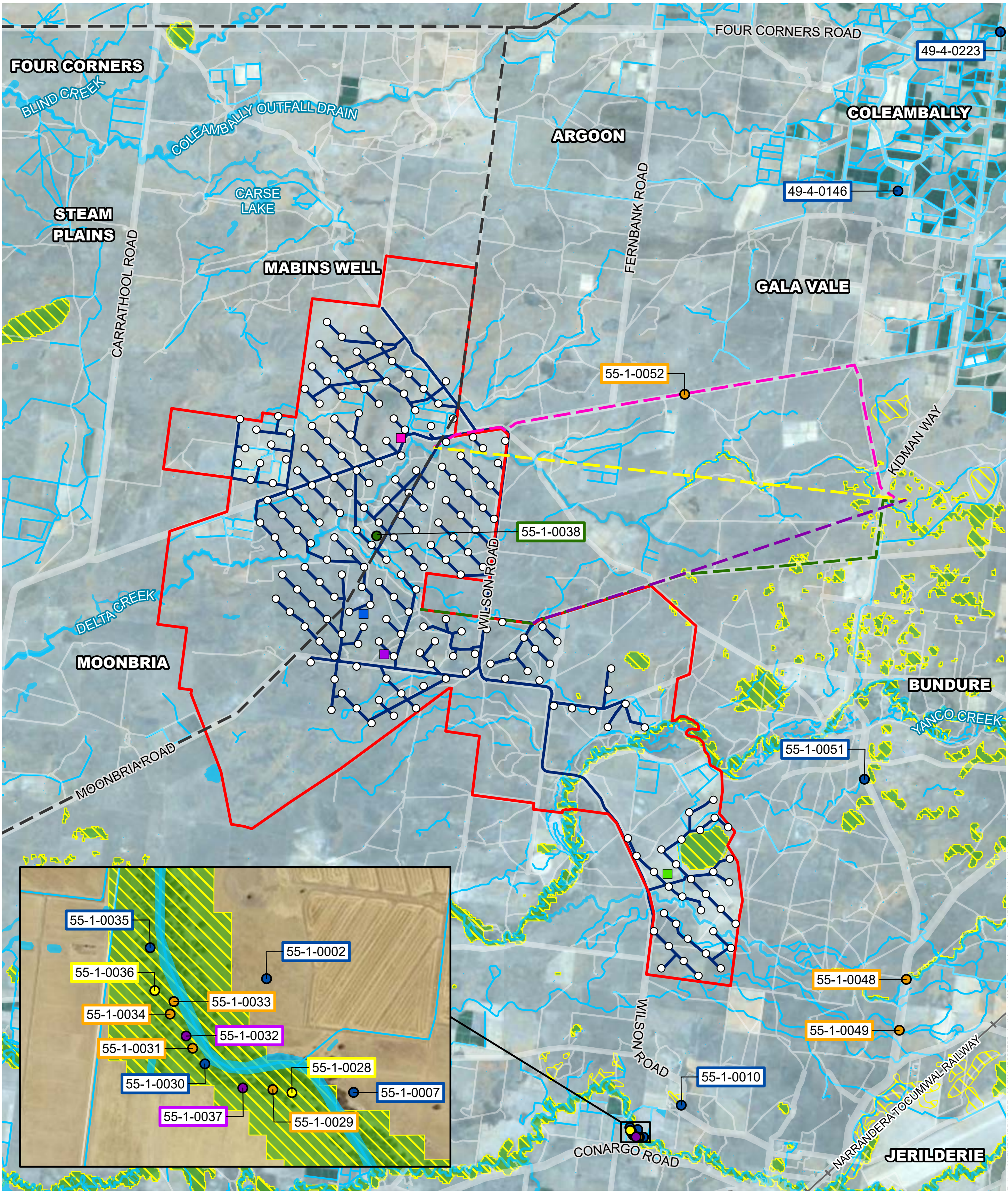
Figure 4-1 Extensive AHIMS results



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AHIMS
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)

- Railway
- Waterways
- Existing electricity transmission line
- Road
- Wetlands (EPI)
- Wetlands of NSW

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

N

IVANHOE
NSW
HAY
CANBERRA
ALBURY
VIC
ECHUCA
OMEO

Data sources

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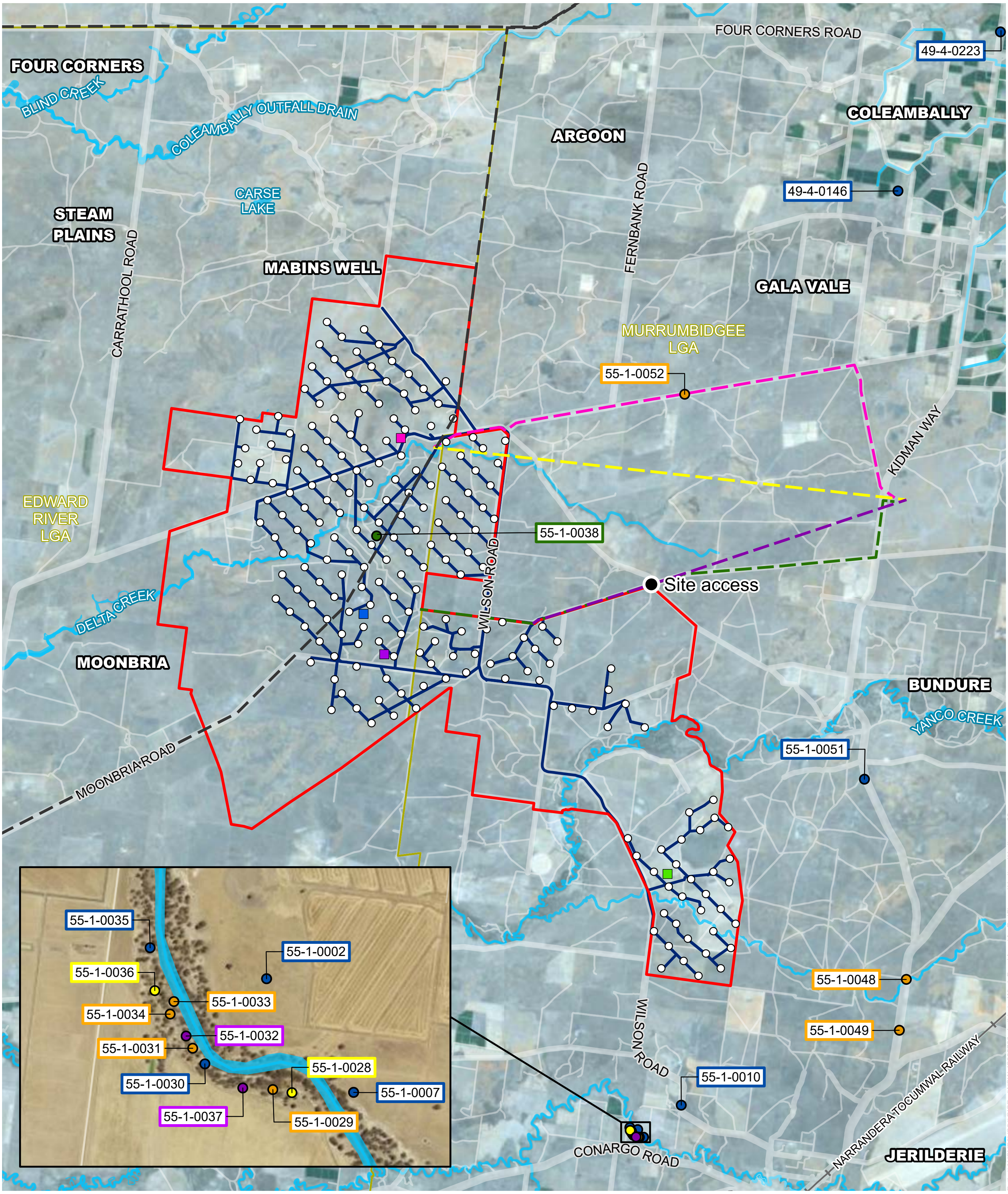
Figure 4-2 Hydrology



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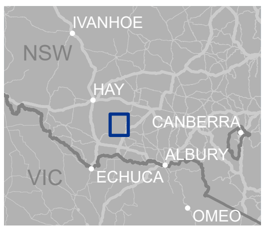
AHIMS
- Artefact
- Artefact, Earth Mound
- Artefact, Earth Mound, Non-Human Bone and Organic Material, Shell
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)

- Local Government Area
- Site access
- Railway
- Waterways
- Existing electricity transmission line
- Road

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

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Figure 4-3 AHIMS registered sites within the vicinity of the study area

4.3 Archaeological context

4.3.1 Regional

Aboriginal occupation within the Murray-Darling Basin dates back to the late Pleistocene epoch, with the Willandra Lakes (located 250 kilometres north-west of the study area) yielding some of the oldest dates. The Willandra Lakes region and Mungo National Park are located approximately 250 kilometres north-west of the current study area. Archaeological excavations in the region have produced Late Pleistocene dates from midden material and Aboriginal ancestral remains (Lawrence 2006). The oldest confirmed dates for Aboriginal occupation along the Murray River are between 18,000 to17,000 years before present (Hope 2000; Lance 1993).

The results of previous archaeological investigation and the search of the AHIMS database, has identified that there are Aboriginal sites present throughout the regional area. There is a dominance of scarred trees, especially in areas which have not been subject to historic land clearance, where there are remnant stands of native trees are present. Scarred trees are particularly frequent along water courses, indicating that additional scarred trees would likely be located where remnant vegetation is located in close proximity to watercourses.

Burials have been found to be predominantly associated with sand hills while floodplains association with ephemeral drainage lines, swamps and lagoons are likely to be associated with earth mounds. Site densities in close proximity to the study area is low. This may suggest the seasonal occupation of the area by Aboriginal people though it is more likely that there has been a lack of archaeological investigations in the area or that historic land use has impacted the survivability of Aboriginal objects.

4.3.2 Local

There have been several archaeological surveys focused on mounds and burials conducted across the wider Murray Valley and Murrumbidgee Region. These studies summarised below in, contribute to an understanding of the nature of Aboriginal occupation in the region.

Buchan (1974) undertook an extensive survey of an area of land 48 kilometres north of the Murray River, extending from Albury to Mildura. The survey resulted in the identification of 198 Aboriginal sites. Based on the site distribution data, Buchan noted that ovens, scarred trees, and middens were typically located on the banks of rivers or creeks which suggested the camps were generally located close to a water and food source. Most of the burials were found to be located within sand dunes. Based on the results of the survey, Buchan developed a predictive model which found that any areas near a water source were likely to contain sites.

Simmons (1980) completed a survey of the Murray Floodplain and channels which resulted in the identification of 75 earth mounds,17 scarred trees as well as lesser numbers of artefact scatters, hearths, middens and burials. The mounds generally contained clay nodules, burned shell and bone fragments. All scarred trees were found to be mature Red Gum species tress. All sites were located on or in association with floodplains, anabranches and lake systems.

McIntyre (1985) carried completed a survey of a 167 km transmission line between Darlington Point and Deniliquin. The survey resulted in the identification of a total of 27 Aboriginal archaeological sites, one of which was associated with historic features. The site types recorded were primarily scarred trees with artefact scatters, with lesser numbers of hearths and earth mounds. Stone artefacts were found to have been manufacture from silcrete, quartz, basalt, siltstone, and chert. All scarred trees recorded during the survey were found to be Grey Box species trees. Consistent with the predictive model developed by Buchan (1974), McIntyre found that most sites were located near existing water courses.

Hamm (1995) completed a survey of a 117 kilometre long optical fibre cable to link telephone exchange networks from Darlington Point, Coleambally, Finley and Jerilderie. The survey resulted in the identification of a total of 20 Aboriginal sites, all scarred trees. In contrast to the findings of McIntyre, all scars were on Yellow Box species trees rather than Grey Box species tress.

Edmonds (1996a) completed a pedestrian and vehicular survey along the Edwards River. Based upon previous archaeological research in the region Edmonds predicted that scarred trees, mounds and burials would be the prominent site types located by the study. Edmonds also predicted that mounds and scarred trees would occur predominantly on the high and low alluvial plains however, while burials would be restricted to sand bodies on the low alluvial plain. The survey resulted in the identification of nine scarred trees and a single burial in a source bordering dune. All scarred trees were found to be River Red Gum species trees, associated with the river and creek banks and Black Box species trees, occurred within the floodplain. The absence of mound sites in the survey area was attributed by Edmonds to a combination of disturbance by rural development and lack of suitable land.

Edmonds (1996b) also completed a pedestrian and vehicular survey for a proposed drainage channel through the Pinelea Drainage Basin, near Finley. This was similar to the previous study in that it was expected that mounds, scarred trees and burials would be the sites most likely to occur. Six scarred trees were recorded during survey on Grey Box associated with swamps, depressions and floodplains, river red gum associated with creek banks and Callitris pine associated with a sandhill. Edmonds noted that that site densities recorded during the survey were lower than other areas on the riverine plain and suggested that prior to European settlement there was likely a greater number and variety of sites in the area.

OzArk (2008) surveyed the 68 kilometres proposed 132 kV transmission line upgrade route proposed from Finley to Mulwala. The survey did not identify any sites and it was assessed that there was low potential for intact, sub-surface archaeological deposits within the study area given the clay soils, lack of permanent water, scale of tree clearing and agricultural developments and absence of rock outcrops in the assessment corridor.

Navin Officer (2009) surveyed the proposed 132 kV transmission line route from Deniliquin to Moama. The route was approximately 69 kilometres long. Nine modified trees and two historic sites were recorded along the proposed transmission line corridor.

NGH Environmental (2016) conducted a Due Diligence assessment of Kyalite Stables for rezoning and residential development for the Edward River Council. The area was located between the Riverina Highway and the Edward River on the eastern edge of the township of Deniliquin. While previous archaeological surveys and modelling for the area suggested that the most archaeologically sensitive areas were relatively intact tracts of riverine Red Gum forest along the floodplains of the major active rivers and creeks, and Black Box fringed depressions no sites were identified.

4.4 Predictive model

Predictive models are important and provide assessments on the most likely areas of archaeological potential within a given subject site. These models also indicate the likely types of archaeological evidence, if present, with a given locations and / or subject site.

This predictive model comprises a series of statements about the nature and distribution of evidence of Aboriginal land use that is expected in the subject site. These statements are based on the information gathered regarding:

- Landscape context and landform units
- Historical descriptions of Aboriginal land use
- Historical disturbance and landscape modification
- Results of previous archaeological work in the vicinity of the subject site
- Historical accounts of Aboriginal occupation, and landscape character
- Predictive modelling proposed in previous archaeological investigations.

Based on the results of desktop assessment the most common Aboriginal site types likely to be identified in the study area include:

- Stone artefacts – are present across the entire landscape, in varying densities. As Aboriginal people traversed the landscape for thousands of years, such finds can occur anywhere and indicate the presence of isolated activity, dropped or discarded artefacts from hunting or gathering expeditions or the ephemeral presence of short term camps
- Burials – are generally found in elevated sandy contexts or in association with rivers and major creeks. No such features exist with the study area and therefore such sites are unlikely to occur. Burials are unlikely to be detected through surface survey
- Scarred Trees – these require the presence of mature trees and are likely to be concentrated along major waterways and around swamps areas. There are patches of remnant vegetation and isolated old growth trees within the study area. Therefore, this feature is likely to occur
- Hearths/Ovens – are identified by burnt clay used for heat retainers. Some are recorded in the district in association with resource locations. However, they could occur either independently or in association with other Aboriginal cultural features such as campsites. While it is possible for this feature to occur, such places are not obvious within the study area and would likely be disturbed or previously destroyed by farming and irrigation activities
- Shell Middens – are the accumulation of shell material disposed of after consumption. Such places are found along the edges of significant waterways, swamps and billabongs. No such natural undisturbed features occur and therefore this site type is unlikely to exist in the study area.

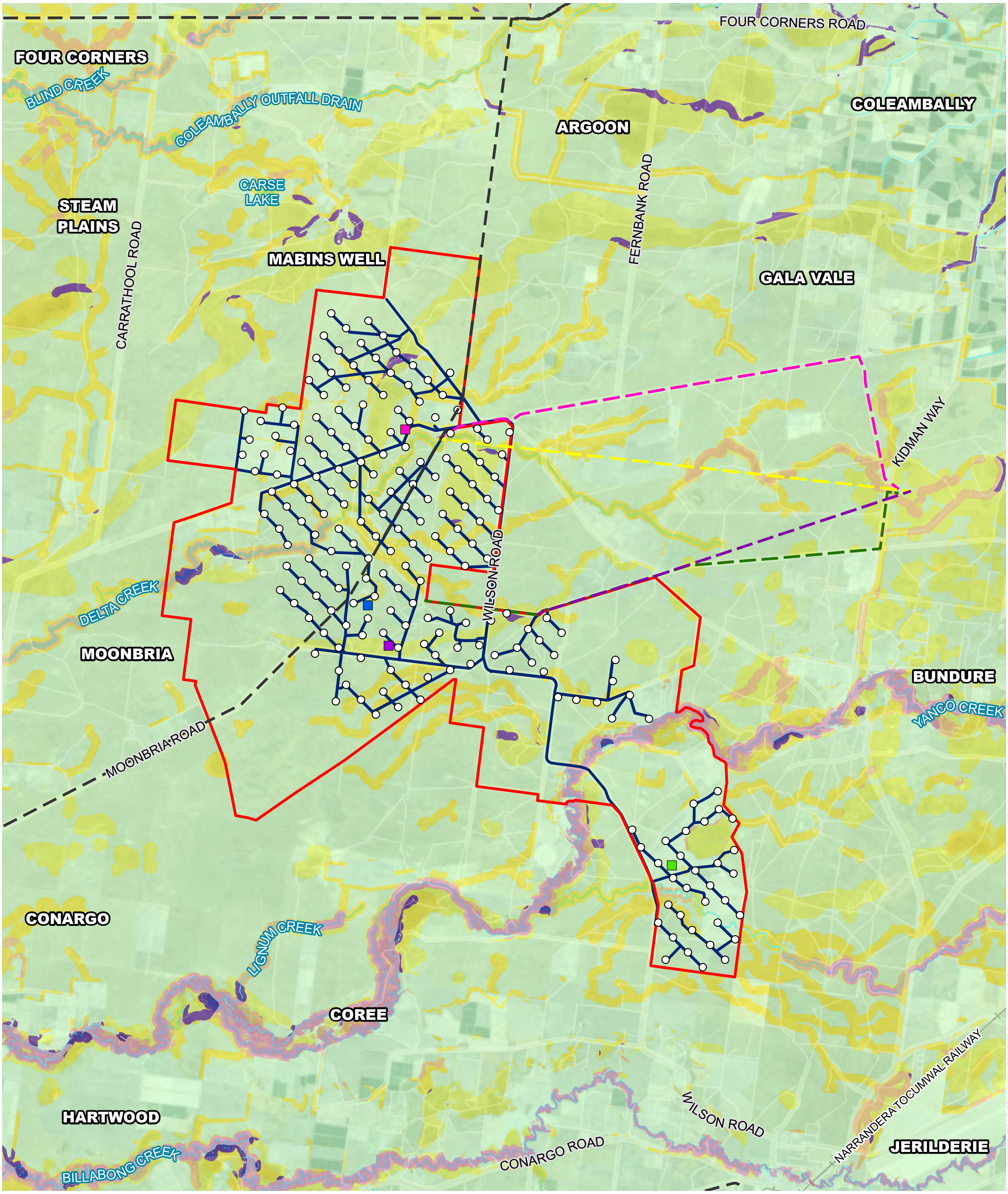
The lack of topographic, environmental or landscape features within the study area means that there are few loci that could potentially be attractive to Aboriginal people to concentrate activity and therefore increasing the chance of leaving archaeological traces. Nonetheless, given that Aboriginal people have lived in the region for tens of thousands of years, there is some potential for archaeological evidence to occur. This is most likely to be in the form of stone artefacts and scarred trees.

Background research has identified that all soil landscapes are considered to have sensitivity to contain Aboriginal objects. The siliceous sands are considered to have high potential to contain Aboriginal objects, the red-brown earth soils are considered to have low potential, and the grey, brown and red clays have moderate potential to include Aboriginal objects. Areas where native vegetation is present have been assessed as having moderate potential to contain Aboriginal objects as this may be an indicator of location where old trees with cultural modification may be present. These areas may also indicate less ground disturbance and high potential for Aboriginal objects to be present. Locations with non-native vegetation have low potential to contain Aboriginal objects. All land located within 200 metres of a water source is considered to have high potential to contain Aboriginal objects. Based on these criteria, Spatial Multi-Criteria Analysis (MCA) has been completed to develop a visual representation of the predicted archaeological potential of the study area (Figure 4-4). The model indicates that the majority of the impact area will avoid locations that are of high predicted archaeological potential.

Background research completed for this assessment resulted in the development of several predictive statements that should be verified by field investigation:

- It is likely that scarred trees will be present within the study area at locations where native vegetation has not been subject to historic land clearance
- Stone artefacts will likely be identified within close proximity to existing roads due to increased surface visibility and exposure facilitating high survey efficiency
- Aboriginal objects will likely be located within 200 metres of major/permanent waterways
- Locations associated with the siliceous sands landscape are likely to contain deep (1.4 metres) deposits that have the potential to contain Aboriginal objects dating to the Pleistocene

- Locations associated with the grey, brown and red clays landscape are unlikely to feutre subsurface artefact deposits, but are likely to feature Aboriginal objects on the ground surface.



Indicative Project

- Project area
- Access tracks/internal cabling
- Turbine locations
- Main Yanco Delta Substation
- Option 1 Substation / Battery
- Option 2 Substation / Battery
- Collector / Secondary Substation
- Proposed transmission line - Option 1
- Proposed transmission line - Option 2
- Proposed transmission line - Option 3
- Proposed transmission line - Option 4
- Railway
- Waterways
- Existing electricity transmission line
- Road

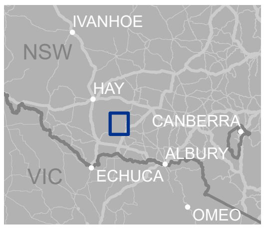
Predictive heritage constraints

- Low risk
- High risk

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55



Data sources

Jacobs 2022
DPE 2021
OEH 2021,
© Department of Customer Service 2020

Figure 4-4 Predictive heritage constraints

5. Significance assessment

5.1 Assessment criteria

An assessment of the cultural heritage significance of an item or place is required in order to form the basis of its management. The *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) provides guidelines, in accordance with the Burra Charter (Australia ICOMOS 2013) for significance assessment with assessments being required to consider the following criteria:

- Social values – does the area have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Historic values – is the area important to the cultural or natural history of the local area and/or region and/or state
- Scientific values – does the area have the potential to yield information that will contribute to an understanding of the cultural and natural history of the local area and/or region and/or state
- Aesthetic values – is the area important in demonstrating aesthetic characteristics in the local area and/or region and/or state.

