Yanco Delta Wind Farm
Environmental Impact Statement

Virya Energy

Yanco Delta Wind Farm
6 November 2022

Executive summary

Virya Energy (the Proponent) proposes to construct, operate and maintain the Yanco Delta Wind Farm (the Project). The Project would be located about 10 kilometres north-west of Jerilderie in New South Wales, within the Murrumbidgee Council and Edward River Council Local Government Areas.

The Project would be located in the South-West Renewable Energy Zone (REZ) which has been formally declared by the Minister for Energy under section 19(1) of the *Electricity Infrastructure Investment Act 2020*. The Project is directly aligned with NSW and Commonwealth government strategic policies and commitments to transition toward increased renewable energy generation in the National Electricity Market, and toward net zero emission targets by 2050. The Project would supply up to 1.5 gigawatts (GW) of electricity when operational, and would connect to the grid via Dinawan Terminal Station to provide clean, reliable electricity to consumers and businesses.

The Project is considered State Significant Development and, accordingly, the Proponent is seeking approval for the Project under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In June 2022, the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (formerly Department of Agriculture, Water and the Environment) determined the Project to be a 'controlled action' under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Approval is, therefore, also sought under Section 75 of the EPBC Act.

The Project

The Project would include the following key features:

- Up to 208 wind turbine generators (WTGs) to a maximum tip height of 270 metres
- Generating capacity of approximately 1500 megawatts (MW)
- Battery Energy Storage System (BESS), approximately 800 MW/800 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 eight collector substations
- Temporary facilities, including site compounds, laydown areas, stockpiles, gravel borrow pit(s) and concrete batch plants.

The majority of the Project is located on private properties owned by eight landowners. The properties are primarily used for sheep grazing and other agricultural purposes. The closest dwelling to the Project is a Host Landowner, and is located more than two kilometres away from the nearest turbine.

The total construction costs for the Project would involve approximately $3.45 billion in investment.

The Project would require up to 300 people per day during peak construction (Year 2) and 150 people per day outside of peak construction (Year 1 and Year 3). During operation, the Project would require up to 30 full time equivalent (FTE) staff.

The Project would generate significant employment in the region, generating an expected total impact on employment from Project expenditure up to 22,892 FTE person years of employment (direct, indirect and induced) during Project construction and 500 FTE person years of employment (direct, indirect and induced) per annum during Project operation.

The Project would have the capacity to supply sufficient clean energy to power the equivalent of approximately 700,000 homes per annum.

Following the end of economic life (30 years of operation), the Project would either be decommissioned or refurbished with upgrades to power generation infrastructure.

Site suitability

The site selection, layout and size of the Project have been developed in consideration of several alternatives to ensure the Project would result in maximum benefits for the locality and region in the long term, whilst minimising impacts to the environment. The location of the Project is suitable for the following reasons:

- It would be located within the South West REZ
- It has consistent wind speeds, ideal for large-scale wind energy generation
- It would be close to Dinawan Terminal Station, providing a connection to dispatch electricity to the National Energy Market (NEM)
- It largely comprises areas that have been previously disturbed and/or historically cleared, associated with the agricultural land use
- The Project would provide for a compatible land use and support the ongoing agricultural use of the surrounding area
- There are minimal nearby dwellings and the surrounding area provides for sufficient separation distances to Non-associated dwellings (minimum of 3.6 kilometres) to minimise noise, hazard and air quality impacts associated with the construction and operation of the Project
- The conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise potential impacts to identified biodiversity and Aboriginal cultural heritage values. Environmental management measures will be implemented to mitigate residual environmental and social impacts associated with the Project.

Alternatives considered

The Project design has been further refined since the Scoping Report was exhibited in April 2022. The revisions have occurred in response to community and stakeholder engagement and outcomes of technical investigations. These include the following changes:

- A nominal 225 WTGs were reduced to 208 WTGs
- A preferred transmission line was selected:
  - Option 1 (along McLennons Bore Road and Cadell Road) has been selected for the preferred transmission line due to wide road reserves and positive feedback from Council in response to this strategy
  - Option 2 to Option 4 are less preferred as power line routes as easements as this would require easements through neighbouring Non-associated properties.
- Revision to locations of WTG and cabling tracks to avoid biodiversity values including:
  - Plains-wanderer important area mapping
  - Threatened flora populations (such as *Swainsona murrayana* and *Swainsona sericea*)
  - Eucalypt woodland with hollow bearing trees
  - Paddock trees with large stick nests, typically for Wedge-tailed Eagle and other raptor species
  - Creeks/riparian areas, and low lying areas with Lignum/Nitre Goosefoot swamps
  - Proximity of the disturbance footprint to known biodiversity conservation sites
- Removal of WTGs to avoid areas of high archaeological potential to contain Aboriginal objects

- Movement of WTGs to avoid impacts to road users and Non-associated Landowners.

Consultation

Community and stakeholder engagement for the Project commenced in 2020 and has been ongoing. During the preparation of the EIS, the following consultation and stakeholder activities were undertaken:

- Dedicated Project website, email address and phone number to provide Project updates and capture any concerns or feedback
- Face-to-face meetings with neighbouring landowners within 10 kilometres of a proposed WTG
- Two community drop-in sessions
- Distribution of Project factsheets to the wider community
- Meetings with the Jerilderie Country Women's Association and Jerilderie Police
- Consultation with the Griffith Local Aboriginal Land Council, the Cummeragunja Local Aboriginal Land Council and registered Aboriginal parties
- Meetings, briefings and correspondence with government agencies and stakeholder including local Council, NSW DPE, DCCEEW, NSW Biodiversity Conservation and Sciences, Transgrid - Lumea, AirServices Australia and NSW Rural Fire Service.

Consultation with stakeholders and the wider community will continue during exhibition of the EIS.

Environmental and social assessment

This EIS includes a detailed assessment of the potential environmental, social and economic outcomes of the Project and identifies the management and mitigation measures that will be implemented. A summary of the key findings of the EIS is provided in **Table E-1**.

Table E-1 Summary of key impacts

Discipline	Summary
Landscape and visual amenity	The Project is located on RU1 – Primary Production under both the Conargo Local Environmental Plan (LEP) and the Jerilderie LEP. There are six landscape character units within and surrounding the Project with scenic quality rating from 'Low' to 'Moderate to high'. The VIZ analysis has considered dwellings within the blue (5.3 km) and black line (3.6 km), as well as dwellings beyond 5.3 km of a WTG. Key findings of the assessment include: • No dwellings would be located within the black line • Three Non-associated dwellings (R04, R05, R09) would be located within the blue and black line • Areas of landscape which are likely to offer views toward the WTGs and demonstrate that most views generally occur within private property and across tracts of unoccupied rural landscape. • A total of seven public viewpoints were assessed with visual significance between 'negligible' to 'Moderate to high' • The Project is not considered to result in an alteration or disruption of views towards significant landform, vegetation or visually prominent cultural features • Construction activities are temporary in nature and typically restricted to various discrete areas within the Project. As such, construction activities are unlikely to result in an unacceptable level of visual impact • Ancillary electrical infrastructure would not be visible from the Non-associated dwellings

Discipline	Summary
	• After decommissioning, the Project's visual amenity would be restored, and the landscape character would be returned to the existing condition from the dwellings and key public viewpoints. Management measures are proposed to minimise light spill and where appropriate apply vegetation screening to maintain visual filtering or screening.
Noise and vibration	There are 20 receivers identified within 8 km of a WTG. The background noise level in the Project is typical of rural areas, with minimum rating background noise levels between 30-35 dB(A). Key findings of the assessment include: • No Non-associated Receivers predicted to experience noise greater than the noise management level (NML) • During standard construction hours, noise at R01 may be up to 6 dB(A) over the NML, while noise at R06 may also be up to 5 dB(A) greater than the NML. Mitigation and management measures have been proposed to minimise noise impacts on affected receivers • For construction traffic along two construction routes – Kidman Way and Jerilderie Street, traffic noise is predicted to be greater than the noise criteria, and appropriate mitigation and management measures will be implemented to minimise noise impacts for receivers located close to the road that may be affected by an increase in noise levels • No vibration impacts are expected to occur during Project construction • At all Non-Associated Receivers, WTGs have not been predicted to produce noise impacts greater than the 35 dB(A) baseline criteria established in Wind Energy: Noise Assessment Bulletin (DPE, 2016c) (Noise Bulletin). Two Host receivers R01 and R02 have been predicted to be 1dB(A) greater than criteria • Noise from proposed substations have not been predicted to result in any exceedances of the Noise Policy for Industry (NSW EPA, 2017) noise limits • Decommissioning activities have also been predicted to produce noise and vibration to a similar extent as was predicted for construction. A Construction Noise Management Plan will be implemented based on industry best practice guidelines to minimise potential noise at receivers, through feasible and reasonable noise reduction, control and management strategies.
Biodiversity	A Biodiversity Development Assessment Report was prepared for the Project in accordance with the Biodiversity Assessment Method. Key findings of the assessment include: • The disturbance footprint is comprised of: – 173.39 hectares of native vegetation, comprised of 10 plant community types (PCTs) – 60.29 hectares of non-native vegetation that is established on the cropping land and is regularly ploughed and cultivated and is dominated by annual exotic species • Four threatened ecological communities (TECs) are present in the disturbance footprint: – Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions, listed as endangered ecological community (EEC) under the NSW *Biodiversity Conservation (BC) Act 2016* – Weeping Myall Woodlands, listed as EEC under the EPBC Act

Discipline	Summary
	– Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions, listed as EEC under the BC Act – Natural Grasslands of the Murray Valley Plains, listed as critically endangered ecological community (CEEC) under the EPBC Act • The Project has been designed and refined to avoid impacts to TECs, fauna habitat and threatened species, in particular Plains-wanderer important habitat, *Swainsona murrayana*, *Swainsona sericea* and areas with Lignum/Nitre Goosefoot • Due to inclement weather (November 2021 and September 2022) not all areas of suitable habitat for threatened flora were surveyed during the targeted surveys. The area of native vegetation within the disturbance footprint that was not able to be traversed comprises 41 hectares or 16% of the disturbance footprint. In accordance with Section 5.1.2 (1), Section 5.2.4 (2), Section 5.3 (1b) and Section 10.1.1 (3) of the BAM, the assumption of presence is required where adequate survey cannot be undertaken. As such, the remaining areas of suitable habitat that we not traversed are assumed to be habitat for candidate species associated with the relevant PCTs • During construction, the Project would remove native vegetation and associated fauna habitat – Based on the assessment of significance findings, the Project is likely to have a significant impact on Natural Grasslands of the Murray Valley Plains CEEC, Plains-wanderer and White-throated needletail – The Project would also have a significant impact on the following migratory species; Rainbow bee-eater and Fork-tailed swift • The following offsets are required to mitigate biodiversity impacts associated with the Project; 5,854 ecosystem credits and 13,675 species credits – A Biodiversity Offset Strategy to meet the offset obligation will be developed post-approval and consider a range of offsetting options, including an on-site Biodiversity Stewardship Agreement, off-site credits and/or direct payment into the Biodiversity Conservation Trust Fund. A Biodiversity Management Plan (BMP) will be prepared and approved prior to construction. The BMP will be prepared by a qualified ecologist in consultation with Environment, Energy and Science – Biodiversity, Conservation and Sciences and include a plan for implementing, evaluating and reporting on the effectiveness of all required mitigation measures. A Bird and Bat Adaptive Management Plan will also be prepared to measure any impacts on bird and bats species.
Aboriginal heritage	An archaeological survey was carried out on foot by a team of archaeologists and Registered Aboriginal Parties (RAPs) to assess the potential for Aboriginal sites within the Aboriginal heritage study area (disturbance footprint with a 100 m buffer). Key findings of the assessment include: • Two listed sites (PEC-E-G2 (AHIMS ID 55-1-0052), PEC-E-43 (AHIMS ID 55-1-0053) are located within the study area • One listed site (Tooleybuc Bridge PAD (AHIMS ID 55-1-0038)) that was originally identified in the database as being within the study area was found to have incorrect coordinates, and was not located within the study area • Following field survey, eight previously unregistered sites were identified within or near the study area: – Yanco Delta PAD 01 – Yanco Delta AS PAD 01 – Yanco Delta AS PAD Hearth 01

Discipline	Summary
	– Yanco Delta AS PAD 02 – Yanco Delta AS Hearth 01 – Yanco Delta AS Hearth 02 – Yanco Delta AS 01 – Yanco Delta Hearth 01 • The Project design would avoid the following Aboriginal sites; Yanco Delta PAD 01, Yanco Delta AS PAD 01, Yanco Delta AS PAD Hearth 01 and Yanco Delta AS PAD 02 • Where possible, impacts to the remaining Aboriginal sites would be avoided with micro-siting of Project elements during detailed design, to allow them to be conserved in situ. Where conservation is not practical, salvage of surface artefacts or preliminary excavation will be carried out at the following sites: – Where harm to Yanco Delta AS Hearth 01, Yanco Delta AS Hearth 02, Yanco Delta AS 01, Yanco Delta Hearth 01 is unavoidable, a program of preliminary excavation would occur at each location, which would allow management and mitigation measures to be determined. These measures – Where harm to PEC-E-G2 (AHIMS ID 55-1-0052); PEC-E-43 (AHIMS ID 55-1-0053) is unavoidable, surface collection of artefacts salvage would be completed under the authorisation of the Minster's Conditions of Approval. However, neither site was relocated during the survey, likely as a result of their position on an area of sheet erosion. • A desktop assessment of the potential road upgrades was undertaken to identify any impacts to Aboriginal heritage. A search of the AHIMS database identified that there are also no registered AHIMS sites within or adjacent to any of the proposed locations (closest is 1.6 km away). Additionally, they are situated in areas that have been, or are likely to have been, subject to previous disturbance, largely as a result of road construction activities. Prior to the submission of the response to submission report, an assessment of each proposed road upgrade location will occur. A Cultural Heritage Management Plan (CHMP) will be developed to provide guidance on the proposed archaeological excavations, as well as a procedure for the identification of unexpected Aboriginal objects and the long-term management of Aboriginal objects retrieved from archaeological excavations.
Non-Aboriginal heritage	A field survey by heritage consultants was carried out of the study area (disturbance footprint with a 50 metre buffer from the outermost WTGs and transmission line) and heritage visual impact study area (8 km buffer zone) to identify any indirect visual impacts on heritage. Key findings of the assessment include: • There are no listed heritage items within the study area • One listed heritage item is located within the heritage visual impact study area, The Yanko Station Store/ The Yanko Store, listed as 'State significant' on the SHR (02439) and 'local significance' on the Jerilderie LEP 2012 (I19); located 6.5 km from the nearest WTG • Following field survey and archaeological assessment, five potential heritage items were found to meet the threshold for local heritage significance: – Potential remains of historic camp, 300 metres from ground disturbance – Willandra Wells Yanco property: Potential site of old Cobb & Co horse exchange, 150 metres from ground disturbance – Moonbria Homestead group including Woolshed, outside of Project – 2.1 km from nearest proposed WTG

Discipline	Summary
	– Waringah Homestead group including Woolshed, outside of Project – 2.7 km from nearest proposed WTG – Goolgumbla Station homestead group, outside of Project, 3.7 km from nearest proposed WTG • During construction, all heritage items will be avoided, and exclusion zones will be erected for the two items within the Project • Overall, given the physical separation between heritage items and Project elements and the implementation of management measures, the potential for indirect visual impacts on heritage items would be negligible to minor. A Historical Heritage Management Plan will be prepared prior to construction in consultation with Heritage NSW.
Traffic and transport	The Project would be accessed via a network of local and State roads including Liddles Lane, Jerrys Lane, Wilson Road, Kidman Way, Newell Highway and Sturt Highway. Site access would be via an upgraded access track from Liddles Lane, four kilometres east of Wilson Road. The surrounding road network would be used during construction of the Project to transport staff, equipment and materials from nearby centres. The WTG components and other specialist equipment would be imported from overseas and transported to the Project via oversize overmass (OSOM) vehicles from GeelongPort, Victoria. Key findings of the assessment include: • The road network currently operates well within its capacity and have a satisfactory Level of Service (LoS). During Project construction, all the roads in the network would continue to operate at LoS A, with the exception of a section of Liddles Lane, and a section of the Jerilderie Street, which would experience a decrease in LoS from A to B during peak hours. All roads would continue to see a stable flow of traffic and no significant road performance impacts are anticipated • Minor potential amenity impacts to active transport at town centres due to the addition of construction vehicles on the road network temporarily • Crown roads would be used for vehicular access to permanent ancillary infrastructure and temporary facilities during the Project construction. However, Crown roads would not be relied upon for access to the Project and have zero or very low traffic volumes using the roads, as primary access to the Project would be via a designated and upgraded access track from Liddles Lane • Two OSOM vehicle routes have been considered between the GeelongPort and the Project. The final route would refined in consultation with relevant road authorities • During Project operation, traffic generation would be limited to a small number of vehicle movements associated with operation and maintenance staff and activities, at up to 60 trips a day locally. Project operation is not expected to impact on road capacity and performance, road safety or other transport infrastructure • Decommissioning activities have also been predicted to be largely similar to that of Project construction but with lower number of vehicle movements. The future road network is expected to have sufficient capacity to accommodate traffic demand during decommissioning. A Construction Traffic Management Plan will be implemented prior to construction in consultation with road authorities to minimise traffic and transport impacts on the road network.

Discipline	Summary
Water and soils	The Project is located within the Murrumbidgee River Catchment. The key watercourses within and close to the Project include the Delta Creek, Yanco Creek and Turn Back Jimmy Creek. Yanco Creek is a perennial stream that flows south-west towards the Murray River, while the other two streams are ephemeral and typically only flows after rainfall events. Based on existing case modelling for 1% AEP event and PMF, the Project is generally characterised by flow velocities of less than 0.5 m per second and depths of one to three metres along the three major creeks and around one metre on the adjacent floodplains. Most of the Project infrastructure has been designed to avoid waterways, and the Project would not involve discharge to waterways or water take from surface water resources. Key findings of the assessment include: • Based on the results of the Stage 1 contamination investigation, identified areas of environmental interest were classified as very low and low • The majority of the Project has an extremely low or low probability of Acid Sulfate Soil (ASS) occurrence, however, small areas near to still water bodies and waterways have been identified as having high ASS potential • Potential impacts to surface water quality are considered to be minor with the implementation of environmental management measures, including erosion and sedimentation controls, surface water monitoring program, site specific controls related to spills, leaks and potential runoff • Potential impacts to groundwater are considered minimal, as the Project would not intersect the regional water table and, as a result, would not impact on water drawdown at bores or affect the groundwater salinity • Soils present throughout the southern half of the Project have a high potential for erosion via wind and/or water. Potential soil erosion hazards can be managed subject to the implementation of appropriate management measures during construction • The Project has a high potential for land salinity, and a moderate overall salinity hazard, however, based on construction activities, the groundwater table and associated salinity is unlikely to be impacted by construction activities • There are generally not expected to be any significant impacts on the flood behaviour as obstruction of flood flows would generally be minor • Impacts to hydrology and surface flow regimes in main watercourses would be negligible as increases in impervious areas would be negligible compared to watercourse catchment areas. A Construction Soil and Water Management Plan will be implemented prior to construction to manage and mitigate soil erosion risks and acid sulfate soils presence in part of the Project. Further, any unexpected contamination would be managed via the Construction Environmental Management Plan for the Project.
Air quality	Overall, there is expected to be a minimal impact to air quality from Project construction following the implementation of management measures. This is due to the large area within which the Project is located and the distance of the proposed Project elements to sensitive receptors.
Land	There are 1,427 ha of land within the broader Project area mapped as State Significant Agricultural Land (SSAL) (still in draft). Key findings of the assessment include: • Aerial spraying is only used on two of the properties within the Project

Discipline	Summary
	• The overall impact of the Project on regional agricultural production is negligible. Lost annual agricultural production is estimated to be around $46,000, which is less than 1/10th of one percent (<0.01%) of regional gross value of agricultural production ($795M/annum) • Project elements would be outside design areas for irrigation and therefore the Project would not impact on irrigated production • Potential impacts as a result of disruptions to farming activities include sheep management, biosecurity breeches and interference with aerial spraying; and will be mitigated by proposed management measures • No mapped SSAL exactly would be compromised by the Project. Management measures to minimise disruption to agricultural activities and annual financial compensation will be effective in addressing impacts at an individual property or business level. Implementation of a comprehensive biosecurity management plan will minimise the risk of weeds, disease or pest spread.
Aviation safety	There are nine aerodromes and various smaller private airstrips near but outside the Project. The closest aerodrome to the Project is Jerilderie Airport located 10.9 km south of the Project, and the closest privately-owned airstrip located 3.77 km north of the Project. The maximum heights of WTGs vary from 373 m to 379.3 m Australian Height Datum. Key findings of the assessment: • The Project would not impact on the operation of certified or uncertified aerodromes, including Jerilderie Airport • The Project would not penetrate Procedures for Air Navigation Services - Aircraft Operations • The Project would not have an impact on Obstacle Limitation Surfaces • The Project would be outside the clearance zones associated with Air Traffic Control Surveillance System Performance and aeronautical navigation aids • The Project would infringe on air route W419 and grid lowest safe altitude (LSALT). Consultation has been undertaken with Airservices Australia to assess potential impacts and amend the LSALT • The Project has the potential to result in wake turbulence affecting a private landing ground north of the Project. Consultation will be carried out with the owner/operator of this private airstrip to discuss impacts and potential mitigation measures. The location of ‘as constructed’ WTGs and permanent meteorological masts would be advised to AirServices, the Royal Australian Air Force and the Civil Aviation Safety Authority. Lighting and marking of Project elements, such as WTGs, will be carried out in accordance with relevant guidelines.
Telecommunications	Telecommunication links in the area include radio, broadcasting, internet and mobile phone communication, as well as emergency services, government, aviation and meteorological operations. Key findings of the assessment include: • All risks to telecommunication links are predicted to be low • There are six point-to-point links that would intersect the Project with seven WTGs having potential to impact on two telecommunication licensees – the NSW Electricity Networks Operations Pty Ltd, and NSW Rural Fire Service. Further stakeholder consultation will be undertaken with each of the licensees to investigate clearance heights and suitable options to avoid disturbance on telecommunication services.

Discipline	Summary
Health and electromagnetic fields	Electromagnetic fields (EMF) can be produced by all electrical and electronic equipment and appliance. In wind farms, extremely low frequency EMF is produced by transmission lines and other electrical components such as transformers, cabling and equipment within the WTGs Key findings of the assessment include: • Project elements such as WTGs, underground cables, overhead power lines, substations would produce EMF lower than the exposure limits specified in the International Commission on Non-Ionising Radiation Protection guidelines • Expected EMF levels from the Project would comply with the relevant Australian and international standards and guidelines however prudent avoidance measures to further reduce public exposure to EMF generated by the Project will be considered as part of the detailed design process.
Bush fire risk	The Project would be located within the Southern Riverina Fire Area for the purposes of fire danger ratings, and would fall within the Mid Murray Zone Bush Fire Management Committee region. Key findings of the assessment include: • A large portion of the Project west of Wilson Road is identified as bush fire prone land Vegetation Category 3, identifying medium bush fire risk vegetation • Bush fire risks can be managed with permanent bush fire protection measures developed specifically for the Project. Implementation of environmental management measures is expected to reduce risks to an acceptable level and minimise impacts to livelihoods and assets. A Construction and Operation Bush fire Emergency Management will be developed for the Project in accordance with Planning for Bush Fire Protection 2019 (NSW Rural Fire Service, 2019) and in consultation with the RFS (including any requirements in relation to aerial firefighting).
Preliminary Hazard Analysis	Key findings of the assessment relating to potential hazards associated with the BESS include: • The State Environmental Planning Policy (Resilience and Hazards) 2021 thresholds are not exceeded for any material and the Project would not be considered potentially hazardous • The assessment concludes that, with the standard sizing of BESS enclosures, separation distances and balance of plant, the nominated capacity of the BESS would be able to be accommodated within the designated area within the Project • The assessment considers the hazards and associated risks can be mitigated to so far as reasonably practical through adoption of controls in place with the Project requirements and various recommendations arising from the PHA.
Blade throw	Blade throw refers to an incident where a structural failure in the blade of a WTG occurs during operation, and the blade or parts of it can detach and be thrown from the turbine. Blade throw incidents are generally rare, given the manufacturing quality controls and operational inspections and maintenance that are in place on a wind farm. The key findings of the assessment is that blade throw distance impacting on nearby dwellings and roads are considered very low. WTG components will be manufactured and certified to current best practice Australian and international (IEC 61400-23) safety standards and are equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary. WTGs will also be subject to stringent safety and security

Discipline	Summary
	measures including regular maintenance and servicing (within an ISO90001 Quality Assurance system).
Social impacts	Outcomes of consultation activities have informed the social impact assessment for the Project and understand community concerns and views. Key findings of the assessment include: • The Project would involve creation of local employment and training opportunities • There would be opportunities for local businesses to support construction activities and the needs of the construction workforce • Increased participation in recreation, sporting and community clubs would result in the surrounding areas due to influx of construction workers • Potential for temporary property impacts associated with the establishment of temporary construction sites and accesses as a result of the Project • An influx of up to 150 non-local construction workers to the surrounding areas would result in an increased demand for housing, accommodation and essential community services, and has the potential to impact on community cohesion. This may be due to such things as disparities in community participation, impact on residents' access to services, possible anti-social behaviour • Potential for noise and dust associated with Project construction and haulage activities, which may potentially impact on the amenity for residential uses closest to the Project • The Project would involve increased use of roads by construction traffic, which may result in temporary disruptions and potential road safety risks • During operation, the Project would have long-term and wide-ranging benefits for communities across NSW through the support of renewable energy targets and increased energy security by contributing to a more diverse energy mix • Locally, Project operation would also support benefits for nearby communities through contributions to a community benefit fund, local business opportunities, and regular lease payments and annual financial participation contributions to local landowners • Ongoing negative social and economic impacts of the Project operation would mainly relate to the introduction of the WTGs and loss of agricultural land, and changes to landscape and visual values. A Community and Stakeholder Engagement Plan will be implemented prior to construction to inform and consult the community of any potential impacts during construction activities. Further, a Workforce Accommodation Strategy and Local Workforce Strategy will be implemented to manage demand in accommodation service and maximise local employment or training opportunities for Project construction personnel.
Economic impacts	The Project will generate significant employment in the region, generating an expected total impact on employment from Project expenditure up to 22,,892 FTE person years of employment (direct, indirect and induced) during Project construction and 500 FTE person years of employment (direct, indirect and induced) per annum during Project operation. Overall, the Project will involve approximately $3.45 billion in investment for construction and have the capacity to supply sufficient clean energy to power the equivalent of approximately 700,000 homes per annum. The Project is expected to generate a total gross value added (GVA) of $1.094.53 billion Australian dollars to NSW, which includes a GVA increase of $391.26 million for the Project region. Additionally the GVA generated through Project spending will create further supply chain impacts and increase in jobs, with

Discipline	Summary
	an estimated 8,176 FTE person-years during Project construction created regionally.
Waste	Majority of the waste generated by the Project would be during Project construction and decommissioning. Waste generated during operation would be minimal as it would only involve maintenance or monitoring activities with a small operational workforce. A Waste Management Plan will be prepared which will include a detailed breakdown of waste types and quantities in accordance with relevant legislation and guidelines. The plan will outline the strategies to reuse, recycle and dispose of waste and will also refine the indicative waste quantities for each waste type.
Cumulative	There are a total of 11 energy-related projects within 130 km of the Project. Most of the projects are also part of the South West REZ , and are considered relevant to the cumulative impact assessment due to their proximity, and potential benefits and adverse effects for the local and regional area. • Based on available information, the cumulative impacts to biodiversity in the region were further assessed by identifying the expected loss of vegetation and TECs associated with the EnergyConnect (Eastern) project. Given that the TEC's and threatened species across both projects are similar, it is likely that there will be a cumulative impact associated with the loss of similar native vegetation and threatened species habitat in the region • The Project would have one or more construction access routes overlap with nearby projects. A mid-block capacity assessment carried out assessed cumulative traffic impacts on road capacity and performance has found that, with the Project and nearby concurrent developments, all roads would operate satisfactorily at a LoS A in the road network, apart from one section of Liddles Lane and Jerilderie Street within the township of Jerilderie. However, the flow of traffic would remain stable and the road network would be sufficient capacity to accommodate cumulative traffic demand and potential minor impacts • Cumulative noise impacts are not anticipated to occur due to the distance between the proposed developments and the receivers assessed for this Project • Whilst other wind farm projects are at various stages of development within proximity to the Project, there is limited publicly available information, and no detailed data that would be required to prepare a multiple wind turbine tool analysis against other wind farm projects within 30 kilometres of the Project WTGs, or to make considered judgements on potential cumulative visual effects. • Potential for cumulative social and economic impacts as a result of a demand for local construction workers and accommodation by construction personnel of multiple projects, use of local and regional roads, increased number of non-local workers temporarily moving to townships near the Project and construction fatigue • As the impact of the Project on agricultural production is negligible (<0.01% of regional production), it will not make a notable contribution to regional cumulative agricultural impacts from infrastructure projects. Cumulative impacts will be managed through ongoing consultation with local Council and relevant stakeholders, including other proponents, to coordinate Project delivery and manage impacts such as construction traffic and road upgrades.

Other issues, including air quality, greenhouse gas and waste management, are considered to have negligible to minor impacts.