Scientific values should be considered in light of the following criteria:

- Research potential – does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- Representativeness – how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity – is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential – does the subject area contain teaching sites or sites that might have teaching potential?

It is important to note that heritage significance is a dynamic value.

5.2 Significance assessment

Based on the results of background research and a search of the AHIMS database, no identified Aboriginal objects or places are located within the study area. However, background research has identified that the lack of registered Aboriginal sites is likely the result of limited archaeological investigations within the study area. The study has the potential to contain surface and subsurface artefact scatters, scarred trees, hearths, and shell middens. The archaeological value of any objects that may be located within the study area cannot be determined without further investigation in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b).

As background research has identified that limited archaeological investigations have been completed within the region, it is likely that any identified Aboriginal objects would be considered to have moderate to high research potential. The lack of known Aboriginal objects within the local and regional context would also result in any identified Aboriginal objects being assessed as highly rare. Representativeness would be determined based on the variability of site types but would likely be high due to the lack of existing sites that would be conserved in the regional context. Educational potential would likely be assessed as high due to the lack of material available in the region for educational purposes.

Based on mapping of the soil profiles, the study area overlaps with former paleochannels (siliceous sands) which have the potential to contain deep deposits and Aboriginal objects associated with the earliest stages of human occupation in Australia. Archaeological material identified at Mungo National Park, located approximately 250 kilometres north-west of the study area, has yielded the oldest dates of human occupation in Australia and the siliceous sands have the potential to comparable material. As a result, it is predicted that any Aboriginal objects identified within the study area would likely be assessed as demonstrating high scientific value.

Social, aesthetic, and historic values would need to be assessed following comprehensive consultation with Aboriginal stakeholders in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRP) (DECCW 2010a). No specific historic values associated with the study area were identified during the completion of background research for this report. However, additional research completed in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) and Aboriginal stakeholder consultation may identify historically significant information. Social, aesthetic, and historic values would be assessed in relation to any identified Aboriginal objects and not against the study area as a whole.

6. Risk assessment

6.1 Critical risks

There are no identified Aboriginal objects within the study area, but this assessment has found that it is likely that surface and subsurface Aboriginal objects will be present. Due to the rarity of Aboriginal objects and lack of archaeological investigations within the region, it is likely that any Aboriginal objects identified within the study area would be considered to be of high scientific value.

Regardless of the level of assessed significance, a permit must be in place to authorise harm (as defined in Section 2.2.2) to any known of unknown Aboriginal objects. It is understood that the project will be seeking approval to be considered SSD and if approved the Minster's Conditions of Approval (MCoA) must be in place to authorise harm to any identified Aboriginal objects.

If archaeologically or culturally significant Aboriginal sites are located, conservation should be considered. Any impacts would be undertaken in consultation with the Aboriginal stakeholders. If Aboriginal skeletal material is located, conservation in situ may be required as a reflection of its significance to Aboriginal people.

Potential conservation in situ is likely to be the biggest risk to the project and could only be partially managed by targeted test excavations. Test excavation may further inform assessment of archaeological potential and significance but would not necessarily mitigate risk of significant finds in areas that had not been tested.

Cultural significance should also be accounted for during the planning and assessment phases. Risks associated with community responses to impacts on cultural significance could be mitigated through comprehensive Aboriginal community consultation. This consultation could focus on design input not just management of cultural heritage. Impacts to cultural significance can also be mitigated by appropriate heritage interpretation.

6.2 Design considerations

As no Aboriginal objects could be identified based on the results of desktop research, it will not be possible to provide advice on design considerations to avoid harm to unknown Aboriginal objects. The background research has resulted in the development of predictive statement regarding the likely location of Aboriginal objects. However, archaeological survey, and potentially test excavations completed in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) and the SEARs will be required to adequately assess the likely impacts to Aboriginal objects.

7. Strategic management

This section recommends strategic mitigation and management measures that would minimise the impacts of any future proposed works to Aboriginal heritage.

7.1 Guiding Principles

The overall guiding principle for cultural heritage management is that where possible Aboriginal objects should be conserved. If conservation is not practicable, measures should be taken to mitigate against impacts to Aboriginal sites. These mitigation measures are based of the assessed significance of the site against the proposed impacts:

- Unknown scientific value – Further archaeological investigation is required to determine significance. A permit usually will not be issued to authorise harm until the scientific value has been determined and test excavation is not a mitigation measure.
- Low scientific value – Conservation where possible. MCoA would be required to impact the site before works can commence
- Moderate scientific value – Conservation where possible. If conservation was not practicable further archaeological investigation would be required such as salvage excavations or surface collection under the MCoA
- High scientific value – Conservation as a priority. The MCoA would be required only if other practical alternatives have been discounted. Recommendations for the conditions of the MCoA would depend on the nature of the site, but may comprehensive, large scale salvage excavations.

Based on the findings of this assessment, the study area is considered to be of unknown scientific value and further archaeological assessment is required to develop specific mitigation measures.

7.2 Further investigations

It is recommended that a pedestrian survey of the study area is completed in accordance with the requirements of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). Vehicle survey is not acceptable and can only be utilised for reconnaissance activities associated with the development of a survey strategy. The survey strategy would involve dividing the study area into survey units which would be assessed and the ground visibility (percent of bare ground) and exposure (percent of land where it is likely that Aboriginal objects will be visible) will be recorded. The survey team would carry and GPS unit to record any sites and survey transects. A full photographic record would also be kept documenting the survey units and any identified sites.

The survey may result in the identification of PADs and test excavations may be required to confirm the presence of subsurface Aboriginal objects. In accordance with the requirements of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b), a test excavation methodology must be developed in consultation with the registered Aboriginal parties and submitted to Heritage NSW 14 days prior to the commencement of any test excavation program. As a result, test excavations cannot take place concurrently with the survey program, as the results of the survey are required to inform the development of the test excavation methodology.

Where it is identified that identified Aboriginal objects will be harmed by the proposed works, an ACHAR must be completed. An ACHAR may also be required by the SEARs regardless of the findings of the archaeological investigations.

7.3 Mitigation and management measures

As no Aboriginal objects have been identified during the completion of this desktop study and the significance of unknown Aboriginal objects cannot be determined until field investigations are complete, it is not possible to develop specific mitigation and management measures. However, it is likely that salvage excavations would be required where harm to significant sub-surface Aboriginal objects cannot be avoided. Where harm cannot be avoided to surface Aboriginal objects, regardless of significance, it is likely that a salvage of surface artefacts will be required.

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Appendix A. AHIMS records

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : IS395700

Client Service ID : 627192

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
54-3-0010	D D #6;	AGD	55	344100	6089900	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1326,1352
	Contact	**Recorders**	J Carroll,George McIntyre					**Permits**		
54-3-0011	D D #9;	AGD	55	344200	6093600	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1326
	Contact	**Recorders**	Doctor.Susan (left ahms) Mcintyre-Tamwoy					**Permits**		
54-3-0012	D D #6;	AGD	55	344100	6089600	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1326
	Contact	**Recorders**	Doctor.Susan (left ahms) Mcintyre-Tamwoy					**Permits**		
54-3-0013	D D #6;	AGD	55	344100	6089900	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1326
	Contact	**Recorders**	J Carroll,George McIntyre					**Permits**		
54-3-0014	D D #6;	AGD	55	344000	6089800	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1326
	Contact	**Recorders**	J Carroll,George McIntyre					**Permits**		
55-1-0002	Billabong Creek;	AGD	55	377947	6089347	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	ASRSYS					**Permits**		
55-1-0003	Billabong Creek;	AGD	55	377947	6089347	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	ASRSYS					**Permits**		
55-1-0007	Billabong Creek;	AGD	55	378225	6088984	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	ASRSYS					**Permits**		
55-1-0009	Billabong Creek;	AGD	55	378225	6088984	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	ASRSYS					**Permits**		
55-1-0010	Wilson's Rd Scarred Tree;	AGD	55	380020	6090510	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	Harvey Johnston					**Permits**		
54-3-0009	D D #7;	AGD	55	343800	6091300	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1326
	Contact	**Recorders**	J Carroll,George McIntyre					**Permits**		

Report generated by AHIMS Web Service on 01/10/2021 for Ryan Taddeucci for the following area at Datum :GDA, Zone : 55, Eastings : 343764.83 - 396348.52, Northings : 6089153.64 - 6144064.62 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 28

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : IS395700

Client Service ID : 627192

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
55-1-0028	Brookvale 2	AGD	55	378028	6088983	Open site	Valid	Artefact : 14, Earth Mound : 1		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0029	Brookvale 3	AGD	55	377967	6088993	Open site	Valid	Artefact : 2		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0030	Brookvale 4	AGD	55	377750	6089075	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0031	Brookvale 5	AGD	55	377711	6089125	Open site	Valid	Artefact : 6		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0032	Brookvale 6	AGD	55	377690	6089164	Open site	Valid	Artefact : 36, Earth Mound : 8, Non-Human Bone and Organic Material : -, Shell : -		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0033	Brookvale 7	AGD	55	377651	6089274	Open site	Valid	Artefact : 3		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0034	Brookvale 8	AGD	55	377639	6089234	Open site	Valid	Artefact : 7		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0035	Brookvale 9	AGD	55	377575	6089446	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0036	Brookvale 10	AGD	55	377590	6089309	Open site	Valid	Artefact : 4, Earth Mound : 10		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0037	Brookvale 11	AGD	55	377871	6088998	Open site	Valid	Artefact : 67, Earth Mound : 10, Shell : -, Non-Human Bone and Organic Material : -		
	Contact	Recorders	Doctor.Chris Clarkson					Permits		
55-1-0038	Tooleybuc Bridge PAD	GDA	55	365638	6117781	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Jeffrey Hill					Permits		
49-4-0146	Coleambally Rogarts rd Scar Tree 1	GDA	55	390447	6134196	Open site	Valid	Modified Tree (Carved or Scarred) : -		

Report generated by AHIMS Web Service on 01/10/2021 for Ryan Taddeucci for the following area at Datum :GDA, Zone : 55, Eastings : 343764.83 - 396348.52, Northings : 6089153.64 - 6144064.62 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 28

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Mr.Peter Ingram					**Permits**		
55-1-0051	CO-ST-001	GDA	55	388850	6106205	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	Kayandel Archaeological Services,Miss.Meggan Walker					**Permits**		
49-4-0223	CO-ST-002	GDA	55	395322	6141764	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	Kayandel Archaeological Services,Miss.Meggan Walker					**Permits**		
55-1-0048	JE-IF-001	GDA	55	390843	6096680	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Kayandel Archaeological Services,Miss.Meggan Walker					**Permits**		
55-1-0049	JE-IF-002	GDA	55	390511	6094259	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Kayandel Archaeological Services,Miss.Meggan Walker					**Permits**		
55-1-0052	PEC-E-G2	GDA	55	380298	6124522	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mr.Adrian Cressey					**Permits**		

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Appendix B. AHIMS ID 55-1-0038 site card

Aboriginal Site Recording Form

AHIMS — Aboriginal Heritage Information Management System

NSW Government — Office of Environment & Heritage

AHIMS Registrar
PO Box 1967, Hurstville NSW 2220

Office Use Only

Site Number ___

Date received __/__/__ Date entered into system __/__/__ Date catalogued __/__/__

Entered by (I.D.) ___

Information Access

☐ Gender/male ☐ Gender/female ☐ Location restriction ☐ General restriction ☐ No access

Office Use Only

For Further Information Contact:

☐ **Nominated Trustee**

Title	Surname	First Name	Initials

Organisation ___

Address ___

Phone number ___ Fax ___

Client on system ☐

☐ **Knowledge Holder**

Title	Surname	First Name	Initials

Organisation ___

Address ___

Phone number ___ Fax ___

Client on system ☐

Aboriginal Heritage Unit or Cultural Heritage Division Contacts

___

Geographic Location

Site Name: Tooleybuc Bridge PAD

Easting: 165638 Northing: 6117781 AGD/GDA: GDA

Mapsheet: ___

Zone 55 Location Method: Differential GPS

Other Registration: ___

Primary Recorder

Title	Surname	First Name	Initials
Mr	Hill	Jeffrey	JH

Organisation: Jacobs Group Australia

Address: 452 Flinders St Melbourne

Phone number: 38668 3154 Fax: ___

Date recorded: 18/12/2015

Client on system ☐

NPWS Aboriginal Site Recording Form - Site Information

OPEN/CLOSE SITE Open Site

Site Context

Landform

- [ ] Mountainous
- [x] Plain
- [ ] Rolling hills
- [ ] Steep hills
- [ ] Undulating plain

Slope

[ ] degrees

Landform Unit

- [ ] Beach
- [ ] Coastal rock platform
- [x] Dune
- [ ] Intertidal flat
- [ ] Lagoon
- [ ] Tidal Creek
- [ ] Tidal Flat
- [ ] Cliff
- [ ] Crest
- [ ] Flat
- [ ] Lower slope
- [ ] Mid slope
- [ ] Upper slope
- [ ] Plain
- [ ] Ridge
- [ ] Tor
- [ ] Valley flat
- [ ] Levy
- [ ] Stream bank
- [ ] Stream channel
- [ ] Swamp
- [ ] Terrace
- [ ] Terrace flat

Vegetation

- [ ] Closed forest
- [ ] Grasslands
- [ ] Isolated clumps of trees
- [ ] Open forest
- [x] Open woodland
- [ ] Scrub
- [ ] Woodland
- [x] Cleared
- [ ] Revegetated
- [ ] N/A

Land use

- [ ] Conservation
- [ ] Established urban
- [ ] Farming-intensive
- [x] Farming-low intensity
- [ ] Forestry
- [ ] Industrial
- [ ] Mining
- [ ] Pastoral/grazing
- [x] Recreation
- [ ] Semi-rural
- [ ] Service corridor
- [ ] Transport corridor
- [ ] Urban expansion
- [ ] Residential

Water

Distance to permanent water source	25	metres
Distance to temporary water source		metres
Name of nearest permanent water source	Murray River	
Name of nearest temporary water		

Directions for Relocation

Current Land Tenure

- [x] Public
- [ ] Private

National Park / other Government Dept.

Primary report

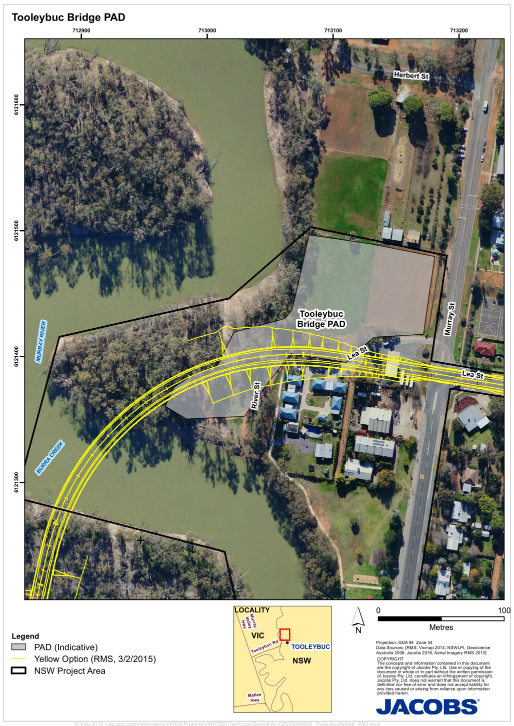
I.D. (I.D. Office Use only)

Site Location Map

NW N NE

W E

SW S SE



N

General Site Information

Closed Site

Shelter/Cave Formation
- ☐ Boulder
- ☐ Wind erosion
- ☐ Water erosion
- ☐ Rock collapse

Rock Surface Condition
- ☐ Boulder
- ☐ Sandstone platform
- ☐ Silica gloss
- ☐ Tessellated
- ☐ Weathered
- ☐ Other platform

Condition of Ceiling
- ☐ Boulder
- ☐ Sandstone platform
- ☐ Silica gloss
- ☐ Tessellated
- ☐ Weathered
- ☐ Other platform

Shelter Aspect
- ☐ North
- ☐ North East
- ☐ East
- ☐ South East
- ☐ South
- ☐ South West
- ☐ West
- ☐ North West

Open Site

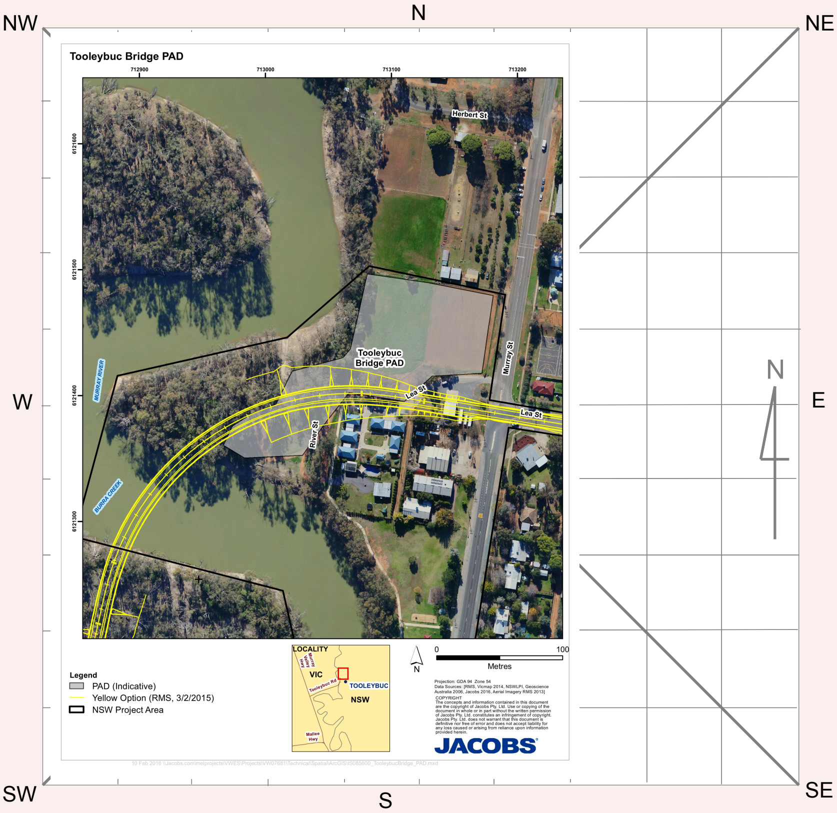
Site Orientation
- ☐ N-S
- ☐ NE-SW
- ☐ E-W
- ☐ SE-NW
- ☐ N/A

Features

- ☐ 1. Aboriginal Ceremony & Dreaming
- ☐ 2. Aboriginal Resource & Gathering
- ☐ 3. Art
- ☐ 4. Artefact
- ☐ 5. Burial
- ☐ 6. Ceremonial Ring
- ☐ 7. Conflict
- ☐ 8. Earth Mound
- ☐ 9. Fish Trap
- ☐ 10. Grinding Groove
- ☐ 11. Habitation Structure
- ☐ 12. Hearth
- ☐ 13. Non Human Bone & Organic Material
- ☐ 14. Ochre quarry
- ✔ 15. Potential Archaeological Deposit
- ☐ 16. Stone Quarry
- ☐ 17. Shell
- ☐ 18. Stone Arrangement
- ☐ 19. Modified Tree
- ☐ 20. Water Hole

Site Plan

Indicate scale, boundaries of site, features



Site Dimensions

Closed Site Dimensions (m)

	Internal length
	Internal width
	Shelter height
	Shelter floor area

Open Site Dimensions (m)

240	Total length of visible site
50	Average width of visible site
13,250	Estimated area of visible site
	Length of assessed site area

Aboriginal Community Interpretation and Management Recommendations

Aboriginal community recommended sub-surface testing because the site could have been a camping spot above the Murray River where large fishing holes are said to exist.

Preliminary Site Assessment

Site Cultural & Scientific Analysis and Preliminary Management Recommendations

Site is of low-moderate scientific significance. the sand dune interfaces with the floodplain within this PAD and these interface areas are of heightened sensitivity. Land clearance and landscaping may have removed this sensitivity. Sub-surface testing is recommended to determine the nature of the potential deposit.

This section should only be filled in by the Endorsees

Endorsed by: ☐ Knowledge Holder ☐ Nominated Trustee ☐ Native Title Holder ☐ Community Consensus

Title

Surname

First Name

Initials

Organisation

Address

Phone number

Fax

Attachments (No.)

- ☐ A4 location map
- ☐ B/W photographs
- ☐ Colour photographs
- ☐ Slides
- ☐ Aerial photographs
- ☐ Site plans, drawings
- ☐ Recording tables
- ☐ Other
- ☐ Feature inserts-No. ☐

Comments

NPWS FEATURE RECORDING FORM - ARTEFACT

Site I.D.