The Project is a direct response to Commonwealth and State climate change commitments to transition to renewable energy generation and greenhouse gas emission reductions. The Project would also provide a source of affordable, reliable energy generation to the NEM and is consistent with the NSW government objectives for renewable energy generation within the South West REZ. In addition, the Project would also provide a range of social and economic benefits, including:

- Opportunities for local and regional investment
- Opportunities for local contractors, suppliers and businesses
- Increased employment opportunities
- Contributions to a community benefit fund.

Overall, the Project would be consistent with the principles of ecologically sustainable development, and the objectives of legislation, including the EP&A Act. Based on the above, the Project should be approved under the EP&A Act.

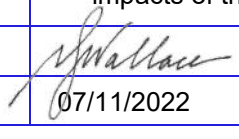
Contents

Appendices

Tables

Figures

EIS declaration

EIS prepared by	
Project details	
Project name	Yanco Delta Wind Farm
Application number	SSD-41743746
Address of the land in respect of which the development application is made	Land 10 to 40 km north-west of Jerilderie, New South Wales See **Appendix A** of this EIS
Applicant details	
Applicant name	Virya Energy Pty Limited
Applicant address	3/35 Stewart St, Brunswick, VIC 3056
Details of person by whom this EIS was prepared	
Name	Nikki Wallace
Address	Level 7, 177 Pacific Highway, North Sydney, NSW 2060
Professional qualifications	Master of Conservation, University College London 2011 Bachelor of Science, University of New South Wales 2007
Declaration	
Name	Nikki Wallace
Organisation registered with	Jacobs Group (Australia) Pty Ltd
Declaration	The undersigned declares that this EIS: • Has been prepared in accordance with sections 190 and 192 of the Environmental Planning and Assessment Regulation 2021; • Contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; • Does not contain information that is false or misleading; • Addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project; • Identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; • Has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement; • Contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; • Contains a consolidated description of the project in a single chapter of the EIS; • Contains an accurate summary of the findings of any community engagement; and • Contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.
Signature	
Date	07/11/2022

Glossary of terms and abbreviations

Term/ Abbreviation	Definition
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AIMD	Active Implantable Medical Devices
APZ	Asset Protection Zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASS	Acid Sulfate Soil
Associated Landowner	*Landowners located outside of the Project that do not host any Project infrastructure but have negotiated participation agreements in place with the Proponent regarding Project impacts and, as such, are associated with the Project*
BAM	Biodiversity Assessment Method
BCS	NSW Biodiversity, Conservation and Science Directorate
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
BOS	Biodiversity Offsets Scheme
BPL	Bushfire Prone Land
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
CIV	Capital Investment Value
CNVG	Construction Noise and Vibration Guideline
CSEP	Community and Stakeholder Engagement Plan
CSP	Community Strategic Plan
CSWMP	Construction Soil and Water Management Plan
CTMP	Construction Traffic Management Plan
DCCEEW	Australian Department of Climate Change, Energy, the Environment and Water
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries

Term/ Abbreviation	Definition
DPIE	NSW Department of Planning, Industry and Environment (former)
Disturbance footprint	*The area that would be directly impacted during Project construction and operation (e.g. where structures would be sited and the area around that would be required to construct it)*
EDS	Economic Development Strategy
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency
EMF	Electromagnetic Fields
EMI	Electromagnetic Interference
EPA	NSW Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
ESOO	Electricity Statement of Opportunities
FDR	Fire Danger Rating
FRNSW	Fire and Rescue NSW
FTE	Full Time Equivalent
GDE	Groundwater Dependent Ecosystem
GFDI	Grass Fire Danger Index
GHG	Greenhouse Gas
GVA	Gross Value Added
Host Landowners	*The eight landowners located within the Project that would host WTGs and/or related Project infrastructure. Each have signed Option to Lease agreements (Noting that one Host Landowner has a dwelling at R20)*
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission on Non-Ionising Radiation Protection
IFR	Instrument Flight Rules
ISP	Integrated System Plan
KFH	Key Fish Habitat
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
LSALT	Lowest Safe Altitude
LSC	Land and Soil Capability

Term/ Abbreviation	Definition
MNES	Matters of National Environmental Significance
MWTT	Multiple Wind Turbine Tool
NASF	National Airports Safeguarding Framework
NEM	National Energy Market
NHVR	National Heavy Vehicle Regulator
NML	Noise Management Level
Non-associated Landowner	*Landowners located outside the Project, within 8 km of a WTG, that are not associated with the Project; each have been consulted and offered neighbouring agreements but have opted not to enter into one.*
NPI	Noise Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage (former)
OEMP	Operational Environmental Management Plan
OLS	Obstacle Limitation Surface
OSOM	Oversized Overmass
PAD	Potential Archaeological Deposit
PASS	Potential Acid Sulfate Soil
PBP	Planning for Bushfire Protection
PCT	Plant Community Type
PHA	Preliminary Hazard Analysis
PMF	Probable Maximum Flood
POEO Act	*Protection of the Environment Operations Act 1997*
Project	*The proposed construction, operation and decommissioning of the Yanco Delta Wind Farm*
Project area	*The property boundaries of Project Host landowners (i.e. landowners that have entered into agreements with Virya Energy to have WTGs or associated infrastructure on their properties*
RAAF	Royal Australian Air Force
RBL	Rating Background Level
REZ	Renewable Energy Zone
RFS	NSW Rural Fire Service
RNP	Road Noise Policy
SAII	Serious and Irreversible Impact
SEAR	Secretary's Environmental Assessment Requirement
SEPP	State Environmental Planning Policy

Term/ Abbreviation	Definition
SHR	State Heritage Register
SIA	Social Impact Assessment
SLUD	Sensitive Land Use Designation
SSAL	State Significant Agricultural Land
SSD	State Significant Development
Study area	*Describes the area investigated as part of this EIS. References to study area varies according to the specific environmental issue under consideration (e.g. traffic, heritage, visual amenity etc) and is described within each relevant section of the EIS.*
TEC	Threatened Ecological Community
TSP	Total Suspended Particulates
TSR	Travelling Stock Route
Vehicle movement	*A single, one-way, vehicle pass-through*
VFR	Visual Flight Rules
VI	Vegetation Integrity
VIZ	Visual Influence Zone
VNI	Victoria to NSW Interconnector
VRE	Variable Renewable Energy
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WMP	Waste Management Plan
WQO	Water Quality Objectives
WTG	Wind Turbine Generator
ZVI	Zone of Visual Influence

1. Introduction

This chapter introduces the Project and the Proponent, identifies Project objectives and outlines the purpose and structure of this report. It also outlines strategies that have been used to inform the Project location, siting of Project elements and the avoidance or minimisation of social and environmental impacts.

1.1 Project overview

Virya Energy (the Proponent, refer **Section 1.4**) 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 208 wind turbine generators (WTGs), a battery energy storage system (BESS) and associated electrical infrastructure. The generating capacity of the wind farm would be about 1,500 megawatts (MW).

The Project would be located about 10 kilometres north-west of the town of Jerilderie, within the Murrumbidgee Council and Edward River Council Local Government Areas (LGAs). The Project would be located within the South-West Renewable Energy Zone (REZ) in New South Wales (NSW). It would connect to Transgrid's Dinawan Terminal Station, scheduled for completion in 2025, as part of Project EnergyConnect.

A map showing the Project in the regional context is provided in **Figure 1-1**.

An indicative Project layout is provided in **Figure 1-2**. This has been used to identify the disturbance footprint defined as the area that would be directly impacted during construction and operation (refer to **Section 3.2**). The layout would be further refined in response to identified environmental constraints and ongoing stakeholder consultation.

1.2 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.

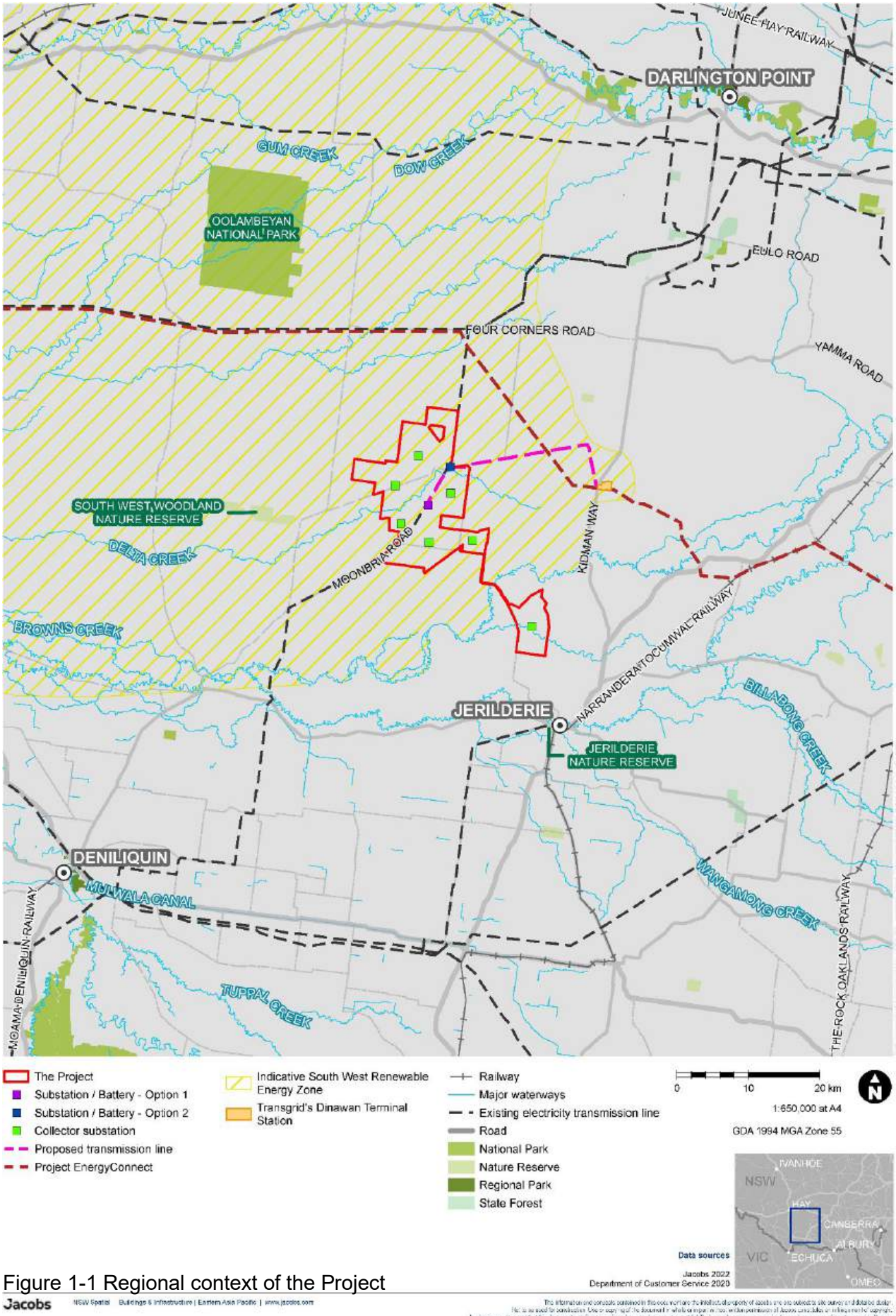


Figure 1-1 Regional context of the Project

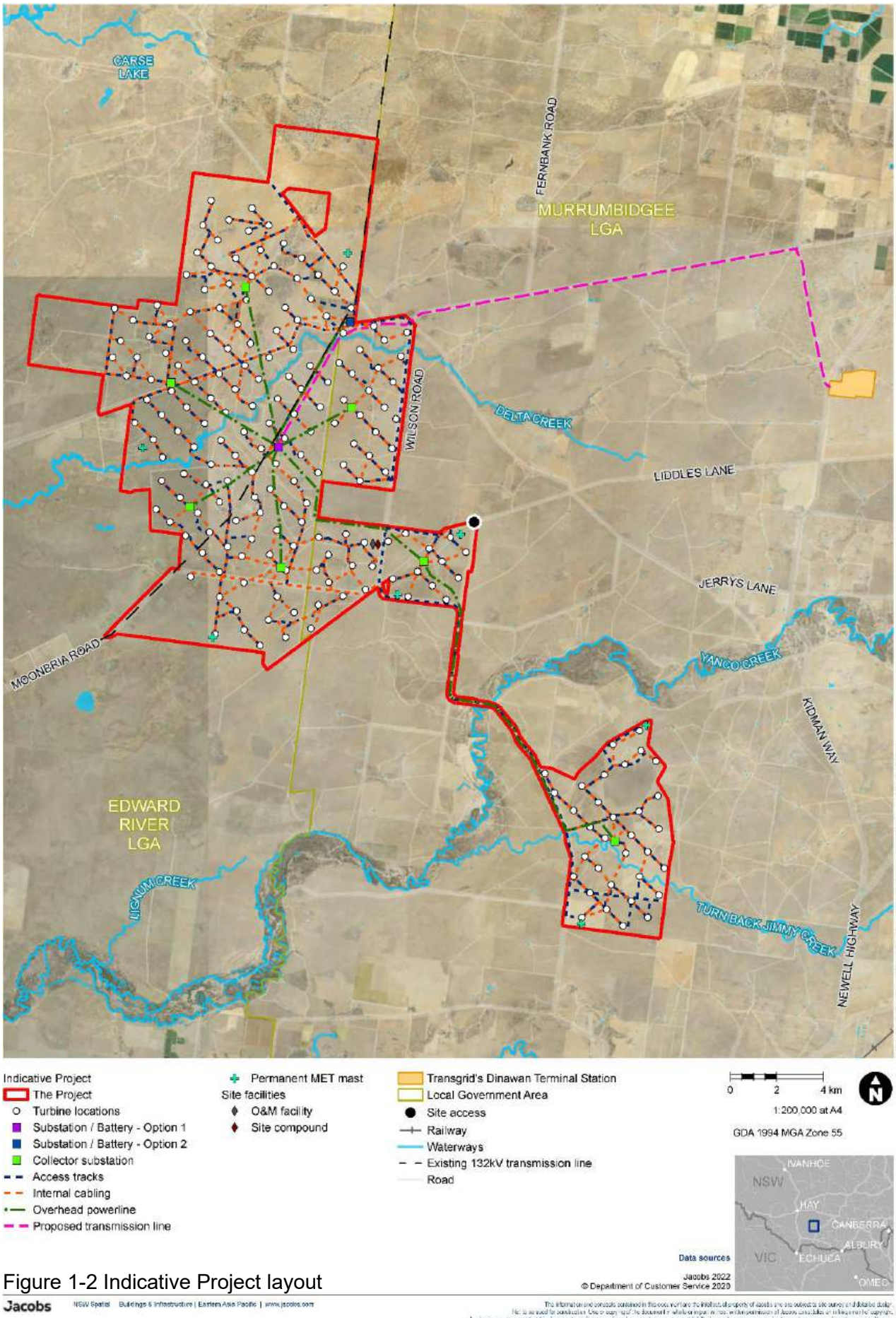


Figure 1-2 Indicative Project layout

1.3 Project background

The NSW Government's Electricity Strategy (NSW Government, 2019, refer to **Section 2.1**) and Electricity Infrastructure Roadmap (DPIE, 2020a, refer to **Section 2.1**) set out a plan to deliver the State's first five REZs. These are located 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 declaration for a REZ in the South-West region of NSW. It would be located 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 South West REZ was formally declared on 4 November 2022 by the Minister for Energy under section 19(1) of the Electricity Infrastructure Investment Act 2020.

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 in NSW (330 kilovolt (kV) and 500 kV transmission) and includes the development of the Dinawan Terminal Station, that would be located 16.5 kilometres west of the Project.

The completion of Project EnergyConnect would support the South West REZ and support the Project by unlocking up to 1.2 gigawatts (GW) of additional transmission capacity and transporting electricity from the REZ to homes and businesses across the State. The South West REZ would be further boosted by the construction of the Victoria-NSW Interconnector West (VNI West). This will be a 500 kV high-voltage alternating current interconnector between the Snowy Mountains region and Melbourne to increase transfer capacity between New South Wales and 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, 2021a). A Developer Registration of Interest application was submitted by Virya Energy to EnergyCo NSW for the Project in November 2021.

The location of the South West REZ is shown in **Figure 1-1** and **Figure 2-1**.

1.4 The Proponent

The Proponent for the Project is Virya Energy Pty Ltd (Virya Energy), an Australian company that is active in the development, finance, 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 Energiequelle GmbH, one of the largest privately owned renewable energy developers in Europe with over 300 staff and 750 projects.

In addition to the Project, Virya Energy are developing a pipeline of projects that would produce up to 1.5 GW in other States.

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

Table 1-1 Proponent details

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

1.5 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. A number of environmental and social constraints were identified within and surrounding the Project including (**Figure 1-3**):

- Nearby dwellings
- Threatened ecological community and recorded threatened flora and fauna
- Listed Aboriginal heritage sites (AHIMS) and historical heritage
- Draft State Significant Agricultural Land (SSAL)
- Waterways
- Landowner dams

Alternatives considered for the Project are discussed in **Section 3.10**.

Strategies that have been used to avoid or minimise potential Project impacts during Project inception included the following:

- Siting of Project where there is low population density and homogenous agricultural land use within and surrounding the Project, to minimise the number of sensitive receivers
- Planned placement of WTGs to avoid proximity to neighbouring dwellings to ensure generous setbacks are maintained
- Preliminary consultation with the local community, including neighbours to the Project, to ensure the Project receives largely positive feedback
- Siting of Project where the Project would be highly compatible with existing pastoral land uses, resulting in minimal impact to current agricultural activities during both construction and operation
- Planned placement of WTGs and associate infrastructure across a number of landowners to minimise impacts on land, business and agriculture
- Early consultation with landowners and neighbours, including offers to enter into participation agreements to manage impacts
- Siting of Project in a location that 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
- Siting of Project on terrain that is generally flat and is expected to result in simple construction compared to other geographic areas to reduce disturbance footprint and impacts to visual amenity
- Preliminary biodiversity constraints mapping to avoid large areas of Natural Grasslands of the Murray Valley Plains, listed as critically endangered ecological community (CEEC) under the EPBC Act, that were found to be in high condition.

Throughout the development of this EIS, a number of key strategies have been adopted to further avoid or minimise any potential impacts. These strategies would continue to be adopted throughout detailed design and construction, and operation of the Project, and include:

- Reduction of the number of WTGs to avoid areas of high integrity native vegetation and potential visual amenity impacts to nearby Non-associated receivers
- Refining Project layout (i.e. siting), such as location of WTGs, access tracks and underground cable routes to avoid areas of high integrity native vegetation, threatened species habitat and areas of high archaeological potential
- Relocation of WTGs to avoid impacts to road users
- Selection of a preferred transmission line route to avoid native vegetation clearing and property impacts.

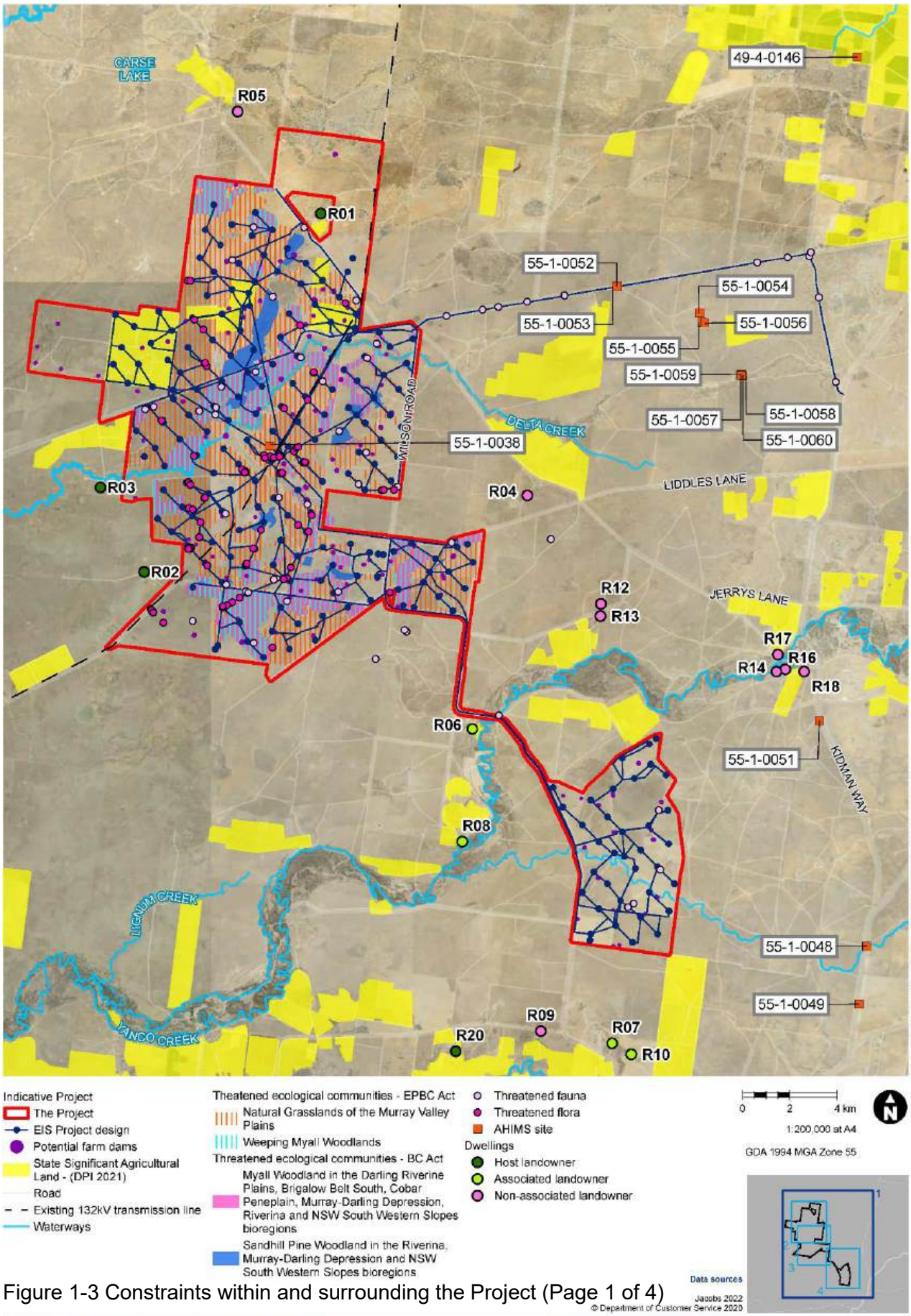


Figure 1-3 Constraints within and surrounding the Project (Page 1 of 4)

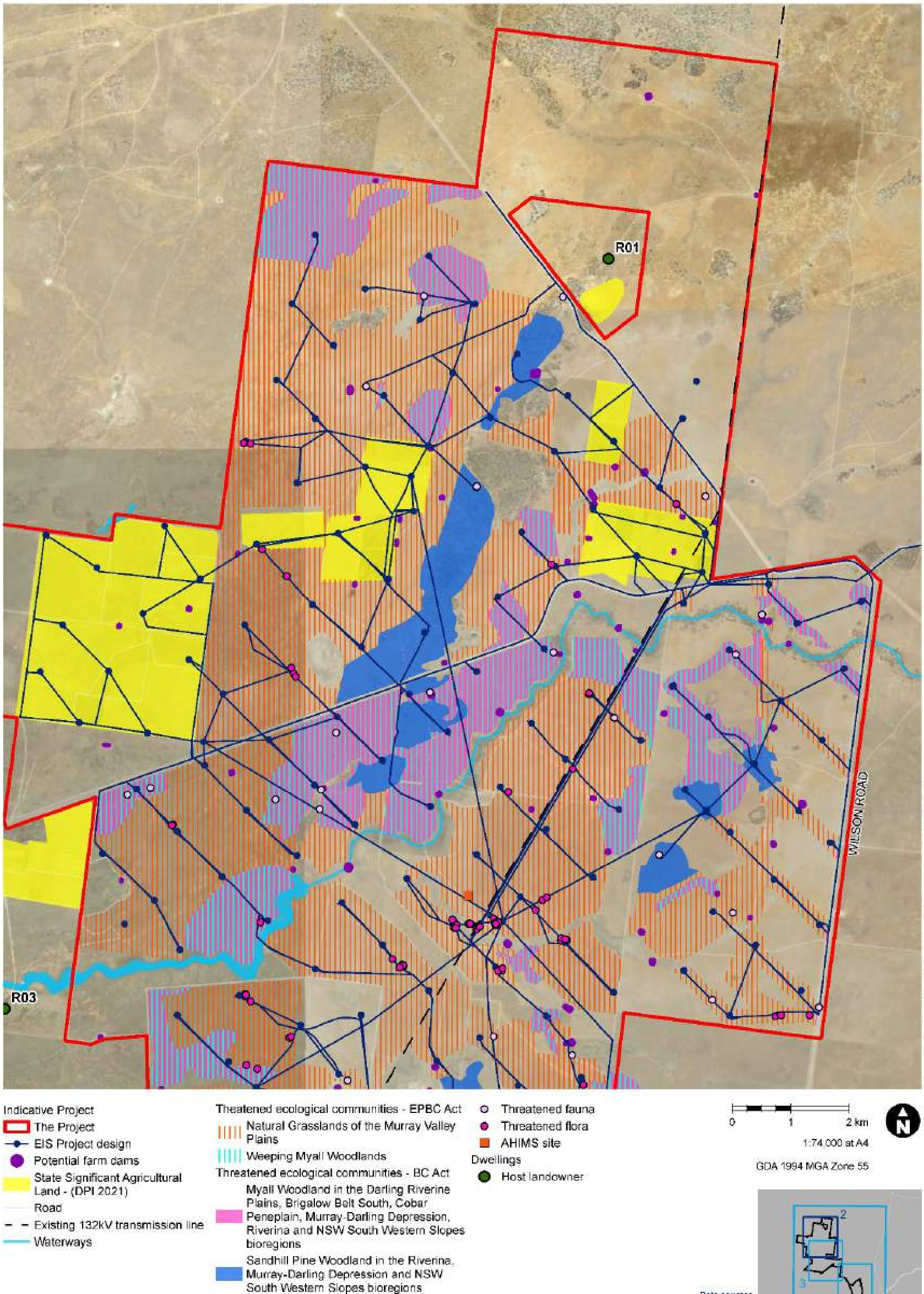


Figure 1-3 Constraints within and surrounding the Project (Page 2 of 4)

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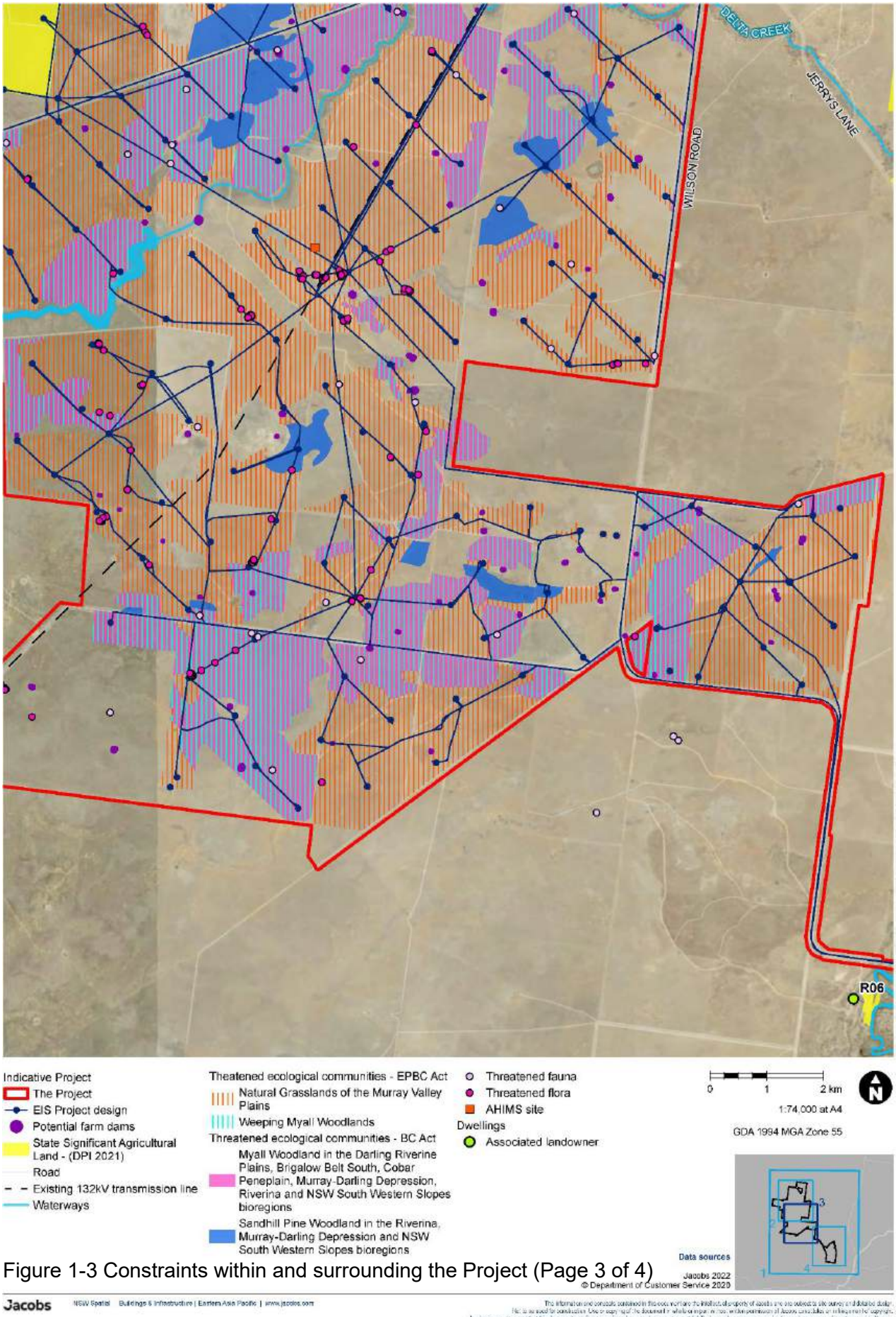

Figure 1-3 Constraints within and surrounding the Project (Page 3 of 4)

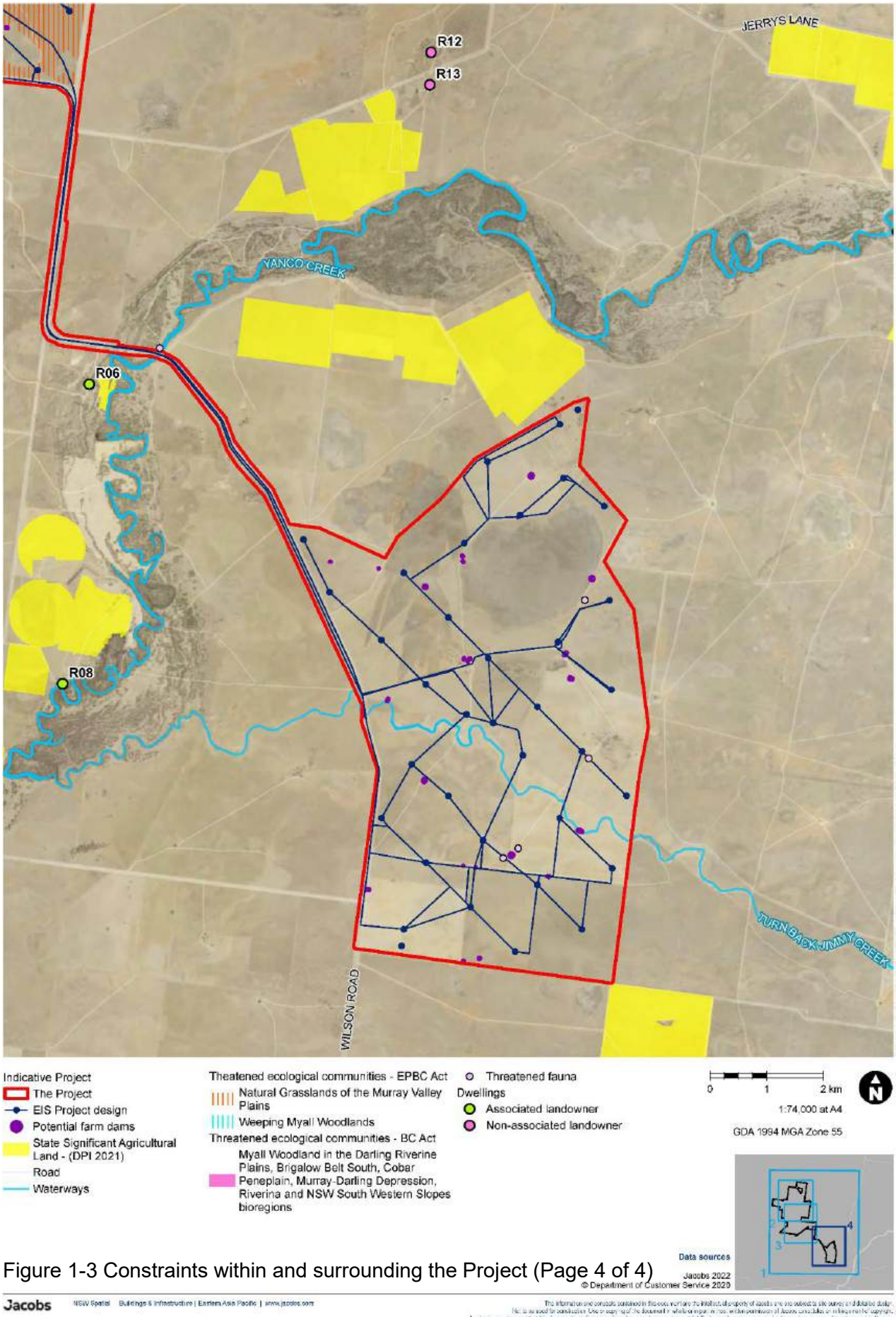

Figure 1-3 Constraints within and surrounding the Project (Page 4 of 4)

1.6 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.

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

1.7 Document purpose

The Proponent is seeking State Significant Development (SSD) consent under Part 4, Division 4.7, of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Under section 4.12(8) of the EP&A Act, a development application for SSD must be accompanied by an EIS. This EIS has been prepared in accordance with the form and content requirements prescribed by section 190 and section 192 of Division 5 of the *Environmental Planning and Assessment Regulation 2021* (EPA Regulation) (refer to **Appendix D**).

A request for SEARs was made to the Department of Planning and Environment (DPE) in April 2022. The application was supported by the Yanco Delta Wind Farm Scoping Report (Jacobs, 2022a) (the Scoping Report). SEARs for the Project were issued on 27 May 2022 (SSD-41743746).

In addition, the Project was referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (formerly Department of Agriculture, Water and the Environment) on 12 April 2022 and was determined to be a 'controlled action' under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 28 June 2022 (EPBC Referral 09214). Approval is also sought under Section 75 of the EPBC Act (EPBC Approval). Supplementary SEARs were issued in response to the determination on 08 September 2022 (refer to **Appendix C**).

This EIS addresses the supplementary SEARs, including the Commonwealth requirements under the referral decision, and the issues identified in the stakeholder engagement process by assessing the environmental impacts of the Project.

This EIS 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: Visual Assessment Bulletin (Visual Bulletin) (DPE, 2016b)
- Wind Energy: Noise Assessment Bulletin (Noise Bulletin) (DPE, 2016c)
- Standard Secretary's Environmental Assessment Requirements
- Wind Energy Framework Q&As.

A table listing the SEARs and where each SEAR is addressed within this EIS is included in **Appendix B**. The supplementary SEARs for the Project in line with the Commonwealth requirements is provided in **Appendix C**. A table listing the regulatory requirements for the preparation of an EIS, and where each requirement is addressed within this EIS is included as **Appendix D**.

1.8 Document structure and content

The structure and content of this EIS is outlined in **Table 1-2**, and the structure of the appendices is outlined in **Table 1-3**.

Table 1-2 Structure and content of the EIS

Chapter	Description
Chapter 1 Introduction	Introduces the Project and the Proponent, identifies Project objectives and outlines the purpose and structure of the EIS; and outlines strategies that have been used to avoid or minimise impacts
Chapter 2 Strategic context	Identifies the key strategic issues that are relevant to the assessment of the Project and an analysis of feasible alternatives considered, having regard to the objectives of the development
Chapter 3 Project description	Provides a detailed description of the Project, including construction, operation, maintenance and decommissioning; and outlines the alternatives that were considered during the development of the Project
Chapter 4 Statutory context	Identifies the relevant NSW planning framework and statutory requirements for the Project
Chapter 5 Engagement	Outlines stakeholder and community engagement carried out to date for the Project and ongoing as well as future consultation
Chapter 6 Assessment of impacts	Provides an overview of the assessment methodologies for key and other issues relevant to the Project
Chapter 7 to Chapter 21 Assessment of environmental and social impacts	Provides an assessment of the potential direct and indirect impacts that may result during the Project, including decommissioning and cumulative impacts where relevant
Chapter 22 Management and mitigation summary	Provides a summary of the proposed measures to manage and/or mitigate impacts associated with the Project
Chapter 23 Justification of the Project	Provides a justification of the Project taking into consideration the associated environmental and social impacts and the suitability of the Project

Table 1-3 Content of appendices

Appendix	Description
Appendix A Schedule of Land to which this EIS applies	Identifies the lot/DPs located within the Project to which this development applies
Appendix B SEARs table	Outlines the SEARs and where each SEAR is addressed within the EIS
Appendix C EPBC referral decision	Outlines the Commonwealth requirements for the Project in line with the EPBC referral for the Project
Appendix D Statutory compliance table	Outlines the compliance of the Project with regulatory requirements for the preparation of an EIS
Appendix E to **Appendix V** Specialist technical reports	Provides the technical reports prepared for the Project, in response to the SEARs and to inform the EIS

2. Strategic context

This chapter identifies the key strategic issues that are relevant to the assessment of the Project and an analysis of feasible alternatives considered, having regard to the Project objectives.

2.1 Strategic justification

The NSW Government has identified a need to facilitate the delivery of new generation infrastructure to replace coal fire power stations that are scheduled to close within the next 15 years or have had expected proposal dates brought forward. The development of renewable energy infrastructure would contribute to a State electricity generation network with lower associated carbon emissions than non-renewables.

The Project would be located in the South West REZ, an area identified as strategically advantageous for energy generation, storage and transmission. Establishing the Project within this REZ would align with relevant NSW government strategies and further diversify the current mix of energy resources in NSW. The Project would be located about 16.5 kilometres from Dinawan Terminal Station, to which the electricity generated would be transmitted.

The use of wind power as the predominant generation type for the Project has been driven by the requirement to harness energy and charge batteries at night and minimise the amount of land area required. Compared to solar power, wind power consumes less energy, produces more energy and contributes less carbon dioxide to the atmosphere. Wind resource monitoring indicates that wind speeds are relatively consistent at the Project and surrounding region, which would help make the wind farm viable at the Project. Wind speed data indicate that the average wind speed at 150 metres above ground level around the Project is about 7.5 metres per second (m/s) (NSW Department of Industry, Skills and Regional Development, 2016).

The Project would also provide opportunities for local and regional investment; opportunities for local contractors, suppliers and businesses; increased employment opportunities; and contributions to a community benefit fund.

2.1.1 Government strategies, policies and plans

There are a number of Government strategies, policies or plans that provide strategic support for the Project. These are summarised in **Table 2-1**.

Table 2-1 Government strategies, policies and plans

Policy	Description	Relevance to Project
International		
Paris Agreement (UNFCCC, 2015)	The agreement 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. In 2022, the Australian Government legislated the commitment to reduce greenhouse gas emissions by 43% below 2005 levels by 2030. This updated Nationally Determined Contribution (NDC) has been communicated to the United Nations Framework Convention on Climate Change secretariat. The updated NDC also reaffirmed the target to achieve net zero emissions by 2050 (UNFCCC, 2022). 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. 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, 2020a) 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.
National		
2022 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 2022 Integrated System Plan (ISP) which provides a whole of system plan and roadmap to supply reliable and affordable electricity to the NEM, and to achieve net zero ambitions in Australia (AEMO, 2022a). The 2022 ISP identified that energy transition to firmed renewables (i.e. output from variable, intermittent power sources such as wind and solar whose output can be maintained for a committed period of time) is accelerating and irreversible. The best strategy to deliver this is through investment in low-cost renewable energy such as wind energy, firming resources such as battery storage, and essential transmission.	The Project would contribute to the VRE requirements identified in the 2022 ISP and would strengthen renewable energy supply, as well as deliver flexible dispatchability through the wind farm and associated BESS infrastructure. The Project would generate up to 1.5 GW capacity in

Policy	Description	Relevance to Project
	The 2022 ISP identified the optimal development path for the NEM and recognises that to meet increasing demand alongside the phase-out of coal fired generation, a 'Step Change' scenario is the most likely to occur and would continue to drive NEM planning and investment through to 2050 (AEMO, 2022a). The Step Change scenario includes the following forecasts: • The NEM would need to double the electricity supplied, to approximately 320 terawatt hours per year in 2050 to meet forecast demands • About 14 GW of coal-fired generation capacity (60% of total) withdrawn from the system by 2030 as a result of planned closures of coal power stations • The NEM would require nine times increase in large scale variable renewable energy (VRE), which includes wind and solar farms, most of which would be built in REZs • Nearly five times the distributed solar photovoltaics (PV) capacity and distributed storage would be required to supply 69 GW capacity by 2050 • An additional 46 GW of dispatchable storage is needed by 2050 to provide firming capacity to VRE, which includes battery energy storage and pumped hydro storage.	wind energy, and energy storage provided as part of the Project BESS. This would further enable VRE to meet times of peak demand by storing surplus generation for discharge during periods of high demand.
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 that 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. This includes severe weather events or impacts of extreme temperature on wind farms that may reduce generation output unexpectedly (AEMO, 2021). 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 a 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. The 2022 update to the 2021 ESOO accounted for the announced closure of Eraring Power Station by 2025 and other power station closures (AEMO, 2022b). The updated forecast provided that if investment and additional generation capacity outlined in the 2022 ISP are developed ahead of the Eraring Power Station retirement, the reliability of electricity in NSW would remain within the reliability standard.	The Project would contribute to this additional generation capacity required in NSW to help meet reliability standards.

Policy	Description	Relevance to Project
ESB Market 2025 Directions Paper	The former Coalition of Australian Governments 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, 2021) 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, 2021) would align with 2020 ISP and REZ development.	The Project would be consistent with the ESB Post 2025 design and would contribute towards the requirement for an increase in VRE generators in the NEM.
GenCost 2021-22: Final Report	The GenCost 2021-22: Final Report (Graham et al., 2022) provides projections of future changes in cost of electricity. Renewables remain the cheapest new-build electricity generation option, as the report reaffirms the 2020-21 findings that wind and solar are the fasted growing energy source and also the cheapest source of electricity (Graham et al., 2022). Under a 'Global Net Zero by 2050' scenario with an accelerated renewable energy development pathway, the cost of onshore wind development would continue to decrease through 2030 to 2050. Battery storage also have a large role to play in supporting VRE and costs are similarly projected to decrease rapidly to 2050.	The Project aligns with the GenCost 2021-22 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 cost reduction of electricity generation across the NEM.
Technology Investment Roadmap 2020	The Technology Investment Roadmap 2020 (Commonwealth of Australia, 2020a) 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, 2020b). 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 emission technology priorities.

Policy	Description	Relevance to Project
NSW		
NSW Climate Change Policy Framework	The NSW Climate Change Policy Framework was released in 2016 and outlines the long-term policy objectives to achieve net zero emissions by 2050 (NSW Government, 2016). The policy aims to maximise the economic, social and environmental wellbeing of NSW in the context of climate change. Under the framework the NSW Government has provided grants to household energy, electricity generation projects. The policy also seeks to boost energy productivity and put downward pressure on household and business energy bills.	The Project would align with the NSW Climate Change Policy Framework through the generation of renewable wind energy, which is the most cost-efficient way to produce electricity. The Project would contribute to net zero emission targets by facilitating the phase out of coal-fired generation and replacing up to 1.5 GW of generation capacity with clean, reliable renewable energy that would significantly reduce emissions compared to the use of fossil fuels.
NSW Net Zero Plan Stage 1: 2020-2030 (Net Zero Plan) (NSW Government, 2020a)	The Plan 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. The NSW Government has announced in 2021 that the new objective is to deliver a 50% reduction by 2030, compared to 2005 emissions levels. Previously, the emissions reduction target under the Net Zero Plan was 35% by 2030. 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 to 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 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.
NSW Electricity Strategy 2019 (NSW Government, 2019)	The Strategy 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. It has determined the cheapest resources of generation are large-scale wind and solar farms located in the REZs (NSW Government, 2019).	The Project would supply considerable amounts of renewable energy to the NEM and support the growth and co-location of low-emission

Policy	Description	Relevance to Project
	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 South West REZ was formally declared on 4 November 2022 by the Minister for Energy under section 19(1) of the *Electricity Infrastructure Investment Act 2020.* The Project would be located in the South West REZ, as shown in **Figure 1-1** and **Figure 2-1**. The Project would enable the objectives and target benefits of the Electricity Strategy and Electricity Infrastructure Roadmap. 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, 2019).	generation capacity in the South West REZ.
NSW Electricity Infrastructure Roadmap 2020	The Electricity Strategy 2019 is also closely aligned with the Net Zero Plan. The NSW Government subsequently released the NSW Electricity Infrastructure Roadmap 2020 (DPIE, 2020a), 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 2020 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, 2020b). 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, 2020a).	The Project would be consistent with the objectives of the Electricity Infrastructure Roadmap. Virya Energy has already commenced consultation with stakeholders to obtain their inputs into the Project planning, design and environmental impact assessment process.

Policy	Description	Relevance to Project
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). This would inform future agricultural land use planning policies (DPI, 2021). The Draft SSAL 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 as shown in **Figure 2-2**.
Regional and local		
20-Year Economic Vision for Regional NSW	The 20-Year Economic Vision for Regional NSW - Refresh (2021 Economic Vision Refresh) (NSW Government, 2021c) 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, 2021c). 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, 2021c).	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.

Policy	Description	Relevance to Project
Murrumbidgee Council Economic Development Strategy	The Murrumbidgee Council Economic Development Strategy (Murrumbidgee EDS) (Murrumbidgee Council, 2019) 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. 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, 2019). 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.	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.
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	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

Policy	Description	Relevance to Project
	• Digital connectivity • Health services • Industry, workforce, job growth (including education).	sustainability, wellbeing and liveability of the region's communities.
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 South West REZ extends across the Murrumbidgee Council LGA and 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 area 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	The Project would seek to develop renewable wind energy generation, which would promote local and regional economic

Policy	Description	Relevance to Project
	• 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.	growth. The Edward River Council LGA is located in the South West REZ which would further attract investment from value-adding industries such as energy generation.
Riverina Murray Regional Plan 2036	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, as the Project's proposed renewable wind energy development would increase the renewable generation in the region. 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 LGA and would contribute towards the priorities of the Regional Economic Development Strategy.

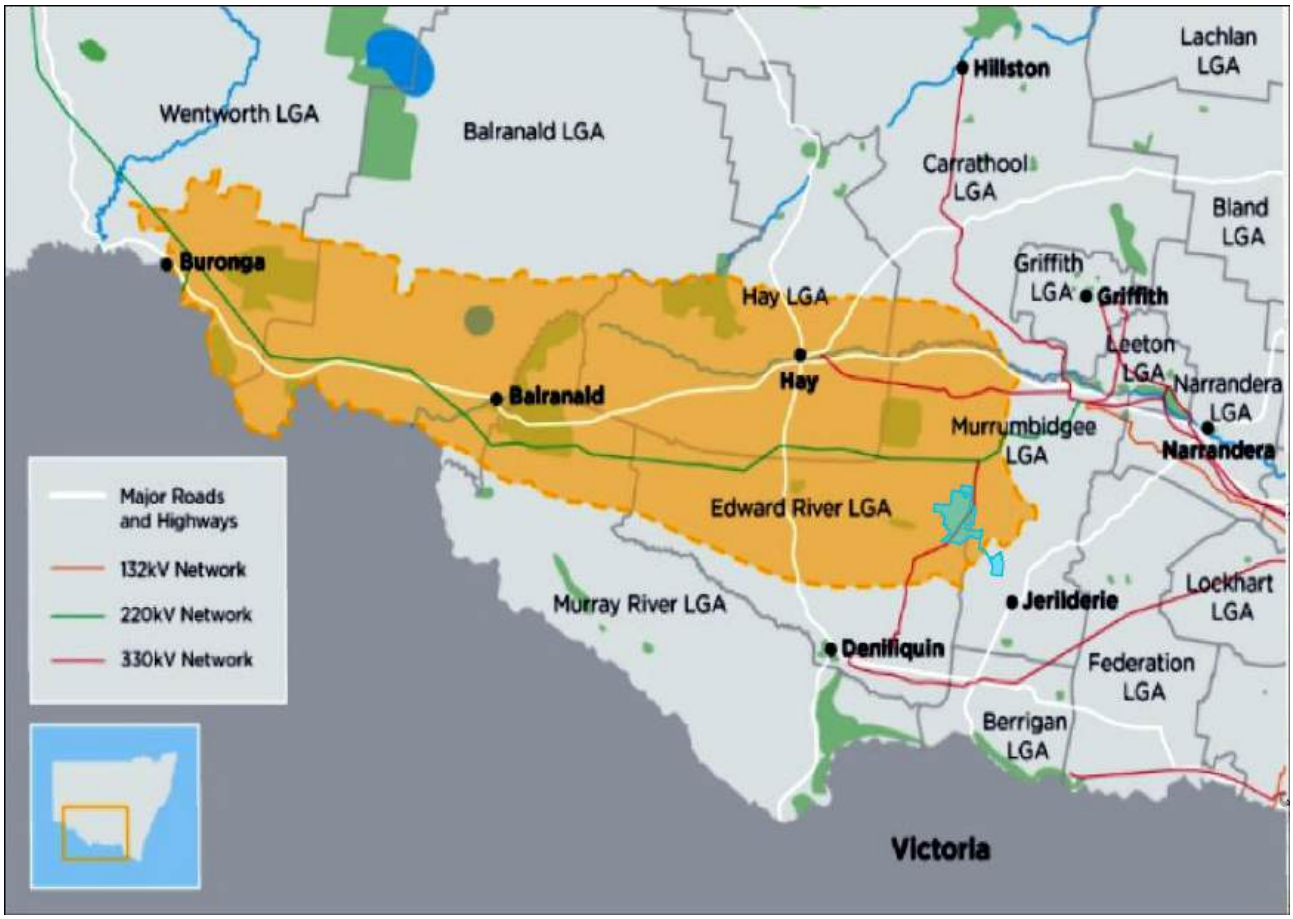

Figure 2-1 Indicative boundary for South West REZ and Project (in blue) (NSW Government, 2021a)

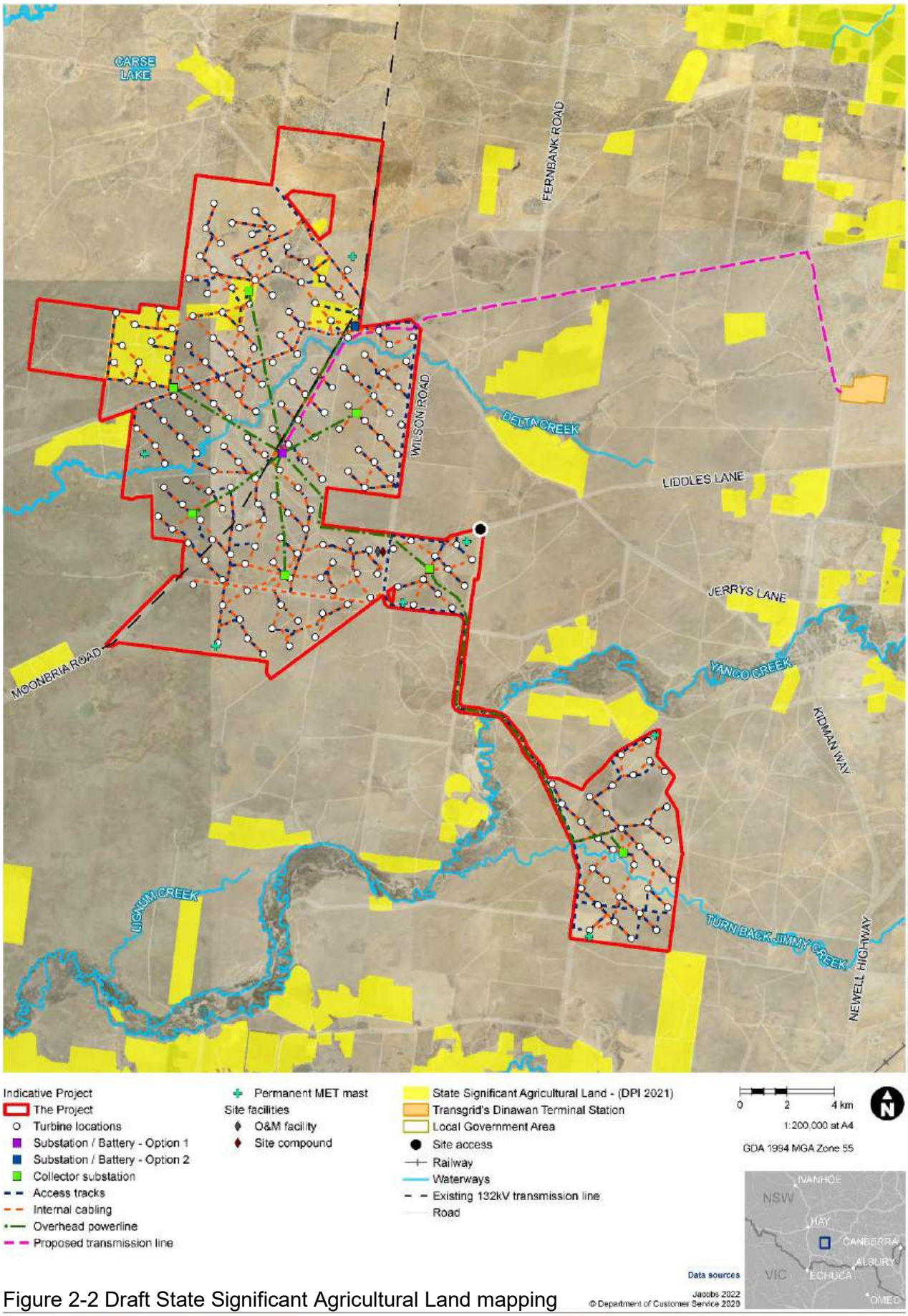

Figure 2-2 Draft State Significant Agricultural Land mapping

2.2 Key features of the Project and surrounds

2.2.1 Existing land use

The Project would be located on land zoned as RU1 – Primary Production under both the Conargo Local Environmental Plan (LEP) and the Jerilderie LEP. The Project would be located on rural land with agricultural land use, including for grazing, cropping and irrigated cropping.

The land surrounding the Project is also rural with mostly agricultural land uses. Other land uses include residential farm infrastructure, road reserves and managed resource protection (DPE, 2017).

During a desktop review, one trigonometric station (TS 5327) was identified as being north of Mabins Well Road on the boundary of Lot 68 and Lot 69 at DP756334. However, a review of the metadata revealed it was destroyed in 2015 and the current status is unknown. No other trigonometric stations are located within the Project.

There are no current minerals, coal or petroleum and gas titles within the Project.

2.2.2 Land ownership

The majority of the Project would be located on private properties owned by eight landowners as shown in **Figure 2-3**. Virya has entered into Options to Lease agreements with each Host landowner (refer to **Section 2.3**).

Project infrastructure would mostly be on private property, with the exception of small sections of internal cabling within the Project and the proposed transmission line along McLennons Bore Road which would occupy Crown land, of which Murrumbidgee Council and Edward River Council are the lessee. Consultation with Councils regarding the use of Crown land has been carried out.

Parcels of Crown land are also located within the Project (refer to **Figure 2-5**). These Crown land areas are also Travelling Stock Reserves with medium to high conservational values.

Further to the above, proposed road upgrades are required to facilitate the transportation of oversize and overmass goods. Further details relating to proposed road upgrades and relevant road authorities is provided in **Section 3.6.7.2**.

A summary of the lots hosting Project infrastructure is provided in **Appendix A**.