Site Name

Importance

First recorded date

No. of instances

Recorded by

Yes No

Stone artefacts only

Artefacts collected

Permit issued

Percentage of Non-stone Artefacts to Percentage of Stone Artefacts

0-9% 10-19% 20-29% 30-39% 40-49% 50-59% 60-69% 70-79% 80-89% 90-100%

Feature Context & Condition

Scatter No. Easting Northing

Density

(Artefact count per square metre)

Dimensions

Length (m) Width (m) Depth (m)

Yes No

In situ

Stratified

Feature Condition

- Very good
- Good
- Poor

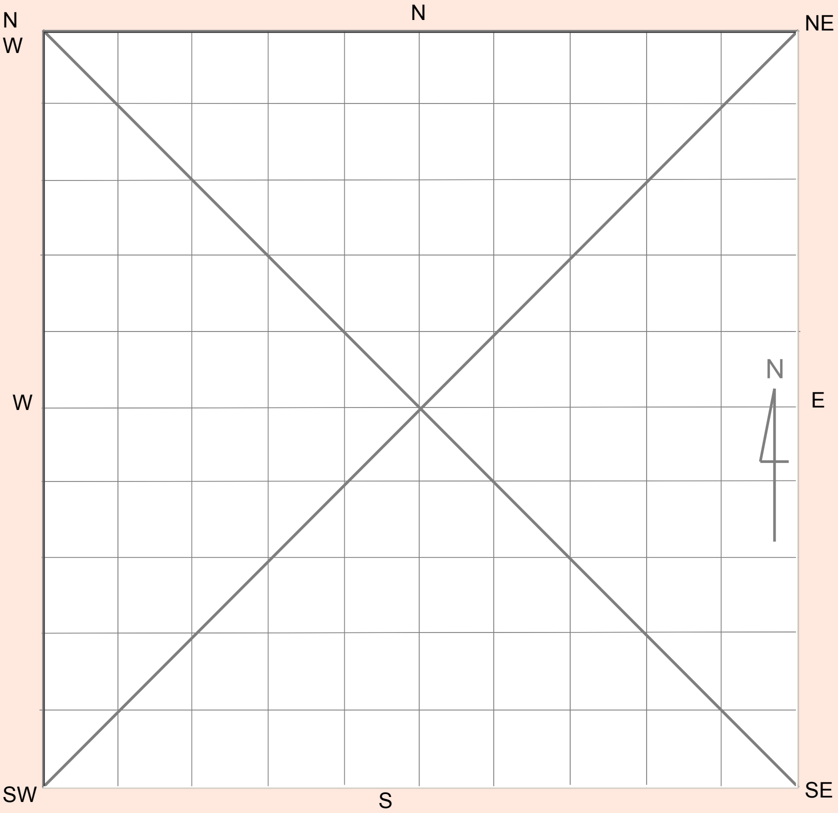
General Condition

- Weathered
- Vehicle damage
- Surface water wash
- Fire damage
- Erosion
- Stock damage
- Exposed archaeological material

Recommended Action

- Boardwalk
- Fencing
- Closure to public
- Continued inspection
- Fire hazard reduction
- Expert assessment
- Meeting with land manager
- Revegetation
- Signage
- Soil erosion control
- Track closure/re-routing
- Additional recording

Feature Plan (Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

Land form

Land form unit

Slope

Vegetation

Land use

Water

Distance to permanent water source metres

Distance to temporary water source metres

Name of nearest permanent water source

Name of nearest temporary water

Stone Artefact

Instance No.	Recording Date	Artefact Material	Artefact Type	Platform Surface	Platform Type	Termination	Cross Section	Length (mm)	Width (mm)	Thickness (mm)

Other Artefact Type

Instance No.	Recording Date	Artefact Material	Artefact Type	Description	Length (mm)	Width (mm)	Thickness (mm)

Material

Basalt
Chert
Fine grained siliceous
Granite
Quartz
Quartzite
Sandstone
Silcrete
Green glass
Amber glass
Amethyst glass
Clear glass
Ceramic
Porcelain
Tin can
Wire
Nail
Button
Shell
Bone
Wood
Resin

Artefact Description

Adze
Anvil
Axe
Backed blade
Blade
Core
Core tool
Cyclon
Distal fragment
Eloura
Flake
Flake tool
Flaked piece
Hammerstone
Manuport
Milling slab
Mortar
Muller
Nuclear tool
Pirri
Proximal fragment
Tula
Other diagnostic type
Modified
Unworked

Platform Surface

Cortex
Flake scar
More than one flake scar
Faceted
Ground
Indeterminate
Bipolar

Platform Type

W
Focal
Shattered
Indeterminate
Bipolar

Termination

Feather
Hinge
Step
Outrepasse
Bipolar

Cross Section

High/strong
High/weak
Low/weak
Irregular

Comments:

NPWS FEATURE RECORDING FORM - MODIFIED TREE

Site I.D.

Site Name

First recorded date

Importance

Aboriginal Information Recorded?

No. of instances

Recorded by

Feature description

Easting

Northing

No. of scars

No. of carved panels

Feature Condition

- [ ] Very good
- [ ] Good
- [ ] Poor

Condition

- [ ] Weathered
- [ ] Ringbarked
- [ ] Fire damage
- [ ] Vehicle damage
- [ ] Insects/termites
- [ ] Rot
- [ ] Limb fall
- [ ] Stock damage

Recommended Action

- [ ] Fencing
- [ ] Closure to public
- [ ] Continued inspection
- [ ] Expert assessment
- [ ] Fire hazard reduction
- [ ] Insect removal
- [ ] Meeting with land manager
- [ ] Rubbish removal
- [ ] Signage
- [ ] Tree health assessment
- [ ] Track closure/re-routing
- [ ] Additional recording

Feature environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, page 2)

Land form

Land form unit

Slope

Vegetation

Land use

Water

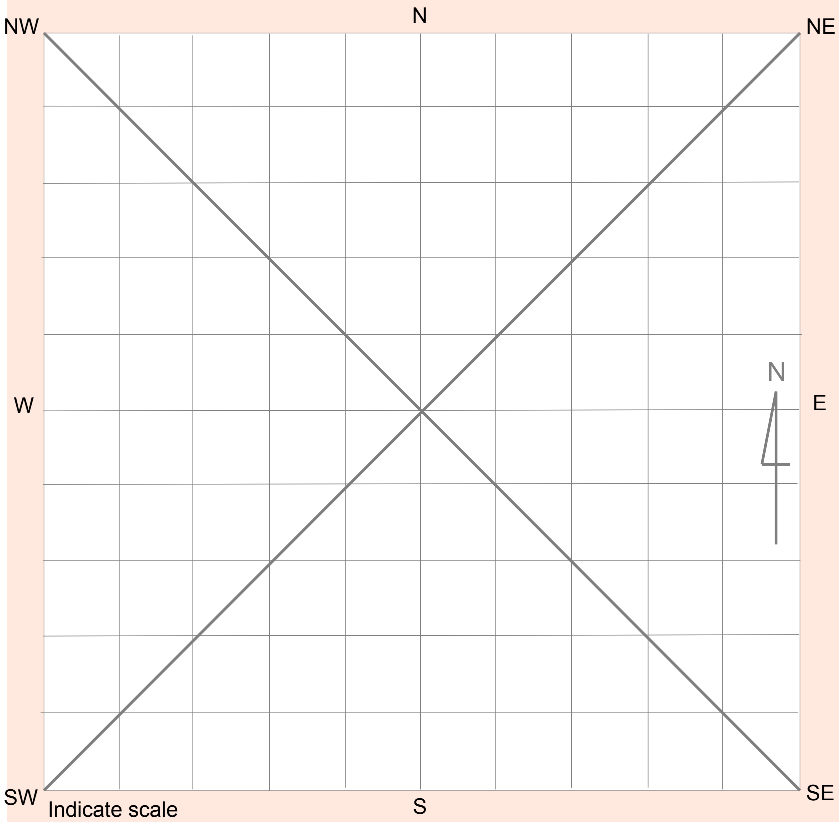
Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source

Name of nearest temporary water

Feature Location Plan



Indicate scale

Scar/Carved Panel Drawing

Attach additional drawings

NPWS FEATURE RECORDING TABLE - MODIFIED TREE

Instance No.	Recording Date	Type	Species	Living Status	Tree Status	Regrowth	Length of Scar	Width of Scar	Depth	Height Above Ground	No. of Scars	Shape	No. of Carved Panels	Carving Type	Orientation	Axe Marks

Type of Tree	**Tree Species**	**L iving Status**	**Tree Status**	**Regrowth**
Carved Tree	Eucalypt	Dead	Standing	Yes
Scarred Tree	Red Gum	Alive	Lying down	No
Carved/Scarred Tree	Angotha	Dying	Partially felled	
			Subject to salinity	
			Not *in situ*	

Scar Shape	**Carving Type**	**Axe Marks**	**Orientation**
Oval	Linear	Metal	North East
Rectangular	Geometric	Stone	East
Square	Pictorial	Indeterminate	South East
Round			South
Other			South West
			West
			North West
			North

Comments:

NPWS FEATURE RECORDING FORM - GROOVE

Site I.D. ☐

Site Name ☐

First recorded date __/__/__

Importance ☐

Aboriginal Information Recorded? ☐

No. of instances ☐

Recorded by ☐

Feature Description

Recording date __/__/__

Type of Grinding Feature

- ☐ Broad
- ☐ Narrow/point
- ☐ Hollow
- ☐ Flat

Seed Species Present ☐

Groove Function ☐

Profile Shape

- ☐ 'U' shaped
- ☐ 'V' shaped
- ☐ Flat

Dimensions

Smallest		**Largest**			
Length (mm)		Length (mm)		Groove count	
Width (mm)		Width (mm)		Cluster count	
Depth (mm)		Depth (mm)			

Feature Context & Condition

Easting ☐☐☐☐☐☐ Northing ☐☐☐☐☐☐☐

Dimensions of Whole Feature ☐ Length (m) ☐ Width (m)

Feature Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised

General Condition ctd

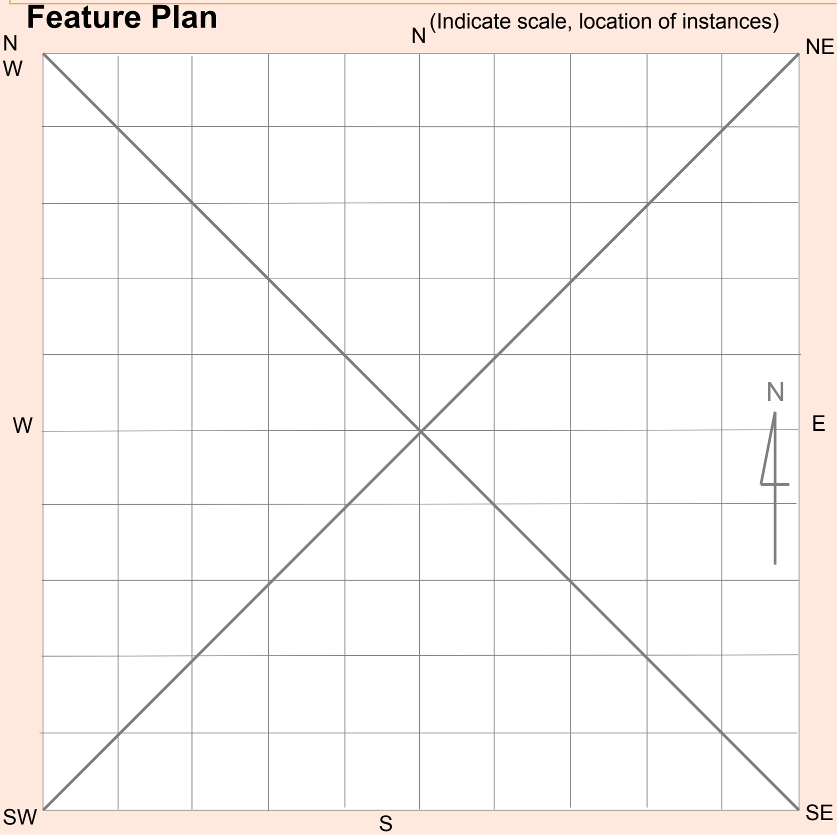
- ☐ Fire damage
- ☐ Surface water wash
- ☐ Graffiti
- ☐ Vehicle damage
- ☐ Erosion
- ☐ Stock damage

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Expert assessment
- ☐ Graffiti removal
- ☐ Meeting with land manager
- ☐ Revegetation
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

☐ Land form

☐ Land form unit

☐ Slope

☐ Vegetation

☐ Land use

Water

Distance to permanent water source ☐ metres

Distance to temporary water source ☐ metres

Name of nearest permanent water source ☐

Name of nearest temporary water ☐

NPWS FEATURE RECORDING FORM - ART

Site I.D. ____ Site Name ____

First recorded date __/__/__ **Importance** ____ **Aboriginal Information Recorded?** ____

No. of instances ____

Recorded by ____

Feature Context & Condition

Easting ____ Northing ____

Pigment ☐ Engraved ☐ Super-impositioning ☐

Artwork Condition

- ☐ Very good
- ☐ Good
- ☐ Poor

General Condition

- ☐ Weathered
- ☐ Vandalised
- ☐ Surface water wash
- ☐ Mineralisation
- ☐ Graffiti
- ☐ Fire damage
- ☐ Insects/termites
- ☐ Erosion
- ☐ Stock
- ☐ Unstable structure

Recommended Action

- ☐ Boardwalk
- ☐ Cage/barrier/fencing
- ☐ Closure to public
- ☐ Continued inspection
- ☐ Dripline
- ☐ Expert assessment
- ☐ Fire hazard removal
- ☐ Graffiti removal
- ☐ Insect/bird nest removal
- ☐ Meeting with land manager
- ☐ Rubbish removal
- ☐ Signage
- ☐ Erosion control
- ☐ Track closure/re-routing
- ☐ Additional recording

Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

____ Land form

____ Land form unit

____ Slope

____ Vegetation

____ Land use

Water

Distance to permanent water source ____ metres

Distance to temporary water source ____ metres

Name of nearest permanent water source ____

Name of nearest temporary water ____

Art Sketch Plan

Sketch and number motif groups

NPWS FEATURE RECORDING TABLE - ART MOTIF

Instance	Recording Date	Motif	Application Technique	Form	Main Colour	Location	Condition

Motif

Anthropomorphic
Bird
Bird Track
Canoe
Circle
Contact material culture
Duck
Eel
Emu
Emu track
European figure
Female
Fish
Foot
Hand
Jellyfish
Kangaroo
Line
Lizard
Macropod
Macropod Track
Male
Marine-Other
Other
Pattern
Quadruped
Reptile
Rifle
Shield
Ship
Snake
Spear
Wallaby

Application Technique

Abraded
Drawn
Other
Painted
Pecked
Pigment & Engraved
Stencilled

Form

Fill
Line
Line+ Fill
Other
Pattern

Main Colour

Black
Mauve *
N/A
Orange *
Other
Red *
White *
Yellow *

Art Location

All over shelter surfaces
ceiling
Floor
Mostly near largest sheltered space
Mostly on out of the way surfaces
Other
Wall

Condition

Faded
Stained
Mineralisation Evident
V brant Colours
Unweathered
Weathered

Comments:

NPWS FEATURE RECORDING FORM - SHELL

Site I.D. ☐

Site Name ☐

First recorded date ☐ / ☐ / ☐

Importance ☐

Aboriginal Information Recorded? ☐

No. of instances ☐

Recorded by ☐

Feature Context & Condition

Easting ☐☐☐☐☐☐

Northing ☐☐☐☐☐☐☐

Dimensions of Whole Feature

☐ Length (m)

☐ Width (m)

☐ Depth (m)

Shell Distribution

☐ Surface scatter

☐ Stratified deposit

☐ Mounded

☐ Distance to high water mark (m)

Feature Condition

☐ Very good

☐ Good

☐ Poor

General Condition

☐ Weathered

☐ Vandalised

☐ Surface water wash

☐ Mineralisation

☐ Graffiti

General Condition ctd

☐ Fire damage

☐ Vehicle damage

☐ Insects/termites

☐ Erosion

☐ Stock damage

☐ Unstable structure

☐ Exposed bone material

☐ Exposed archaeological material

Recommended Action

☐ Boardwalk

☐ Cage/barrier/fencing

☐ Closure to public

☐ Continued inspection

☐ Expert assessment

☐ Fire hazard removal

☐ Graffiti removal

☐ Meeting with land manager

☐ Insect/bird nest removal

☐ Revegetation

☐ Rubbish removal

☐ Signage

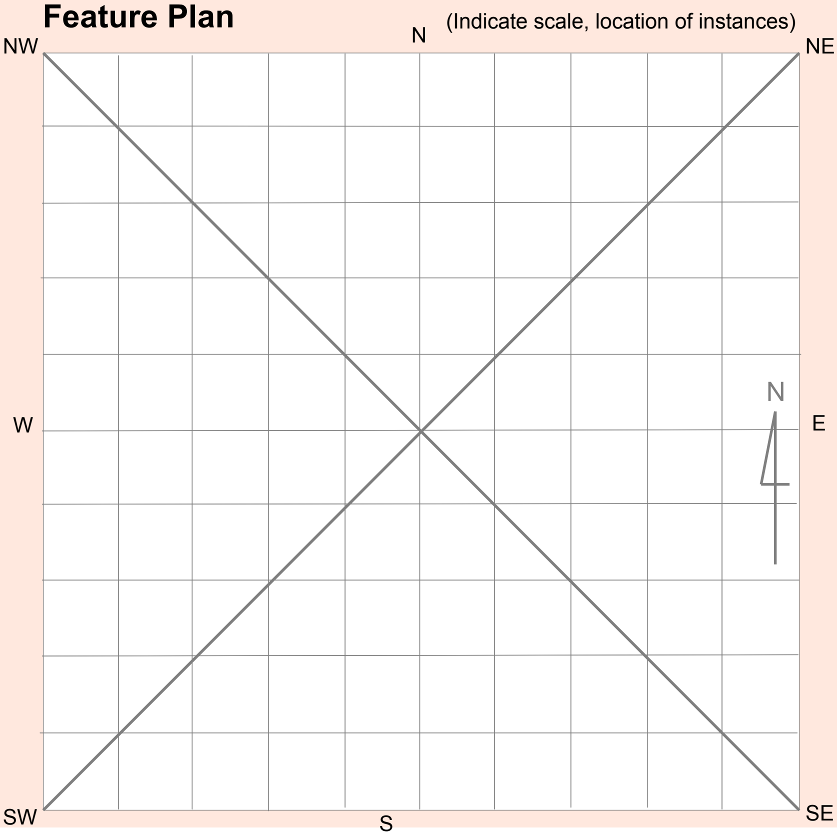
☐ Erosion control

☐ Track closure/re-routing

☐ Additional recording

Feature Plan

(Indicate scale, location of instances)



Feature Environment

(Complete when *feature* environment differs to *site* environment, use attributes from cover card, p. 2)

☐ Land form

☐ Land form unit

☐ Slope

☐ Vegetation

☐ Land use

Water

Distance to permanent water source ☐ metres

Distance to temporary water source ☐ metres

Name of nearest permanent water source

☐

Name of nearest temporary water

☐

NPWS FEATURE RECORDING TABLE - SHELL

Instance No.	Recording Date	Shell Species	% of this species shell to % total of other shell

Species		**Percentage of this Species Shell to Percentage Total of other Shell**
Anadara	Nerita	0 – 9%
Bimbala	Ocean Snail	10 – 19%
Chiton	Periwinkle	20 – 29%
Cowrie	P	30 – 39%
Dog Cockle	Ribbed Cockle	40 – 49%
Duck Bill	Rock Oyster	50 – 59%
Limpit	Thiad	60 – 69%
Mud oyster	Triton	70 – 79%
Mutton Fish	Turban (large)	80 – 89%
		90 – 100%

Comments:

Appendix E. Preliminary LVIA

gbdla.com.au

Yanco Delta wind farm

Stage 1 scoping report

Preliminary landscape and visual assessment

Prepared for ViRYA | 21 April 2022

GBD
Landscape architecture

GBD is a leading specialist in renewable energy landscape and visual impact assessment, setting a course that others follow.

Servicing the renewable energy industry for over 15 years, GBD has gathered a wealth of unrivalled project experience in a variety of landscapes.

GBD has applied knowledge across multiple state planning authorities addressing specific regulatory requirements for renewable energy developments.

Green Bean Design Pty Ltd (GBD)
ABN 86 603 575 702

LIMITATIONS

This report has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use of Jacobs Australia Pty Ltd. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the GBD Proposal dated October 2021.

The methodology adopted and sources of information used are outlined in this report. GBD has made no independent verification of this information beyond the agreed scope of works and GBD assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to GBD was false.

This report was completed between November 2021 and March 2022 and is based on the conditions encountered and information reviewed at the time of preparation. GBD disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

DOCUMENT CONTROL

Project Name	Yanco Delta Wind Farm
Report Title	Stage 1 Scoping Report, Preliminary Landscape and Visual Assessment
Project Number	22-305
Version Number:	V4
Status	Final
Author	Andrew Homewood Registered Landscape Architect AILA, EIANZ *Graduate Diploma Landscape Management, BSc. (Dual Honours) Landscape Design and Archaeology, National Diploma Horticulture*
Date	21 April 2022

Contents

Figures

Tables

Section 1. Report structure

1.1 Report structure

This Preliminary Landscape Visual Assessment (Preliminary LVIA) report has been structured as follows:

Table 1 – Report structure

REPORT SECTION		DESCRIPTION
1	Report structure	This section outlines the content and structure of the Preliminary LVIA.
2	Introduction	This section provides an introductory section that describes the intent and purpose of the Preliminary LVIA.
3	Methodology	This section sets out the structure and methodology employed in the LVIA preparation.
4	Wind energy visual assessment bulletin	This section sets out the objectives, stages and key steps described in the Visual Bulletin as applicable to the Preliminary LVIA.
5	Community consultation	This section describes the community consultation activities undertaken by the Proponent and feedback received from the community relevant to this Preliminary LVIA.
6	Visual magnitude	This section provides an analysis of the preliminary assessment tool for visual magnitude as set out in the Visual Bulletin.
7	Multiple wind turbine tool	This section provides an analysis of the preliminary assessment tool for the multiple wind turbine tool as set out in the Visual Bulletin.
8	Summary	This section provides a summary of the Preliminary LVIA.

Section 2. Introduction

2.1 Introduction

Green Bean Design Pty Ltd (GBD) has been commissioned by Jacobs Group (Australia) Pty Ltd on behalf of Virya Energy Pty Ltd (the Proponent) to undertake a Preliminary LVIA report for the Yanco Delta Wind Farm (the project).

This Preliminary LVIA has been prepared as required by the New South Wales Government, Department of Planning and Environment (DPE) to meet the objectives of the NSW Government - *Wind Energy: Visual Assessment Bulletin* – for State Significant Wind Energy Development (DP&E, 2016), dated December 2016 (the Visual Bulletin). This Preliminary LVIA supports the Scoping Report (a preliminary environmental assessment) for the project and has been prepared to specifically address the Visual Bulletin requirements applicable to a new wind farm development application for a State Significant Development (SSD) through the Secretary's Environmental Assessment Requirements (SEARs).

This Preliminary LVIA has been prepared to consider a layout consisting of 220 wind turbine generator (turbine/s) locations, with a maximum tip height of 270 metres. The wind turbine layout has been subject to several iterations and should be considered as a draft layout for the purposes of this Preliminary LVIA. This Preliminary LVIA has not considered the location or extent of some ancillary infrastructure commonly associated with wind farm developments, including electrical infrastructure and access tracks. Ancillary infrastructure items will be detailed and included in the Stage 2 Environmental Impact Statement (EIS) Assessment and Determination process.

The Visual Bulletin requires consideration of dwellings and key public viewpoints within a defined study area. The study area for the Preliminary LVIA has been defined within an 8 kilometres offset from the wind turbines for the Magnitude Tool assessment (refer Section 6 of this Preliminary LVIA). The study area extends to 8 kilometres for the application of the Multiple Wind Turbine Tool (refer Section 7 of this Preliminary LVIA).

The Magnitude Tool study area within 3.6 kilometres (below the black line) of the wind turbines did not identify any key public viewpoints (e.g., dedicated lookouts, public spaces, recreational areas etc.), and accordingly the preliminary analysis has focused on residential dwellings between the black and blue threshold lines. A further and detailed analysis of key public viewpoints surrounding the project will be undertaken in the Stage 2 EIS report.

The Visual Bulletin requires provision of an overlay of the wind resources (Issue of SEAR's, page 11). An overlay of wind resources is included in **Figure 2**.

Information and stated requirements from the Visual Bulletin included in this Preliminary LVIA are presented in *italics*.