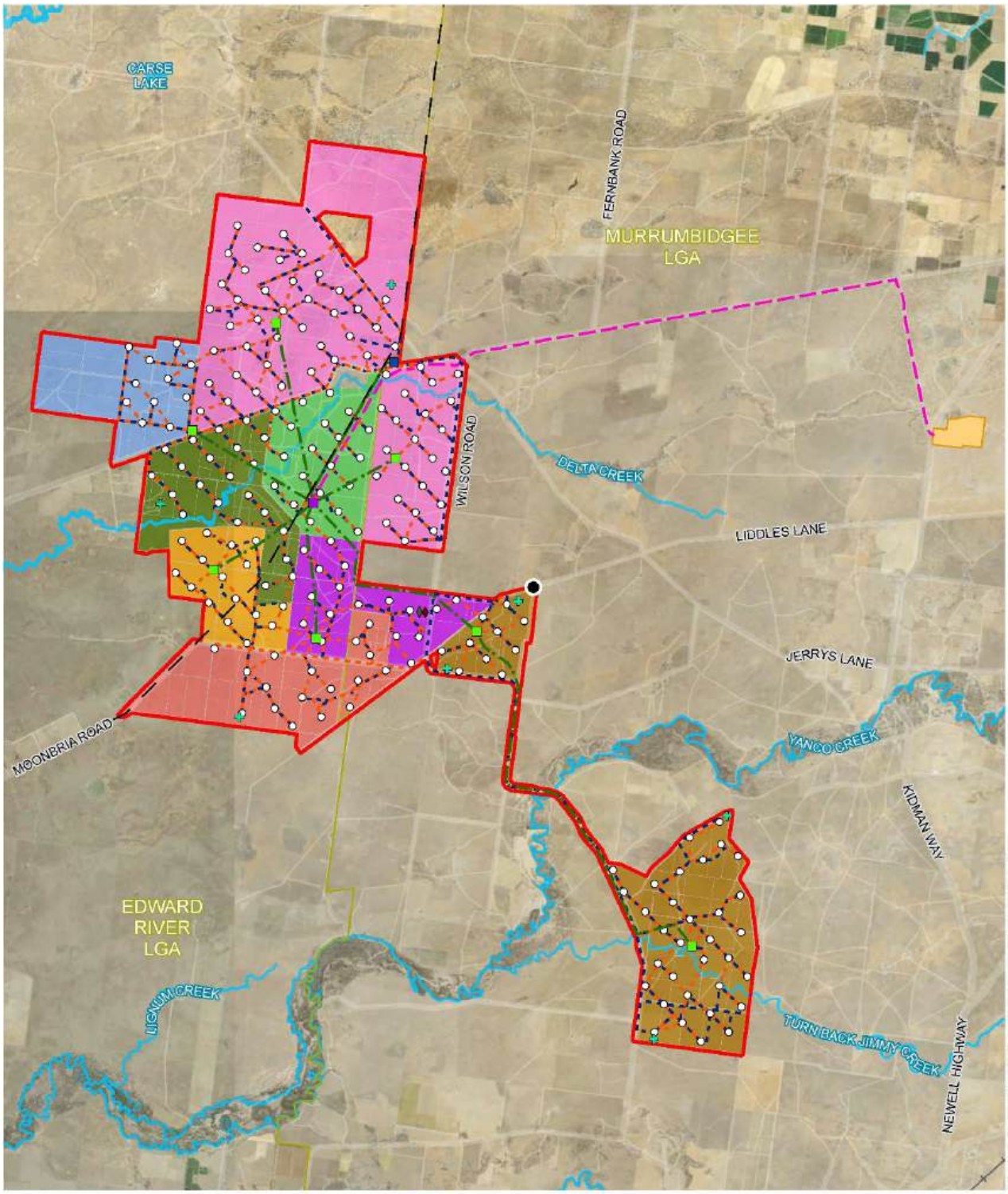

Figure 2-3 Land ownership within the Project

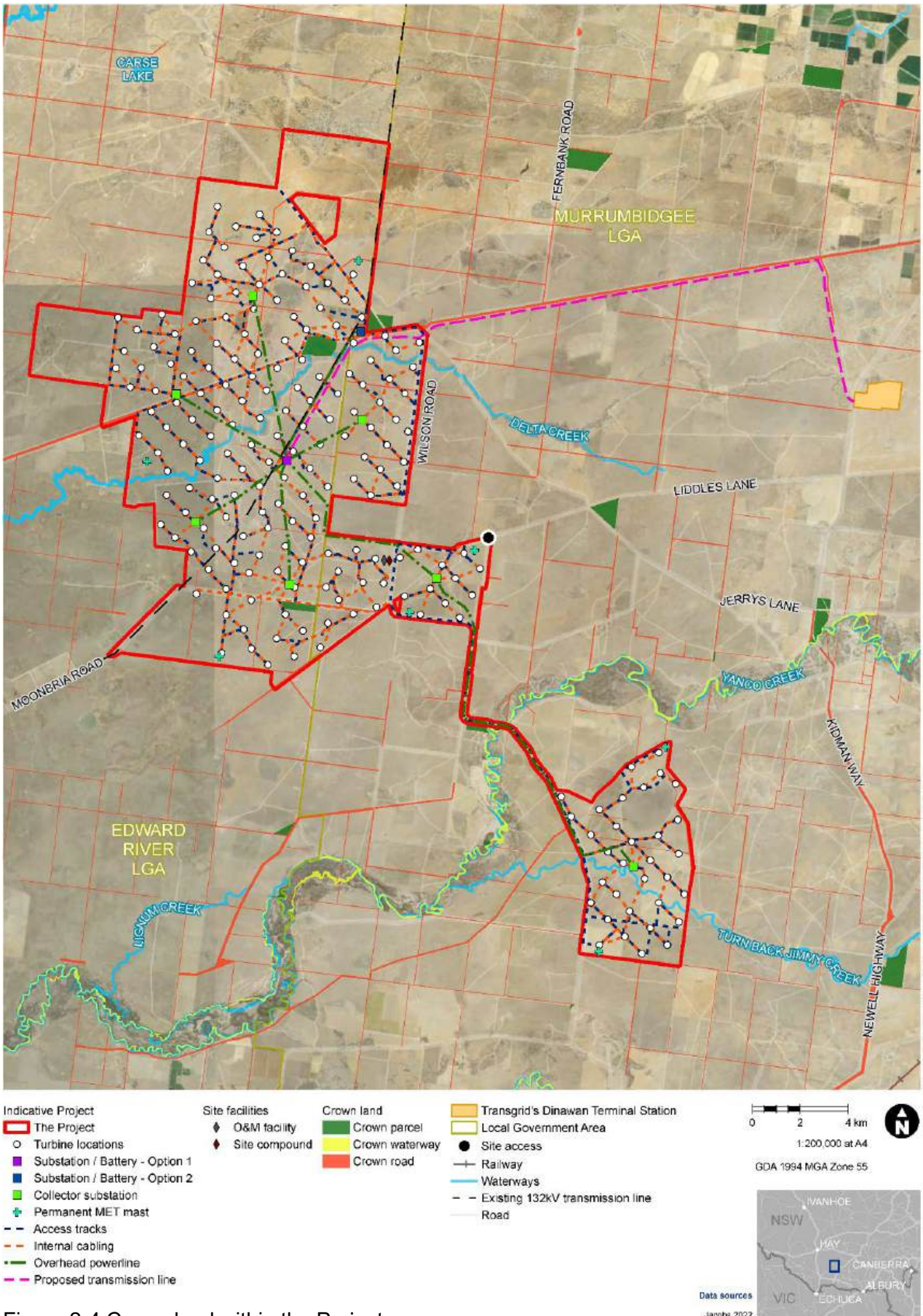

Figure 2-4 Crown land within the Project

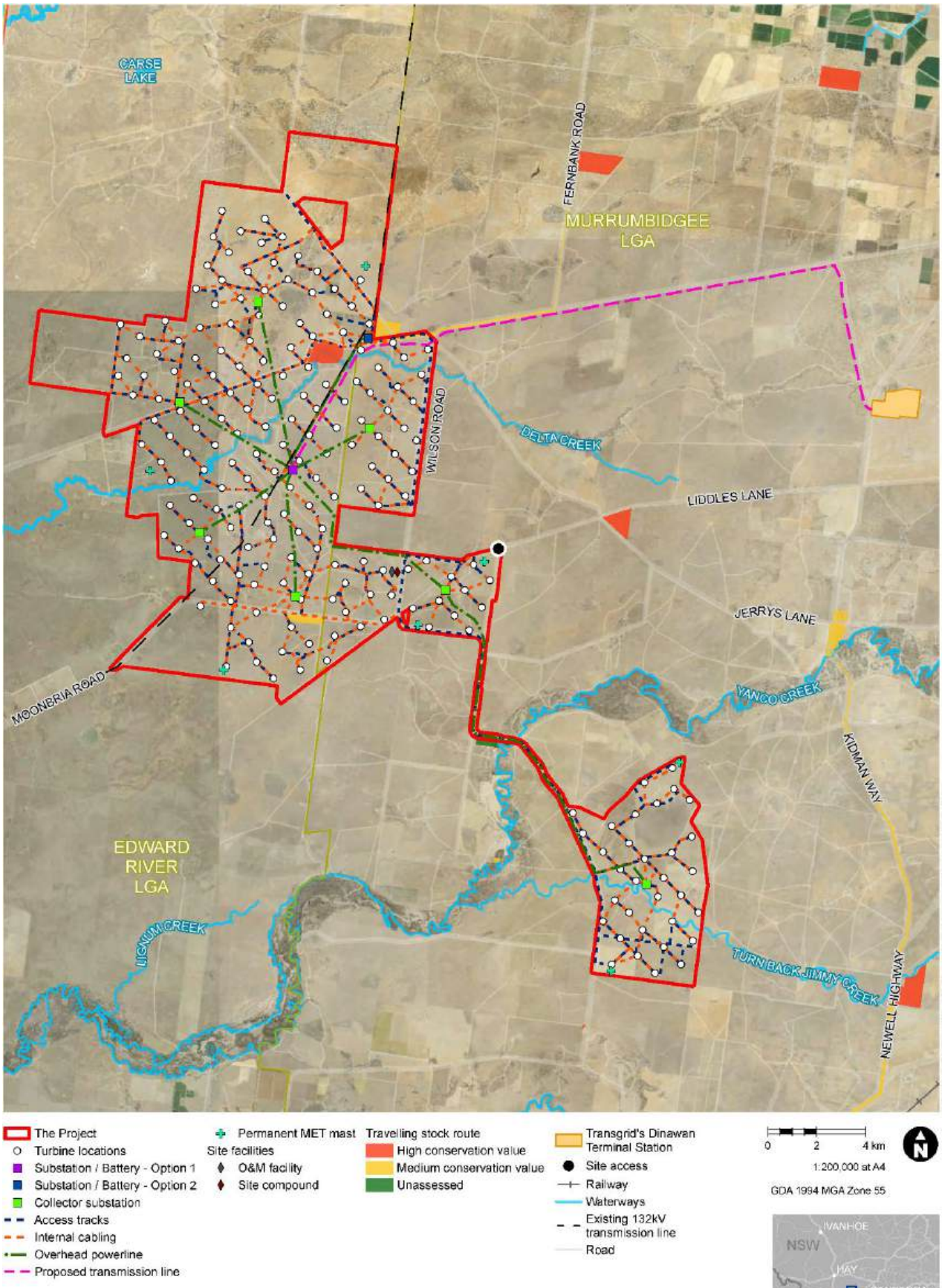

Figure 2-5 Travelling Stock Routes near the Project

2.2.3 Existing infrastructure

Existing infrastructure within the Project is limited to the existing Transgrid 132 kV Deniliquin to Coleambally transmission line.

The closest dwelling to the Project would be a minimum of two kilometres from any proposed WTGs. The closest habitable Non-associated Landowner would be about 3.6 kilometres from the proposed WTGs. Within 8 kilometres of a WTG there are four Host dwellings, seven Associated dwellings and nine Non-associated dwellings (refer to **Section 2.3**)

There are no existing, approved of proposed residential developments or subdivisions within five kilometres of a proposed WTG. The closest town centre to the Project is Jerilderie, which is located about 10 kilometres to the south-east. The largest population centres nearby are Wagga Wagga, about 150 kilometres east of the Project, followed by Deniliquin located about 70 kilometres south west.

No major rail or pipeline infrastructure is located near the Project. The closest major road corridor is Kidman Way, and the southern extent of the Project is about eight kilometres from the intersection of Kidman Way and Newell Highway.

The capacity of the existing transmission network is insufficient to accommodate the Project. However, the Project would eventually connect to Transgrid's approved Dinawan Terminal Station which would provide sufficient new capacity for transmission (refer to **Section 3.6.3.3**). The Dinawan Terminal Station will be located about 16.5 kilometres east of the Project.

There are no existing or approved wind farms in the South West REZ. In the South West REZ, there are five proposed windfarms and one energy hub with WTGs; discussed further in **Chapter 21** (Cumulative impacts). These are in early planning phases and have not yet been registered on the Major Projects website.

2.2.4 Existing environmental features

The Project is largely flat with altitudes varying between 100 metres and 114 metres Australian height datum (AHD). In broad terms, the Project slopes gently downward from east to west.

The closest town centre to the Project is Jerilderie, which is located about 10 kilometres to the south-east. The largest population centres nearby are Wagga Wagga, about 150 kilometres east of the Project, followed by Deniliquin located about 70 kilometres south-west.

The Project is mostly situated on an alluvial floodplain with three watercourses:

- Yanco Creek – A major perennial watercourse which flows south-west toward the Murray River which bisects the northern and southern portions of the Project
- Delta Creek – A minor, ephemeral watercourse 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 which is in the northern portion of the Project
- Turn Back Jimmy Creek – A minor watercourse which intersects the southern portion of the Project.

Aside from the three watercourses described above, there are some minor drainage depressions that hold water during rainfall and flooding, draining 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.

Flooding across the Project is caused by a combination of flood flows in Delta Creek, Yanco Creek and Turn Back Jimmy Creek; in addition to local catchment runoff in flow paths. Delta Creek

generates most of the higher velocity and depth levels in this area. Yanco Creek generates flooding in the lower extent of the northern section, as well as the southern portion of the Project, however the Project avoids its channel. Turn Back Jimmy Creek generates high flows in its channel and contributes to overland flows on the floodplain in the southern portion of the Project.

The Jerilderie Nature Reserve is about 10 kilometres from the southern extent of the Project (refer to **Figure 1-1**). Three small nature reserves of South West Woodland are located eight kilometres west, 17 kilometres east, and 23 kilometres south of the Project. Oolambeyan National Park is located approximately 24 kilometres north-west of the Project. The Murray Valley National Park is located 33.5 kilometres south-west of the Project.

A large portion of the Project west of Wilson Road is identified as bush fire prone land Vegetation Category 3, identifying medium bush fire risk vegetation.

Desktop reviews indicate that, although the majority of the Project would be located within an area considered to have either ‘extremely low’ or ‘low’ probability of ASS occurrence. There are no identified subsidence risks or active mineral exploration licences within the Project.

2.3 Other agreements

There are three types of private landowners described in this EIS. The agreements with each are below:

- **Host Landowners** – The eight landowners located within the Project that would host WTGs and/or related Project infrastructure. Each have signed Option to Lease agreements; noting that one Host Landowner has a dwelling at R20
- **Associated Landowners** – The seven landowners located outside of the Project that do not host any Project infrastructure but have negotiated participation agreements in place with the Proponent regarding Project impacts and, as such, are associated with the Project
- **Non-associated Landowners** – The nine landowners located outside the Project, within eight kilometres of a WTG, that are not associated with the Project; each have been consulted and offered neighbouring agreements but have opted not to enter into one.

The location of dwellings and their association with the Project are shown in **Figure 2-6**.

Virya Energy has begun negotiations on voluntary planning agreements with both Councils. This will include annual contributions to a community benefit fund that would be spent on community projects across both LGAs. These voluntary planning agreements will be in place prior to construction.

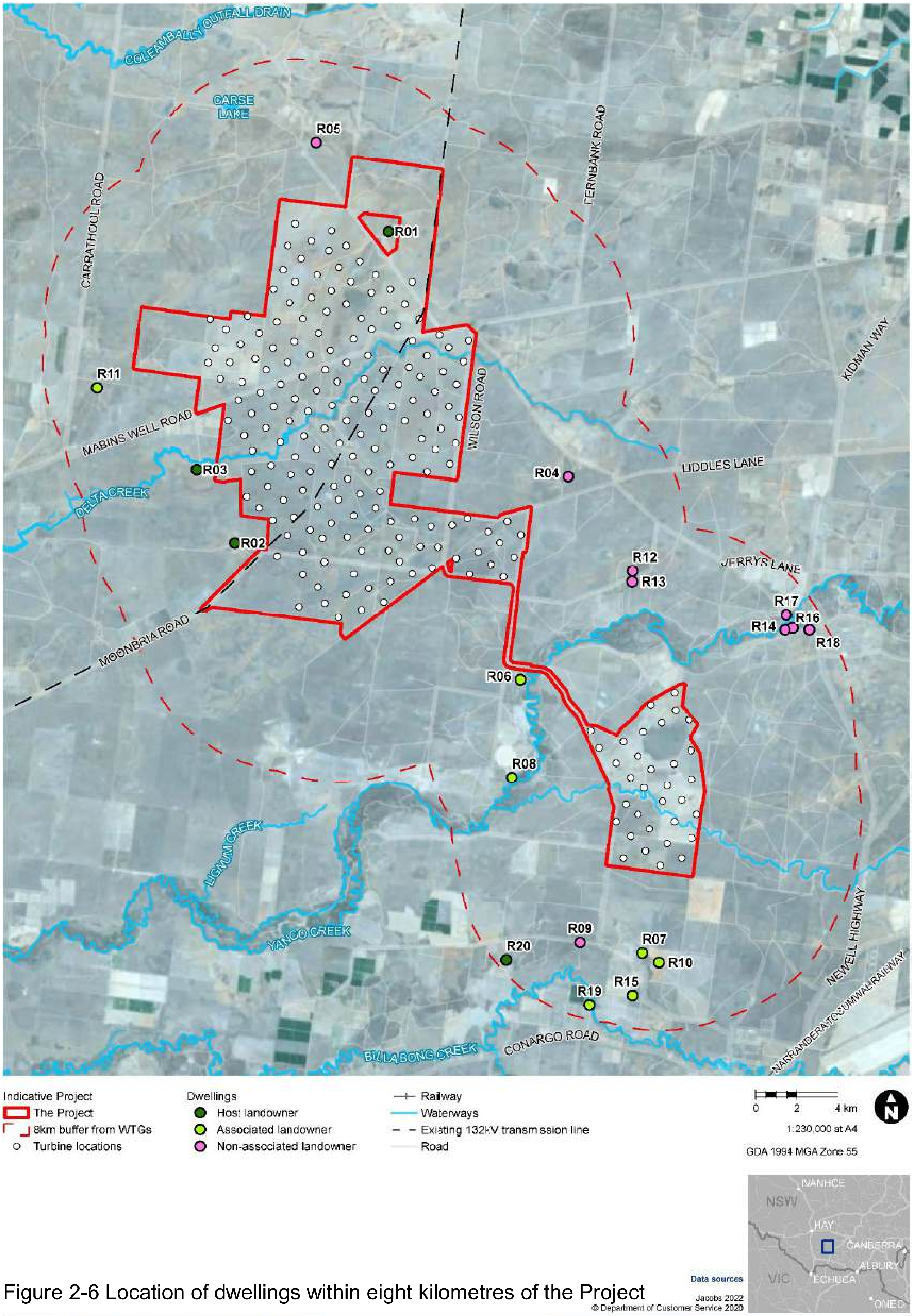

Figure 2-6 Location of dwellings within eight kilometres of the Project

3. Project description

This chapter provides a detailed description of the Project, including construction, operation and decommissioning. This chapter also outlines the alternatives that were considered during the development of the Project.

3.1 Overview

The Project would generally involve the construction, operation and decommissioning of the Yanco Delta Wind Farm, as shown in **Figure 3-1,** including:

- Up to 208 WTGs, each consisting of:
  - A generating capacity of up to 8.0 MW each
  - A three-blade rotor and nacelle mounted onto a tower, with a maximum tip height of 270 metres
  - A crane hardstand area
  - A turbine laydown area
- A 800 MW / 800 MWh BESS
- Electrical infrastructure, including:
  - A central primary substation
  - Up to eight collector substations and associated 66 kV or 132 kV overhead power lines
  - Underground and/or overhead 33 kV or 66 kV power lines to transmit the electricity generated by the WTGs to the substations and/or the BESS
  - An overhead 330 kV or 500 kV transmission line to connect the central primary substation to Dinawan Terminal Station via McLennons Bore Road and Cadel Road
- Permanent ancillary infrastructure, including:
  - An operation and maintenance facility, including site offices and car park
  - Up to eight permanent meteorological masts, located close to a WTG location, with a maximum height of 180 metres
  - Internal access tracks to, from and in between WTGs and substations
- Temporary construction facilities including:
  - One construction compound with laydown areas
  - Stockpile areas
  - Up to two concrete batch plants adjacent to the construction compound
  - Gravel borrow pits (if feasible)
- Upgrades to local roads and crossings where required for the delivery, installation and maintenance of WTG components and associated materials and structures.

There are no relevant related developments to the Project to be incorporated into the Project.

There are no components of the Project that are subject to a separate approval process under the EP&A Act to facilitate the operation of the Project.

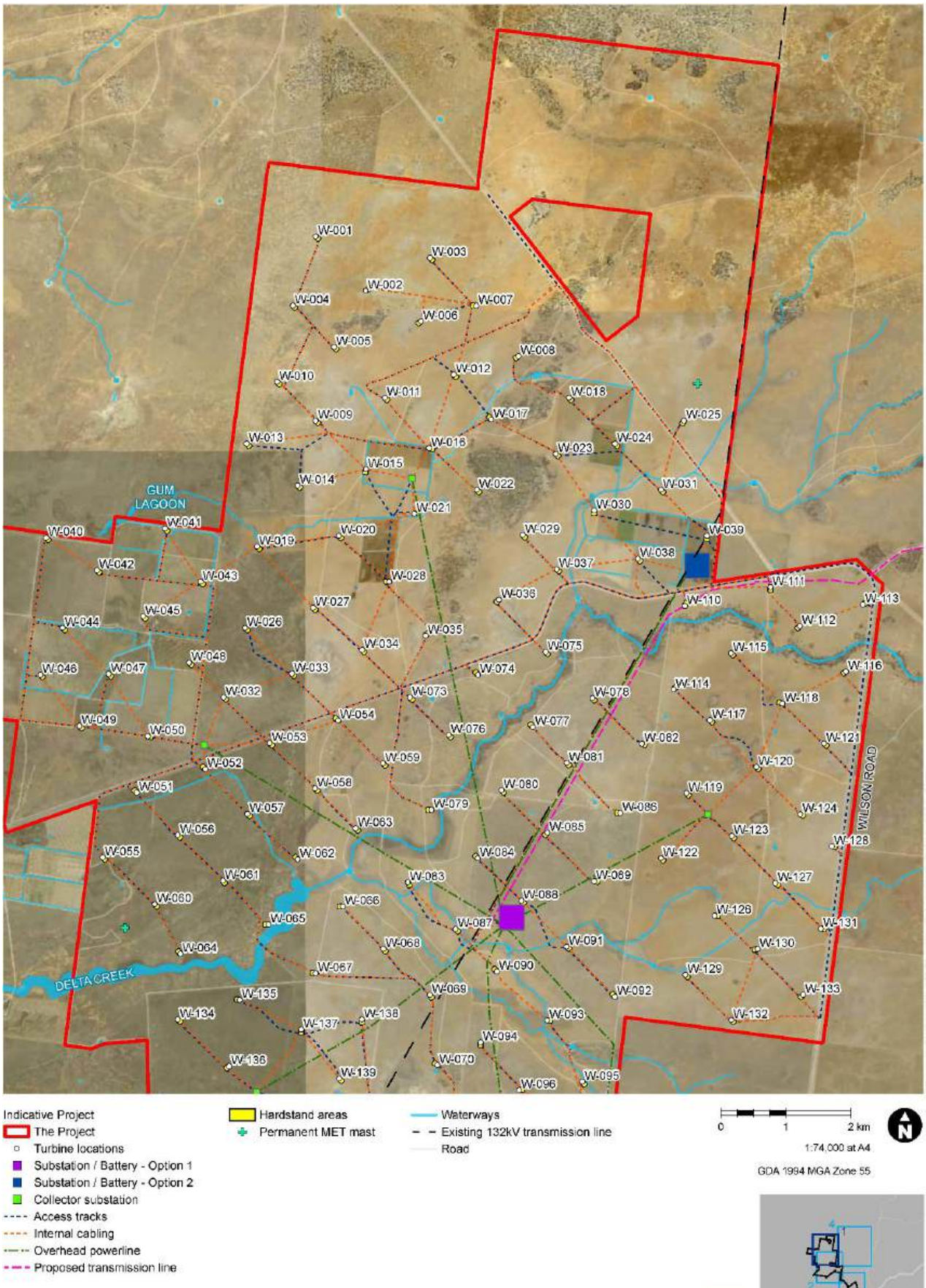

Figure 3-1 Overview of Project layout (Page 1 of 4)

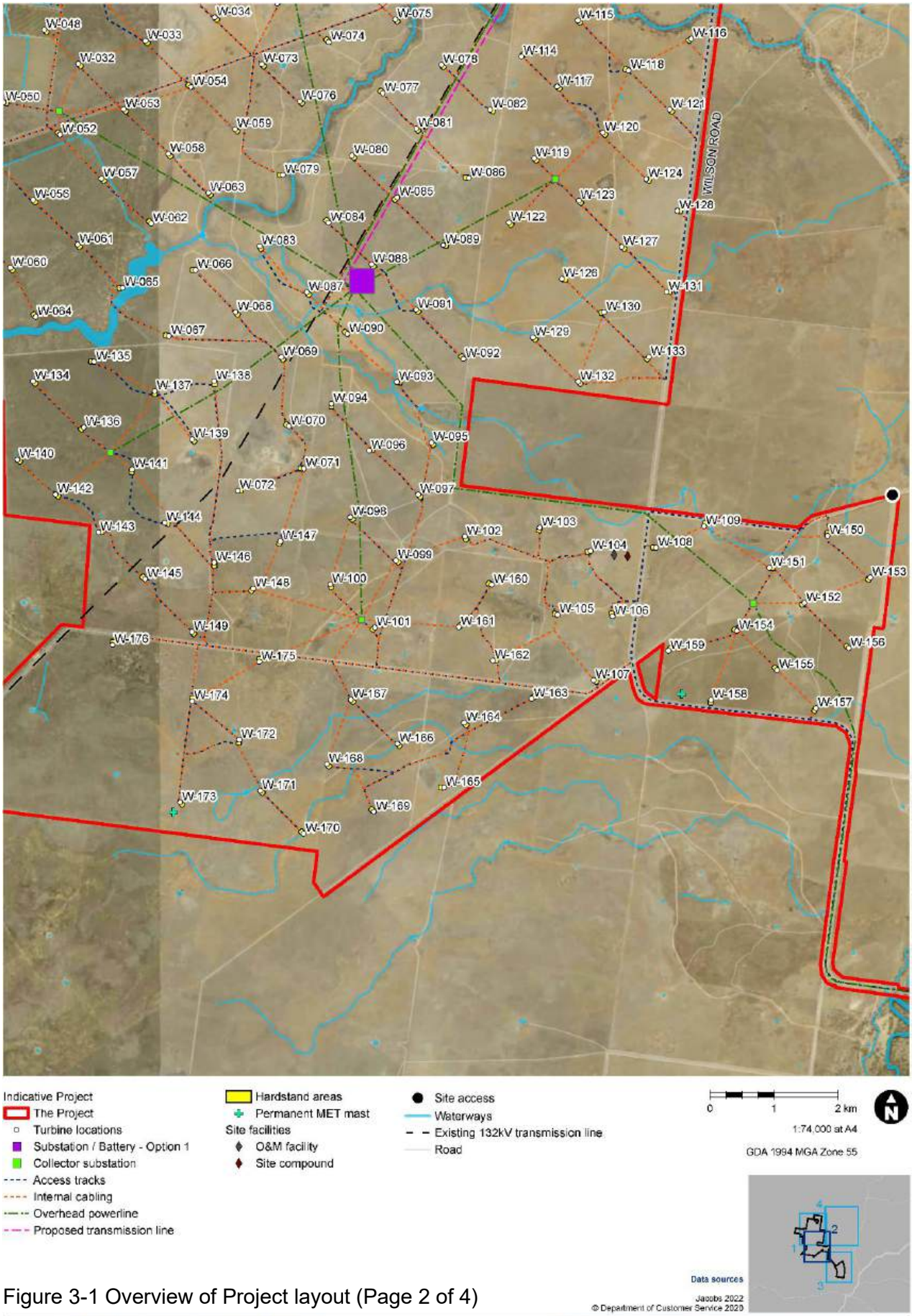

Figure 3-1 Overview of Project layout (Page 2 of 4)

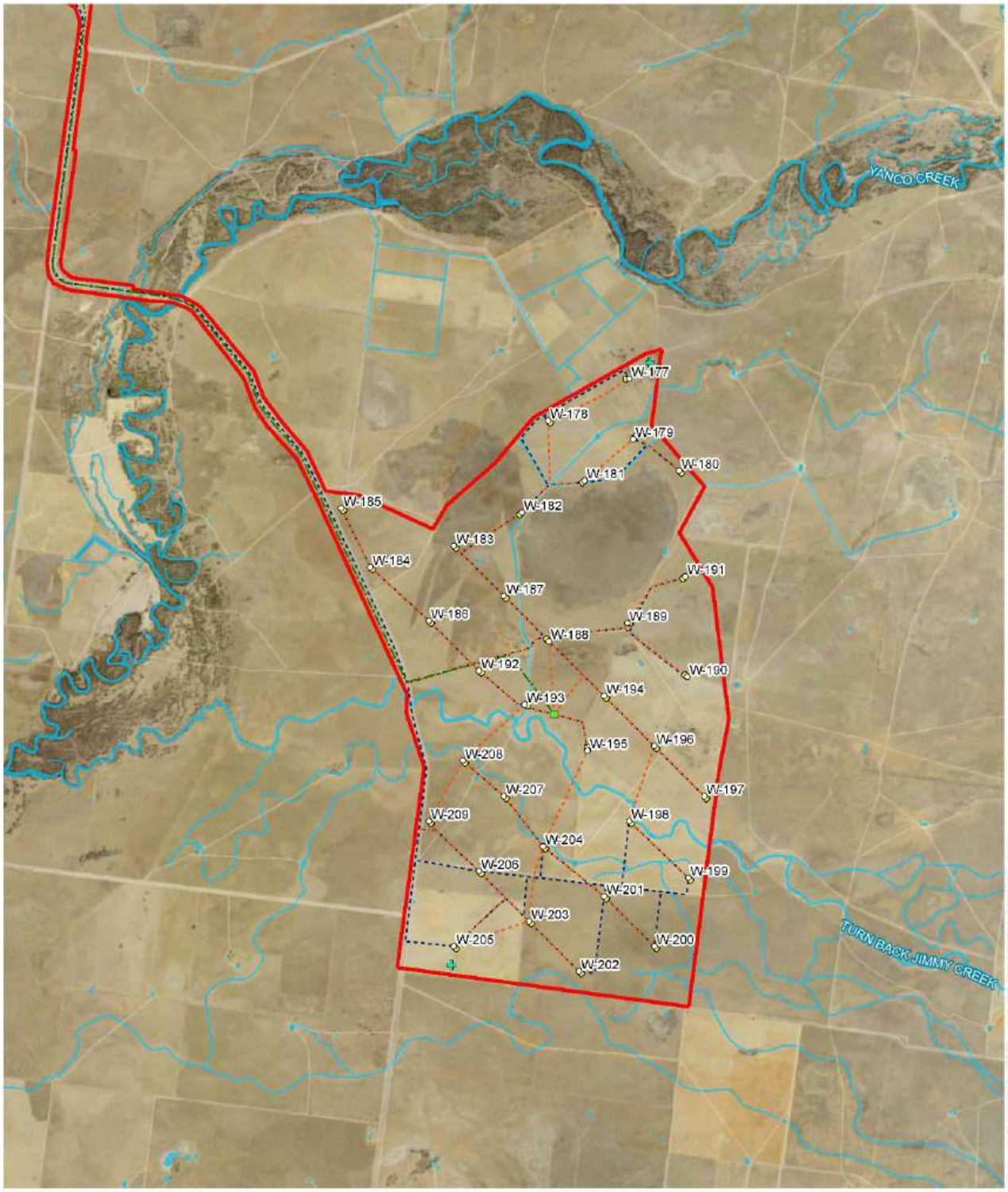

Figure 3-1 Overview of Project layout (Page 3 of 4)