2.2 Professional assessment skills

The Visual Bulletin states that '*Professional assessment skills are critical to the effective application of visual assessment*', and that '*The proponent is expected to engage professionals from relevant natural resource management and design professions (for example environmental planners, geographers, landscape architects, architects, or other visual resource specialists), with demonstrated experience and capabilities in visual assessment to carry out a wind energy project visual assessment'*.

GBD confirms that this Preliminary LVIA has been prepared by GBD Principal Landscape Architect Andrew Homewood. Andrew is a registered Landscape Architect and member of the Australian Institute of Landscape Architects and the Environmental Institute of Australia and New Zealand. Andrew holds tertiary qualifications in Landscape Management, Landscape Design, Archaeology and Horticulture and has over 30 years' experience in landscape consulting. Andrew has prepared multiple wind farm LVIA in New South Wales, Victoria, Queensland, South Australia and Tasmania, at preliminary and detailed stages. Andrew has also acted as an independent expert providing peer reviews for wind farm LVIA on behalf of the DPE.

2.3 Project overview

The Project would be located within Murrumbidgee Council Local Government Area (LGA) and Edward River Council LGA, 10 kilometres north-west of the Jerilderie township, around the localities of Moonbria and Mabins Well. The Project would be located within the proposed South-West Renewable Energy Zone (REZ), in New South Wales.

The project area is approximately 42,000 hectares and is at an elevation of approximately 106 metres above sea level (+/- 5m). The site landform is visually flat with the horizon line extending out at eye level in most directions from the project area. As a generally flat region visibility from eye level extends to around 5 kilometres from a static viewpoint before the curvature of the earth interrupts visibility. Regional locality is identified in **Figure 1**.

The project is proposed to consist of up to 220 wind turbine generator (turbine/s) locations with a combined maximum installed capacity of 1,500 megawatts (MW). A maximum tip height of 270 metres is proposed.

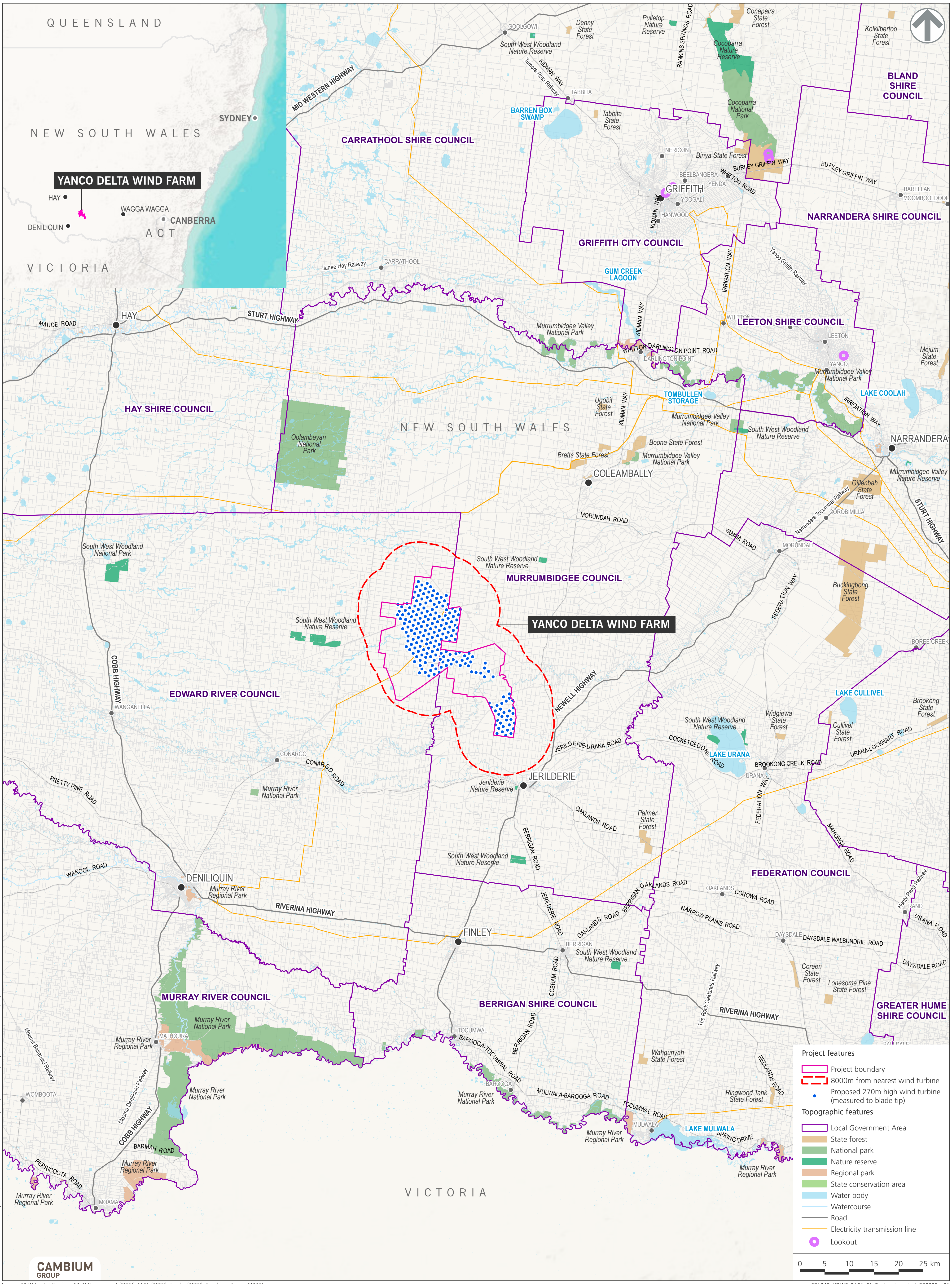
The project would also include:

- Up to 220 WTGs to maximum tip height of 270 metres
- Generating capacity of approximately 1500 megawatts (MW)
- Battery Energy Storage System (BESS), approximately 500 MW/500 megawatt hours (MWh) (type yet to be determined)
- Permanent ancillary infrastructure, including operation and maintenance facility, internal roads, hardstands, underground and overhead cabling, wind monitoring masts, central primary substation and up to five collector substations, and
- Temporary facilities, including site compounds, laydown areas, stockpiles, gravel borrow pit(s) and concrete batch plants, temporary roads and temporary monitoring masts.

The Project would connect to the proposed Transgrid Dinawan substation, which is scheduled to be completed as part of the Transgrid Project EnergyConnect (Eastern) in 2025. A preferred transmission line easement will be selected and assessed at the EIS stage.

Figure 1
Regional context

YANCO DELTA WIND FARM | **PRELIMINARY LANDSCAPE AND VISUAL IMPACT ASSESSMENT**



Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

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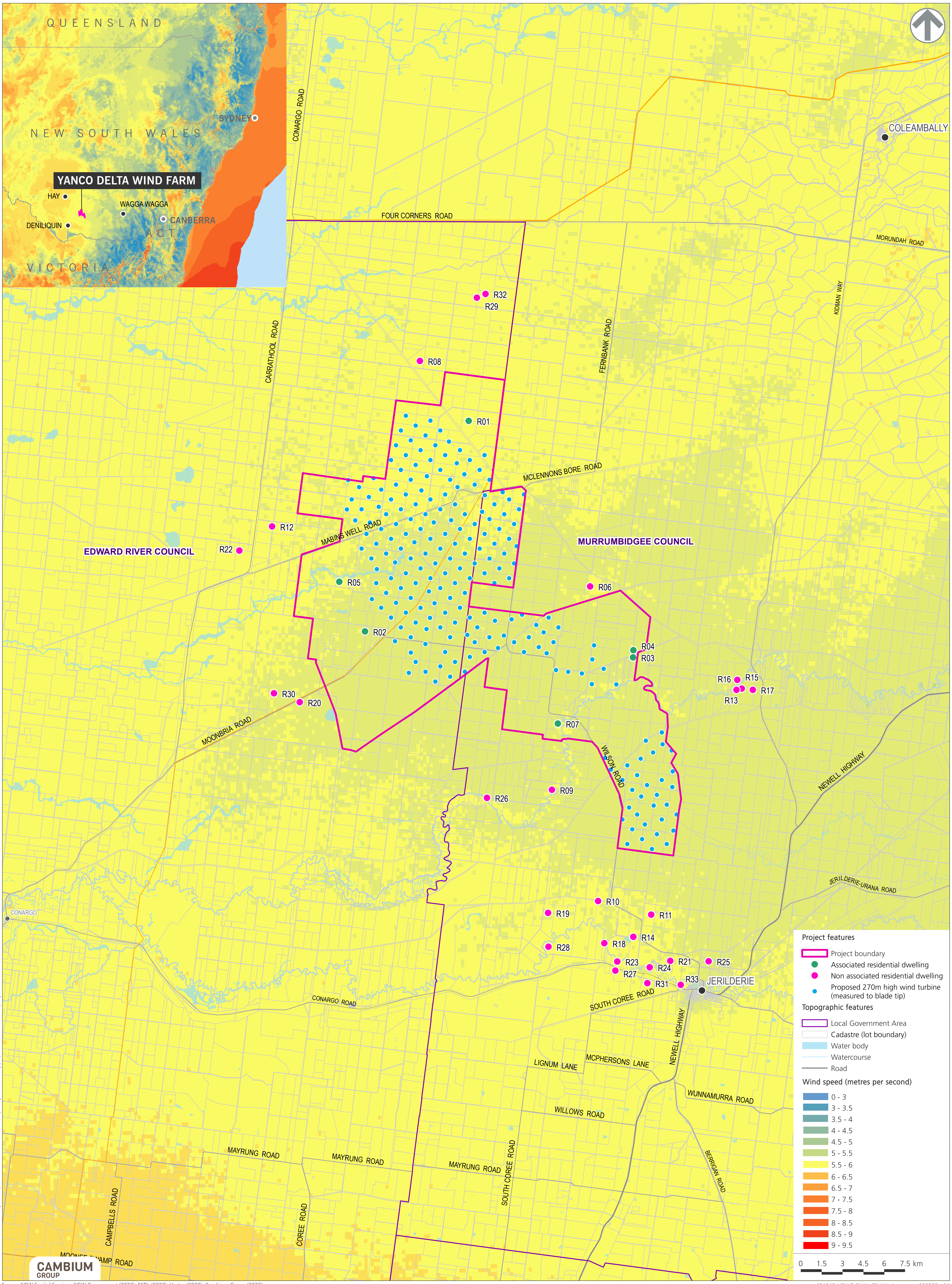
Figure 2
Wind resource

GBD Landscape architecture



CAMBIUM GROUP

Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Vestas (2022), Cambium Group (2022).

Section 3. Methodology

3.1 Introduction

This Preliminary LVIA has been prepared to address the Visual Bulletin through a range of tasks outlined in the Visual Bulletin and/or commonly associated activities applicable to landscape and visual assessment. This Preliminary LVIA included the following key tasks:

- Desktop studies
- Site photography, and
- Mapping and analysis.

3.2 Desktop studies

A desktop study reviewed the preliminary wind turbine layout provided by the Proponent in Google Earth and Google Maps applications. The Proponent provided updated wind turbine layouts during the desktop review process to indicate adjustments to wind turbine locations following on-going landowner consultation by the Proponent.

The desktop study also reviewed dwelling locations against built form considered to be potential agricultural structures such as shearing sheds. The desktop study identified the location, extent and general boundaries between broad landscape character areas to be reviewed during the site inspection work.

3.3 Site photography

The landscape characteristics and elements within and surrounding the project site were captured in a series of ground and aerial images utilising a 35-millimetre SLR full sensor digital camera and aerial drone. The Civil Aviation Safety Authority (CASA) registered drone was flown in strict accordance with CASA rules and regulations applicable to a sub 2 kilograms drone operated for commercial purposes. Outputs from the site inspection carried out on the 22nd February 2022, included preparation of illustrated material to inform community consultation undertaken by the Proponent and the Preliminary LVIA.

3.4 Mapping and analysis

A series of figures have been prepared to address the Visual Bulletin requirement to demonstrate the potential influence of visual magnitude and multiple wind turbines on dwellings. This was undertaken with ArcGIS software using the line-of-sight analysis. Inputs included wind turbine coordinates, tip of blade height, the regional digital elevation model and dwelling locations provided by Jacobs.

Section 4. Wind energy visual assessment bulletin

4.1 Introduction

The Visual Bulletins stated objectives are to:

- *Provide the community, industry and decision-makers with a framework for visual impact analysis and assessment that is focused on minimising and managing the most significant impacts*
- *Facilitate improved wind turbine and ancillary infrastructure siting and design during the pre-lodgement phase of a project, and encourage early consideration of visual impacts to minimise conflicts and delays where possible, and provide for a better planning outcome*
- *Provide the community and other stakeholders with greater clarity on the process along with an opportunity to integrate community landscape values into the assessment process, and*
- *Provide greater consistency in assessment by outlining appropriate assessment terminology and methodologies.*

GBD confirm that this Preliminary LVIA has been prepared to satisfy the key objectives of the Visual Bulletin.

The Visual Bulletin breaks the visual assessment process in to 2 main stages. These include:

- Stage 1 Preliminary Environmental Assessment (PEA), and
- Stage 2 Assessment and Determination.

This Preliminary LVIA has been prepared to address the requirements of the Stage 1 PEA, which is to be submitted in a Scoping Report to DPE as part of a request for SEAR's. Stage 1 is broken down into 3 steps which include:

- *Undertake community consultation on likely areas of development and establish key landscape features, areas of scenic quality and key viewpoints valued by the community*
- *Apply the Preliminary Assessment Tools to the preliminary turbine layout, and*
- *Prepare a Preliminary Environmental Assessment.*

The Visual Bulletin also states that Stage 1 must '*undertake a preliminary environmental assessment that considers the landscape in which a proposed wind energy project will be located. The analysis must include*':

- *Undertaking community consultation to establish key landscape features valued by the community, key viewpoints in the area (both public and private) along with information about the relative scenic quality of the area*
- *Production of a map detailing key landscape features (informed by community consultation and any ground-truthing undertaken), the preliminary wind turbine layout, the location of dwellings and key public viewpoints and an overlay of the wind resource, and*
- *Results of the application of the preliminary assessment tools for both the visual magnitude and multiple wind turbine parameters.*

GBD confirms that this Preliminary LVIA has been prepared in accordance with the Visual Bulletin for Stage 1 PEA (pre-lodgement). The Visual Bulletin requirements and associated Stages are set out in **Figure 3**.

Figure 3
Visual Bulletin - visual assessment stages 1 and 2

GBD
Landscape architecture

STAGE 1

Scoping and design

- Undertake **community consultation** on likely areas of development and establish key landscape features, areas of scenic quality and key viewpoints valued by the community
- Apply the **Preliminary Assessment Tools** to the preliminary turbine layout
- Prepare a **Preliminary Environmental Assessment**

SEARs

- Submit the Preliminary Environmental Assessment including a map with results of community consultation on landscape values overlayed with the wind resource
- Submit the results of the Preliminary Assessment Tools
- DPE issues **Secretary's Environmental Assessment Requirements** (SEARs) including any project specific requirements

STAGE 2

Prepare EIS

- Prepare a **Visual Baseline Study** as part of the **Environmental Impact Statement** (EIS)
- Undertake community consultation on aspects of the visual baseline study and describe **mitigation and management options** in the EIS
- Establish **Visual Influence Zones** from viewpoints using inputs from the visual baseline study
- Undertake an evaluation of the project against the **Visual Performance Objectives**

Public exhibition

- EIS including the visual assessment is exhibited for a minimum period of 28 days
- Proponent may revise the project in response to issues raised during public exhibition
- Proponent submits a **Response to Submissions** report

Assessment and determination

- DPE undertakes a thorough assessment of the visual impacts of the wind energy project drawing on all relevant information provided through the assessment process
- The consent authority determines the overall acceptability of landscape and visual impacts and balance these matters along with other environmental, social and economic considerations
- The consent authority will consider whether **conditions of consent** should be imposed

Monitoring and compliance

- If the project is approved, DPE is responsible for ensuring that the approved project is constructed and operated in accordance with the conditions of consent

CAMBIUM GROUP

Source: Wind Energy - Visual Assessment Bulletin, NSW Government (2016), Cambium Group (2022).

Section 5. Community consultation

5.1 Introduction

The Visual Bulletin notes that '*Consultation with the community at this early stage may be broad, but should include discussions about the proposed project area, likely corridors for development, or preliminary turbine layouts and must involve people from the visual catchment*'.

The Visual Bulletin describes the purpose of early communications is to:

- *Establish the key landscape features, areas of scenic quality and key public viewpoints valued by that community*
- *Allow the community to have input into the ranking of those features and scenic quality into high, moderate or low visual significance*
- *Inform landholders about the proposed project area, likely corridors for development, preliminary turbine layouts and access routes*
- *Inform the community about the proposed project, listen to the community's concerns and suggestions for alternative siting and location designs, and discuss potential visual impacts.*

Key landscape features can include natural features of the landscape (for example, a distinctive mountain peak) as well as important cultural features (for example, an iconic church). Consideration of areas of scenic quality involves the identification of areas of the landscape that are of high scenic quality and those that are moderate or low. It is also important to establish which viewpoints are important to the community. An important source of information at this stage is likely to be the local council. A community survey or focus group could also be utilised to gather this information. Any surveys undertaken should reflect the population profile in the project area as indicated by the most up-to-date Census data available.

Key landscape features surrounding the project site have been identified and illustrated in the Scenic Quality Landscape Area shown in **Figure 4** and photographic sheets shown on **Figure 5** to **Figure 7**.

A detailed summary of consultation conducted for the project is provided in the overarching Scoping Report. Issues relevant to this assessment are described below.

In order to support the community consultation process, GBD prepared a number of figures to illustrate the results of preliminary site work. The figures outline landscape characteristics associated with Scenic Quality Areas (SQA's), which are generally defined by land use, land cover and topography. A preliminary landscape analysis identified six landscape areas within and surrounding the project boundary, including:

- Townships
- Agriculture (cultivated landscapes)
- Creeks
- Transmission line corridors
- Road corridors
- Floodplains and backplains.

Each landscape area was photographed and described for the purposes of the broader project community consultation and stakeholder engagement.

5.2 Consultation activities

During the consultation process, maps were prepared showing the area of investigation, including areas of landscape that had the potential to host wind turbines. This was done to allow feedback to be incorporated into the design of the layout during the ongoing design process. The community identified that rural landscapes and scenic beauty are important values within the local natural and built environment. Specific landscape features, lookout points and landscape values identified from eleven returned community surveys and additional resident feedback identified:

- Areas adjoining creeks
- Lake Jerilderie
- Yanco Creek
- Billabong Creek
- Historic locations and local history
- Certain unique views
- Clear and clean serenity
- Mostly unspoilt natural landscape
- Wildlife conservation areas and scenic beauty
- Pristine creek country with open riverine plains and
- Sunrise and sunset views across the plains.

These places, landscape elements and values will be further considered in an assessment of visual impact during the EIS Assessment and Determination.

The Visual Bulletin notes that '*Where a regional survey or study of landscape values has been undertaken, it must be considered. Proponents should confirm with the Department if there is any such recognised study in place*'.

GBD is not aware of any regional surveys or study of landscape values that have been undertaken within or surrounding the project boundary. This will be confirmed with DPE prior to the commencement of the detailed assessment prepared for the EIS.

Consultation will be ongoing during the EIS Assessment and Determination process.

Figure 4
Scenic quality assessment - Landscape character areas

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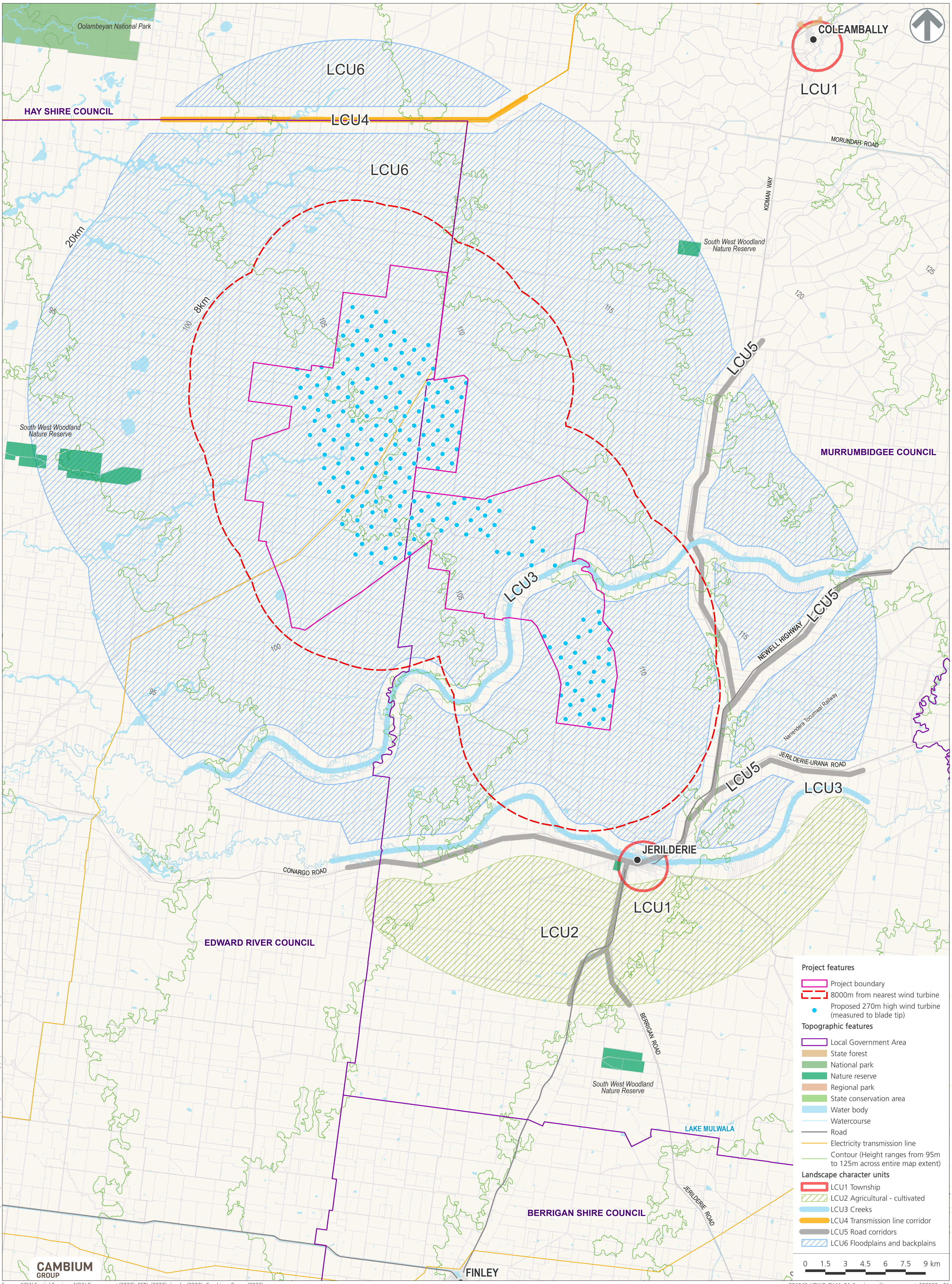
Landscape architecture

YANCO DELTA WIND FARM | **PRELIMINARY LANDSCAPE AND VISUAL IMPACT ASSESSMENT**



Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

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Figure 5

Scenic quality assessment photographs - sheet 1

LCU 1 Township (Jerilderie)

LCU 1 Township (Jerilderie)

Townships and localities, including Jerilderie around 10km south of the project site, are located in generally flat landscapes, in proximity to landscape features such as creeks and rivers.