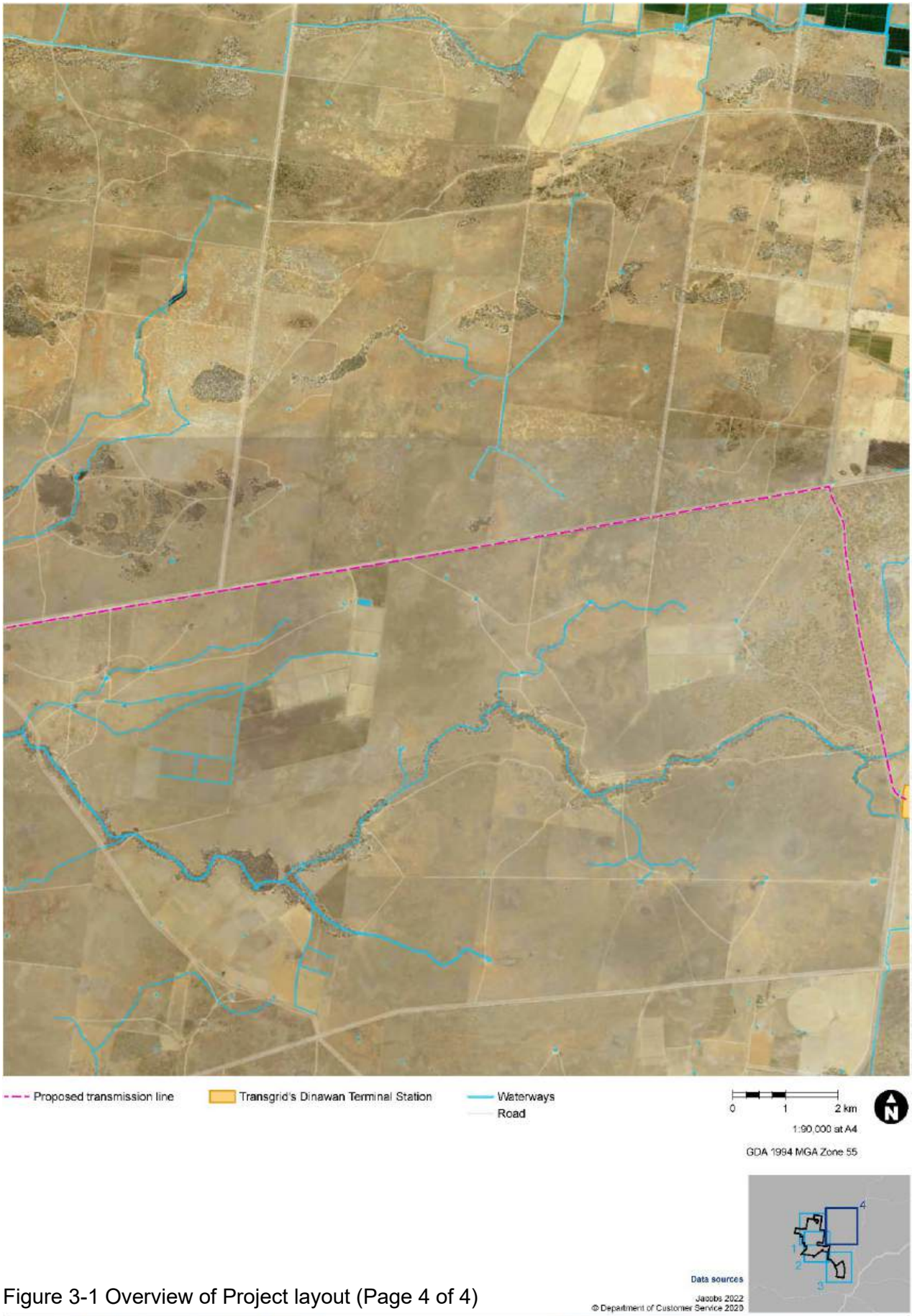

Figure 3-1 Overview of Project layout (Page 4 of 4)

3.2 Project disturbance

For the purposes of determining the maximum disturbance area and direct impacts in **Chapter 6**, the disturbance footprint was defined using the indicative disturbance areas shown in **Table 3-1** and shown in **Figure 3-2**.

Actual disturbance may vary on a case-by-case basis, however, the disturbance footprint would be around 238 hectares.

Table 3-1 Indicative disturbance parameters

Element	Indicative disturbance
Within Project	
WTG foundation excavation	25 to 30 metre radius
WTG hardstand	Up to 40 by 50 metres
BESS/ central primary substation	Up to 15 hectares
Access tracks	Five metres wide
Underground cabling	About 0.5 metres per cable route
Overhead power lines	Five to 10 metre radius around each pole, 200 metres apart
Operation and maintenance facility/ Substation/ Collector substations/ Construction compound	Up to one hectare each on average
Outside of Project	
Road upgrades	Outlined in **Section 3.6.7.2**.
Transmission line (overhead)	10 metre radius around each pole, 400 metres apart

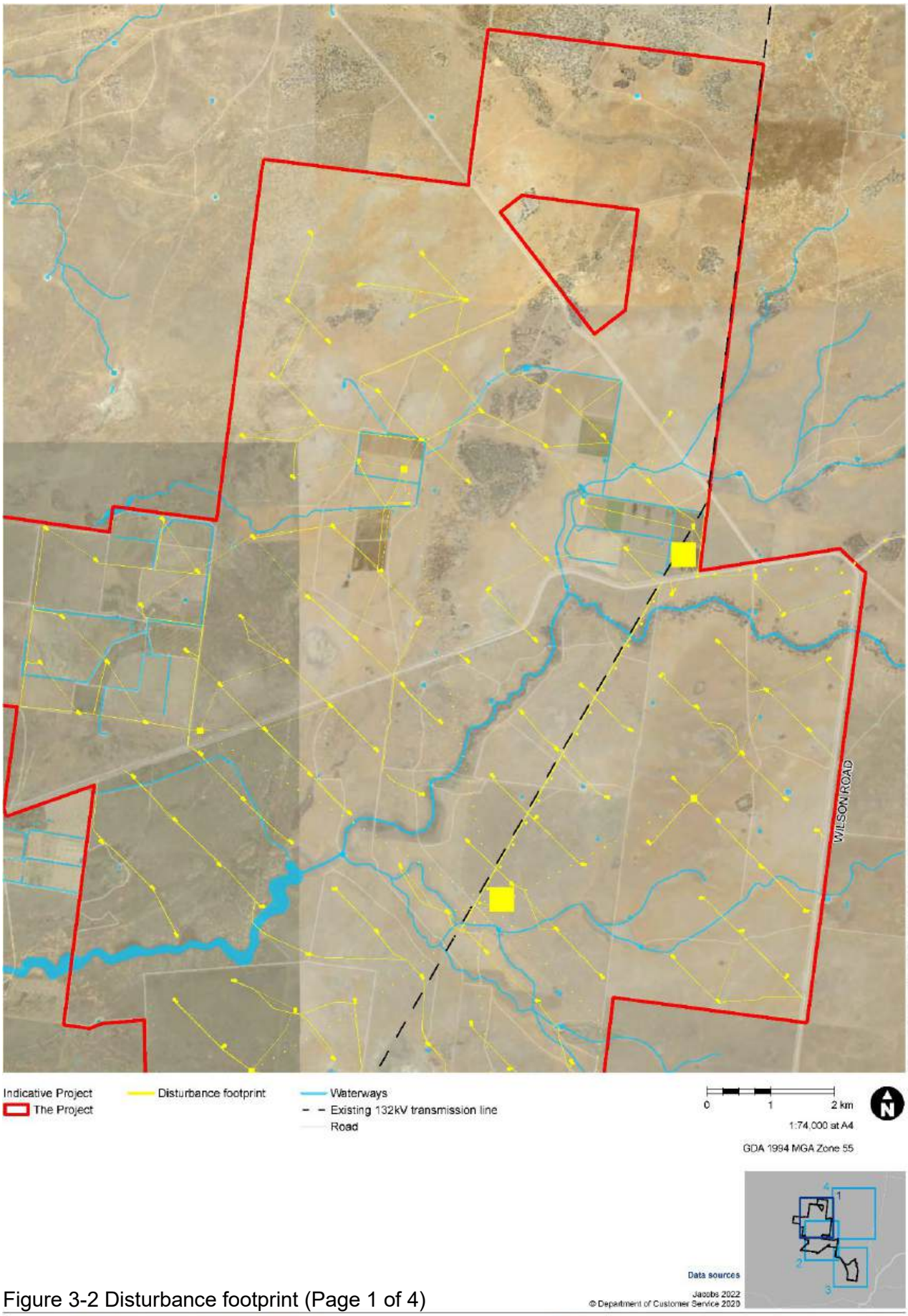

Figure 3-2 Disturbance footprint (Page 1 of 4)

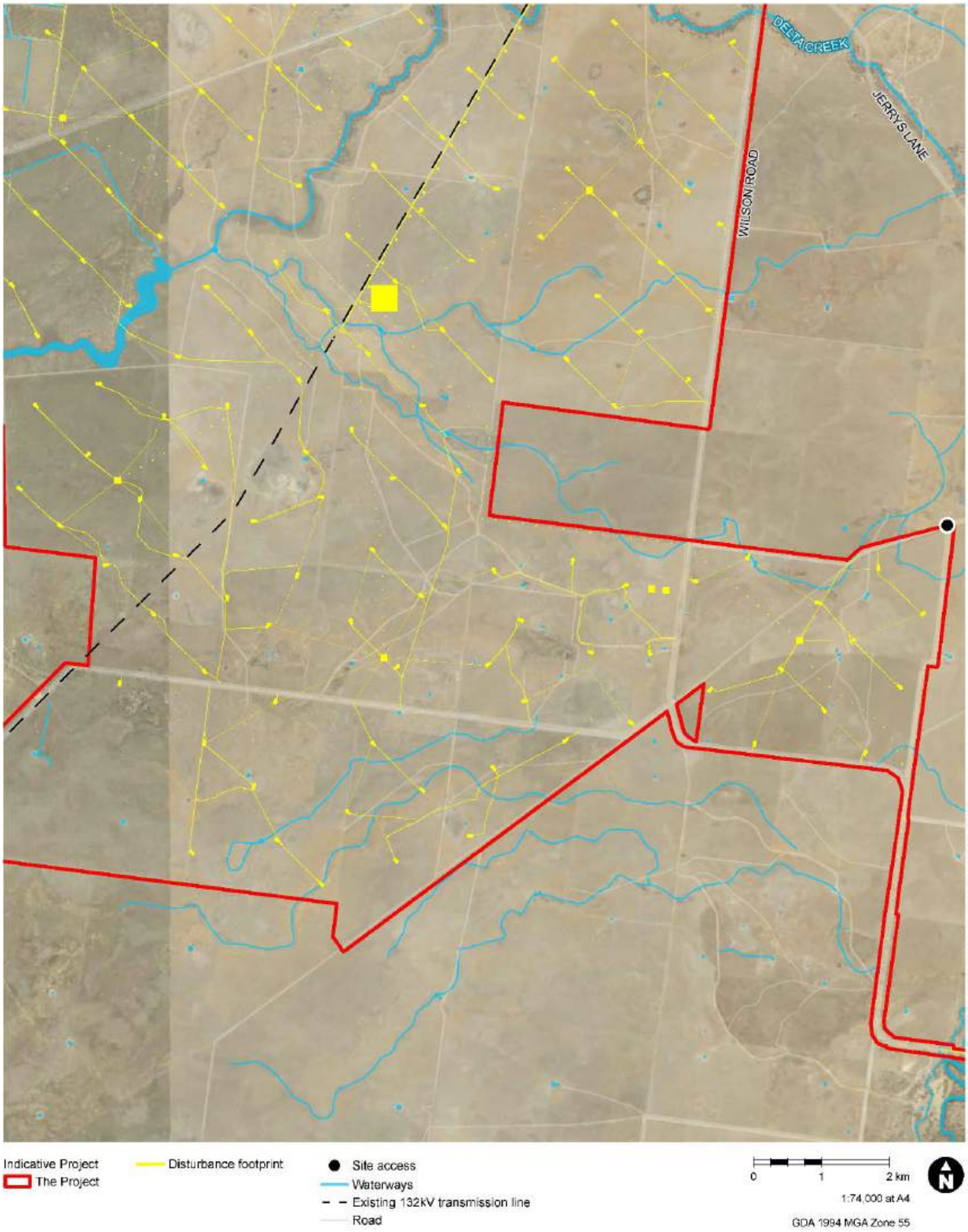

Figure 3-2 Disturbance footprint (Page 2 of 4)

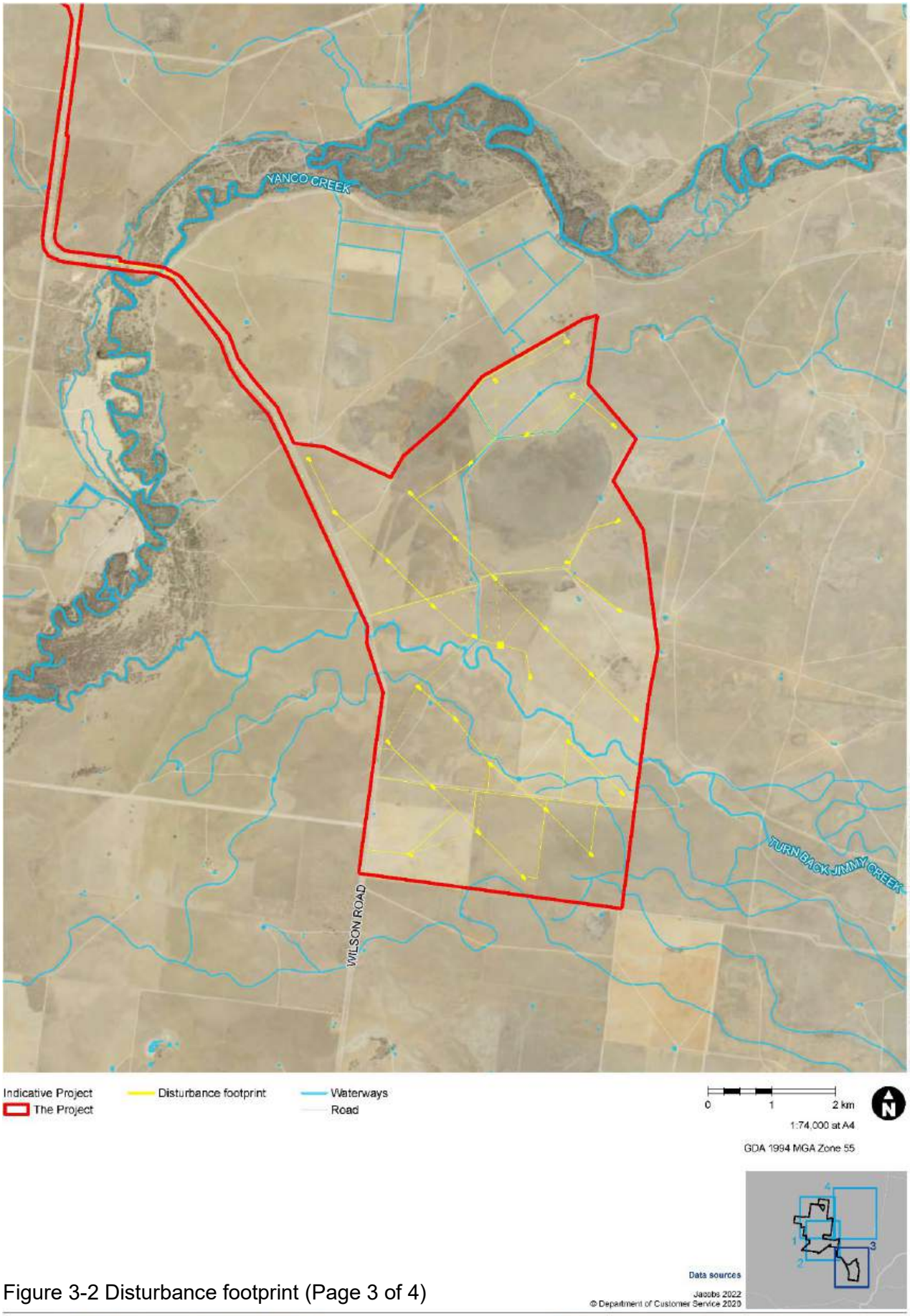

Figure 3-2 Disturbance footprint (Page 3 of 4)

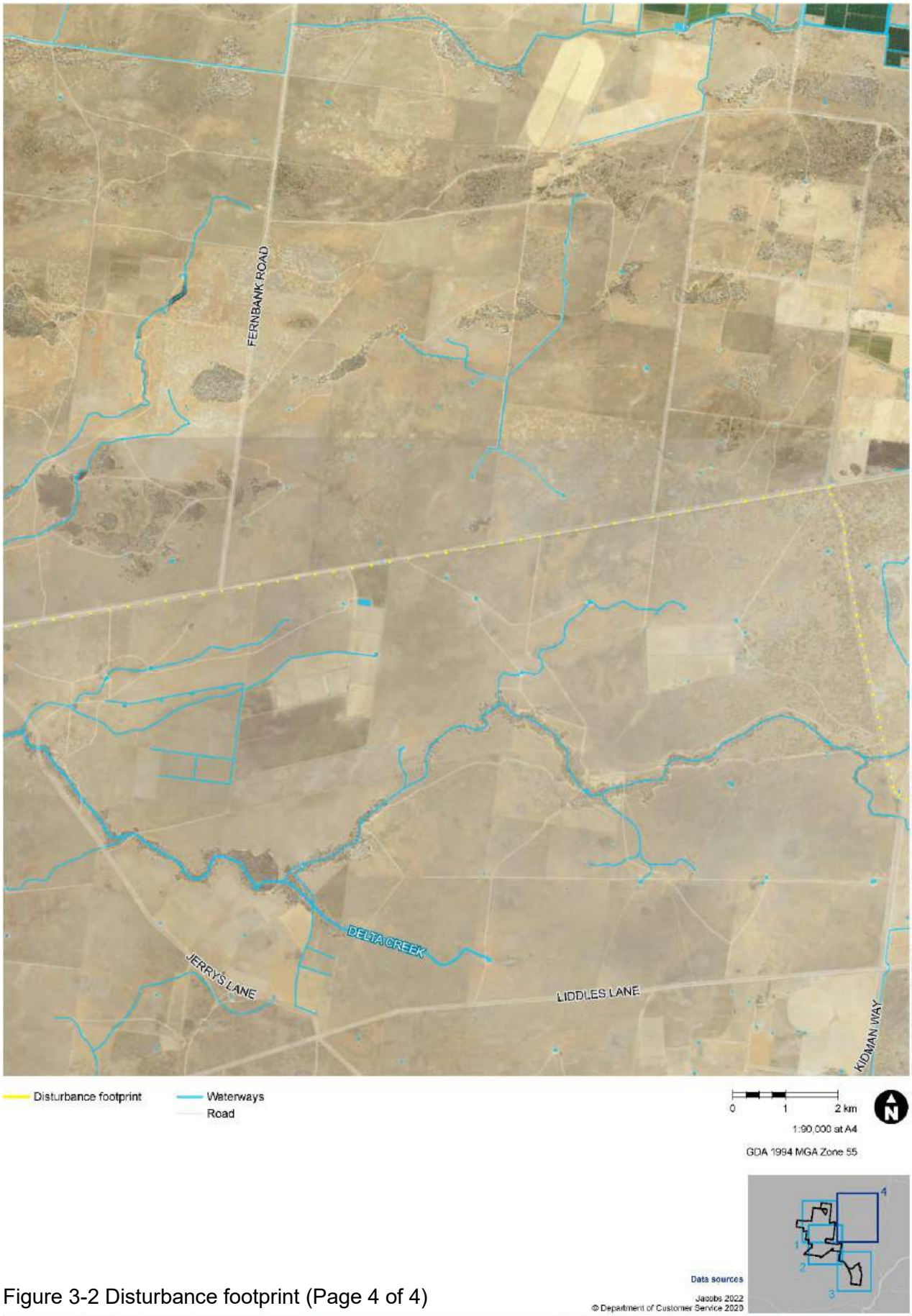

Figure 3-2 Disturbance footprint (Page 4 of 4)

3.3 Project summary

The key elements of the Project are summarised in **Table 3-2** and shown in **Figure 3-1**.

Table 3-2 Key elements of the Project

Aspect	Description
Project	Shown in **Figure 1-2** and encompasses the majority of Project elements. Additional Project elements which are external to this area includes the proposed road upgrades (refer to **Section 3.6.7.2**) and the transmission line (refer to **Section 3.6.3.3**)
Project term	Until the end of the Project's economic life The life cycle of each individual WTG is about 30 years
Impact area	Maximum disturbance of up to 238 hectares
WTGs	Up to 208 three-bladed WTGs each with: • Up to 8 MW in generation capacity • Tip height – up to 270 metres • Rotor diameter – up to 220 metres* • Tower (hub) height – up to 180 metres* • Blade length – up to 110 metres (split blade)* • Crane hardstand area and turbine laydown area *Note the combination of the rotor diameter/blade length and hub height would be a maximum of 270 metres
Generating capacity	Up to about 1,500 MW
BESS	800 MW / 800 MWh BESS
Electrical reticulation infrastructure	• A central primary substation • Up to eight collector substations and associated overhead power lines to connect to the central primary substation • Underground and/or overhead 33 kV or 66 kV power lines to transmit the electricity generated by the WTGs to the collector substations and/or the BESS • 330 kV or 500 kV transmission line to connect the central primary substation to Transgrid's Dinawan Terminal Station via McLennons Bore Road and Cadell Road
Project access	Access to the Project would be via a designated and upgraded access track from Liddles Lane, 4 km east of Wilson Road
Permanent ancillary infrastructure	• An operation and maintenance facility, including offices and car park • Up to eight permanent meteorological masts, up to 180 metres • Internal access tracks to, from and in between WTGs
Temporary construction facilities	• One construction compound with laydown areas • Stockpiles • Up to two concrete batch plants adjacent to the construction compound • Gravel borrow pits (if feasible)
Public infrastructure Work	Modifications (e.g. temporary road sign removal) or upgrades to the road network are outlined in **Section 3.6.7.2**
Construction timeframe and hours	Construction would take up to 36 months

Aspect	Description
	The majority of construction activities would be carried out during standard construction hours, however, certain activities would need to be carried out outside of standard construction hours including: • Work to prevent damage to concrete tower bases and trenches • Work to reduce the safety risk of open trenches and reduce the risk of tower self-oscillation • Concrete pours, in-ground electrical work and WTG installation • 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
Construction equipment	• OSOM and semi-trailers to deliver components to the Project • Excavators, loaders, dozers and other earthmoving machinery • Graders and rollers for road construction • Trucks (including road registered trucks for transportation of materials, concrete mixer trucks and water trucks) • Mobile cranes and elevated work platforms • Hand operated tools
Operational hours	24 hours per day, 7 days per week
Workforce (full time workers)	• Up to 300 people per day during peak construction (Year 2) • Up to 150 people per day outside of peak construction (Year 1 and Year 3) • Up to 30 workers during operation
Capital investment	$3.45 billion

3.4 Program and schedule

If successful in obtaining planning approval and grid connection agreement, the construction of the Project would begin in 2024/2025. The expected construction duration of the Project would be 36 months. Commercial operations of the first commissioned WTGs would commence at the end of 2025, in line with the planned completion and commissioning of Transgrid's Dinawan Terminal Station and Project EnergyConnect.

Project construction may be completed in stages depending on the final grid connection configuration and the offtake agreements. It is expected, however, that any construction staging required would overlap as if it were one continuous phase (i.e. there would be no extended breaks in construction within the Project). An indicative construction schedule is provided as **Table 3-3**. The precise timing of construction activities would be refined as design and grid connection progresses.

Table 3-3 Indicative construction schedule

Construction	Year 1								Year 2								Year 3							
	Q1		Q2		Q3		Q4		Q1		Q2		Q3		Q4		Q1		Q2		Q3		Q4	
Site set-up and civil work																								
Road construction																								
Excavation & foundation construction																								
Electrical installation																								
Turbine delivery and erection																								
Turbine commissioning and testing																								
Construct electrical substations																								
Construct transmission line																								
Commission operational infrastructure and construct the operation and maintenance facility																								
Decommission temporary structures																								

The construction workforce is anticipated to consist of up to 300 people per day during peak construction (Year 2). Outside of peak construction (Year 1 and Year 3), the Project is anticipated to consist of up to 150 people per day.

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

3.4.1 Construction work hours

The 'Interim Construction Noise Guideline' (DECC, 2009) (ICNG) recommends standard hours for construction work as outlined in **Table 3-4**. This would be used for the Project, except where an exemption is granted by the relevant authority.

Table 3-4 ICNG recommended standard hours

Work type	Recommended standard hours
Normal construction	• 7am to 6pm on weekdays • 8am to 1pm on Saturdays • No work on Sundays or public holidays • Additional activities may be subject to an 'Out of Hours Protocol'
Blasting	• 9am to 5pm on weekdays • 9am to 1pm on Saturdays • No blasting on Sundays or public holidays

Based on the geology within the Project, blasting is not anticipated for the Project.

The ICNG (DECC, 2009) recognises there are some situations where construction may need to be carried out outside of the recommended standard construction hours. This is relevant for wind farm construction, as the cranes used for installation of WTGs cannot operate in high winds. In order to minimise delays in the construction program, work outside of standard construction hours would be required to make up for time lost during high wind days. Other activities that would be carried out outside of the standard daytime construction hours or extended 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.

The potential noise and vibration impacts associated with the construction activities are presented in **Chapter 8** (noise and vibration).

3.5 Water demand and supply

Water supply would be required during the 36 month Project construction, including for:

- Soil and fill conditioning
- Dust suppression
- Concrete production
- Concrete washout
- Vehicle and equipment wash down
- Amenities.

The most substantial water demand is expected to be for dust suppression, followed by concrete batching and soil conditioning for road construction. The total water demand is estimated at 417.9 ML during construction. A detailed breakdown is provided in the Surface water quality and groundwater technical report (**Appendix K**).

The majority of water would be imported, and is likely to be sourced through a commercial arrangement with Murrumbidgee Council. Non-potable water would be utilised for construction and potable water would be sourced for the construction compound and amenities.

Sources for non-potable water demands may include:

- Harvested runoff from disturbed areas captured in excavations or sediment basins/traps constructed to prevent sediment transport off-site
- Harvested runoff from farm dams
- Groundwater from licenced bores.

The above water sources from private dams and groundwater bores would need to be with harvestable water rights and water access licencing conditions, in agreement with Host or local landowners.

Water supply would also be required during the 30 year Project operation, including for:

- Road maintenance
- Vehicle and equipment wash down
- Amenities (potable).

Operational water demands would be substantially reduced from even the lowest periods of construction demand, and is anticipated to be less than 3 ML/annum.

Where further licenses are needed to access water from these sources or license amendments are required, these would be sourced by Virya Energy prior to the water being used.

3.6 Project elements

3.6.1 Wind turbine generators

The Project would include up to 208 three-bladed WTGs, with a maximum tip height of 270 metres. The proposed layout of the WTGs is shown in **Figure 3-1** and each WTG would have a generating capacity of about 8.0 MW. The coordinates and heights for each WTG is presented in **Table 3-5**. Noting that W-215 has been removed to avoid biodiversity constraints.

The components of a typical WTG are shown in **Figure 3-3.**

The WTG would feature three blades which are attached to the rotor hub. Each tower is a tubular steel or concrete structure that supports the nacelle (see below), the rotor hub and the three

blades. The interior of the tower contains the power and control cables and an access ladder or lift (with safety controls).

The nacelle is the structure at the top of the tower. It encloses the generator, gearbox (if used) and control gear including motors, pumps, brakes and electrical components. This control gear ensures that the WTG always faces into the wind and adjusts blade angles to maximise power output and minimise blade noise. The nacelle also houses winches to assist in lifting maintenance equipment or smaller replacement parts to the nacelle. The nacelle includes noise suppression devices to minimise the noise generated by the mechanical components.

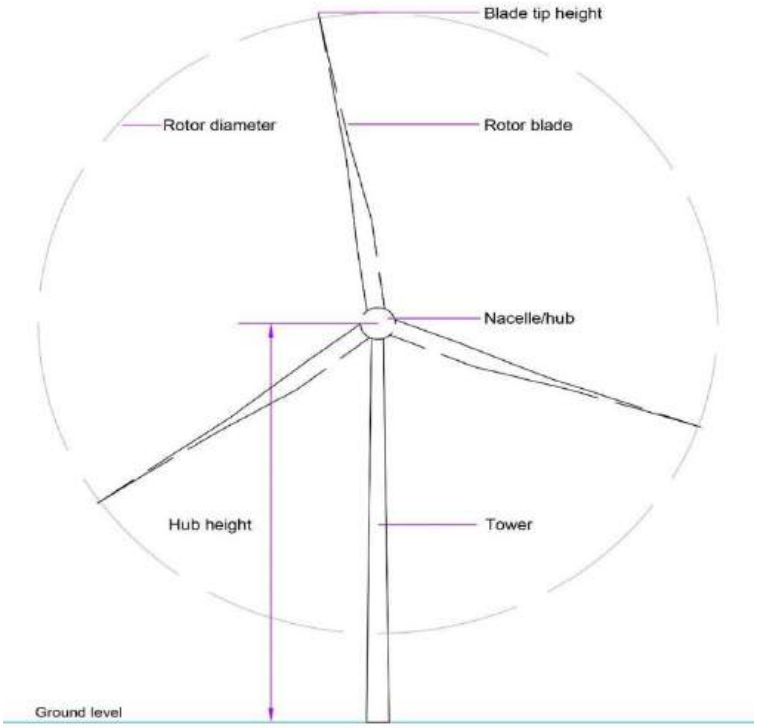

Figure 3-3 Typical wind turbine components

WTGs are fitted with lightning conductors, which direct lightning strikes into the ground. Lightning conductors reduce the risk of damage to the WTG and fire by providing a safe path to earth for lightning strikes. Operation of the WTG would be able to be managed remotely including the ability to shut down the WTG as a safety precaution.