Townships and localities include a range of built structures such as dwellings, commercial buildings and public facilities. Built structures are moderate to small in scale with a varied colour palette.

Visual connectivity between townships and the surrounding landscape is partially restricted and disrupted by tree planting within urban areas and extensive tree cover alongside creeks and drainage lines.

Townships and localities do not tend to include elements or features which might be considered significant or high scenic quality at a national or state level. Notwithstanding, townships and localities do contain elements which may have local visual and historical significance.

LCU 2 Agriculture (cultivated)

LCU 2 Agriculture (cultivated)

Agriculture (cultivated) landscapes tend to extend beyond townships and localities and are often associated with creeks and irrigation channels. Cultivated landscapes present as moderate to large visual elements broken by field boundaries, roads and occasional tree cover.

Constructed elements within cultivated landscapes include roads and tracks, agricultural buildings such as silos and sheds as well as rural dwellings and homesteads.

Visual connectivity extends beyond the cultivated landscapes to adjoining and more distant views across floodplains and backplains.

Cultivated landscapes do not generally exhibit features which tend to result in significant or high levels of scenic quality.

Source: Matt Beaver Photography (2022), Green Bean Design (2022), Cambium Group (2022).

Figure 6
Scenic quality assessment photographs - sheet 2

GBD
Landscape architecture

LCU 3 Creek and billabong

LCU 3 Creek and billabong

Creeks and smaller ephemeral drainage lines occur across the landscape within and beyond the project site. Principal waterways include Billabong Creek to the south of the project site (adjoining Jerilderie), Yanco Creek which flows through the south portion of the project site and Delta Creek which flows through the northern portion of the project site. Creek lines meander in a general east to west direction often within corridors of former channels and billabong.

Built structures are largely absent except where creeks adjoin townships such as Jerilderie. Creek and drainage lines are visually marked in the landscape by trees growing along drainage corridors.

Creek lines provide opportunities for visual relief against large extents of floodplain and backplain backdrops. Creek lines are considered to provide landscape elements of moderate scenic quality.

LCU 4 Transmission line corridor

LCU 4 Transmission line corridor

A short section of transmission line corridor extends east to west through the north portion of the project site. The transmission line corridor extends across open pasture and through easements created within existing tree and shrub vegetation.

Transmission line structures do not form visually prominent features within the landscape and are not considered to contribute to surrounding scenic quality.

Source: Matt Beaver Photography (2022), Green Bean Design (2022), Cambium Group (2022).

Figure 7
Scenic quality assessment photographs - sheet 3

GBD
Landscape architecture

LCU 5 Road corridor

LCU 5 Road corridor

Road corridors extend through the landscape connecting townships and localities north and south of the project site. Principal road corridors include the Kidman Way to the east of the project site and the Newell Highway extending north east away from the project site. A small number of local and largely unsealed roads extend through the project site providing access to rural dwellings and farms.

Roads form small scale built elements within the landscape and provide a range of direct and indirect transitory views toward the project site as well as moderate to long views along road corridors. Road corridors are occasionally framed by tree and shrub vegetation screening and filtering views to the surrounding landscape.

LCU 6 Floodplain and backplain

LCU 6 Floodplain and backplain

Areas of floodplain and backplain are generally flat and visually large scale landscapes that extend across a large portion of the project site extending toward distant horizon lines.

As part of the extensive Murray Basin alluvial fans, the floodplain and backplain contain a range of landscape features such as meandering channels, floodplain, dunes, overflow lakes and swamps.

Landcover largely comprises pasture interspersed with scattered tree and denser forested areas. Areas of vegetation also comprise shrub and saltbush cover.

Constructed elements within areas of floodplain and backplain include occasional sealed road and unsealed tracks, rural dwellings and agricultural structures.

The landscape offers open and distant views toward and beyond other landscape character units with screening and filtering of views provided by vegetation within proximity to drainage channels and overflow lakes.

Floodplain and backplain are considered to provide landscape elements of moderate scenic quality.

CAMBIUM GROUP

Source: Matt Beaver Photography (2022), Green Bean Design (2022), Cambium Group (2022).

Section 6. Preliminary assessment tool – Visual magnitude

The Visual Bulletin states that '*By mapping the dwellings, key public viewpoints and proposed turbines at scale, the potential visual magnitude of a turbine relative to that dwelling or public viewpoint can be established. This is based on the height of the proposed wind turbines to the tip of the blade and distance from dwellings or key public viewpoints shown in the graph at Figure 2*' (The Visual Bulletin, page 9). *'The line depicted in the graph at Figure 2 provides an indication of where proponents should give detailed consideration to the visual impacts on dwellings or key public viewpoints from turbines located below the black line'.*

For the purpose of the Preliminary LVIA the proposed wind turbines are nominated at a 270 metre tip height (from base of tower to tip of blade at vertical position). In accordance with the Visual Bulletin, the black line intersects at a distance of 3.6 kilometres for a tip height of 270 metres.

The Visual Bulletin states the '*Proposed turbines below the black line must be identified, along with the dwellings or key public viewpoints as part of the request for SEARs*'.

The Visual Bulletin notes that '*Further assessment and justification for placement of turbines located in these sensitive areas in the EIS will be required, along with a description of the mitigation and management measures being employed to reduce impacts. This assessment may identify those factors such as topography, relative distance and existing vegetation may minimise or eliminate the impacts of the project*'.

The Visual Bulletin also notes that '*there may be circumstances where dwellings or key public viewpoints located above the line may require further consideration due to topography or other landscape features. The further detailed assessment and ground-truthing at the visual assessment stage must also consider impacts on these dwellings or key viewpoints*'.

This Preliminary LVIA also illustrates dwellings located at 8 kilometres from the wind turbines which coincides with the threshold for multiple wind turbine tool analysis as indicated in **Figure 8**. Dwellings located between 3.6 kilometres and 5.3 kilometres have been identified and illustrated to provide a greater degree of context regarding the location and number of dwellings surrounding the proposed wind farm.

The EIS Assessment and Determination will undertake an assessment and justification for the placement of wind turbines in sensitive areas, including those located within and between the 3.6 kilometres and 5.3 kilometres thresholds from the wind turbine locations.

Non-associated dwellings located below the black line, as well as residential dwellings between the black and blue lines and those extending out to 8 kilometres from the wind turbines, are illustrated in **Figure 9**.

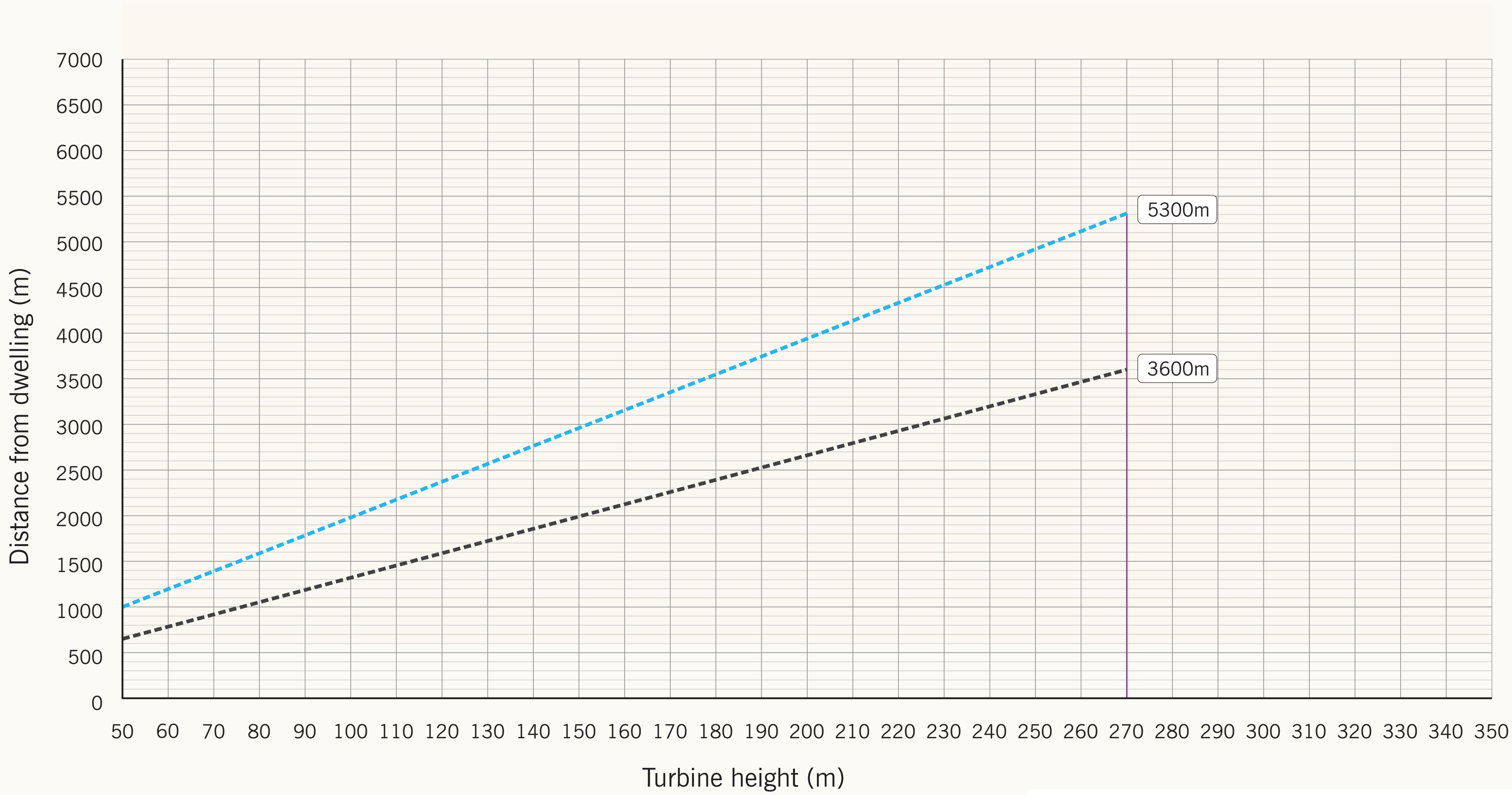
Public view locations within 8 kilometres from the wind turbines are largely confined to a network of unsealed (or partially sealed) roads and tracks which access pastoral land and occasional dwellings and rural homesteads. A short section (around 5.5 kilometres) of the Kidman Way state rural road is located within 8 kilometres from the wind turbines south of the Yanco Creek crossing and north of the Newell Highway intersection. No designated rest stops or lookouts are located along this section of the Kidman Way. Further consideration of public view locations within 8 kilometres from the wind turbines will be undertaken in the EIS.

Public view locations beyond 8 kilometres from the wind turbines will be identified and assessed in the EIS LVIA and will include, but not limited to:

- Surrounding roads and highways including the Kidman Way and Newell Highway
- Local rural roads including the Conargo Road and Carrathool Road
- Jerilderie racecourse
- Jerilderie Lake and surrounding parks and
- Jerilderie Sports Club/golf course.

Figure 8
Visual magnitude thresholds

GBD
Landscape architecture



Visual magnitude
This line provide an indication of where proponents should give detailed consideration to the visual impacts on dwellings or key public viewpoints from turbines located below the black line.

Threshold distance line
Identifies potentially high visual magnitude impacts.

CAMBIUM GROUP

Source: Wind Energy - Visual Assessment Bulletin, NSW Government (2016), Cambium Group (2022).

031243_YDWF_PLVIA_F8_Visual_magnitude_thresholds_220322_v01

Section 7. Preliminary assessment tool – Multiple wind turbines

7.1 Introduction

The Visual Bulletin states that *'This tool will provide a preliminary indication of potential cumulative impacts arising from the proposed wind energy project. To establish whether the degree to which dwellings or key public viewpoints may be impacted by multiple wind turbines, the proponent must map into six sectors of 60° any proposed turbines, and any existing or approved turbines within eight kilometres of each dwelling or key public viewpoint'*.

This Preliminary LVIA has identified 10 individual representative view locations which contain single or multiple viewpoints to 8 kilometres from the wind turbines. This Preliminary LVIA has incorporated multiple residential dwellings into a single view location where dwellings occur within a 500m radius of each other. GBD consider that views from these locations would be similar or identical in most cases.

The Visual Bulletin (at Stage 2 EIS Assessment and Determination, page 12) permits representative view locations, and states '*where relatively close clustering of houses belonging to different landowners or occupants occur, representative viewpoints may be selected and assessed in lieu of every single dwelling in the following types of areas'*:

- *Rural residential clusters*
- *Rural villages, and*
- *Urban residential and commercial areas.*

The 10 representative view locations and the multiple wind turbine analysis are presented in **Figure 9**.

Figure 10 illustrates a Zone of Visual Influence (ZVI) analysis, which indicates areas of the landscape from which wind turbines will not be visible, or visible toward blades only. The extent of screening illustrated in **Figure 10** relates to screening by landform only and does not account for vegetation (tree cover) within the landscape or surrounding residential dwellings.

Where wind turbines are visible within the horizontal views of the dwelling or key public viewpoints in three or more 60° sectors, the proponents must identify the turbines, relative dwelling and key public viewpoint, along with the relative distance and submit these to the Department as part of the request for SEARs. These turbines will become a focus for assessment in the EIS.

Table 2 summarises the results of the multiple wind turbine tool analysis undertaken as part of the Preliminary LVIA. The results include the identification of non-involved dwellings within 8 kilometres of the wind turbines, the distance to the closest wind turbine (and wind turbine ID), the number of 60° sectors the wind turbines occur within to 8 kilometres from the view location, and the number of wind turbines visible within three or more 60° sectors to 8 kilometres from the view location.

Table 2 – Multiple wind turbine analysis results

Representative view location ID	Distance (km) from dwelling to closest wind turbine (and turbine ID)	Number of 60°sectors with wind turbines up to 8km from dwelling	Number of visible wind turbines within 3 or more 60° sectors up to 8km from dwelling
R06	3.72 km (W-153)	3	38
R08	4.06 km (W-001)	1	-
R09	4.45 km (W-193)	2	-
R10	4.59 km (W-213)	1	-
R11	4.71 km (W-210)	1	-
R12	5.51 km (W-046)	1	-
R14	6.44 km (W-210)	1	-
R15	6.54 km (W-185)	1	-
R18	7.30 km (W-213)	1	-
R19	7.53 km (W-213)	1	-

Of the 10 representative dwelling locations:

- 9 dwellings are predicted to have views toward wind turbines in either 1 or 2 60° sectors
- 1 dwelling (R06) is predicted to have views towards wind turbines within 3 or more 60° sectors
- 0 dwellings are located below the black line
- 5 dwellings are located between the black (3.6 kilometres) and blue line (5.3 kilometres) and
- 5 dwellings are located between the blue line and 8 kilometres from the wind turbine locations.

Further assessment and justification for placement of turbines in multiple sectors will be detailed in the EIS, along with a description of the mitigation and management measures being employed to reduce impacts. Such further assessment may identify factors such as relative distance and existing vegetation may minimise the impacts of the project on nearby involved and non-involved residences. The Visual Bulletin notes that '*the relative position of the viewpoints in relation to a dwelling is also an important consideration that will be outlined in the EIS. For example, views to the turbines from the primary living areas of the dwelling would be considered more important than views from non-habitable areas'*.

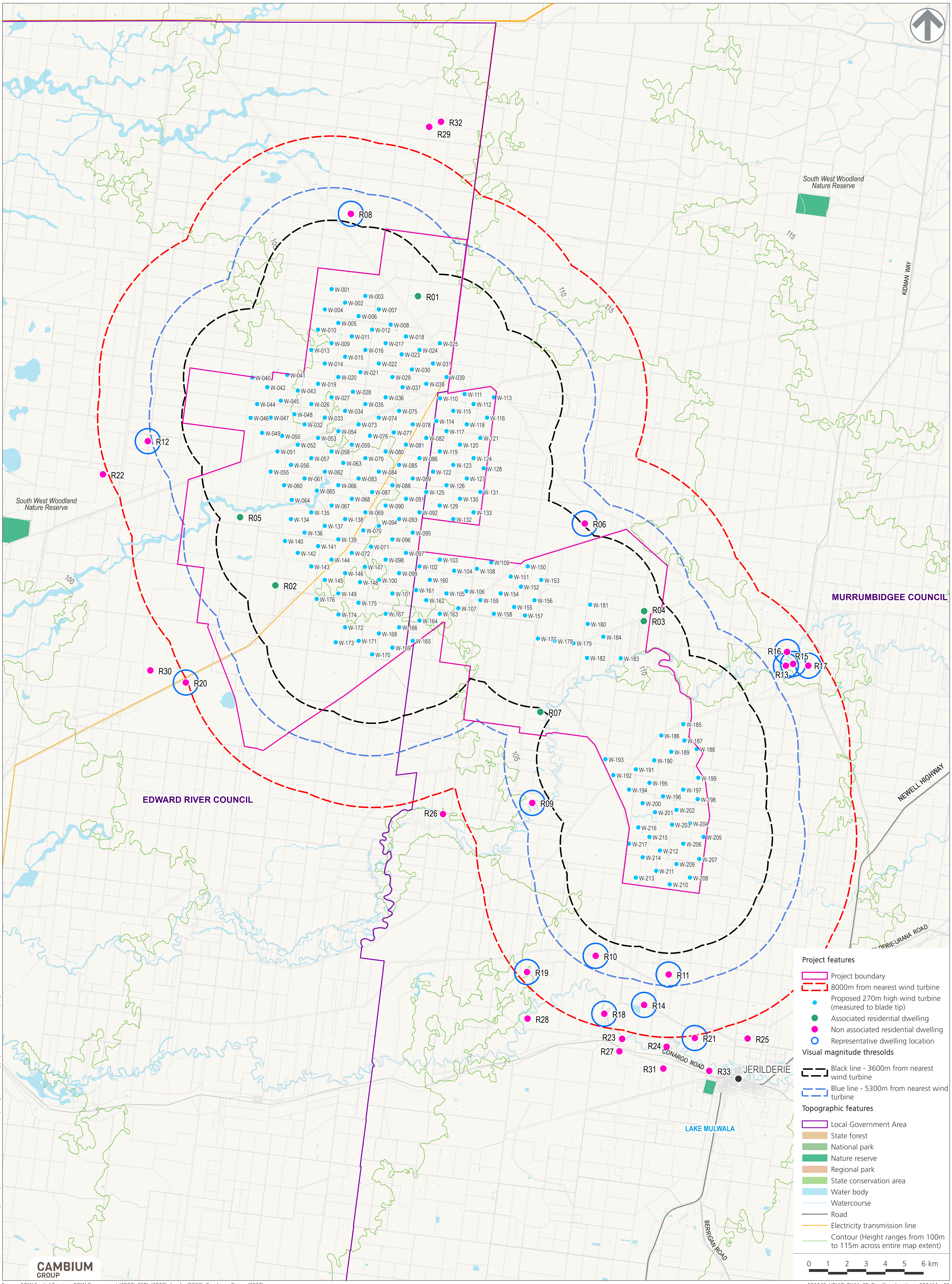
The Stage 2 EIS Assessment and Determination will provide further assessment and justification for the placement of wind turbines within three or more 60° sectors where necessary, and/or provide reasonable and feasible mitigation measures to reduce visual impacts.

A comprehensive assessment of potential cumulative visual impacts will be carried out and included in the Stage 2 EIS Assessment and Determination report.

Multiple wind turbine tool diagrams for the representative view locations are included in **Figure 11** to **Figure 13**.

Figure 9
Dwelling locations

GBD
Landscape architecture



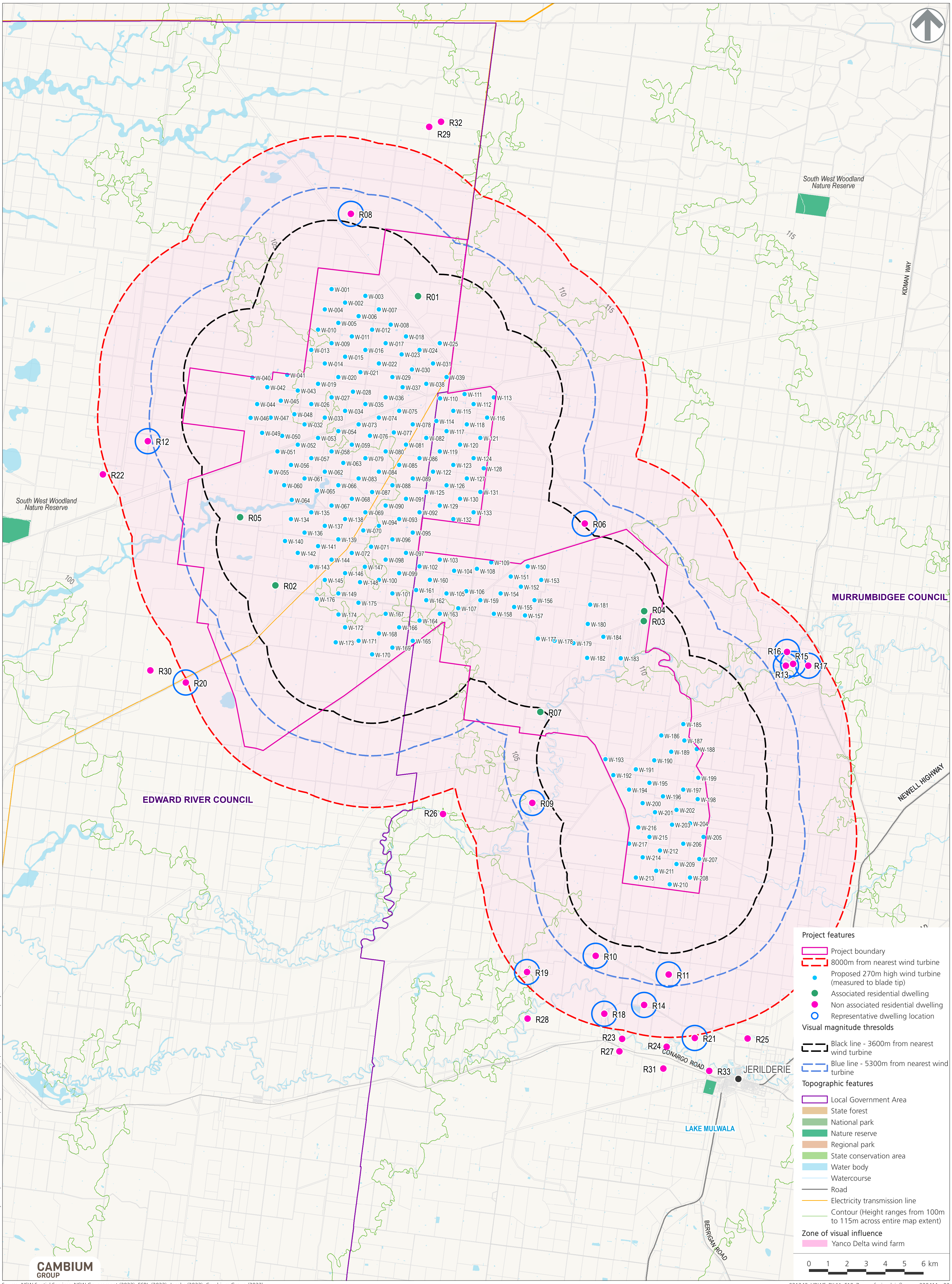
CAMBIUM GROUP

Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

031243_YDWF_PLVIA_F9_Dwelling_locations_220411_v02

Figure 10
Zone of visual influence

GBD
Landscape architecture



CAMBIUM GROUP

Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

031243_YDWF_PLVIA_F10_Zone_of_visual_influence_220411_v02

Figure 11

Representative location dwellings R06, R08, R09 and R10 - Multiple wind turbine tools

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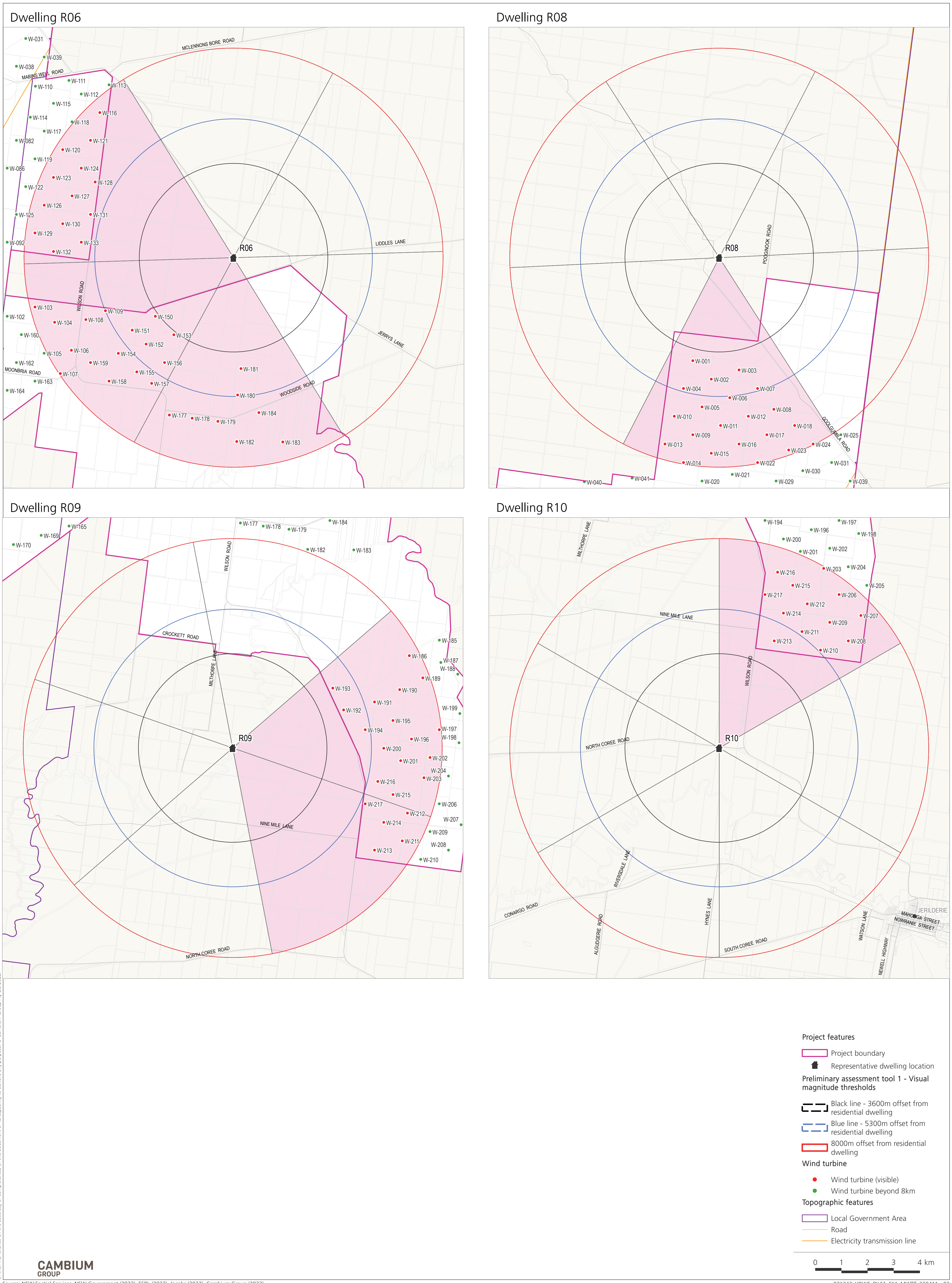
GBD Landscape architecture



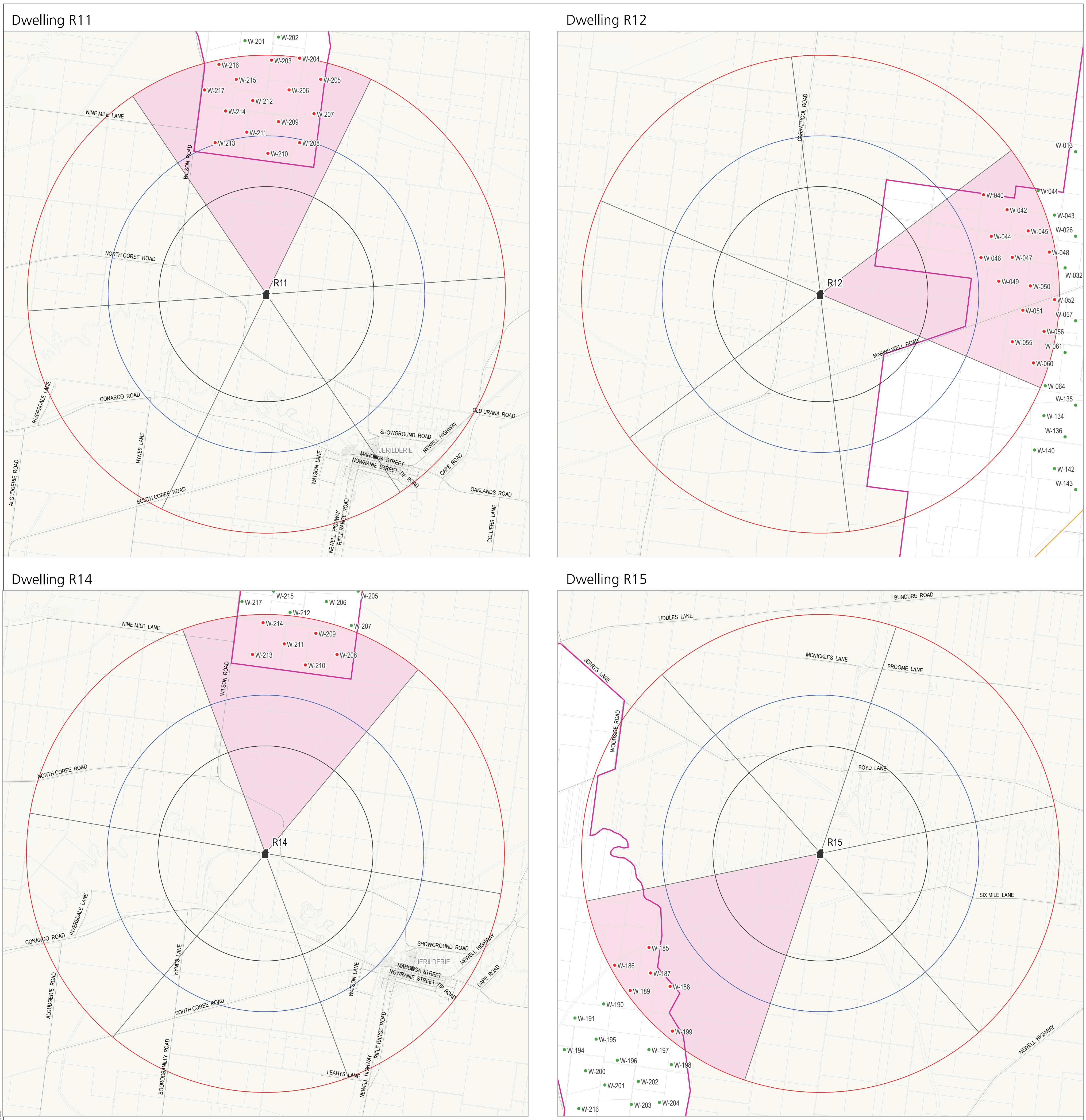
CAMBIUM GROUP

Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

031243_YDWF_PLVIA_F11_MWTT_220411_v03

Figure 12
Representative location dwellings R11, R12, R14 and R15 - Multiple wind turbine tools

GBD Landscape architecture



Project features
- Project boundary
- Representative dwelling location

Preliminary assessment tool 1 - Visual magnitude thresholds
- Black line - 3600m offset from residential dwelling
- Blue line - 5300m offset from residential dwelling
- 8000m offset from residential dwelling

Wind turbine
- Wind turbine (visible)
- Wind turbine beyond 8km

Topographic features
- Local Government Area
- Road
- Electricity transmission line

0 1 2 3 4 km

CAMBIUM GROUP

Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

Figure 13

Representative location dwellings R18 and R19 - Multiple wind turbine tools

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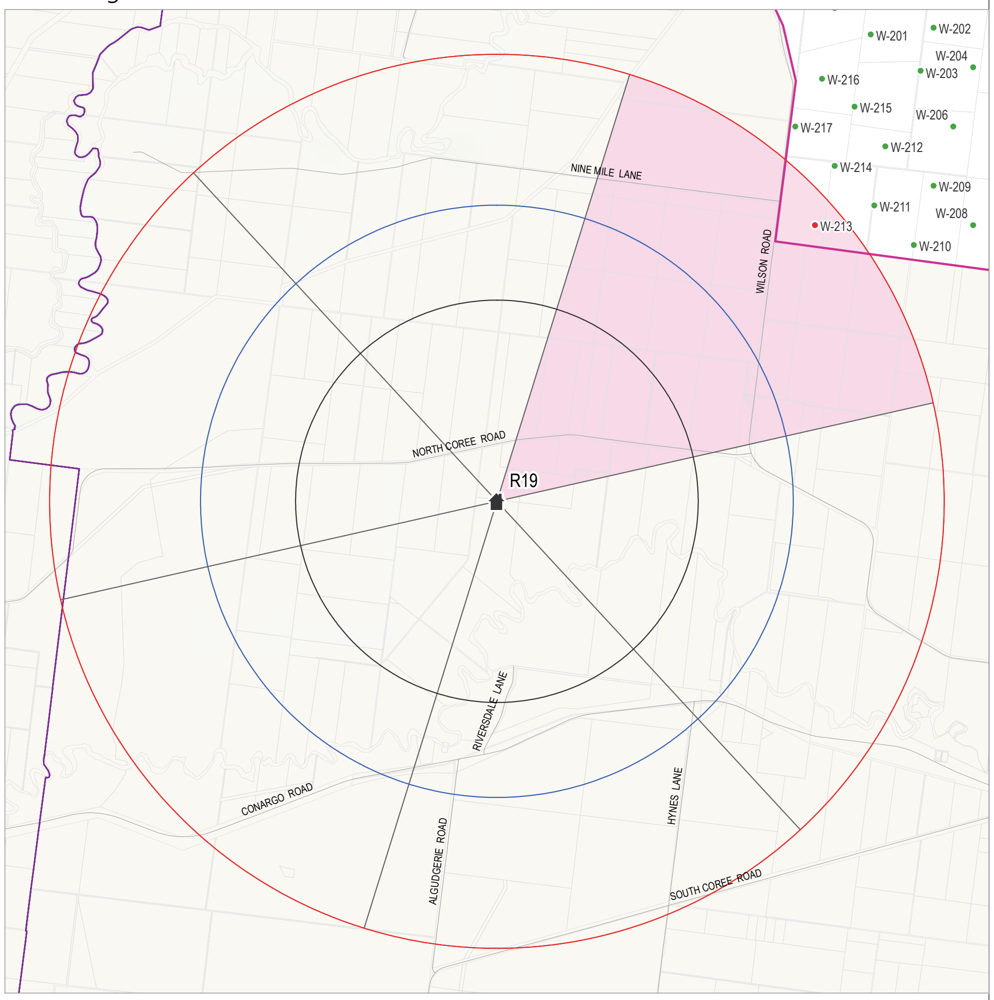
Dwelling R18

Dwelling R19



Project features

Project boundary

Representative dwelling location

Preliminary assessment tool 1 - Visual magnitude thresholds

Black line - 3600m offset from residential dwelling

Blue line - 5300m offset from residential dwelling

8000m offset from residential dwelling

Wind turbine

Wind turbine (visible)

Wind turbine beyond 8km

Topographic features

Local Government Area

Road

Electricity transmission line

0 1 2 3 4 km

CAMBIUM GROUP

Source: NSW Spatial Services, NSW Government (2022), ESRI, (2022), Jacobs (2022), Cambium Group (2022).

031243_YDWF_PLVIA_F13_MWTT_220411_v03

Section 8. Summary

8.1 Summary

This Preliminary LVIA has been prepared in accordance with the Visual Bulletin and specifically addresses the key steps set out in Stage 1 PEA / Scoping Report (pre-lodgement). The Preliminary LVIA has:

- Outlined the community consultation activities undertaken by the Proponent and identified the key landscape features and characteristics that are found within and surrounding the project boundary.
- Noted the landscape features and locations of concern to the community and will further consider these within the Stage 2 EIS Assessment and Determination process.
- Applied the preliminary assessment tools (magnitude and multiple wind turbine) to the preliminary wind turbine layout.
- Documented the process and analysis of the Stage 1 Preliminary Environmental Assessment.

The Preliminary LVIA will be carried forward to the Stage 2 EIS, which will consider the proposed wind farm development against the Visual Bulletin performance objectives and requirements.

8.2 Next steps

This Preliminary LVIA, incorporating the preliminary assessment tools, will be submitted to DPE together with the Scoping Report as a pre-requisite as a request for the Secretary's Environmental Assessment Requirements (SEARs). The Visual Bulletin notes that *'In relation to visual assessment, SEARs for wind energy applications will require the Proponent to provide a comprehensive assessment of the project in accordance with (the) Bulletin that analyses the proposed wind energy project in relation to the visual performance objectives'.*

The Steps in Visual Assessment (refer Section 4) identifies the key steps in the Stage 2 EIS visual assessment. These include:

- Prepare a Visual Baseline Study as part of the EIS
- Undertake community consultation aspects of the visual baseline study and describe mitigation and management options in the EIS
- Establish Visual Influence Zones from viewpoints using inputs from the visual baseline study, and
- Undertake an evaluation of project against the Visual Performance Objectives.

The Proponent will commission a detailed Landscape and Visual Impact Assessment (LVIA) report. The LVIA report will be prepared in accordance with the Visual Bulletin requirements and incorporate:

- Baseline study factors
- Visual performance evaluation, and
- Visual performance objectives

The Stage 2 EIS will incorporate a detailed Landscape and Visual Impact Assessment to address the Visual Bulletin Stage 2 requirement.

GBD
Landscape architecture

Green Bean Design Pty Ltd (GBD) is a highly experienced landscape architectural consultancy specialising in landscape and visual impact assessment. Established in 2006 as an independent consultancy, GBD provide professional advice to a range of commercial and government clients involved in large infrastructure project and policy development.

GBD Director Andrew Homewood is a Registered Landscape Architect, member of the Australian Institute of Landscape Architects and the Environmental Institute of Australia and New Zealand. Andrew has over 30 years' continuous employment in landscape consultancy and has completed numerous landscape and visual impact assessments for a range of state significant developments including wind energy, solar, mining, industrial and transport developments.

GBD has been commissioned for large scale renewable energy projects across New South Wales, Victoria, South Australia, Queensland and Tasmania.

GBD has been engaged as a peer reviewer of renewable energy landscape and visual impact assessments in Victoria and New South Wales.

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Appendix F. Results of community consultation

VIRYA

Virya Energywould like to hear from the Jerilderie community on what you value the most about the area, and your views on the proposed Yanco Delta Wind Farm Project. Feedback from the community will influence the Project design and will be summarised in the Scoping Report to besubmitted to the NSW Department of Planning and Environment. Any information you provide will be treated as confidential.

1.	**Name**						
2.	**Address**						
3.	**Phone**						
4.	**Email**						
5.	**Gender**	☐ Male	☑ Female	☐ Non-binary/ gender diverse	☑ Prefer not to say		
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☐ 30 - 44	☑ 45 - 59	☐ 60 +	☐ Prefer not to say
7.	**How did you hear about the Project?**	☐ Family / Friend	☑ Community Group	☐ Radio or Newspaper	☐ Other		
8.	**Which best describes where you live?**	☐ Within Jerilderie or nearby townships	☑ Rural area	☐ Semi-rural	☐ Other (please specify):		
9.	**What do you value about your local area?**	☑ Agriculture	☑ Recreation opportunities	☑ Employment opportunities	☑ Investment and business growth	☑ Community / family associations	
		☑ Cultural heritage	☑ Ecological heritage / biodiversity	☑ Local history	☑ Rural landscape / scenic beauty	☐ Other (please specify):	
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**	☑ They generate renewable energy.	☑ They reduce greenhouse gas emissions and help to combat climate change.	☑ They bring investment to regional area/centres.	☑ They deliver local economic opportunities (jobs, tourism)		
		☑ They help landowners to diversity their income.	☑ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):			

From your choices which do you value the most? Please write below

11.

Renewable Energy.

Based on your current understanding of renewable energy and the Project, what are your main concerns?

12.

☐ Noise ☐ Traffic ☐ Visual effects ☐ Night time obstacle lighting

☐ Effect on land use ☐ Effect on flora / fauna ☐ I have no concerns ☐ Other (please specify):

What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape ?

13.

All of it.

14. In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)

Not Sure.

15. What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g . if you have a visitor, where do you take them to showcase your local area?)

Creek.

Are there any local or community activities that you value or enjoy participating in?

17.

Golf.

18. What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?

Sporting.

Would you like to be kept up to date with Project newsletters and other updates?

19.

☐ Yes – email newsletter ☐ Yes – post newsletter ☐ Yes – occasional telephone call ☐ ~~No~~

Thank you for providing your feedback. For further feedback or information please email us at:

info@ viryacleanenergy.com.au

Community Feedback Form-
Yanco Delta Wind Farm

VIRYA

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1.	Name						
2.	Address						
3.	Phone						
4.	Email						
5.	Gender	☒ Male	☐ Female	☐ Non-binary/ gender diverse	☐ Prefer not to say		
6.	Age Group	☐ Under 18	☐ 18 - 29	☒ 30 - 44	☐ 45 - 59	☐ 60 +	☐ Prefer not to say
7.	How did you hear about the Project?	☐ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☒ Other		

8. Which best describes where you live?

☐ Within Jerilderie or nearby townships	☐ Rural area	☐ Semi-rural	☒ Other (please specify): WORK IN JERILDERIE LIVE IN MELBOURNE

9. What do you value about your local area?

☐ Agriculture	☐ Recreation opportunities	☒ Employment opportunities	☒ Investment and business growth	☐ Community / family associations
☐ Cultural heritage	☐ Ecological heritage / biodiversity	☒ Local history	☐ Rural landscape / scenic beauty	☐ Other (please specify):

10. Which of the following benefits from wind farms do you consider important? Tick as many as applicable.

☒ They generate renewable energy.	☒ They reduce greenhouse gas emissions and help to combat climate change.	☐ They bring investment to regional area/centres.	☒ They deliver local economic opportunities (jobs, tourism)
☐ They help landowners to diversity their income.	☐ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):	

11.	**From your choices which do you value the most?** Please write below ECONOMIC OPPORTUNITIES
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?** ☐ Noise ☐ Traffic ☐ Visual effects ☐ Night time obstacle lighting ☐ Effect on land use ☐ Effect on flora / fauna ☒ I have no concerns ☐ Other (please specify):
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape ?** N/A
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** LAKES, HISTORIC PLACES
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g . if you have a visitor, where do you take them to showcase your local area?)** N/A
17.	**Are there any local or community activities that you value or enjoy participating in?** NOT CURRENTLY
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?** BETTER EDUCATION OPPORTUNITIES
19.	**Would you like to be kept up to date with Project newsletters and other updates?** ☒ Yes – email newsletter ☐ Yes – post newsletter ☐ Yes – occasional telephone call ☐ No

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3.	**Phone**						
4.	**Email**						
5.	**Gender**	☐ Male	☑ Female		☐ Non-binary/ gender diverse	☐ Prefer not to say	
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☐ 30 - 44	☑ 45 - 59	☐ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☐ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☐ Other ☑ This letter

8.	**Which best describes where you live?**			
	☑ Within Jerilderie or nearby townships	☐ Rural area	☐ Semi-rural	☐ Other (please specify):

9.	**What do you value about your local area?**				
	☑ Agriculture	☑ Recreation opportunities	☐ Employment opportunities	☐ Investment and business growth	☑ Community / family associations
	☐ Cultural heritage	☐ Ecological heritage / biodiversity	☐ Local history	☑ Rural landscape / scenic beauty	☐ Other (please specify):

10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**			
	☑ They generate renewable energy.	☐ They reduce greenhouse gas emissions and help to combat climate change.	☐ They bring investment to regional area/centres.	☑ They deliver local economic opportunities (jobs, tourism)
	☐ They help landowners to diversity their income.	☑ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):	

11.	**From your choices which do you value the most?** Please write below deliver local economic opportunities			
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?**			
	☐ Noise	☐ Traffic	☐ Visual effects	☐ Night time obstacle lighting
	☐ Effect on land use	☐ Effect on flora / fauna	☑ I have no concerns	☐ Other (please specify):
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape ?** That there is always enough water in our creek + our Lake.			
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** The Billabong creek The lake of Jerilderie			
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?)** Same as above			
17.	**Are there any local or community activities that you value or enjoy participating in?** Sports. Fundraising community projects when on.			
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?**			
19.	**Would you like to be kept up to date with Project newsletters and other updates?**			
	☐ Yes – email newsletter	☐ Yes – post newsletter	☐ Yes – occasional telephone call	☑ No