While the exact dimensions for each tower would depend on the final WTG model chosen, the WTG would have a maximum tip height of 270 metres. For assessment purposes a hub height of up to 180 metres and a maximum blade length of up to110 metres have been selected to represent a worst-case scenario for each WTG component.

The WTGs would be painted white, and the surface of the WTGs would be treated or painted to minimise the potential for glare and reflections.

WTGs would include lighting and marking in line with best practice. Further information is provided in **Chapter 7** (landscape and visual amenity) and **Section 16.1** (aviation safety).

Table 3-5 Coordinates and heights for each WTG

Label	Elevation	WTG AHD	WTG AHD(ft)	Label	Elevation	WTG AHD	WTG AHD(ft)
W-001	106.94	376.94	1236.67	W-105	108.90	378.90	1243.12
W-002	106.96	376.96	1236.74	W-106	107.58	377.58	1238.77
W-003	107.31	377.31	1237.90	W-107	106.39	376.39	1234.88
W-004	106.35	376.35	1234.74	W-108	108.04	378.04	1240.27
W-005	107.01	377.01	1236.90	W-109	107.21	377.21	1237.55
W-006	106.65	376.65	1235.72	W-110	107.06	377.06	1237.06
W-007	107.68	377.68	1239.11	W-111	107.53	377.53	1238.62
W-008	108.43	378.43	1241.57	W-112	108.00	378.00	1240.17
W-009	106.36	376.36	1234.76	W-113	108.30	378.30	1241.13
W-010	106.25	376.25	1234.43	W-114	107.25	377.25	1237.68
W-011	106.50	376.50	1235.25	W-115	107.91	377.91	1239.87
W-012	107.95	377.95	1240.00	W-116	107.99	377.99	1240.12
W-013	106.15	376.15	1234.08	W-117	108.06	378.06	1240.37
W-014	106.47	376.47	1235.15	W-118	108.43	378.43	1241.55
W-015	107.29	377.29	1237.83	W-119	106.82	376.82	1236.27
W-016	107.89	377.89	1239.78	W-120	108.33	378.33	1241.26
W-017	109.26	379.26	1244.30	W-121	108.32	378.32	1241.21
W-018	107.94	377.94	1239.96	W-122	108.81	378.81	1242.81
W-019	106.34	376.34	1234.71	W-123	107.67	377.67	1239.08
W-020	106.93	376.93	1236.65	W-124	108.16	378.16	1240.69
W-021	107.59	377.59	1238.83	W-126	106.74	376.74	1236.01
W-022	107.58	377.58	1238.79	W-127	107.47	377.47	1238.40
W-023	107.78	377.78	1239.44	W-128	107.79	377.79	1239.47
W-024	108.26	378.26	1241.03	W-129	105.68	375.68	1232.55
W-025	107.98	377.98	1240.09	W-130	106.96	376.96	1236.76
W-026	106.61	376.61	1235.59	W-131	107.85	377.85	1239.66
W-027	105.87	375.87	1233.16	W-132	106.44	376.44	1235.04
W-028	107.14	377.14	1237.33	W-133	107.59	377.59	1238.80
W-029	107.55	377.55	1238.67	W-134	104.62	374.62	1229.08
W-030	107.60	377.60	1238.84	W-135	104.49	374.49	1228.63
W-031	107.22	377.22	1237.59	W-136	104.81	374.81	1229.69
W-032	105.17	375.17	1230.88	W-137	104.94	374.94	1230.12
W-033	105.63	375.63	1232.37	W-138	105.16	375.16	1230.83
W-034	105.85	375.85	1233.09	W-139	104.88	374.88	1229.92
W-035	107.62	377.62	1238.90	W-140	104.13	374.13	1227.47
W-036	106.55	376.55	1235.39	W-141	104.93	374.93	1230.09
W-037	106.88	376.88	1236.49	W-142	104.66	374.66	1229.21
W-038	107.49	377.49	1238.48	W-143	104.91	374.91	1230.01
W-039	107.94	377.94	1239.96	W-144	104.68	374.68	1229.25

Label	Elevation	WTG AHD	WTG AHD(ft)	Label	Elevation	WTG AHD	WTG AHD(ft)
W-040	104.44	374.44	1228.49	W-145	105.55	375.55	1232.12
W-041	105.40	375.40	1231.62	W-146	105.32	375.32	1231.35
W-042	105.34	375.34	1231.43	W-147	105.65	375.65	1232.45
W-043	105.99	375.99	1233.56	W-148	105.54	375.54	1232.10
W-044	104.63	374.63	1229.11	W-149	105.60	375.60	1232.29
W-045	105.56	375.56	1232.14	W-150	108.37	378.37	1241.37
W-046	104.15	374.15	1227.52	W-151	107.79	377.79	1239.47
W-047	105.24	375.24	1231.09	W-152	107.97	377.97	1240.05
W-048	105.90	375.90	1233.27	W-153	108.06	378.06	1240.35
W-049	104.68	374.68	1229.26	W-154	107.81	377.81	1239.54
W-050	105.45	375.45	1231.78	W-155	107.04	377.04	1236.99
W-051	104.62	374.62	1229.07	W-156	107.56	377.56	1238.73
W-052	105.15	375.15	1230.81	W-157	106.91	376.91	1236.60
W-053	105.09	375.09	1230.62	W-158	107.10	377.10	1237.19
W-054	105.52	375.52	1232.04	W-159	106.97	376.97	1236.77
W-055	103.84	373.84	1226.49	W-160	106.89	376.89	1236.52
W-056	104.40	374.40	1228.33	W-161	106.56	376.56	1235.42
W-057	104.59	374.59	1228.98	W-162	106.60	376.60	1235.57
W-058	104.87	374.87	1229.90	W-163	106.35	376.35	1234.74
W-059	105.80	375.80	1232.93	W-164	106.24	376.24	1234.37
W-060	103.94	373.94	1226.82	W-165	106.12	376.12	1233.99
W-061	104.30	374.30	1228.01	W-166	105.71	375.71	1232.64
W-062	104.62	374.62	1229.08	W-167	105.73	375.73	1232.70
W-063	104.38	374.38	1228.28	W-168	105.62	375.62	1232.34
W-064	103.08	373.08	1224.01	W-169	105.54	375.54	1232.08
W-065	103.63	373.63	1225.81	W-170	105.44	375.44	1231.75
W-066	104.85	374.85	1229.81	W-171	105.01	375.01	1230.36
W-067	104.77	374.77	1229.55	W-172	105.27	375.27	1231.20
W-068	105.31	375.31	1231.34	W-173	104.77	374.77	1229.56
W-069	105.44	375.44	1231.76	W-174	105.43	375.43	1231.73
W-070	106.15	376.15	1234.10	W-175	107.00	377.00	1236.89
W-071	106.68	376.68	1235.84	W-176	105.60	375.60	1232.27
W-072	105.35	375.35	1231.48	W-177	108.39	378.39	1241.45
W-073	105.91	375.91	1233.29	W-178	108.19	378.19	1240.77
W-074	106.49	376.49	1235.19	W-179	108.51	378.51	1241.82
W-075	106.85	376.85	1236.37	W-180	108.31	378.31	1241.16
W-076	106.13	376.13	1234.03	W-181	107.90	377.90	1239.83
W-077	106.30	376.30	1234.57	W-182	107.85	377.85	1239.65
W-078	106.85	376.85	1236.37	W-183	107.29	377.29	1237.83
W-079	104.17	374.17	1227.60	W-184	106.82	376.82	1236.28

Label	Elevation	WTG AHD	WTG AHD(ft)	Label	Elevation	WTG AHD	WTG AHD(ft)
W-080	106.23	376.23	1234.36	W-185	107.00	377.00	1236.86
W-081	106.40	376.40	1234.91	W-186	106.99	376.99	1236.86
W-082	107.00	377.00	1236.87	W-187	107.52	377.52	1238.57
W-083	105.14	375.14	1230.76	W-188	107.29	377.29	1237.83
W-084	105.54	375.54	1232.08	W-189	107.83	377.83	1239.60
W-085	106.04	376.04	1233.72	W-190	108.80	378.80	1242.77
W-086	106.02	376.02	1233.66	W-191	108.09	378.09	1240.44
W-087	105.24	375.24	1231.11	W-192	107.19	377.19	1237.48
W-088	105.83	375.83	1233.05	W-193	106.48	376.48	1235.17
W-089	106.09	376.09	1233.89	W-194	107.59	377.59	1238.81
W-090	106.14	376.14	1234.04	W-195	106.66	376.66	1235.76
W-091	106.03	376.03	1233.70	W-196	107.90	377.90	1239.83
W-092	106.25	376.25	1234.43	W-197	107.71	377.71	1239.19
W-093	105.65	375.65	1232.45	W-198	107.70	377.70	1239.17
W-094	105.96	375.96	1233.46	W-199	107.87	377.87	1239.74
W-095	106.44	376.44	1235.03	W-200	107.67	377.67	1239.08
W-096	106.28	376.28	1234.51	W-201	107.14	377.14	1237.33
W-097	106.59	376.59	1235.54	W-202	107.53	377.53	1238.60
W-098	106.45	376.45	1235.09	W-203	106.85	376.85	1236.40
W-099	106.48	376.48	1235.16	W-204	107.24	377.24	1237.65
W-100	106.04	376.04	1233.72	W-205	106.79	376.79	1236.19
W-101	106.61	376.61	1235.59	W-206	106.91	376.91	1236.59
W-102	106.58	376.58	1235.49	W-207	107.04	377.04	1237.02
W-103	106.86	376.86	1236.42	W-208	106.78	376.78	1236.17
W-104	107.07	377.07	1237.12	W-209	107.03	377.03	1236.98

3.6.1.1 Hardstand areas

Each WTG is mounted on a reinforced concrete footing with a radius of about 30 metres, and would have a crane hardstand area of about 40 by 50 metres. The hardstand would be used for the assembly, erection, maintenance, repowering and/or decommissioning of a WTG.

During construction, the area around the hardstand would serve as a storage area for WTG construction components used to install the WTG. While indicative hardstand areas have been provided, the shape and exact size of the hardstand area would be dependent on the WTG model selected.

Filling and regrading would be undertaken to provide a level hardstand area for construction and maintenance of the WTGs. The detailed design and construction requirements of each WTG hardstand area would depend on topography. Filling, however, will be minimised where possible to mitigate potential obstruction to overland flows. Further information is provided in **Chapter 13** (water and soils).

Spoil and topsoil from footing excavation and hardstand regrading would be stockpiled and would be reused to backfill the foundation and for vegetation rehabilitation within the Project.

3.6.1.2 Micro-siting

Indicative WTG locations are shown in **Figure 1-2**. During Project detailed design and construction, WTGs may need to be relocated to up to 100 metres from the locations identified in this EIS due to potential technical, geotechnical or environmental requirements. This is referred to in the Wind Energy Guideline (DPE, 2016a) as “micro-siting". Other Project elements, including cabling and access tracks, may also be micro-sited.

In accordance with the Wind Energy Guideline (DPE, 2016a), it is not anticipated that micro-siting would materially increase the environmental impacts of the Project. Nevertheless, the potential variability of environmental impacts from micro-siting has been considered throughout this EIS.

3.6.2 Battery Energy Storage System

Storage of energy can add significant benefits to renewable energy 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 proposed BESS would provide firming capability for the wind energy being produced by the Project.

The BESS would cover a footprint of up to five hectares and would be built next to the central primary substation. The BESS would consist of battery modules and components, and ancillary infrastructure, such as overhead power lines. It would connect to the substations and the grid via underground and/or overhead cables. While the battery technology has not yet been determined, the BESS would have a capacity of up to 800 MW/800 MWh. An example of a BESS is shown in **Figure 3-4**. The most commercially suitable type would be chosen depending on the detailed design and financial modelling process. The specific design details of the BESS would not exceed the specifications assessed in **Section 16.5** (battery storage).

Two indicative locations for the BESS are shown in **Figure 1-2**. Filling would be required to raise the BESS configuration above the Probable Maximum Flood (PMF) for either Option 1 (0.3 metres) or Option 2 (0.8 metres). Further information is provided in **Chapter 13** (water and soils).

Figure 3-4 Example of a BESS

3.6.3 Electrical connections

3.6.3.1 Internal cabling within the Project

There would be two types of internal cabling within the Project:

- Underground or overhead cabling – connecting each WTG to each other and to the collector substations
- Overhead power lines – connecting each collector substation to the central primary substation.

Each WTG would have a transformer to transform the voltage of the electricity produced by the WTG for efficiency of transport. The transformer would be housed either within the nacelle or a separate enclosure within the WTG hardstand area. The transformed electricity would be transmitted to the closest collector substation via 33 kV or 66 kV cables, which run between each WTG. About 287 kilometres of underground cables would be required for the Project, the majority of which would be underground and along proposed access tracks (where possible).

The construction of underground cables would require the excavation of trenches about 0.5 metres in width and 1.2 metres in depth. Any overhead power lines would require the installation of poles about 200 metres apart, and construction would require a five to 10 metre radius disturbance area around each pole.

Overhead 33 kV or 66 kV power lines would then connect each collector substation to the central primary substation and BESS. About 60 kilometres of overhead power lines would be required for the Project. These would be single circuit or double circuit power lines. Where practicable, overhead power lines would be designed to minimise visual impacts and would follow access tracks.

Adjustment of internal cabling may be required to enable micro-siting of WTGs or other constraints identified during detailed design or construction.

3.6.3.2 Substations

As described above, electricity generated from the WTGs would be transported to one of eight proposed collector substations. Each collector substation would then connect into the proposed central primary substation and BESS.

Two indicative locations for the central primary substation have been assessed in this EIS (refer to **Figure 1-2**). A preferred option would be selected during detailed design and the unselected option would be used to site the eighth collector substation. An example of a typical substation is shown in **Figure 3-5**.

Figure 3-5 Example of typical substation

The primary purpose of the substations would be the receipt, transformation and transmission of the electricity generated by the WTGs and/or stored in the BESS. The substations would house transformers, switches and electrical equipment for the transformation and distribution of electricity.

The substation components would be located on hardstand foundations and would be surrounded by bunds and/or sumps. These would have sufficient capacity to retain the full volume of oil contained within each transformer in the unlikely event of a spill.

Connections to the required telecommunications services would be facilitated through cables, optical fibres and/or electromagnetic transmissions.

The substations would be contained within fenced enclosures to prevent unauthorised access. To reduce the risk of fires, an appropriate Asset Protection Zone (APZ) would be established around each substation in accordance with Planning for Bush fire Protection (Rural Fire Service (RFS), 2006) as described in **Chapter 16.4** (bush fire risk).

Night lighting would be installed at the substations to enable critical maintenance work to be undertaken safely at night. These lights would be of low intensity and directed downwards in accordance with relevant Australian Standards.

Filling would be required to raise the substations above the PMF, this includes:

- Central primary substation:
  - Option 1 (0.3 metres)
  - Option 2 (0.8 metres)
- Collector substations, between 0.2 and 0.7 metres.

Further information is provided in **Chapter 13** (water and soils).

3.6.3.3 Transmission line

An overhead transmission line of 330 kV or 500 kV would connect the central primary substation to Transgrid's Dinawan Terminal Station via McLennons Bore Road and Cadell Road (refer to **Figure 1-2**).

The transmission line would be up to 30 kilometres in length and would be suspended on up to 65 metre tall lattice steel towers spaced at intervals of about 200 to 400 metres, dependent on topography. It would be fitted with an earth wire to prevent lightning strikes being carried along the transmission line, and the towers would be fitted with insulators.

Construction would be within an existing easement. Some corridor vegetation may be trimmed and/or cleared if required for safety clearance.

The final design of the transmission line would be developed in consultation with Lumea and Transgrid, any other relevant authorities or landowners.

3.6.4 Temporary facilities

3.6.4.1 Construction compound

A construction compound would be erected and used throughout construction. An indicative location for the construction compound is shown in **Figure 1-2**. The construction compound would be up to one hectare and would include a site office, car park area, storage, and equipment laydown areas.

The construction compound would be dismantled following construction.

3.6.4.2 Gravel borrow pits and concrete batch plants

Up to two concrete batching plants would be used during construction to produce the concrete required for construction of hardstand areas and other ancillary infrastructure. The batching plants would include loading bays and hardstand areas, materials storage, stockpiles of gravel and sand, and water storage. The concrete batching plants would be located adjacent to the construction compound.

Gravel for concrete production may be sourced from gravel pits as required.

3.6.4.3 Construction access tracks

About 270 kilometres of internal access tracks would provide access to and from the WTGs, the temporary facilities and other construction areas as required. Where possible, existing tracks would be utilised to avoid further disturbance. Where necessary, tracks would be cleared of vegetation and stabilised, but would not be paved or asphalted unless required by and in negotiation with landowners. Access tracks would be retained following construction to allow for maintenance of the WTGs.

3.6.5 Permanent ancillary infrastructure

3.6.5.1 Operation and maintenance facility

Up to 30 operational staff would be required to oversee the operation of the Project and carry out routine inspections and maintenance. An operation and maintenance facility would be constructed to act as an administrative office and control room for these workers during the operation of the Project. An indicative location for the operation and maintenance facility is shown in **Figure 1-2**.

The operation and maintenance facility would include:

- A main control room
- Offices and amenities for operational staff
- Storage and laydown areas for equipment and materials
- Water tanks and a septic system
- A car park for workers.

Night lighting would be installed at the operation and maintenance facility to enable critical maintenance work to be undertaken safely at night. These lights would be of low intensity and directed downwards in accordance with relevant Australian Standards.

3.6.5.2 Communications

Fibre-optic communications cables would be installed between each WTG and the operations and maintenance facility to allow for remote operation of each WTG. These cables would be installed with the internal cabling described in **Section 3.6.3.1** to minimise ground disturbance.

An external communications network for operational workers may also be established. This network could consist of equipment mounted on masts to allow for radio and microwave transmissions and improve mobile phone reception.

3.6.5.3 Permanent meteorological masts

Up to eight permanent meteorological monitoring masts could be installed to verify wind speed and confirm the generation performance. The indicative locations for the masts are shown in **Figure 1-2**. The masts would consist of a guyed lattice tower and be at the hub height of the WTGs.

The masts would be equipped with instruments to measure wind speed and direction, pressure and temperature at various levels.

During detailed design, any required marking and lighting of the permanent meteorological monitoring masts will be confirmed. These would be developed in line with the National Airports Safeguarding Framework (NASF) Guideline D (Department of Infrastructure and Regional Development, Australian Government, National Airport Safeguarding Framework, 2013) and best practice. Further information is provided in **Section 16.1** (aviation safety).

3.6.5.4 Permanent internal access tracks

The temporary internal access tracks described in **Section 3.6.4.3** would be retained and used as permanent access tracks where required. These tracks would provide access to and from the WTGs, the central primary substation, collector substations and the operation and maintenance facility to allow for worker and maintenance access. Tracks maintenance would be undertaken as necessary.

3.6.6 Imported materials

Materials used for construction would be sourced in situ where practicable. Where required, materials such as gravel and sand for concrete production would be obtained from the nearest appropriate material providers. Further discussion on materials is provided in **Chapter 20** (greenhouse gas) and **Chapter 19** (waste management).

During construction, the most substantial water demand is expected to be for dust suppression, followed by concrete batching and soil conditioning for road construction. The total water demand

for the Project construction is discussed in **Section 3.5**. Operational water demands would be substantially reduced from even the lowest periods of construction demand.

3.6.7 Access and road network upgrades

3.6.7.1 Public road access route

Access to the Project would be via a designated and upgraded access track from Liddles Lane, four kilometres east of Wilson Road (refer to **Figure 1-2**). The site access would involve upgrades to existing roads in accordance with relevant guidelines.

The WTG components are expected to be shipped to the GeelongPort and then transported to the Project via the road network. Oversize and/or overmass (OSOM) vehicles would be required to deliver the turbine components to the Project. Further information on OSOM routes is provided in **Chapter 12** (traffic and transport).

3.6.7.2 Public road and infrastructure upgrades

An OSOM route assessment was conducted to identify potential issues and pinch points on the proposed OSOM haulage routes from GeelongPort to the Project. In addition, a series of swept path assessments of intersections were undertaken using AutoTURN to identify locations where civil work or modifications would likely be required to facilitate the delivery of OSOM components to the Project.

Table 3-6 provides the schedule of proposed road and intersection upgrade work within NSW only, for the proposed OSOM route. The site-specific upgrades would be assessed in greater detail once the WTG design and transporting vehicle dimensions are confirmed and as part of the OSOM Transport Management Plan. This is discussed further in **Chapter 12** (traffic and transport).

Discussions with and approval from the relevant road authorities have been commenced to undertake the modifications (e.g. temporary road sign removal) or upgrades to the road network. No Crown roads are proposed to be upgraded, however, authority to access and/or use Crown roads during the construction or operation of the Project is being sought as part of this EIS from DPE. Further structural investigation will be undertaken for culverts and underground services in collaboration with the relevant road authorities once the final route and the vehicle specifications and loads are confirmed.

Table 3-6 Schedule of proposed road upgrades

Intersection / road	Road authority	Proposed upgrade	Timing
Intersection of Newell Highway with Conargo Road, Jerilderie	Murrumbidgee Council	Temporary removal of road signs and street lighting	As required to accommodate OSOM vehicle movements
Intersection of Newell Highway and Kidman Way	Murrumbidgee Council	Minor earthworks to provide level roadside environment to support the path of travel	Prior to delivery of OSOM components to Project
Intersection of Kidman Way and Jerrys Lane	Murrumbidgee Council	Additional hardstand required to accommodate the vehicle swept path; as well as extension and protection of existing culvert to sustain vehicle loads	Prior to delivery of OSOM components to Project

Intersection / road	Road authority	Proposed upgrade	Timing
Jerrys Lane	Murrumbidgee Council	Vegetation clearing / trimming and road widening as required along Jerrys Lane to provide a clear path of travel, as well as consideration of surface treatment and drainage upgrades to ensure all weather access is achievable	Prior to delivery of OSOM components to Project
Intersection of Jerrys Lane and Liddles Lane	Murrumbidgee Council	Vegetation clearing and local road widening to accommodate the vehicle swept path	Prior to delivery of OSOM components to Project
Liddles Lane	Murrumbidgee Council	Vegetation clearing / trimming and road widening as required along Liddles Lane to provide a clear path of travel, as well as consideration of surface treatment and drainage upgrades to ensure all weather access is achievable	Prior to delivery of OSOM components to Project
Bend on Liddles Lane, east of Wilson Road	Murrumbidgee Council	Local widening of road footprint as required	Prior to delivery of OSOM components to Project
Intersection of Liddles Lane and Wilson Road	Murrumbidgee Council	Vegetation clearing and local road widening to accommodate the vehicle swept path	Prior to delivery of OSOM components to Project
Wilson Road	Murrumbidgee Council	Vegetation clearing / trimming and road widening as required along Wilson Road to provide a clear path of travel, as well as consideration regarding surface treatment and drainage upgrades to ensure all weather access is achievable	Prior to delivery of OSOM components to Project
Intersection of Wilson Road and Moonbria Road	Murrumbidgee Council	Vegetation clearing and local road widening to accommodate the vehicle swept path	Prior to delivery of OSOM components to Project
Moonbria Road	Murrumbidgee Council and Edward River Council	Vegetation clearing / trimming and road widening as required along Moonbria Road to provide a clear path of travel, as well as consideration to surface treatment and drainage upgrades to ensure all weather access is achievable	Prior to delivery of OSOM components to Project
Wilson Road bridge over Yanco Creek	Murrumbidgee Council	Bridge weight structure will be assessed to determine suitability for equipment and load combination to be transported along this route	Prior to delivery of OSOM components to Project

3.7 Progressive rehabilitation

As construction is progressively completed, temporary plant and equipment would be removed as they are no longer required. Disturbed areas that would not be required for operational activities would be progressively revegetated and rehabilitated.

Sediment and erosion controls would be established as described in **Chapter 13** (water and soils).

3.8 Refurbishment

Following the end of economic life, the Project would either be decommissioned or refurbished with upgrades to power generation infrastructure.

Individual WTGs are expected to have an operational lifespan of about 30 years. Depending on the model of WTG selected, some or all of the major components would be replaced to ensure its ongoing safe operation. Wherever possible, the concrete foundations and towers would be reused for the refurbished WTGs.

The access tracks established during the initial construction phase would continue to be used for Any required refurbishment work. The refurbishment process would be similar to the original construction of the WTGs. WTGs that are not refurbished would be decommissioned as described in **Section 3.9**.

3.9 Decommissioning

When decommissioned, the Project would be rehabilitated to its pre-construction conditions. The decommissioning process would generally involve the removal of above ground infrastructure, including WTGs, electrical infrastructure and maintenance buildings unless required for the future land use of the Project. If a future use is identified for any above ground infrastructure associated with the Project, that infrastructure may be retained in agreement with the interested stakeholders. Otherwise, all above ground electrical infrastructure would be removed during Project decommissioning.

Underground infrastructure such as underground cables and footings, would generally remain in situ to avoid further disturbance. Some infrastructure, such as access tracks and laydown areas, may be of benefit to the landowners and may be retained in situ following an agreement with the landowners.

During decommissioning, existing access tracks would generally be used for equipment access and removal of materials from the Project. The dismantled infrastructure components would generally be sold as parts or scrap materials. All waste would be recycled where practical, or, where necessary, disposed of in a relevantly licensed facility as described in **Chapter 19** (waste management).

Disturbed areas would be rehabilitated to meet the intended final land use and be comparable with pre-construction conditions in consultation with landowners.

The decommissioning process for the Project is further described in **Table 3-7**.

Table 3-7 Decommissioning process

Component	Decommissioning activity
WTGs	• Disconnection • Drainage of liquids, including oils and lubricants, and safe disposal of drained liquids • Disassembly of components using a crane • Remove all items to ground level • Foundations would be left below ground and covered with topsoil • Transportation of components
WTG hardstand areas	• Reduced to access track size or left if requested by the landowners
Substations	• Deactivation of transformer and other infrastructure • Drainage of liquids, including oils and lubricants, and safe disposal of drained liquids • Disassembly of components
Transmission line and cables	• The overhead portion of the transmission line would be dismantled and removed unless retained in agreement with an interested stakeholder for the future land use of the area • Underground cables and the underground portion of the transmission line would remain in situ
Access tracks	• Access tracks would be retained if requested by a landowner • If not retained, gravel and underlying layers of the access tracks would be removed and either used as fill in the rehabilitation of the area or transported off-site, and culverts, crossings and drainage structures would be removed
Operation and maintenance facility and other buildings	• Buildings would be retained in agreement with an interested landowner for the future land use of the area • If not retained, buildings would be demolished in accordance with relevant standards in agreement with landowner

3.10 Alternatives considered

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

- Option 1 – 'do nothing'
- Option 2 – up to 225 WTGs located in other areas within the Project
- Option 3 – up to 225 WTGs located within the area identified in **Figure 1-2** (the Project).

Option 1 (do nothing) does not meet the NSW need for generation capacity or the Commonwealth and State climate change commitments to transition to renewable energy generation and greenhouse gas emission reductions. Further, the future security and reliability of electricity supply in NSW would be weakened as a result of planned closures of coal power stations by 2030. In addition, not proceeding with the Project would result in the loss of significant financial benefit to the region (approximately $3.45 billion), and sufficient clean energy to power the equivalent of approximately 700,000 homes would not be realised. Based on these considerations, Option 1 (do nothing) 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 (i.e. good social licence)
- Suitable renewable energy resource potential
- Proximity to Transgrid's 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 areas considered:

- Based on preliminary ecological surveys, Project elements have been situated to avoid impacts to high integrity endangered ecological communities (EECs) where possible
- Following preliminary predictive modelling of archaeological potential within the Project, 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 were reduced from 245 to around 225 during pre-scoping phase to increase setbacks from neighbouring properties and to reduce impact on flora and fauna
- Preliminary feedback from landowner consultation has been positive.

The Project design has been further refined since the Scoping Report was exhibited in April 2022. The revisions have occurred in response to community and stakeholder engagement and technical investigations. These include the following changes for which approval is sought and as assessed in this EIS:

- A nominal 225 WTGs were reduced to 208 WTGs
- Option 1 has been selected for the preferred transmission line due to wide road reserves and positive feedback from Council in response to this strategy. Option 2 to Option 4 are less preferred as power line routes as easements as this would require easements through neighbouring Non-associated properties.
- Revision of WTGs and cabling tracks to avoid biodiversity values including:
  - Plains-wanderer important area mapping
  - Threatened flora populations (such as *Swainsona murrayana* and *Swainsona sericea*)
  - Eucalypt woodland with hollow bearing trees
  - Paddock trees with large stick nests, typically for Wedge-tailed Eagle and other raptor species
  - Creeks/riparian areas and low lying areas with Lignum/Nitre Goosefoot swamps
  - Proximity of the disturbance footprint to known biodiversity conservation sites
- Maximising use of existing access tracks, non-native vegetation and lower condition vegetation of the sitting of Project infrastructure
- Removal of WTGs to avoid areas of high archaeological potential to contain Aboriginal objects
- Movement of WTGs to avoid impacts to road users and Non-associated Landowners.