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4.	**Email**						
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6.	**Age Group**	☐ Under 18	☐ 18 - 29	☑ 30 - 44	☐ 45 - 59	☐ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☐ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☑ Other
8.	**Which best describes where you live?**				
	☑ Within Jerilderie or nearby townships	☐ Rural area	☐ Semi-rural	☐ Other (please specify):	
9.	**What do you value about your local area?**				
	☐ Agriculture	☐ Recreation opportunities	☐ Employment opportunities	☐ Investment and business growth	☐ Community / family associations
	☐ Cultural heritage	☐ Ecological heritage / biodiversity	☐ Local history	☑ Rural landscape / scenic beauty	☐ Other (please specify):
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**				
	☑ They generate renewable energy.	☐ They reduce greenhouse gas emissions and help to combat climate change.	☐ They bring investment to regional area/centres.	☐ They deliver local economic opportunities (jobs, tourism)	
	☐ They help landowners to diversity their income.	☐ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):		

11.	**From your choices which do you value the most?** Please write below			
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?**			
	☐ Noise	☐ Traffic	☑ Visual effects	☐ Night time obstacle lighting
	☐ Effect on land use	☑ Effect on flora / fauna	☐ I have no concerns	☐ Other (please specify):
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape?**			
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** dont know were being built			
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?)** dont know where being built			
17.	**Are there any local or community activities that you value or enjoy participating in?**			
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?**			
19.	**Would you like to be kept up to date with Project newsletters and other updates?**			
	☐ Yes – email newsletter	☐ Yes – post newsletter	☐ Yes – occasional telephone call	☑ No

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Community Feedback Form -
Yanco Delta Wind Farm

VIRYA

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1.	**Name**						
2.	**Address**						
3.	**Phone**						
4.	**Email**						
5.	**Gender**	☐ Male	☑ Female	diverse		☐ Prefer not to say	
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☑ 30 - 44	☐ 45 - 59	☐ 60 +	☐ Prefer not to say
7.	**How did you hear about the Project?**	☐ Family / Friend	☑ Community Group	☐ Radio or Newspaper	☐ Other		

8. Which best describes where you live?

☐ Within Jerilderie or nearby townships	☑ Rural area	☐ Semi-rural	☐ Other (please specify):

9. What do you value about your local area?

☐ Agriculture	☐ Recreation opportunities	☐ Employment opportunities	☑ Investment and business growth	☐ Community / family associations
☐ Cultural heritage	☐ Ecological heritage / biodiversity	☐ Local history	☐ Rural landscape / scenic beauty	☐ Other (please specify):

10. Which of the following benefits from wind farms do you consider important? Tick as many as applicable.

☑ They generate renewable energy.	☐ They reduce greenhouse gas emissions and help to combat climate change.	☑ They bring investment to regional area/centres.	☑ They deliver local economic opportunities (jobs, tourism)
☑ They help landowners to diversity their income.	☑ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):	

11.	**From your choices which do you value the most?** Please write below Economic benfit
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?** ☐ Noise ☐ Traffic ☐ Visual effects ☐ Night time obstacle lighting ☐ Effect on land use ☐ Effect on flora / fauna ☑ I have no concerns ☐ Other (please specify):
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape ?** They good opprunities
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** unique view
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g . if you have a visitor, where do you take them to showcase your local area?)** Lake
17.	**Are there any local or community activities that you value or enjoy participating in?** Lake events
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?** Sponsorships and job opprunities
19.	**Would you like to be kept up to date with Project newsletters and other updates?** ☑ Yes – email newsletter ☑ Yes – post newsletter ☐ Yes – occasional telephone call ☐ No

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info@ viryacleanenergy.com.au

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1.	**Name**	[illegible]					
2.	**Address**	[illegible]					
3.	**Phone**	[illegible]					
4.	**Email**	[illegible]					
5.	**Gender**	☑ Male	☐ Female		☐ Non-binary/ gender diverse		☐ Prefer not to say
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☑ 30 - 44	☐ 45 - 59	☐ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☑ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☐ Other
8.	**Which best describes where you live?**				
	☐ Within Jerilderie or nearby townships	☑ Rural area	☐ Semi-rural	☐ Other (please specify):	
9.	**What do you value about your local area?**				
	☑ Agriculture	☑ Recreation opportunities	☐ Employment opportunities	☑ Investment and business growth	☐ Community / family associations
	☑ Cultural heritage	☐ Ecological heritage / biodiversity	☐ Local history	☐ Rural landscape / scenic beauty	☐ Other (please specify):
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**				
	☑ They generate renewable energy.	☑ They reduce greenhouse gas emissions and help to combat climate change.	☑ They bring investment to regional area/centres.	☑ They deliver local economic opportunities (jobs, tourism)	
	☐ They help landowners to diversity their income.	☑ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):		

11.	**From your choices which do you value the most?** Please write below Jobs opprtunities			
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?**			
	☐ Noise	☐ Traffic	☐ Visual effects	☐ Night time obstacle lighting
	☐ Effect on land use	☑ ~~Effect~~ on flora / fauna	☐ I have no concerns	☐ Other (please specify):
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape?** They good for as localsite			
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** certain Historic place.			
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?)** Lake			
17.	**Are there any local or community activities that you value or enjoy participating in?** lake events			
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?** Community fund			
19.	**Would you like to be kept up to date with Project newsletters and other updates?**			
	☐ Yes – email newsletter	☑ Yes – post newsletter	☐ Yes – occasional telephone call	☐ No

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Community Feedback Form –
Yanco Delta Wind Farm

VIRYA

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1.	**Name**						
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3.	**Phone**						
4.	**Email**						
5.	**Gender**	☐ Male		☑ Female	☐ Non-binary/ gender diverse		☐ Prefer not to say
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☐ 30 - 44	☐ 45 - 59	☑ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☑ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☐ Other
8.	**Which best describes where you live?**				
	☐ Within Jerilderie or nearby townships	☑ Rural area	☐ Semi-rural	☐ Other (please specify):	
9.	**What do you value about your local area?**				
	☐ Agriculture	☐ Recreation opportunities	☐ Employment opportunities	☐ Investment and business growth	☐ Community / family associations
	☐ Cultural heritage	☐ Ecological heritage / biodiversity	☑ Local history	☐ Rural landscape / scenic beauty	☐ Other (please specify):
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**				
	☐ They generate renewable energy.	☐ They reduce greenhouse gas emissions and help to combat climate change.	☑ They bring investment to regional area/centres.	☑ They deliver local economic opportunities (jobs, tourism)	
	☑ They help landowners to diversity their income.	☑ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):		

11.	From your choices which do you value the most? Please write below They bring investment in area			
12.	Based on your current understanding of renewable energy and the Project, what are your main concerns?			
	☐ Noise	☐ Traffic	☐ Visual effects	☑ Night time obstacle lighting
	☐ Effect on land use	☐ Effect on flora / fauna	☐ I have no concerns	☐ Other (please specify):
13.	What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape? The good for town development			
14.	In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views) Unique view			
15.	What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?) Lake			
17.	Are there any local or community activities that you value or enjoy participating in? Lacke events			
18.	What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar? grants. Scheme			
19.	Would you like to be kept up to date with Project newsletters and other updates?			
	☐ Yes – email newsletter	☑ Yes – post newsletter	☐ Yes – occasional telephone call	☐ No

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1.	**Name**						
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4.	**Email**						
5.	**Gender**	☑ Male	☐ Female		☐ Non-binary/ gender diverse		☐ Prefer not to say
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☐ 30 - 44	☑ 45 - 59	☐ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☐ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☑ Other
8.	**Which best describes where you live?**				
	☑ Within Jerilderie or nearby townships	☐ Rural area	☐ Semi-rural	☐ Other (please specify):	
9.	**What do you value about your local area?**				
	☑ Agriculture	☐ Recreation opportunities	☐ Employment opportunities	☑ Investment and business growth	☐ Community / family associations
	☑ Cultural heritage	☑ Ecological heritage / biodiversity	☑ Local history	☑ Rural landscape / scenic beauty	☐ Other (please specify):
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**				
	☑ They generate renewable energy.	☑ They reduce greenhouse gas emissions and help to combat climate change.	☐ They bring investment to regional area/centres.	☐ They deliver local economic opportunities (jobs, tourism)	
	☐ They help landowners to diversity their income.	☐ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):		

	From your choices which do you value the most? Please write below
11.	RENEWABLE ENERGY.
	Based on your current understanding of renewable energy and the Project, what are your main concerns?
12.	☑ Noise ☐ Traffic ☐ Visual effects ☑ Night time obstacle lighting
	☑ Effect on land use ☑ Effect on flora / fauna ☐ I have no concerns ☐ Other (please specify):
	What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape ?
13.	THE CLEAR + CLEAN SERENITY.
14.	In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views) HAVING LIVED NEAR A WINDFARM IN VIC I'M AGAINST THE NOISE LEVELS THEY GENERATE WHICH IS VERY BAD!!!
15.	What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g . if you have a visitor, where do you take them to showcase your local area?) THE LAKE AND THE CREEK.
	Are there any local or community activities that you value or enjoy participating in?
17.	NO
18.	What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar? NO VIEW
	Would you like to be kept up to date with Project newsletters and other updates?
19.	☐ Yes – email newsletter ☑ Yes – post newsletter ☐ Yes – occasional telephone call ☐ No

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VIRYA

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3.	**Phone**						
4.	**Email**						
5.	**Gender**	☒ Male		☐ Female	☐ Non-binary/ gender diverse		☐ Prefer not to say
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☐ 30 - 44	☐ 45 - 59	☒ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☐ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☒ Other Project representative visited property	
8.	**Which best describes where you live?**					
	☐ Within Jerilderie or nearby townships	☒ Rural area	☐ Semi-rural	☒ Other (please specify): Directly next to wind farm		
9.	**What do you value about your local area?**					
	☒ Agriculture	☐ Recreation opportunities	☐ Employment opportunities	☐ Investment and business growth	☐ Community / family associations	
	☐ Cultural heritage	☐ Ecological heritage / biodiversity	☐ Local history	☐ Rural landscape / scenic beauty	☒ Other (please specify): Skyline	
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**					
	☒ They generate renewable energy.	☒ They reduce greenhouse gas emissions and help to combat climate change.	☒ They bring investment to regional area/centres.	☒ They deliver local economic opportunities (jobs, tourism)		
	☒ They help landowners to diversity their income.	☒ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):			

11.	**From your choices which do you value the most?** Please write below Values all equally			
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?**			
	☐ Noise	☐ Traffic	☐ Visual effects	☐ Night time obstacle lighting
	☐ Effect on land use	☐ Effect on flora / fauna	☐ I have no concerns	☒ Other (please specify): Skyline changes
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape?** The natural pastural country			
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** The project will be close to the Yanco Creek			
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?)** N/A			
17.	**Are there any local or community activities that you value or enjoy participating in?** The Jerilderee Working Dog Auction			
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?** N/A			
19.	**Would you like to be kept up to date with Project newsletters and other updates?**			
	☒ Yes – email newsletter	☐ Yes – post newsletter	☐ Yes – occasional telephone call	☐ No

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3.	**Phone**						
4.	**Email**						
5.	**Gender**	☐ Male		☒ Female	☐ Non-binary/ gender diverse		☐ Prefer not to say
6.	**Age Group**	☐ Under 18	☐ 18 - 29	☐ 30 - 44	☐ 45 - 59	☒ 60 +	☐ Prefer not to say

7.	**How did you hear about the Project?**	☐ Family / Friend	☐ Community Group	☐ Radio or Newspaper	☒ Other Met with Project Representative
8.	**Which best describes where you live?**				
	☐ Within Jerilderie or nearby townships	☒ Rural area	☐ Semi-rural	☐ Other (please specify):	
9.	**What do you value about your local area?**				
	☒ Agriculture	☐ Recreation opportunities	☐ Employment opportunities	☐ Investment and business growth	☐ Community / family associations
	☐ Cultural heritage	☒ Ecological heritage / biodiversity	☒ Local history	☐ Rural landscape / scenic beauty	☐ Other (please specify):
10.	**Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**				
	☒ They generate renewable energy.	☒ They reduce greenhouse gas emissions and help to combat climate change.	☒ They bring investment to regional area/centres.	☒ They deliver local economic opportunities (jobs, tourism)	
	☒ They help landowners to diversity their income.	☒ They deliver community benefits, such as funding or initiatives.	☐ Other (please specify):		

11.	**From your choices which do you value the most?** Please write below They generate renewable energy and they help landowners to diversify their income.			
12.	**Based on your current understanding of renewable energy and the Project, what are your main concerns?**			
	☐ Noise	☐ Traffic	☐ Visual effects	☐ Night time obstacle lighting
	☐ Effect on land use	☐ Effect on flora / fauna	☒ I have no concerns	☐ Other (please specify):
13.	**What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape?** The area is mostly unspoilt natural landscape			
14.	**In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)** None			
15.	**What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?)** Along the creeks in the area			
17.	**Are there any local or community activities that you value or enjoy participating in?** Although Carolyn doesn't participate in local sports herself, she said that she recognises that it is a big part of the local community. She also values the history of the town.			
18.	**What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?** The Monash, Kelly Statue to go into the park in the centre of town which the community is currently trying to raise money for.			
19.	**Would you like to be kept up to date with Project newsletters and other updates?**			
	☒ Yes – email newsletter	☐ Yes – post newsletter	☐ Yes – occasional telephone call	☐ No

Thank you for providing your feedback. For further feedback or information please email us at:

info@viryacleanenergy.com.au

Virya Energy would like to hear from the Jerilderie community on what you value the most about the area, and your views on the proposed Yanco Delta Wind Farm Project. Feedback from the community will influence the Project design and will be summarised in the Scoping Report to be submitted to the NSW Department of Planning and Environment. Any information you provide will be treated as confidential.

1. **Name**
2. **Address**
3. **Phone**
4. **Email**
5. **Gender** ☐ Male ☐ Female ☐ Non-binary/ gender diverse ☐ Prefer not to say
6. **Age Group** ☐ Under 18 ☐ 18 - 29 ☐ 30 - 44 ☐ 45 - 59 ☑ 60 + ☐ Prefer not to say
7. **How did you hear about the Project?** ☐ Family / Friend ☐ Community Group ☐ Radio or Newspaper ☑ Other
8. **Which best describes where you live?**
   ☐ Within Jerilderie or nearby townships ☑ Rural area ☐ Semi-rural ☐ Other (please specify):
9. **What do you value about your local area?**
   ☑ Agriculture ☑ Recreation opportunities ☑ Employment opportunities ☑ Investment and business growth ☑ Community / family associations
   ☐ Cultural heritage ☑ Ecological heritage / biodiversity ☑ Local history ☑ Rural landscape / scenic beauty ☐ Other (please specify):
10. **Which of the following benefits from wind farms do you consider important? Tick as many as applicable.**
   ☑ They generate renewable energy. ☑ They reduce greenhouse gas emissions and help to combat climate change. ☐ They bring investment to regional area/centres. ☐ They deliver local economic opportunities (jobs, tourism)
   ☐ They help landowners to diversity their income. ☐ They deliver community benefits, such as funding or initiatives. ☐ Other (please specify):

11. From your choices which do you value the most? Please write below

AGRICULTURAL WAY OF LIFE IN AN UNSPOILED NATURAL LANDSCAPE.

12. Based on your current understanding of renewable energy and the Project, what are your main concerns?

- ☐ Noise
- ☐ Traffic
- ☑ Visual effects
- ☑ Night time obstacle lighting
- ☑ Effect on land use
- ☑ Effect on flora / fauna
- ☐ I have no concerns
- ☑ Other (please specify): EXTREME VISUAL POLLUTION. LANDSCAPE CHARACTER CHANGE AND VISUAL IMPACTS.

13. What do you value about the existing natural and built environment around Jerilderie and the surrounding landscape?

UNSPOILED NATURAL ENVIRONMENT, WILD-LIFE CONSERVATION AREA, SCENIC BEAUTY

14. In your opinion what are the key landscape features in the vicinity of the Project? (e.g. a distinct water body, or certain historic places, or any unique views)

PRISTINE CREEK COUNTRY ENVIRONMENT WITH OPEN SURROUNDING RIVERINE PLAINS

15. What are the best lookouts / public viewing locations within the vicinity of the Project? (e.g. if you have a visitor, where do you take them to showcase your local area?)

ALONG THE CREEKS AND SUNRISE AND SUNSET VIEWS ACROSS THE PLAINS

17. Are there any local or community activities that you value or enjoy participating in?

SPORT (eg. GOLF), BUSH WALKING, BARBEQUES OUTDOOR MUSIC CONCERTS

18. What local initiatives do you think the Project could help with through a community fund, grant s scheme, sponsorships or similar?

WE DON'T THINK THE PROJECT IS A BENEFIT TO THE COMMUNITY

19. Would you like to be kept up to date with Project newsletters and other updates?

- ☐ Yes – email newsletter
- ☐ Yes – post newsletter
- ☐ Yes – occasional telephone call
- ☑ No

Thank you for providing your feedback. For further feedback or information please email us at:

info@viryacleanenergy.com.au

Appendix G. Preliminary Noise Impact Assessment

Yanco Delta Wind Farm Preliminary Noise Impact Assessment

Date:	12 April 2022
Project name:	Yanco Delta Wind Farm
Project no:	IS408300
Attention:	Steve Crowe
Company:	Jacobs Group Australia Pty Ltd:
Prepared by:	Sean Brennan
Document no:	Rev01

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1.1 Introduction

Virya Energy is seeking approval for the proposed Yanco Delta Wind Farm (the Project) approximately 10 kilometres north-west of the town of Jerilderie, in the localities of Moonbria and Mabins Well, within the Murrumbidgee Council and Edward River Council Local Government Areas (LGA).

The Project would involve the construction, operation and maintenance of a wind farm with up to 225 wind turbine generators (WTGs).

1.2 Policy Background

Wind farm projects, such as this project, have been known to produce noise at a level which may impact the noise amenity of properties in the areas surrounding the project. As such, it important that the potential noise from prospective wind farms is understood and controlled.

In order to manage wind farm noise in NSW, the NSW Department of Planning and Environment (DPE) (now Department of Planning, Industry and Environment) developed the *Wind Energy: Noise Assessment Bulletin* (NSW DPE, 2016) ('the Bulletin'). The Bulletin adopts the guidance from the South Australian *Wind farms – environmental noise guidelines* (SA 2009) document in order to produce a standard for wind farm noise assessment in NSW.

As part of the Bulletin's guidance, a preliminary noise impact assessment (PNIA) must be developed at the pre-lodgement stage to identify potential noise issues and inform the design of the project. The assessment would also assist in the application for the Secretary's Environmental Assessment Requirements (SEARs) and guide the preparation of the Environmental Impact Statement (EIS) for the project.

1.3 Methodology and Criteria

The noise impacts from the proposed wind farm were predicted using the SoundPLAN 8.2 acoustic modelling software. Within the noise modelling software, the CONCAWE noise propagation algorithm was applied for dB(A) noise calculations. The CONCAWE noise calculation method was selected due to its reliability in assessing industrial noise impacts. CONCAWE considers noise propagation and attenuation by:

- Geometrical spreading
- Atmospheric absorption
- Ground effects
- Meteorological conditions conducive of the propagation of noise
- Barriers
- Topography and distance between the source and receptor.

In order to comply with the requirements of the Bulletin, a number of conservative inputs and assumptions were adopted for assessment, producing the worst case noise propagation conditions within the model. These are detailed in **Table 1**.

Table 1 Noise model inputs and assumptions

Model Input	Details
Topography	Terrain data were derived from a combination of the NSW Land Property Information (LPI) 10m resolution bare earth Digital Elevation Model (DEM).
Receivers	Noise sensitive receivers were identified in Table 6-5 and Figure 6-12 of the Scoping Report. Building footprints for receivers were determined from aerial photography. Buildings were assumed to be 5m in height and single storey (3 m per floor plus 2 m for the roof).
Ground Absorption	Hard Ground: (Absorption coefficient = 0.00)
Noise Sources	Noise source data obtained from *D2830475_005-SGRE ON SG 6.6-170 Developer Package.docx/.pdf*, provided by the supplier. Each individual turbine was determined to have a sound power level of 106 dB(A), equivalent to the worst case turbine noise levels provided by the candidate supplier (i.e. operating at a wind speed up to the cut-out point (12 m/s)). This was based on Table 1 of the report. Sources were situated at a height of 170m, equivalent to the hub/rotor height as provided by the supplier. The quantities and positioning of the noise sources was based on Figure 6-12 of the scoping report. Noise spectra were provided in Table 2 of the document. These were in 1/1 octave bands from 63Hz to 8kHz. Consequently tonality and low frequency noise impacts could not be assessed. Note that the spectrum provided in Table 2 was assumed to be A-weighted).
Meteorological Conditions	'Noise-Enhancing' Meteorological conditions, as defined by the *Noise Policy for Industry* (EPA, 2017): Air Temperature: 10°C Humidity: 70% Air Pressure: 1013.3 mbar Wind Speed: 2 m/s Wind Direction: Source to Receiver Pasquill Stability Class: F

For the purposes of the PNIA, the base criterion of 35 dB(A) nominated in the Bulletin for non-involved residences, has been adopted as the noise criteria for all residences. The Bulletin also displays a number of different noise standards, which compares the NSW base criterion for wind farm noise to other states and countries'. These are shown in **Table 2**.

Table 2 Comparison of wind energy noise criteria

Jurisdiction and applicability	Noise Level (dB(A))
NSW & UK lower daytime base	35 dB(A)
Denmark	37 – 44 dB(A)
Vic, SA, NZ, UK upper base, US (typical), Europe Night	40 dB(A)
Netherlands wind farm night time	41 dB(A)
UK night wind farm base criteria	43 dB(A)
Europe WHO Night Noise Guidelines interim goal	55 dB(A)

1.4 Noise Modelling Prediction Results

The indicative noise levels predicted for this PNIA are provided in **Table 3**. Where predicted noise levels are greater than the base 35 dB(A) criterion, the levels are **bolded**.

As shown in **Table 3**, five receivers are predicted to receive noise levels greater than the 35 dB(A) base criterion. These exceedances range from 1 dB(A) to 6 dB(A). It should be noted however, that due to limited 1/1 octave data provided, the influence of low-frequency noise and tonality could not be determined, and hence any penalties, if applicable, could not be applied.