A comparison of the Scoping Report and EIS Project designs is shown in **Figure 3-6**.

At time of lodgement of this 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 assessments in **Chapter 7** to **Chapter 21**.

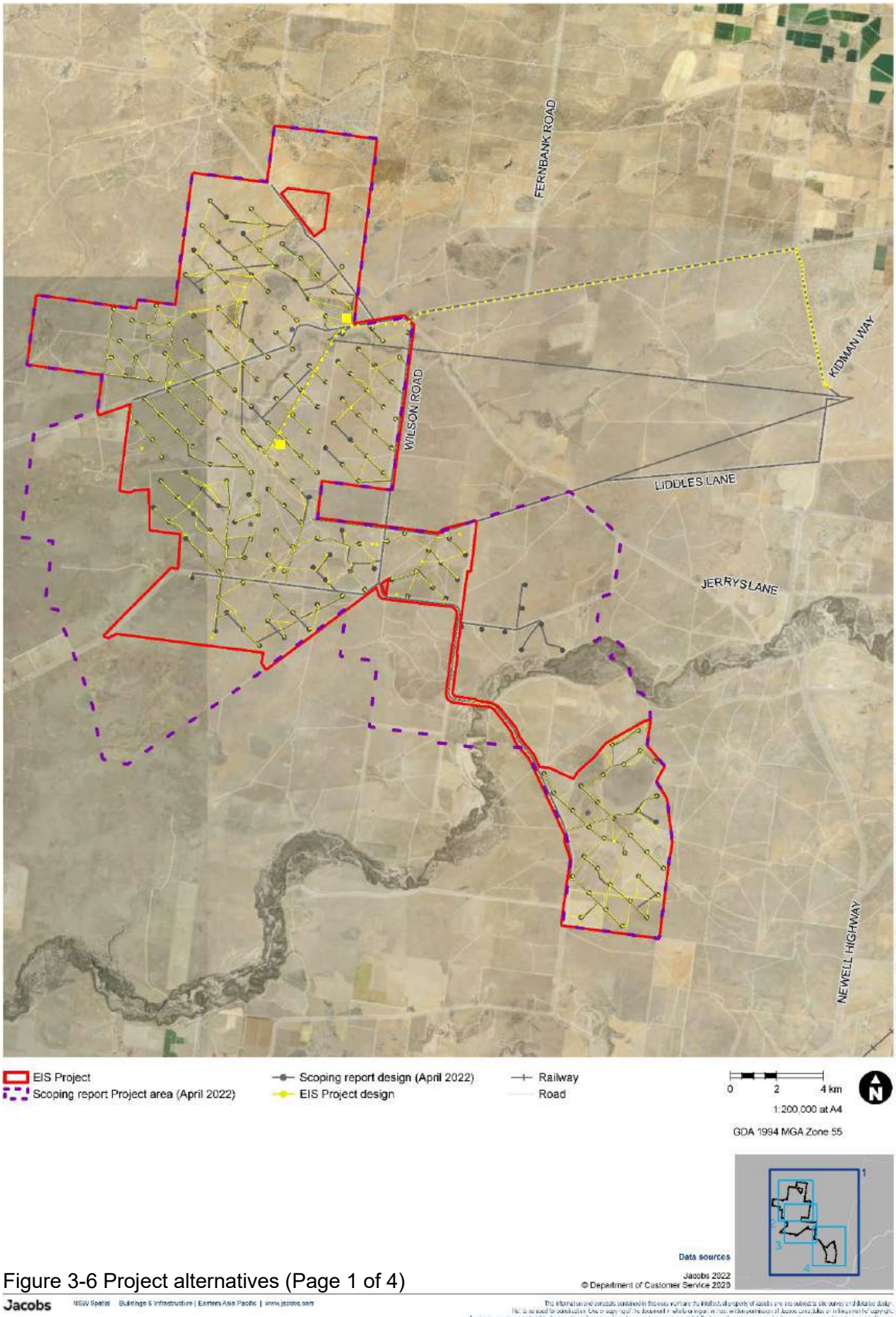

Figure 3-6 Project alternatives (Page 1 of 4)

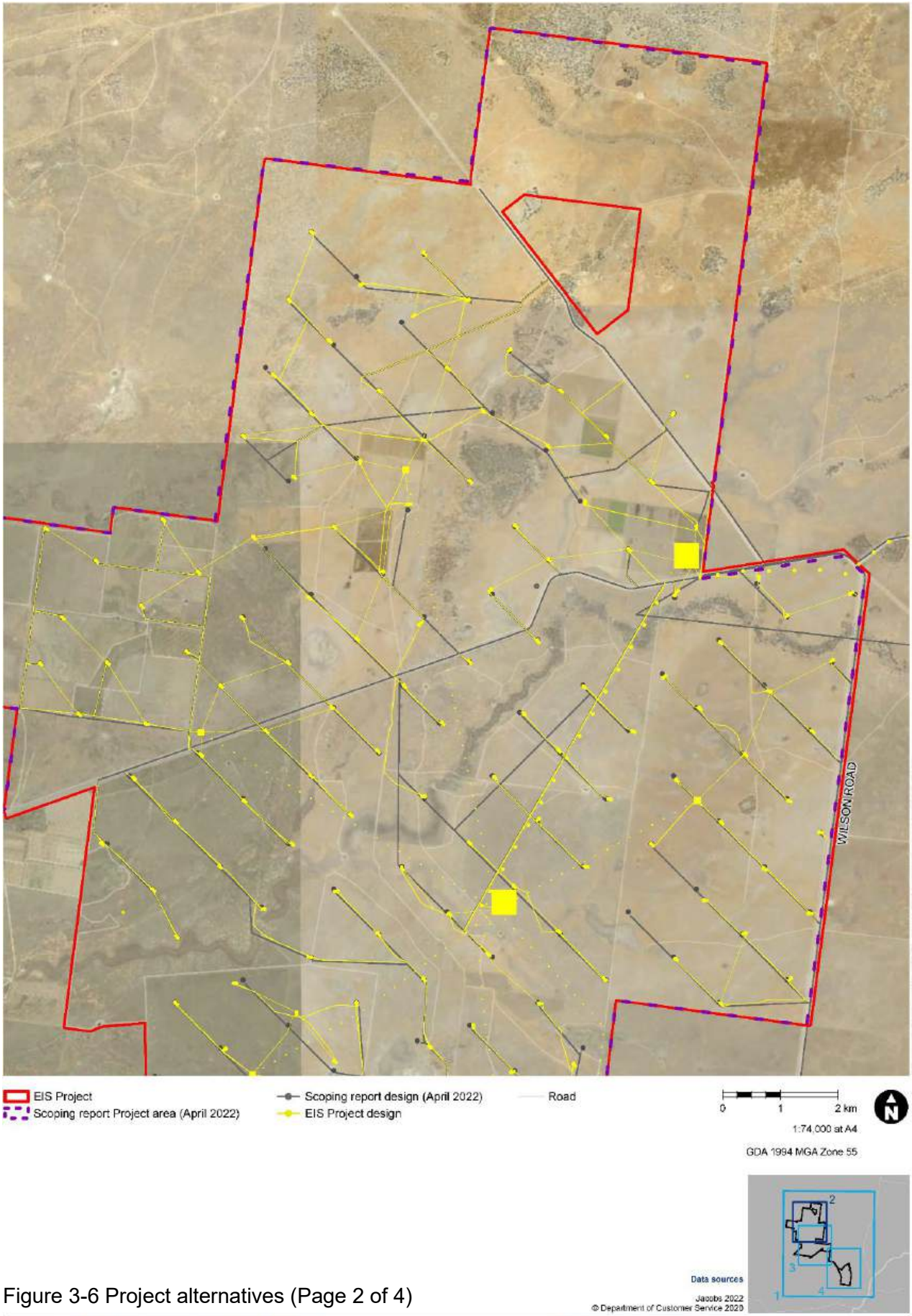

Figure 3-6 Project alternatives (Page 2 of 4)

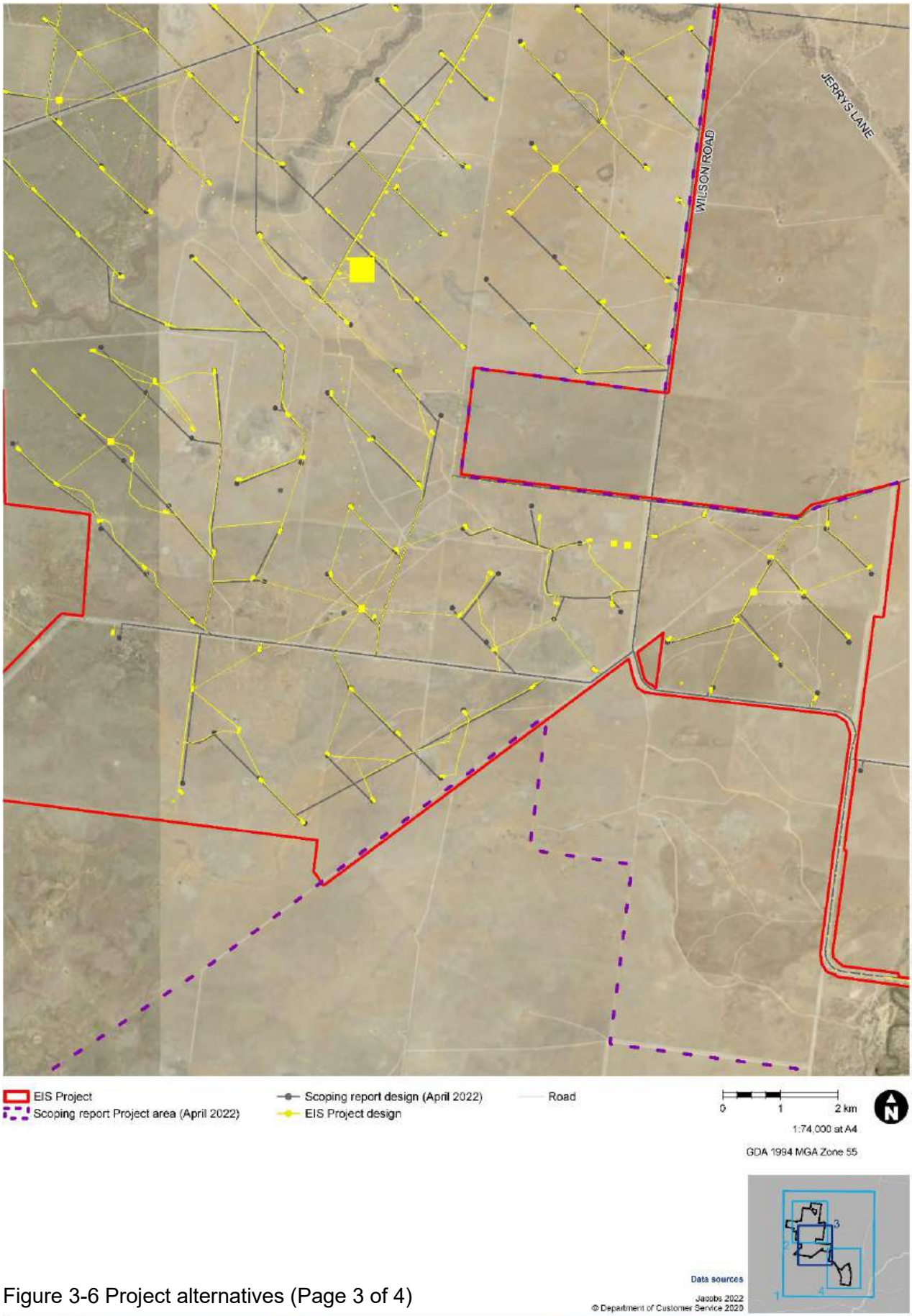

Figure 3-6 Project alternatives (Page 3 of 4)

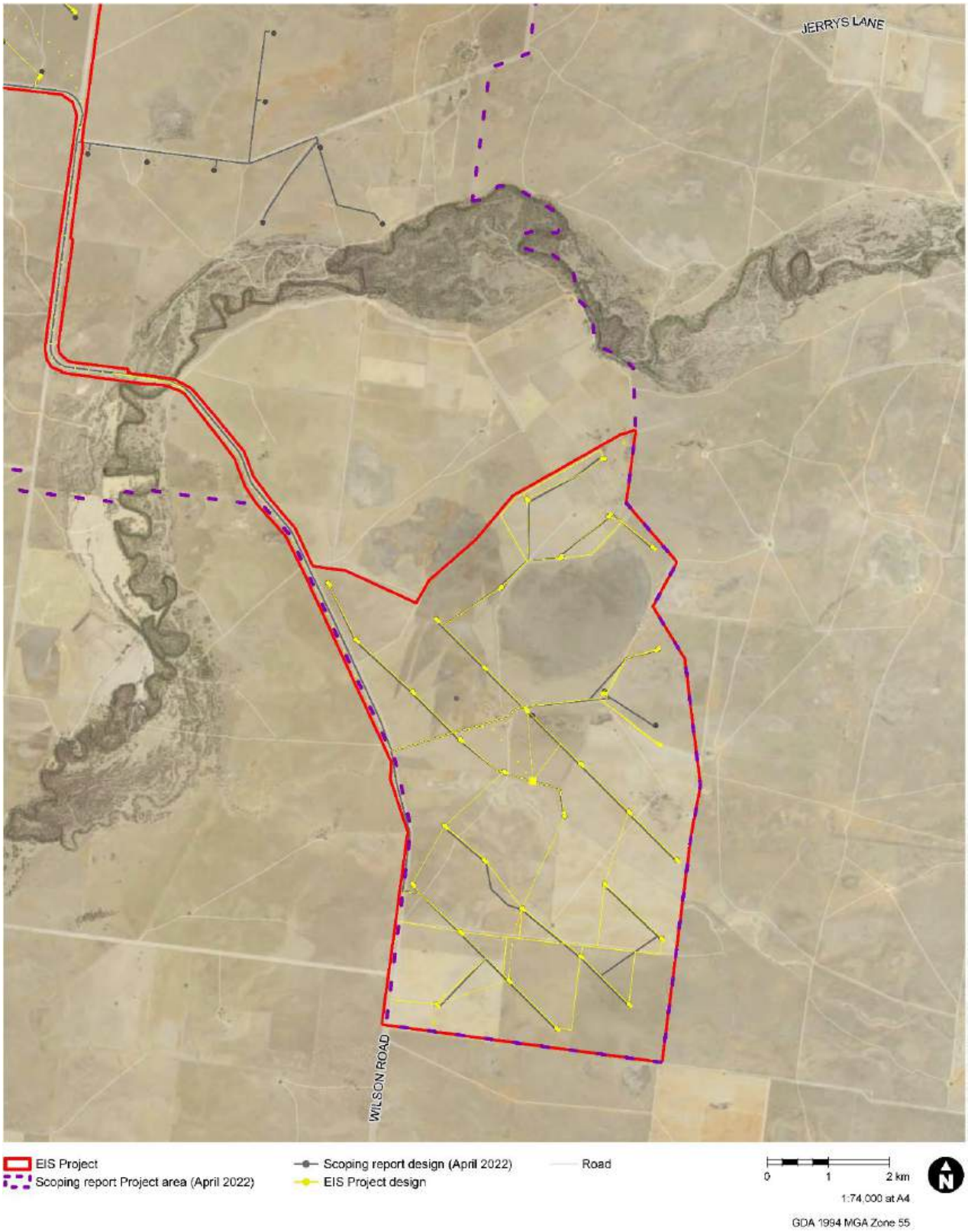

Figure 3-6 Project alternatives (Page 4 of 4)

4. Statutory context

This chapter identifies the relevant NSW planning framework and statutory requirements for the Project.

4.1 NSW planning framework

The EP&A Act and the Environmental Planning and Assessment Regulation 2021 (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 (Planning Systems SEPP).

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 work and capital investment value of more than $30 million).

The Project is defined as electricity generating work and has a capital investment value (CIV) estimated to exceed 30 million Australian 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 prepared by or on behalf of the applicant in the form prescribed by the Regulations.

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.

The matters for consideration and where they have been addressed in this EIS is provided in **Table 4-1**.

Table 4-1 Section 4.15 Matters for consideration

Matters for consideration	Where this is addressed
(a) the provisions of:	
(i) any environmental planning instrument that apply to the land to which the development application relates	**Section 4.2.4**
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved) that apply to the land to which the development application relates	**Section 4.2.4**
(iii) any development control plan that apply to the land to which the development application relates	Not applicable under section 2.10 of the Planning Systems SEPP, which excludes the application of development control plans to SSD projects
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4 that apply to the land to which the development application relates	**Section 2.3**
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates	**Appendix C**
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	**Chapter 7** to **Chapter 21**
(c) the suitability of the site for the development that apply to the land to which the development application relates	**Section 2.2** and **Section 23.1.1**
(d) any submissions made in accordance with this Act or the regulations	To be addressed following public exhibition
(e) the public interest.	**Chapter 5** and **Chapter 17**

4.2.2.1 Further considerations under the EP&A Act

The relevant mandatory provisions of the EP&A Act are identified in **Table 4-2**.

Table 4-2 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 Planning Systems SEPP being 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 Part 4, 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 is described throughout **Chapter 5** (engagement).
Section 4.40 Evaluation	The application is to be determined under Section 4.15 of the EP&A Act (refer to **Table 4-1**)

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 4-3**.

Table 4-3 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 near the Project. No impacts to the heritage items or value are expected as a result of the Project (refer to **Chapter 11** (historical heritage)).
An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974* (NPW Act)	Impacts to Aboriginal heritage are considered in **Chapter 10** (Aboriginal heritage). The Project design would avoid the following Aboriginal sites; Yanco Delta PAD 01, Yanco Delta AS PAD 01, Yanco Delta AS PAD Hearth 01 and Yanco Delta AS PAD 02 Where possible, impacts to the remaining Aboriginal sites would be avoided with micro-siting of Project elements during detailed design, to allow them to be conserved in situ. Where conservation is not practical, salvage of surface artefacts or preliminary excavation will be carried out at the following sites: • Where harm to Yanco Delta AS Hearth 01, Yanco Delta AS Hearth 02, Yanco Delta AS 01, Yanco Delta Hearth 01 is unavoidable, a program of preliminary excavation would occur

Approval	Consideration
	at each location, which would allow management and mitigation measures to be determined. These measures • Where harm to PEC-E-G2 (AHIMS ID 55-1-0052); PEC-E-43 (AHIMS ID 55-1-0053) is unavoidable, surface collection of artefacts salvage would be completed under the authorisation of the Minster's Conditions of Approval. However, neither site was relocated during the survey, likely as a result of their position on an area of sheet erosion. A Cultural Heritage Management Plan (CHMP) will be developed to provide guidance on the proposed archaeological excavations, as well as a procedure for the identification of unexpected Aboriginal objects and the long-term management of Aboriginal objects retrieved from archaeological excavations. Further details are provided in **Chapter 10** (Aboriginal heritage).
Bush fire safety authority under section 100B of the *Rural Fires Act 1997*	The Project would be located within identified bush fire prone land. Potential risks associated with bush fire and proposed bush fire protection measures are discussed in **Section 16.4** (Bush fire risk).
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 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 involve trenching through waterways and other construction work within 40 metres of waterways, however, a controlled activity approval is not required for the Project which falls under the exemptions listed in Section 4.41 of the EP&A 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 4-4**.

Table 4-4 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*	There are no identified active mineral exploration licences within the Project.
A production lease under the *Petroleum (Onshore) Act 1991*	The Project would not involve petroleum production and no production lease is required.

Approval	Consideration
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)	The Proponent would seek an EPL prior to the start of construction.
A consent under section 138 of the *Roads Act 1993*	Consultation has started to gain consent from the relevant road authorities for proposed road upgrades to access the Project (refer to **Table 3-6**).
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 4-5**.

Table 4-5 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. The potential for contaminated soil to exist within the Project is low. Potential risks associated with contamination are considered in **Chapter 13** (water and soils).
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 Project would involve the removal of 173.39 hectares of native vegetation, and two threatened ecological communities (TEC) listed under the BC Act, these are: • Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions, listed as EEC • Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions, listed as EEC. Potential biodiversity impacts are considered in **Chapter 9** (biodiversity).
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. Details regarding biosecurity risk is discussed in **Chapter 9** (biodiversity) and **Chapter 15** (land).
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 within the Project.

Legislation	Requirement
	The Project would not occupy Crown land, with the exception of the internal cabling and the proposed transmission line. Sections of Crown roads may be used for vehicular access to permanent ancillary infrastructure and temporary facilities. Authority to access and / or use Crown roads during the Project construction is being sought as part of this EIS from DPE in accordance with the *Crown Land Management Act 2016* and the *NSW Roads Act 1993.*
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 Project. One listed heritage item is located within visual impact study area (eight kilometre buffer zone), The Yanko Station Store, listed as 'State significant' on the SHR (02439) Potential heritage impacts are considered in **Chapter 11** (historical heritage).
Native Title (New South Wales) Act 1994	This Act provides for native title in relation to land or water. The Project would 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 would fall within land reserved under the *National Parks and Wildlife Act 1974* or NSW National Parks owned or managed lands. Potential Aboriginal heritage impacts are considered in **Chapter 10** (Aboriginal heritage).
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, which are considered in **Chapter 8** (noise and vibration), **Chapter 13** (water and soils), **Chapter 14** (air quality) and **Chapter 19** (waste management).
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. Consent will be sought from the relevant road authorities for proposed road upgrades to access the Project (refer to **Table 3-6**).
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.

Legislation	Requirement
	The proposed transmission line connecting the Project to Transgrid's Dinawan Terminal Station forms part of this Project.
Waste Avoidance and Resource Recovery Act 2001	This Act encourages the most efficient use of resources in order to reduce environmental harm. Potential waste impacts are considered in **Chapter 19** (waste management).

4.2.4 NSW environmental planning instruments

Relevant SEPPs and LEP to the Project have been considered in **Table 4-6**.

Table 4-6 Relevant NSW environmental planning instruments

Environmental planning instrument	Considerations
State Environmental Planning Policy (Planning Systems) 2021	The Project is classified as SSD under Section 2.6(1), in conjunction with Section 20 of Schedule 1 of the Planning Systems SEPP 2021.
State Environmental Planning Policy (Transport and Infrastructure) 2021	The aim of the State Environmental Planning Policy (Transport and Infrastructure) 2021 is to facilitate effective delivery of infrastructure projects across NSW. The Project is 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 (Resilience and Hazards) 2021	The object of Chapter 4 (Remediation of land) of the State Environmental Planning Policy (Resilience and Hazards) 2021 is to provide for a State-wide 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: It has considered whether the land is contaminated, and • 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 • 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. The potential for contaminated soil to exist within the Project is low. Potential contamination risks are considered in **Chapter 13** (water and soils).
State Environmental Planning Policy (Resilience and Hazards) 2021	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.

Environmental planning instrument	Considerations
	Section 3.12 of the State Environmental Planning Policy (Resilience and Hazards) 2021 specifies that the consent authority must consider: • Current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development • Whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply • 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 • 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) • 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, a preliminary hazard analysis has been prepared as described in **Section 16.5** (battery storage)
State Environmental Planning Policy (Primary Production and Rural Development) 2019	Clause 11 states that land is State significant agricultural land if it is listed in Schedule 1 of the Rural SEPP. However, Schedule 1 does not list any State significant agricultural land (SSAL) at present. A draft map of SSAL has been developed and was included in this assessment (refer to **Section 2.1.1**). Potential impacts to agricultural land is presented in **Section 15** (land)
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 is located on land zoned RU1 – Primary Production. Other applicable sections of the LEP which need to be considered in relation to specific mandatory considerations prior to the issue of development consent include: • Section 5.10 heritage conservation • Section 5.21 flood planning • Section 6.1 earthworks • Section 6.3 terrestrial biodiversity • Section 6.4 groundwater vulnerability • Section 6.5 riparian land and watercourses • Section 6.6 wetlands and watercourses. The majority of the Project 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, potential biodiversity impacts are considered in **Chapter 9** (biodiversity).
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 is zoned RU1 – Primary Production.

Environmental planning instrument	Considerations
	Other applicable sections of the LEP which need to be considered in relation to specific mandatory considerations prior to the issue of development consent include: • Section 5.10 heritage conservation • Section 5.21 flood planning • Section 6.1 earthworks • Section 6.4 terrestrial biodiversity • Section 6.5 groundwater vulnerability • Section 6.6 riparian land and watercourses • Section 6.7 wetlands and watercourses • Section 6.8 essential services. The majority of the Project 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, potential biodiversity impacts are considered in Section **Chapter 9** (biodiversity).

4.2.5 Commonwealth environmental legislation

4.2.5.1 Environment Protection and Biodiversity Conservation Act 1999

The 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. 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 and Water.

In February 2015, a bilateral agreement was made under Section 45 of the EPBC Act between the Commonwealth of Australia and the State of NSW relating to environmental assessment. This bilateral agreement was amended (Amending Agreement No.1) effective 24 March 2020 to reflect changes to the EP&A Act, in particular the repeal of the *Threatened Species Conservation Act 1995* and replacement with the *Biodiversity Conservation Act 2016* (BC Act).

Under Amending Agreement No.1, the BAM and Biodiversity Offsets Scheme (BOS), as introduced under the BC Act are Accredited processes. A proponent must make a Referral under section 68 of the EPBC Act if the proposed action has the potential to result in significant impacts to MNES.

The Project was referred to DCCEEW on 12 April 2022. The Project was deemed to be a controlled action under Section 75 of the EPBC Act on 28 June 2022 (EPBC Referral 09214) for the following relevant controlling provisions: Listed threatened species and communities (sections 18 & 18A). Approval is also sought under section 75 of the EPBC Act (EPBC Approval).

The assessment path for the Project is under the bilateral agreement between the Commonwealth and NSW Governments and DCCEEW has issued its assessment requirements which have been incorporated into the SEARs for the Project (refer to **Appendix B**). This EIS addresses the assessment requirements, with a summary of the assessment findings related to MNES included in **Section 9.3.8** (biodiversity).

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.

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.

Consultation has been undertaken with Airservices Australia to assess potential impacts of the Project and to address the lowest safe altitude (LSALT) impact of air route W419 and Grid LSALTs in the vicinity of the Project which will need to be raised. The CASR are considered in **Section 16.1** (aviation safety).

4.3 Summary of licences and approvals

A summary of the approvals, permits or authorisations required for the Project is provided in **Table 4-7.** No other licences and permits under other legislation would be required by the Project prior to commencement of construction. Network connection agreements with Transgrid and Energy Co. are being progressed separately.

Table 4-7 Summary of licenses and approvals required

Legislation	Requirement	Authority
EP&A Act	Approval under section 4.36 as SSD	Minister for Planning
EPBC Act	Controlled activity approval in accordance with the Amended Bilateral Agreement No 1	Federal Minister for the Department of Climate Change, Energy, the Environment and Water
POEO Act	An EPL	NSW Environmental Protection Authority
Roads Act 1993	Approval under Section 138 for proposed road upgrades	• Department of Transport (Victoria) • Transport for NSW • Murrumbidgee Council • Edward River Council
Civil Aviation Regulations 1988	Approval to raise the lowest safe altitude (LSALT) impact of air route W419 and Grid LSALTs near the Project	Civil Aviation Safety Authority

5. Engagement

This chapter provides a summary of the community and stakeholder engagement undertaken for the Project and its key findings. It also provides an overview of the overall engagement objectives and strategy for the Project, the engagement process, the findings that have been incorporated into this EIS and the Proponent's commitment to ongoing engagement.

5.1 Community and Stakeholder Engagement Strategy and Approach

The Community and Stakeholder Engagement Strategy for the Project (Jacobs, 2022b) is in line with the International Association of Public Participation (IAP2) Public Participation Spectrum. In addition, the strategy has been developed in accordance with the Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021a), the Community Participation Plan (DPIE, 2019) and consultation requirements detailed in the NSW Wind Energy Visual Assessment Bulletin (DPE, 2016b).

The Community and Stakeholder Engagement Strategy describes the overall approach for engagement and communication for the Project during the planning and approval phase, but also more broadly. It outlines:

- How stakeholders and community members would be provided with information about the Project and via what engagement methods
- How stakeholders and community members would be presented with the opportunities to provide input
- How this stakeholders and community feedback would be considered and responded to.

The strategy identifies the stakeholders with an interest in the Project and who are likely to be impacted (refer to **Section 5.5.1**). This includes Host Landowners, Associated Landowners, near neighbours, local community, Councils and government agencies. It includes early engagement activities which have been undertaken to date, whilst also providing a detailed plan on how engagement would be carried out into the future. The engagement activities undertaken and proposed, including community information sessions and face-to-face briefings, have actively sought to present the community and stakeholders with an introduction and understanding of the Project and provide them with the opportunity to provide feedback.

The engagement approach has been shaped by the Project's proposed location within the South West REZ. The planned REZ would include new electrical infrastructure and has sparked considerable interest as a potential site for several other renewable energy projects. Proponents for each of these other projects have already held several consultation sessions with the local community. To avoid consultation fatigue and disengagement among the community and stakeholders, engagement activities have been targeted and staggered in the early phases of the Project, including during the scoping of the Project and the SEARS application process.