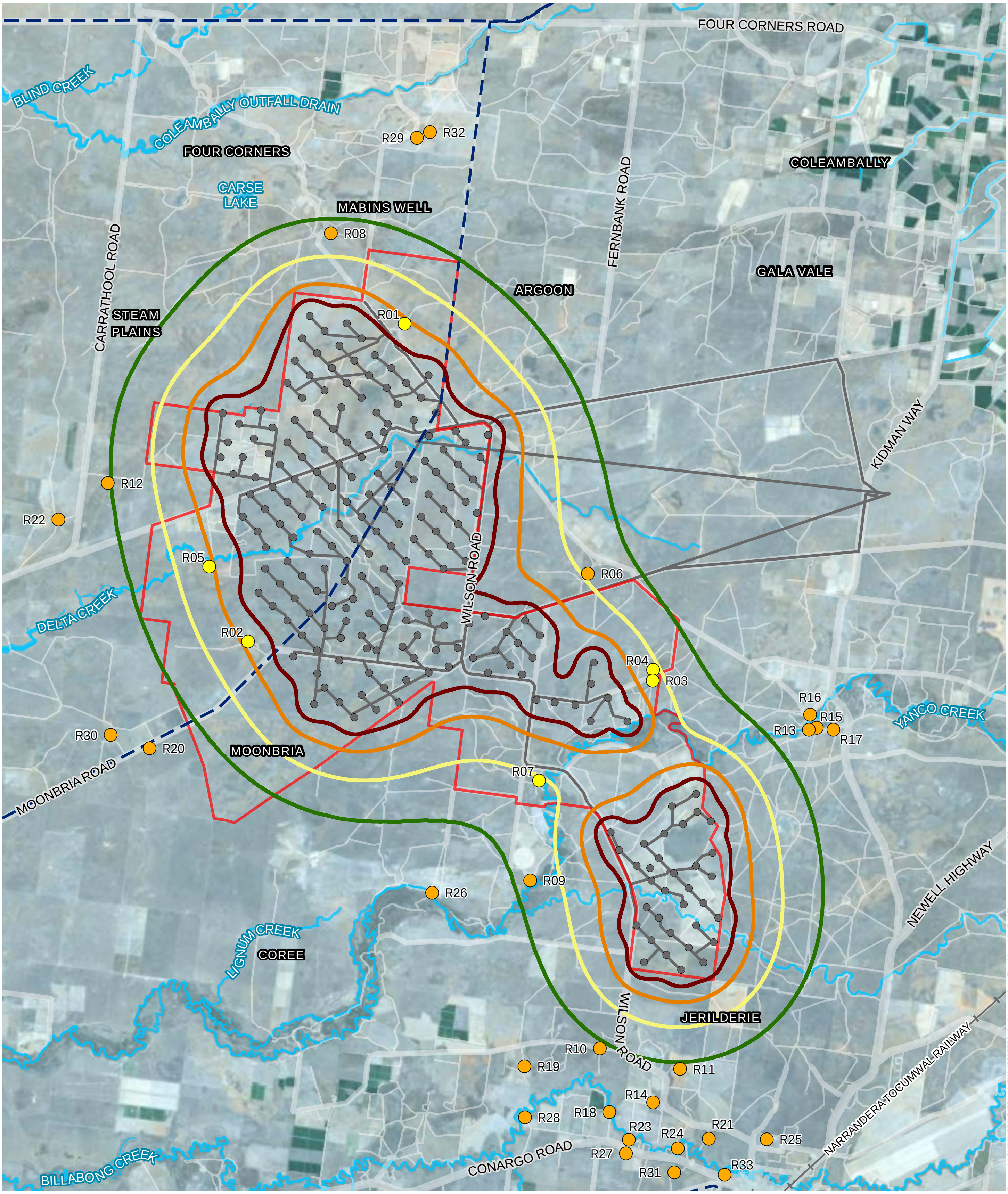
It should also be noted that all receivers where noise greater than 35 dB(A) has been predicted are associated receivers. These impacts will be further managed through detailed design and hence no further modification to the location of the wind turbines has been deemed necessary for the scoping report.

Noise contours displaying the predicted noise impacts are provided in **Figure 1**.

Table 3 Predicted noise levels at each identified receiver

Receiver ID	Receiver Type	Associated	Approximate distance from nearest WTG (m)	Predicted Noise Level (dB(A))
R01	Residential	Associated	2058	**41**
R02	Residential	Associated	2062	**41**
R03	Residential	Associated	2270	**37**
R04	Residential	Associated	2520	**36**
R05	Residential	Associated	2656	**39**
R06	Residential	Non-associated	3724	34
R07	Residential	Associated	3739	34
R08	Residential	Non-associated	4062	32
R09	Residential	Non-associated	4457	31
R10	Residential	Non-associated	4599	29
R11	Residential	Non-associated	4715	29
R12	Residential	Non-associated	5513	30
R13	Residential	Non-associated	6172	26
R14	Residential	Non-associated	6447	25
R15	Residential	Non-associated	6546	27
R16	Residential	Non-associated	6607	25
R17	Residential	Non-associated	7212	24
R18	Residential	Non-associated	7307	23
R19	Residential	Non-associated	7535	23
R20	Residential	Non-associated	8112	24
R21	Residential	Non-associated	8141	22
R22	Residential	Non-associated	8270	24
R23	Residential	Non-associated	8455	21
R24	Residential	Non-associated	8496	21
R25	Residential	Non-associated	8938	20
R26	Residential	Non-associated	8964	25
R27	Residential	Non-associated	9119	20
R28	Residential	Non-associated	9296	18

Receiver ID	Receiver Type	Associated	Approximate distance from nearest WTG (m)	Predicted Noise Level (dB(A))
R29	Residential	Non-associated	9442	20
R30	Residential	Non-associated	9464	22
R31	Residential	Non-associated	9638	18
R32	Residential	Non-associated	9924	19
R33	Residential	Non-associated	9968	17



Indicative Project
- Project area
- Proposed footprint

Existing environment
- Waterways
- Road
- Existing electricity transmission line

Predicted Noise Level, $L_{Aeq,15min}$
- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)

Existing Dwellings
- Associated
- Non-associated

0 4 8 km

1:250,000 at A4

GDA 1994 MGA Zone 55

IVANHOE
NSW
HAY
CANBERRA
ALBURY
VIC
ECHUCA
OMEO

Data sources

Jacobs 2022
DPI 2021
Department of Regional NSW 2020
© Department of Customer Service 2020

Figure 1 Predicted Noise Impact of Project

1.5 Considerations for NIA

Based on the outcomes of the Preliminary Noise Impact Assessment and the scoping report, potential noise risks associated with the wind farm have been identified. As such, following the conclusion of the scoping phase of the project, an in-depth Noise and Vibration Impact Assessment (NVIA) will be developed.

The NVIA will assess all components of the project, including:

- Wind turbine noise in accordance with the requirements of the *Wind Energy: Noise Assessment Bulletin* (NSW DPE, 2016)
- Auxiliary battery energy storage system (BESS) noise in line with the requirements of the *Noise Policy for Industry* (EPA, 2017)
- Construction noise in line with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009) or the current version of the *Construction Noise Guideline* if published before the NVIA completion
- Construction Traffic Noise under the *NSW Road Noise Policy* (DECCW, 2011)
- Vibration impacts under *Assessing Vibration: A technical guideline* (DEC, 2006), *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration* and *German Standard DIN 4150-3:2016 Vibrations in buildings – Part 3: Effects on structures*.

The scope of the NVIA will include:

- Review the previously performed background conditions monitoring program, specifically the background noise and meteorological conditions surveys
- The establishment of noise criteria based on the results of background noise monitoring, or alternatively adopt the base criteria in line with the bulletin, in consultation with the client
- Identification of key construction and operation noise sources
- Review details of the project including plant and equipment type, sizes, locations, activities, utilisation, duration and timing to develop an inventory quantifying potential noise and vibration emissions during construction
- Review turbine models and provided details (supplier, model, rated power, rotor diameter, hub height, guaranteed spectral noise data, details regarding tonality or any special audible characteristics and planned locations), as well as details for any other noise sources (such as the auxiliary BESS) during operations.
- Developing a site noise model and predicting potential noise levels at the identified surrounding sensitive receivers. Using calculation methods to assess potential peak particle velocity and vibration dose values at surrounding receivers.
- A desktop study to determine any nearby construction activities and/or industrial operations which may result in a cumulative noise impact, followed by a cumulative noise assessment if any cumulative noise risks are identified
- Evaluating predictions by comparing predicted levels against management levels and criteria determined for the project. The potential for cumulative impacts, as well as any noise impacts resulting from traffic generated as a result of the development would also be completed as part of this assessment.
- If necessary, the identification of reasonable and feasible noise and vibration mitigation and management measures.

Appendix H. Social Impact Assessment Scoping Worksheet

Scoping Worksheet

	Social Impact Assessment (SIA) Worksheet					Project name: Yanco Delta Wind Farm							Date: 16 December 2021					
PROJECT ACTIVITIES	**CATEGORIES OF SOCIAL IMPACTS**	**POTENTIAL IMPACTS ON PEOPLE**		**PREVIOUS INVESTIGATION OF IMPACT**		**CUMULATIVE IMPACTS**		**ELEMENTS OF IMPACTS - Based on preliminary investigation**					**ASSESSMENT LEVEL FOR EACH IMPACT**				**PROJECT REFINEMENT**	**MITIGATION / ENHANCEMENT MEASURES**
Which **project activity / activities** could produce social impacts ?	what **social impact categories** could be affected by the project activities	What impacts are likely, and what concerns/aspirations have people expressed about the impact? Summarise how each relevant stakeholder group might experience the impact. NB. Where there are multiple stakeholder groups affected differently by an impact, or more than one impact from the activity, please add an additional row.	Is the impact expected to be **positive or negative**	Has this impact previously been investigated (on this or other project/s)?	If "yes - this project," briefly describe the previous investigation. If "yes - other project," identify the other project and investigation	Will this impact combine with others from this project (think about when and where), and/or with impacts from other projects (cumulative)?	If yes, identify which other impacts and/or projects	Will the project activity (without mitigation or enhancement) cause a material social impact in terms of its: You can also consider the various magnitudes of these characteristics					Level of assessment for each social impact	What methods and data sources will be used to investigate this impact?			Has the project been refined in response to preliminary impact evaluation or stakeholder feedback?	What **mitigation / enhancement measures** are being considered?
								extent i.e. number of people potentially affected?	**duration** of expected impacts? (i.e. construction vs operational phase)	**intensity** of expected impacts i.e. scale or degree of change?	**sensitivity** or vulnerability of people potentially affected?	**level of concern/interest** of people potentially affected?		Secondary data	Primary Data - Consultation	Primary Data - Research		
Payment to host landowners	livelihoods	Regular non-agricultural income would improve the financial wellbeing of landowners making it easier for them to remain on their property into the future if they choose to do so	Positive	Yes - other project	Hills of Gold Wind Farm examined this and found the establishment of a community enhancement fund with appropriate governance structures in place would distribute benefits for the local community	Yes	Potential cumulative impacts with other energy projects	Yes	Yes	Yes	Unknown	No	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Construction workforce increase demand for existing services and accommodation	livelihoods	Local businesses experience increased demand for services including hospitality, retail, trade services and accommodation	Positive	Yes - other project	Hills of Gold Wind Farm examined this and found during construction and operation of the project there would be economic opportunities and potentially more income for local businesses	Yes	Potential cumulative impacts with other energy projects	Yes	No	Yes	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Sourcing regional labour and materials for the project	livelihoods	Use of regional labour and materials would have a positive economic effect on the regional economy	Positive	Yes - other project	Hills of Gold Wind Farm examined this and found during construction and operation of the project there would be economic opportunities including to upskill the labour force, or work with local operators to create or increase tourism in the region	Yes	Potential cumulative impacts with other energy projects	Yes	No	No	No	Unknown	Standard assessment of the impact	Required	Targeted consultation	Potentially targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Placement of turbines in proximity to dwellings - Planning, construction and operation	way of life	There may be a perception that the combined visual, landscape changes could diminish the ability of people to enjoy their dwellings, particularly where they overlook the WTGs	Negative	Yes - other project	Uungula Wind Farm has examined this imapct and found that the region around that project has the capability to visually accommodate the project without eroding the broad landscape character. For acoustic changes, noise management strategies are proposed to minimise potential impacts on dwellings nearby	Yes	Potential cumulative impacts with other energy projects	No	Yes	No	No	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Transport and installation of wind turbines and associated infrastructure - construction	way of life	Construction noise, dust and other impacts may adversely impact on the amenity of dwellings and could diminish the ability of people to enjoy their dwellings	Negative	Yes - other project	Uungula Wind Farm examined this and found that construction noise and dust impacts would require appropriate mitigation measures to be in place to minimise potential impacts	Yes	Cumulative impact from multiple turbines	Yes	No	No	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Construction workforce use local services and accommodation	way of life	Construction workforce creating increased demand on accommodation services in the region may affect local providers and impact tourism by displacing visitors	Negative	Yes - other project	Hills of Gold Wind Farm examined this and found the local community had divergent views on potential impacts. Planning coordination and appropriate mitigation would be required with local stakeholders to reduce potential impacts	Yes	Potential cumulative impacts with other energy projects	Unknown	No	Yes	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Changes in valued landscape	surroundings	WTGs could be perceived to adversely impact on the landscape by residents and visitors to the region	Negative	Yes - other project	Uungula Wind Farm has examined this imapct and found that the region around that project has the capability to visually accommodate the project without eroding the broad landscape character. Mitigation measures would be put in place to improve the visual integration of the project	Yes	Potential cumulative impacts with other energy projects	Yes	Yes	Unknown	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Changes in valued landscape	surroundings	WTGs could be perceived to positively impact on the landscape by residents and visitors to the region	Positive	Unknown		Yes	Potential cumulative impacts with multiple WTGs, and other energy projects	Yes	Yes	Unknown	Unknown	Unknown	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Transport and installation of wind turbines affecting safety on roads	livelihoods	Construction activities could create a perception that safety of public road network is reduced	Negative	Yes - other project	Hills of Gold Wind Farm examined this and found that implementing road and traffic controls including communicating with the road authority and providing speed limits on certain roads can reduce potential impacts on road safety	No	Not required	No	No	No	No	Unknown	Minor assessment of the impact	Required	Limited - if required (e.g. local council)	Not required	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Payment to host landowners	community	Non-associated landowners may perceive there to be an uneven distribution of benefits to the local community. Conflicting views as to the desirability of the project could create conflict between affected landowners or within the community	Negative	Yes - other project	Hills of Gold Wind Farm examined this and found the establishment of a community enhancement fund with appropriate governance structures in place would distribute benefits for the local community	Yes	Potential cumulative impacts with other energy projects	Unknown	Yes	Yes	Unknown	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.
Payment to community or council funds	community	Non-associated landowners may perceive the Project to deliver a large injection of community funding that is not currently available to them	Positive	Yes - other project	Hills of Gold Wind Farm examined this and found the establishment of a community enhancement fund with appropriate governance structures in place would distribute benefits for the local community	Yes	Potential cumulative impacts with multiple WTGs, and other energy projects	Unknown	Yes	Yes	Unknown	Yes	Detailed assessment of the impact	Required	Broad consultation	Targeted research	Yes	Proposed mitigation measures include refining the Project area to adjust wind turbine footprint to avoid or minimise impacts. A detailed suite of proposed mitigation measures will be provided as part of the preparation of the Environmental Impact Statement.

CATEGORIES		MEANING FOR WORKSHEET PURPOSE	FURTHER EXPLANATION AND EXAMPLES
SOCIAL IMPACTS	*way of life*	*how people live, how they get around, how they work, how they play, and how they interact on a daily basis*	*Impacts on people's daily routines caused by construction activities and/or operational arrangements. Impacts on people's commuting/travelling times, their experience of travel, and their ability to move around freely. Impacts on people's experience of privacy, peace, and quiet enjoyment, especially if affected by increased noise. Impacts on people's general experience of life in their community, especially if the project might cause a 'tipping point' of cumulative impacts on their lives, e.g. through property acquisitions, severance of communities, or major disruption during construction.*
	community	*composition, character, cohesion, function, and sense of place*	Composition - impacts on demographic characteristics and community structure. Can be changed by in-migration and out-migration over time, including the presence of newcomers and loss of longer term residents or sections of the community. Also inflow/outflow of temporary residents, e.g. during construction. Character - impacts on a community's shared identity and attributes, and natural and built features that people value. Can be affected by changes to buildings, vegetation, landscapes, land uses/industries, or land ownership and management. Cohesion and function - impacts on social connections, interrelationships, networks and interactions, trust and cooperation, participation in community activities and institutions, and the potential for harmony or conflict. Lack of cohesion can result in social dislocation, alienation, division, dispossession, tensions, impoverishment, and crime. Sense of place - impacts on feelings of belonging in a place, or identity with a place, which may derive from cultural or historical connections.
	access	*how people access and use infrastructure, services and facilities, whether provided by local, state, or federal governments, or by for-profit or not-for-profit organisations or groups*	*Impacts on how people use roads and other access routes; severance, restrictions, and/or improvements in access. Impacts of project (including project-related transport) on pedestrian routes and people's access to schools, medical services, community services, and businesses. Impacts on capacity of services to respond to in-migrating residents.*
	culture	*both Aboriginal and non-Aboriginal culture, including shared beliefs, customs, values, and stories, and connections to country, land, waterways, places, and buildings*	*Impacts on people's values, customs, and beliefs associated with (or embedded in) the site or locality, e.g. as secondary effects of changes to scenic quality, landforms, or water flows. Strengthening of community values and culture through project design elements.* *For Aboriginal cultural heritage, also consider potential for intangible harm through 'cultural or spiritual loss' (i.e., loss or diminution of traditional attachment to the land or connection to country, or loss of rights to gain spiritual sustenance from the land).*
	health and wellbeing	*physical and mental health*[1], especially for those who are highly vulnerable to social exclusion or substantial change, plus wellbeing of individuals and communities	*Health impacts, and well-founded concerns/fears about health impacts, associated with noise, dust, odour, vibration, lighting, and toxic materials. Stress, anxiety, and uncertainty - or hopes - about a proposal, about changes to adjacent uses, and about cumulative change to a neighbourhood. Psychological stress and fears/hopes for the future. Potential impact of the project on social behaviours such as alcohol/drug use, domestic or other violence. Impacts of project elements on ability to sleep, people's general health and wellbeing, and overall community health.*
	surroundings	*access to, and use of, services that ecosystems provide*[2], public safety and security, access to and use of the natural and built environment, and its aesthetic value and amenity[3]	*Impacts on anything provided by the environment and that is useful for people, e.g. food and clean water supply, flood or fire defences. Impacts on safety of pedestrians, children, drivers, and cyclists. Impacts on* levels of crime and violence, perceptions of crime, safety, and security, especially for women. Loss or enhancement of public spaces. Impacts on the perceived quality and uses of a natural or built area. Impacts on the valued features, the soundscape, and aesthetics of a place and how people use or appreciate it.
	livelihoods	*people's capacity to sustain themselves, whether they experience personal breach or disadvantage, and the distributive equity of impacts and benefits*	*Impacts on people's livelihoods, e.g. from new employment and business opportunities (positive), or from disruption during construction (negative).* *For Aboriginal people, rights to land and to gain spiritual and cultural sustenance from the land.*
	decision-making systems	*whether people experience procedural fairness; can make informed decisions; have power to influence decisions; and can access complaint, remedy and grievance mechanisms*	*Capacity of affected people to influence project decisions, including elements of project design. Extent to which they can navigate large amounts of technical material and make informed decisions. Effectiveness of engagement mechanisms at enabling all groups (especially vulnerable or marginalised groups) to participate in the assessment process. Levels of trust in the rigour and impartiality of the assessment process. Extent to which people feel empowered to determine their futures, including after a project closes. Opportunities for people to have a say in the project's community investment decisions. Accessibility and effectiveness of complaint and remedy procedures.*

CATEGORIES	EXAMPLES
A social impact may be physically observable or it may manifest as rational or justified fears (of negative impacts in the future) or aspirations (of positive impacts in the future).	**Physically observable impacts** *More paths and cycleways* *Acquisition of residential properties*
	Rational or justified fears *Psychological stress regarding the future personal and community impacts of compulsory property acquisition*
A social impact may be experienced positively by some people, and negatively by others.	**Positive** *Improved livelihoods owing to more work opportunities*
	Negative *Increased prevalence of adverse health conditions*
A social impact may be tangible or intangible.	**Tangible** *Availability of affordable housing*
	Intangible *Community cohesion*
Social impacts may be direct or indirect. They may also combine with other impacts from a single project or be cumulative with impacts from other projects.	**Direct** *Sleep disturbance caused by construction noise*
	Indirect *Strain on family relations and health from sleep disturbance caused by construction noise*
	Combined *Sleep disturbance due to increased noise and restricted access because of significantly reduced street parking caused by a single project*
	Cumulative *Sleep disturbance due to increased noise and restricted access because of significantly reduced street parking from one project. In addition, poor air quality creating health conditions and strained family relations from another project*
A social impact may be best assessed using quantitative methods or qualitative methods.	**Directly quantitative** *Changes in population demographics*
	Partially/indirectly quantitative *Incidence of voluntary work among a community as a proxy indicator of community cohesion*
	Qualitative (measurable through perception surveys or oral story telling, for example) *Cultural values* *Sense of place* *Connection to Country*
A social impact may be experienced differently within a community, by different communities, and at different times/stages of the project.	**Different experiences within a community** *An increase in the value/cost of housing may be positive for homeowners wanting to rent out or sell their properties, but negative for individuals and families wanting to buy or rent.*
	Different experiences for different communities *People living near a project may experience most of the noise and dust impacts, while people in the region's nearest town may benefit from most of the job opportunities.*
	Different experiences over time *People's experiences of impacts during project construction may be quite negative, whereas experiences during operation may be more positive.*

LEVEL		MEANING FOR WORKSHEET PURPOSE
LEVEL OF ASSESSMENT FOR EACH SOCIAL IMPACT	*Detailed assessment*	The project may result in significant social impacts, including cumulative impacts.
	Standard assessment	The project is unlikely to result in significant social impacts, including cumulative impacts.
	Minor assessment	The project may result in minor social impacts.
	Not relevant	The project will have no social impact, or the social impacts of the project will be so small that they do not warrant consideration.

DIMENSIONS		DETAILS NEEDED TO ENABLE ASSESSMENT
CONSEQUENCE	*extent*	Which location(s) is/are affected? (e.g. near neighbours, local, regional)
	duration	Will the impact be time-limited (e.g. over particular project phases) or permanent?
	severity or scale	What is the likely scale or level of change? (e.g. mild, moderate, severe)
	sensitivity or importance	How sensitive/vulnerable (or how adaptable/resilient) are people to the impact, or (for positive impacts) how important is it to them? This might depend on: the value they attach to the matter; whether it is rare/unique or replaceable; the extent to which it is tied to their identity; and their capacity to cope with or adapt to change.
	level of concern/interest	How concerned/interested are people, according to the findings from research and engagement? Sometimes, concerns may be disproportionate to findings from technical assessments of likelihood, duration, and/or severity. Concern itself can lead to negative impacts, while interest can lead to expectations of positive impacts.