In the initial phases of the Project, engagement has focused on key stakeholders. This includes landowners within the Project, near neighbours (within eight kilometres of the Project), government representatives, Aboriginal representatives, and energy industry organisations and businesses. During the preparation of this EIS, engagement has been extended to focus on engaging with the wider stakeholders and community, while continuing to build the relationships with key stakeholders.

5.2 Objectives

The communication and engagement objectives for the Project are to:

- Support the Project in securing environmental and planning approval by implementing a communication and engagement process which meets NSW government requirements and expectations
- Carry out an effective communication and engagement process that informs, consults and involves stakeholders as appropriate and manages expectations about influence levels
- Develop relationships with stakeholders by raising early Project awareness and gain an understanding of stakeholder issues, possible impacts and concerns
- Ensure stakeholders understand how to access information about the Project and build stakeholder capacity to provide informed feedback and input at all stages
- Record evidence of engagement activities undertaken to enable efficient statutory and environmental planning approvals.

5.3 Engagement tools

Table 5-1 outlines the range of engagement tools used to collect input from various stakeholders.

Table 5-1 Engagement tools

Tools	Description
Factsheets	• Used to communicate Project details including key facts and benefits, the South West REZ, the planning approval processes, and commonly expressed concerns • Typically between one to two pages that communicate information in an accessible short read format with the inclusion of text, infographics, maps and images • Distribution was via community drop in sessions, letter drop boxes and hand delivery to stakeholders; as well as via the Project website
Email, phone calls and visits to stakeholders	• Direct communication with stakeholders has been ongoing and is important where there are no other existing communication channels or where it is important to maximise the likelihood that stakeholders would receive Project information and foster trust between the Project team and stakeholders and the community
Stakeholder briefings (group or individual)	• Meetings with individual or groups of stakeholders to outline Project details and understand their concerns, in addition to providing further information
Drop-in sessions	• The Project team presented Project information at a high-level in an informal setting • The sessions allowed for stakeholders to ask questions and provide feedback on or input to Project decision-making

5.4 Community consultation overview

Engagement with the community commenced in 2020 to:

- Build Project awareness among the community
- Commence conversations with potential near neighbours to understand their needs and foresee any potential impacts
- Encourage the community to ask questions and share their feedback
- Foster meaningful relationships with the community.

In the initial stages of the Project, consultation was staged over two phases. Firstly, engagement focused on key stakeholders including host landholders, near neighbours, government agencies and local councils. After this first phase, engagement was extended to the broader community. Consultation has also informed the Scoping Report for the Project and in preparation of the EIS and specialist assessments, in particular the Social Impact Assessment and the Landscape and Visual Impact Assessment. A summary of the community engagement that has been undertaken is provided in the following sections. This includes the engagement mechanisms employed and the feedback provided.

Virya Energy is also a major sponsor of the Jerilderie Football Netball Club, Jerilderie Race Club's Annual 'Gold Cup' race day, the community's Monash-Kelly landmark statue and Jerilderie Sports Club (Golf, Bowls, Tennis, etc.).

It is important to note that while this consultation summary report covers engagement activities completed to September 2022, Virya Energy intends to continue engaging with the community and stakeholders throughout the Project life cycle.

5.4.1 Community engagement mechanisms

Preliminary analysis of the existing social environment noted that communities in the study area are home to an ageing population. In response, engagement activities and tools for the EIS were designed to highly accessible and user friendly to reflect the targeted audience, and included letter box drops of factsheets and in person community information.

The engagement mechanisms that have been used for the Project with the community are detailed in **Table 5-2**.

Table 5-2 Community consultation – Engagement mechanisms

Mechanism	Target audience	Date	Description and feedback
Landowner meetings	• Near neighbours/ landowners within 10 km of the Project	Ongoing since November 2020	Ongoing face to face and phone briefings with landowners and near neighbours. In these briefings stakeholders have been introduced to the Project, provided with detailed Project information and provided with an opportunity to express concerns. About 15 host landowners and near neighbours have been consulted.
Community drop-in session	• Wider community • Near neighbours	March 2022 July 2022	Community drop-in sessions were held at Jerilderie IGA in March 2022 and at the Jerilderie Football and Netball Club in July 2022, where the community was invited to view Project posters, maps and ask the team any questions about the Project.
Factsheets	• Wider community • Near neighbours	August, 20022	To date, five factsheets have been developed for the Project. Further factsheets will be developed to respond to community concerns as they are expressed and also to summarise the finding of the technical reports undertaken as part of the EIS.
Community survey	• Wider community • Near neighbours	March - April 2022	A community survey was used to capture community feedback on the Project to inform the scoping report. Thirteen surveys were completed, and the outcomes are incorporated in the LVIA.
SIA interviews/ personal meetings	• Local Council • Community and special interest groups • Local business and industry groups	July – August 2022	Individual meetings held in person via telephone or video conference with: • Jerilderie Police • Country Women's Association • Murrumbidgee Council. Stakeholders were identified through a stakeholder identification process. The purpose of these meetings were to: • Understand stakeholder and community views on the Project and identify issues of importance • Understand how the Project may impact on the community (positively and negatively) • Identify any potential strategies to mitigate negative impacts or to enhance positive/community benefits
Publications in community pamphlet	• Wider community	September 2022	• Photomontage in the race day book for the Jerilderie Gold Cup to demonstrate future vistas from the Jerilderie race course and grandstand.

5.4.2 Community feedback

This section summarises the feedback received from the community during the first two phases of consultation. The community provided feedback on the Project during face-to-face briefings, meetings with host landowners and near neighbours, community drop-in sessions, and a community survey. Feedback, concerns and issues about the proposed Project was also gathered through interviews with community groups and members as part of the Socio-economic impact assessment technical report (**Appendix V**), including the Jerilderie Police, the Jerilderie Country Women's Association, and officers from the Murrumbidgee Council. The summary provided in **Table 5-3** also includes community responses to the landscape and visual impact assessment survey undertaken in April 2022.

Key issues raised about the Project related to the potential employment and economic opportunities expected to be generated by the Project, in addition to the visual impacts on landscape and the environment.

Follow up discussions have occurred where possible, where issues have been raised, to further discuss individual's concerns in relation to the Project and to ensure that these have been considered as appropriate in this EIS.

Table 5-3 Summary of feedback – Virya Energy community and stakeholder consultation

Theme	Summary of feedback	Project amendments in response to feedback
Property impacts	• Concerned about the loss of productive land particular from the implementation of access tracks in stock feeding areas • Need to offset from neighbouring residents • Question on whether grazing could continue during operation of the Project	• Turbines have been removed from the 245 originally proposed at start of design to the current 208 WTGs. WTGs are also located at a minimum of 2 km from a dwelling. Some of these were to provide greater offset from neighbours • Where possible, existing access tracks have been prioritised for Project use to minimise impacts to land use • Grazing will continue alongside Project construction and operation, no Project amendments needed
Employment and business	• Project will be very positive for the town and businesses in the area • Project will generate jobs • Project would provide local business opportunities • Support for the Project's potential to increase the local population and money flow in the town • Businesses currently finding it difficult to get local workers – Hard to get labourers – Low level of unemployment – Stop to international travel during COVID-19 saw drop in workers • Encouragement for the Project to work with local high schools to create opportunities (i.e., on traineeships for youth) • Help landowners diversify their income • Good for town development	• No Project amendments needed • Details on social benefits are described in **Chapter 17** (social impacts)
Equity of impacts and benefits	• Questions on whether electricity generated by the Project could supply power to Jerilderie • Concerned that Project was creating renewable energy that would not be available to power local homes and businesses • Concerned about farmers who are getting transmission infrastructure and not being paid the same as those getting turbines • Concerns about equity of impacts versus long-term benefits – Electricity prices are nearly double those in Sydney – Power from the Project will go to Sydney	• While no Project amendments are required, a fact sheet was released to clarify the distinction between the Project and other electrical infrastructure in the area • The distribution and pricing of electricity is outside of the scope of this Project • Benefits associated with the Project, including the community benefit fund is provided in **Chapter 17** (social impacts)

Theme	Summary of feedback	Project amendments in response to feedback
	– Question the long-term community benefit due to the South West REZ – community understand why it is needed but need some long-term benefits for the community – The highest impact of the South West REZ will be between Jerilderie and Coleambally	
Agriculture	• Importance of grazing to the region, with this forming a major source of income and employment in the area	• No Project amendments needed, as grazing would be able to continue during Project construction and operation
Local character and community cohesion	• Low socio-economic issues facing some members of the community • Kids in Jerilderie are quite free and safe • Community feels like they are a part of something – everyone looks after each other, care about the community and about growing it • Awesome place to live and it is great to be part of the community • Appreciate people who do things for the community • Community organisations and groups include Health Advisory Committee, Tidy Towns, Apex Club, Anglican Church Op-shop and the Swimming Club • Netball and football are very big, golf is popular • Previously issues with labourers who would drink too much during free time and cause trouble	• No Project amendments needed in response • Socio-economic benefits associated with the Project is discussed in **Chapter 17** (social impacts)
Social infrastructure	• Potential for the Project to have a high impact on health services – up to seven week wait to get to see a GP • Currently one full-time doctor in Jerilderie and part-time doctor (0.5 time) in each of Darlington Point and Coleambally • Local hospital has had trouble getting nurses requiring the accident and emergency department to close overnight. For three months emergency patients were taken to Finley • Council currently subsidise GPs with accommodation • Appreciate the community, pool and freedom.	• No Project amendments needed in response • A workforce health and safety plan would be prepared for the Project that outlines measures for responding to health, medical and safety incidents during the construction phase. • Consultation and communication with local communities about the timing of peak construction work and potential influx of non-local workers should be undertaken prior to, and during construction, to assist with managing potential impacts associated with increased demand for services by construction workers.
Valued local or community activities	• Importance of public facilities like the swimming pool as it keeps kids out of the creek, which is dangerous and muddy. The pool was recently refurbished but further funding is needed • Sports	• No Project amendments needed in response

Theme	Summary of feedback	Project amendments in response to feedback
	• Fundraising community projects • Lake events and outdoor music concerts • Jerilderie Working Dog Auction • History of the town • Bushwalking • BBQs	
Community benefit fund opportunities	• Sporting • Better education opportunities • Job opportunities • The John Monash and Ned Kelly statues planned to for the main street. • Don't think the Project is a benefit to the community • Value of community benefit fund and how the fund could be split	• No Project amendments needed in response • The Project is expected to create approximately 300 jobs during the 12-month peak of construction and up to 150 jobs during the other two years of construction • Where possible, the Project would seek to maximise local employment and source workers from existing towns and centres up to about a 1.5-hour commute from the Project, subject to the availability of the necessary skills in the local labour force and the level of unemployed labour available for lower skilled positions (e.g. such as traffic management or labourers). • The creation of employment opportunities during construction would support enhanced social outcomes by supporting improved incomes and skills development for individuals
Housing and accommodation	• Housing is the most important issue – Darlington Point has some places that accommodate short-term workers. • Rental accommodation is at a premium, with the vacancy rate being 0.7% or less – high older age population and lot of people on fixed incomes • Not enough accommodation in town (Jerilderie) for workers expected to come to town as part of the Project • Noted that B&B had been 'pretty booked out' since end of COVID-19 lockdowns • Lot of people stopping in town on their way to Queensland, Melbourne or Adelaide • Busy periods at the caravan park when grey nomads head out of Victoria after Easter and then again in September when they head back.	• No Project amendments needed in response • The availability of accommodation was investigated as part of the Socio-economic impact assessment technical report (**Appendix V**) which identified that there is capacity in short-term accommodation up to about one hour from the Project to accommodate the construction workforce during the peak and non-peak periods • A workforce accommodation strategy would be prepared prior to construction in consultation with Edward River and Murrumbidgee Councils and tourism representatives that outlines strategies to manage demand for accommodation during the construction phase

Theme	Summary of feedback	Project amendments in response to feedback
	• Ability for the Project to result in positive housing outcomes – if there is the ability for Projects to build houses, would be able to sell at the end of construction	
Landscape, natural and built environment features and values	• Concerned about loss of vegetation, including removal of trees and scrub • Value agricultural way of life in unspoiled natural landscape • Always enough water in creek and lake • Clear and clean serenity • Natural pastoral country • Unspoiled natural environment, wildlife conservation area, scenic beauty • Lake Jerilderie, Billabong Creek • Unique views • Historic places • Pristine creek, country environment with open surrounding riverine plains • Lookout and viewing locations including creeks, lake, sunrise and sunset views across the plains	• Project infrastructure has been removed and relocated to avoid and minimise impacts to flora and fauna • Community values is considered in **Chapter 17** (social impacts)
Impacts on environmental values	• Against noise levels wind farms generate which is very bad • Project will be close to Yanco Creek • Concerned about the noise • Worried about the Project's impacts on eagles and Plains-wanderer • Concerned about potential impacts on vegetation • Community concerns about impacts on bird life • Impact of low frequency sound on animals	• Project infrastructure has been removed and relocated to avoid and minimise impacts to flora and fauna, including Plains-wanderer important habitat • Crossing the Yanco Creek will utilise existing bridges and infrastructure, and overhead power lines to avoid instream works • Environmental management measures will be implemented to manage any risks to surface water • Noise impact associated with the operation of the Project is discussed in **Section 8.5**. At all Non-associated Receivers, WTGs have not been predicted to produce noise impacts greater than the 35 dB(A) baseline criteria • No receiver has been predicted to experience noise levels greater than 60 dB(C) and as such no low frequency noise are anticipated • A Bird and Bat Adaptive Management Plan (BBAMP) will be prepared for the Project to mitigate and monitor impacts to birds and bats.

Theme	Summary of feedback	Project amendments in response to feedback
Concerns about natural hazards	• Potential fire threat from wind farm – lot of grassland around the Project • Concerned about fire threat and wind storms – get tornadoes through here every couple of years. Worried about the potential damage that could be caused by the turbines during tornadoes and subsequent impact on the surround vegetation and people • Potential impact of the WTGs on use of water bombers	• Where possible, the Project has avoided moderate to high value grasslands • Asset Protection Zones will be included around each WTG, substation and BESS. • Construction and Operation Bush fire Emergency Management Plans will be developed for the Project in accordance with PBP and in consultation with the RFS (**Section 16.4**) • The Project has also considered the impact to aerial firefighting operations and includes registering all towers (WTGs and meteorological monitoring towers) with firefighting agencies and WTG shutdown procedures in a Y-position in case of a fire in the area.
Visual impacts	• Impact of the WTGs on the landscape and possibility of seeing the wind farm from town • House is surrounded with trees and not concerned about seeing turbines • Appreciate the vastness and emptiness of the landscape and uninterrupted views of the countryside • How far will the turbines be seen from town • Concerned that will see the turbines from property • Worried that the Project will change the landscape and the openness – perceived loss of natural vista which they have grown up with	• No Project amendments needed in response • An assessment of potential impacts to landscape and visual amenity are presented in **Chapter 7**.
Traffic impacts	• Concerns about the roads – only one main road and a lot of the farmers use the same roads to get in and out. • Concerns raised about increased traffic and damage this would have to already damaged road • Often contractors would not follow the road rules • Lot of trucks impact on local roads – with other large-scale developments, number of trucks increase once construction gets going • Issues with some roads during wet weather – some roads are not all-weather roads and are closed or impassable at times (e.g., McLennons Bore Road) • Farmers have trucks going up and down the road during harvest	• No Project amendments needed in response • The EIS has included an assessment of road traffic impacts during construction and operation of the Project (**Chapter 12**). The capacity assessment identified that impacts to road performance would be minor and the existing road network is expected to have sufficient capacity to accommodate the traffic demand during the peak construction period of the Project. • The Project will include a dilapidation report to identify any potential impacts to road surfaces associated with the proposed OSOM route.

Theme	Summary of feedback	Project amendments in response to feedback
Other energy infrastructure	• Concerned about disparity in payments to landowners hosting energy infrastructure for various projects (e.g. transmission lines, WTGs, solar panels) • Location of transmission lines proposed by other energy projects in the region. • Worried about the spread of box thorn via the bird presence associated with renewable projects (such as solar panels). The spread of the box throne promotes rabbits, which is a significant problem • Some people not too happy about the power lines	• While no Project amendments are required, a fact sheet was released to clarify the distinction between the Project and other electrical infrastructure • Measures to manage biosecurity risk are provided in **Section 9.13** (biosecurity) and **Section 15.8** (land)
Other issues	• Concerned by the health impacts of wind farms • Transport routes to be used by Project vehicles	• No Project amendments needed in response • Potential health impacts have been considered (**Section 16.3**). The electromagnetic fields associated with the Project would be much lower than the ICNIRP reference levels • Consultation with road authorities has commenced, and the proposed OSOM route for the Project has been revised to reflect consultation outcomes

5.5 Stakeholder engagement

Engagement with stakeholders commenced in 2020 to:

- Identify key stakeholders
- Introduce the Project and key Project team members
- Build Project awareness among stakeholders
- Create opportunities for stakeholders to ask questions and share their feedback.

This section provides a summary of stakeholder engagement, feedback provided and on-going engagement efforts.

5.5.1 Stakeholder identification

Key stakeholders relevant to the Project were identified through a variety of means including:

- Identification of landowners within eight kilometres of the Project
- A detailed review of local community groups, Aboriginal groups and organisations, local land councils and relevant government agencies and departments
- Discussion with regulators, local councils and statutory bodies
- Engagement activities, including community drop-in session and newsletters
- Inclusion of all stakeholders referenced in the SEARs.

A comprehensive stakeholder analysis has identified a number of key interest groups. These are listed in **Table 5-4**. GeelongPort has been nominated for use during Project construction. As such, GeelongPort was contacted as the relevant authority instead of Victoria Ports Corporation (Melbourne).

Table 5-4 Identified stakeholders

Stakeholder type	Stakeholder
Local Government and Elected Representatives	• Edward River Council • Murrumbidgee Council • Elected Government representatives both State and Federal
Government agencies/authority consultation	• Federal DCCEEW • Federal Department of Defence • NSW Department of Planning & Environment (DPE) • DPE Water Group • Murray-Riverina Biodiversity Conservation Trust • Regional NSW – Mining, Exploration & Geoscience • Department of Primary Industries – Agriculture • Department of Finance, Services and Innovation – Telco Authority • Environment, Energy and Science – Biodiversity, Conservation and Sciences (BCS) • NSW Environment Protection Authority • Heritage NSW • Transport for NSW • Civil Aviation Safety Authority • AirServices Australia • NSW Rural Fires Service (RFS) • Fire and Rescue NSW • Royal Australian Air Force Base – Wagga • Crown Lands • GeelongPort • Victorian Department of Transport

Stakeholder type	Stakeholder
Community/special interest groups	• Host Landowners hosting WTG/s or associated infrastructure for the Project, • Associated Landowners with a negotiated agreement with the Proponent • Non-associated Landowners (i.e. nearby landowners within 8 km of the Project) • Griffith Local Aboriginal Land Council • Cummeragunja Local Aboriginal Land Council • Registered Aboriginal Parties • South West REZ Regional Reference Group • Nearby communities • Local community and business groups
Service providers	• Transgrid - Lumea • Australian Energy Market Operator (AEMO)

5.5.2 Agency engagement

A summary of the Government agency and authority consultation undertaken to date and the feedback received is included in **Table 5-5**.

Table 5-5 Agency and authorities consultation

Agency/ authority	Date	Activity	Purpose	Key feedback/detail	Amendments in response to feedback
Local government and representatives					
Murrumbidgee Council	November 2021 to September 2022	• Email correspondence • Briefings • Online presentation • Online interview • Community drop-in session	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council • Placement of infrastructure along Crown land • Approval for placement of infrastructure on Council managed roads • Proposed road upgrades • Discuss potential impact on social infrastructure and the community • Discuss mitigation methods for any potential impacts.	• Requested confirmation on haulage routes to be used by Project vehicles • The Project team may struggle to find suitable gravel for road infrastructure • Requested for options for renewable energy schemes and highlighted desire for cheaper energy prices • Noted the value of community benefit fund • Queries on how the community benefit fund could be split • Requested Project elements be recycled at the end of life instead of going into landfill • Potential opportunities to benefit the community including programs with the local high school and the construction of housing as part of the Project. • Recognition of Project potential to create jobs and generate investment • Concerns regarding the potential strains on the health care systems in the region when construction occurs,	• No Project amendments needed • Waste streams are discussed in **Chapter 19**. Where possible Project elements would be recycled • A Workforce Health and Safety Plan will be implemented that includes measures for responding to health, medical and safety incidents during construction • A Local Workforce Strategy will be prepared for the Project, in consultation with Councils and relevant stakeholders • A dilapidation report will be submitted with the proposed design in reference to Austroads Design guidelines

Agency/ authority	Date	Activity	Purpose	Key feedback/detail	Amendments in response to feedback
				• Request for a dilapidation survey and review of culverts along proposed haulage route	
Edward River Council	October 2021 to September 2022	• Email correspondence • Briefings • In person presentation	• Project awareness • Introduction to Project team • Project benefits • Project's alignment with council • Use of Deniliquin Landfill Depot for general waste • Placement of infrastructure within Crown land	• Receptive to potential investment in the region • Positive about the Project	• No Project amendments needed • Council noted that the landfill is looking at developing a new cell over the next five and would need to consider any sources of waste over this time period into our calculations • Council notes that the two larger reserves, off Mabins Well Road and Moonbria Road, are managed by Local Land Services for the purpose of water supply • Where infrastructure is located within land that Council control mainly any public reserves, Council in principle agrees to the location of infrastructure on Council land (subject to an agreement being entered into by the owner of the infrastructure regarding fees, charges, insurance and maintenance) • Economic benefits of the Project are discussed in **Chapter 18**

Agency/ authority	Date	Activity	Purpose	Key feedback/detail	Amendments in response to feedback
Federal Government agencies					
Federal DCCEEW	March 2022 April 2022	• Briefing • Field visit	• Pre-referral scoping meeting	• Positive about field work to date • Outlines requirements and expectations as part of the EPBC referral process • Support for the transmission line route being acceptable	• No Project amendments needed
State Government agencies					
NSW Biodiversity Conservation and Sciences (BCS) – South West office	January 2022 June 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 • Update on BAM surveys and methodology for the BDAR • Correspondence on Cat 1 land methodology	• 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 • BCS to arrange a draft Category 1 land under a licence agreement for the Project • BCS requested coordinates for Plains-wanderer and to understand more about records	• Additional spring survey added in September 2022 for plant community types and threatened flora • Category 1 land mapped and provided to BCS for confirmation prior to exhibition • Project infrastructure relocated to avoid Plains-wanderer important habitat
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	• Turbines have been removed from the 245 originally proposed at start of design to the current 208 WTGs. WTGs are also located at a minimum of 2 km from a dwelling. Some of these were to provide greater offset from neighbours

Agency/ authority	Date	Activity	Purpose	Key feedback/detail	Amendments in response to feedback
	May 2022 to September 2022	• Briefing	• Project updates	• Discussion on expectation of time frames and deliverables • Expectations around consultation with Councils and road authorities regarding OSOM traffic routes • Expectations around landowner consent of road reserves • Request that the LVIA provides WTG numbers in reporting	• No Project amendments needed in response • Consultation with road authorities regarding the proposed OSOM routes has been carried out (**Table 5-6**) • Consultation with Crown lands and associated lessee's has commenced • WTG numbering has been included in the LVIA
Heritage NSW	February 2022	• Email correspondence	• Propose a meeting to discuss the survey methodology	• Outlined that that Heritage NSW would review the Project during agency consultation with DPE	• No Project amendments needed in response
Rural Fire Service	August 2022	• Email correspondence	• Review of bush fire technical report	• No review comments received.	• N/A
Fire and Rescue NSW	June 2022	• Email correspondence	• Review of bush fire technical report	• Response received that the Department would review during exhibition of the EIS through the Dept Planning Portal	• No Project amendments needed in response

5.5.3 Other stakeholder engagement

A summary of consultation undertaken to date with other stakeholders is included in **Table 5-6.**

Table 5-6 Consultation with other stakeholders

Stakeholder	Date	Activity	Purpose	Key feedback/detail	Project amendments in response to feedback
Transgrid - Lumea	September 2021 – September 2022	• Email correspondence • Briefings	• Connection studies and power line design	• Virya Energy has engaged Transgrid-Lumea to design the proposed transmission line required to connect the Project to the Dinawan Terminal Station	• The preferred transmission line route reflects the design provided by Transgrid-Lumea • Discussion are ongoing regarding grid studies and other connection requirements
Energy Corporation	September 2021 – September 2022	• Registration of Interest • Email correspondence • Briefings	• Ensure the Project meets the requirements of the South West REZ	• The Project has been included in the network augmentation plans released by Energy Co in their Network Infrastructure Strategy	• Discussion are ongoing regarding South West REZ access and other connection requirements
City of Geelong	August 2022 – September 2022	• Email correspondence • Phone call	• Consultation regarding OSOM route	• Provided details on preferred OSOM route leaving Port • Confirmation that Council will review all applications for haulage along the above mentioned routes when received through the National Heavy Vehicle Regulator portal	• Proposed OSOM route was revised in response to Council consultation
Berrigan Shire Council	August 2022	• Email correspondence	• Consultation regarding OSOM route • W419 LSALT will need to be increased from 2100ft to 2300ft	No response received	N/A

Stakeholder	Date	Activity	Purpose	Key feedback/detail	Project amendments in response to feedback
			which may affect operations at Tocumwal Airport		
Transport for NSW	August 2022	• Email correspondence	• Consultation regarding OSOM route and proposed road upgrades	No response received	N/A
Victorian Department of Transport	August 2022	• Email correspondence	• Consultation regarding OSOM route and proposed road upgrades	• Advised that an exemption permit would be required from the National Heavy Vehicle Regulator (NHVR) for the proposed OSOM route • A Transport Management Plan will need to be completed by the company transporting the OSOM components. • Victorian projects would get priority over NSW projects to undertake OSOM movements on the Victorian road network, if required to minimise cumulative impacts.	• Where required, a NHVR exemption permit will be obtained for any parts of the proposed OSOM route which requires access through roads which are restricted or conditionally approved for OSOM vehicles. • A Construction Traffic Management Plan will be prepared and implemented by the construction contractor.
Crown Lands	August 2022	• Email correspondence	• Proposed infrastructure on Crown lands	No response received	N/A
Australian Department of Defence	August 2022	• Email correspondence	• Potential impacts on aircraft safety, military low flying	No response received	N/A

Stakeholder	Date	Activity	Purpose	Key feedback/detail	Project amendments in response to feedback
			and radar interference.		
Civil Aviation Safety Authority	September 2022	• Email correspondence	• Consultation regarding the location of the WTGs and infringement on LSALTs	No response received	N/A
AirServices Australia	August 2022	• Email correspondence	• Consultation regarding the location of the WTGs and infringement on LSALTs	• The air route W419 LSALT will need to be increased from 2100 ft to 2300ft. This change is not expected to adversely impact enroute instrument flight rules operations • No additional instructions or concerns • Request consultation with nearest aerodrome, Tocumwal Airport, along with aviation operators there to ensure that all stakeholders fully understand the proposed changes that are required to accommodate the Project • All work to amend the W419 air route will be undertaken on a commercial basis and require further consultation	• Consultation letter sent to Berrigan Shire Council, the owner/operator of Tocumwal Airport

Stakeholder	Date	Activity	Purpose	Key feedback/detail	Project amendments in response to feedback
Murray-Riverina Biodiversity Conservation Trust	September 2022	• Email correspondence	• Project information regarding biodiversity impacts	No response received	N/A
GeelongPort	September 2022	• Email correspondence	• Regarding the use of the GeelongPort	• Confirmation that GeelongPort's existing wharf infrastructure and project cargo laydown areas have facilitated several on-shore wind farm projects over the past 5 years • Requested a meeting to introduce the Project.	• Discussions with GeelongPort has commenced around the timing of the Project.
South West REZ Regional Reference Group	September 2022	• Email correspondence	• Regarding the location of the Project within the South West REZ	No response received	N/A
Murray Local Land Services	September 2022	• Email correspondence	• Proposed infrastructure on Crown lands managed by Murray Local Land Services	No response received	N/A

5.6 Aboriginal community consultation

The Aboriginal community consultation for the Project was carried out in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010). The Aboriginal community consultation program generally consisted of the following components:

- Stage 1 – Notification and registration
- Stage 2 – Project information
- Stage 3 – Survey methodology and fieldwork
- Stage 4 – Draft Aboriginal Cultural Heritage Assessment Report (ACHAR) review.

A summary of the Aboriginal community consultation for the Project is described below. Further details are described in **Chapter 10** (Aboriginal heritage).

The consultation involved:

- Stage 1 – Notification and Registration of Aboriginal Parties
  - Notifications were developed and the registration of Aboriginal parties was completed in accordance with Part 5, Division 2 Section 60 of the NPW Regulation
  - As a result of the notification process, four RAPs were identified
  - Griffith LALC and Cummeragunja LALC did not register an interest in the Project but have been consulted and were 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.
- Stage 2 and 3 – Presenting and Gathering Information about Cultural Significance
  - Correspondence relating to survey methodology and review of the draft ACHAR
  - Consultation was also undertaken and recorded during the survey.

Consultation with the Aboriginal community was undertaken in accordance with the NPW Act and NPW Regulation, with reference to the Guide to investigating assessing and reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011). The consultation process is outlined in **Table 5-7**. Further detail relating to the consultation is provided in **Appendix H** (Aboriginal cultural heritage assessment report).

Table 5-7 Aboriginal community consultation

Consultation	Timing
Provision of letter (via email) requesting identification of Aboriginal parties with cultural knowledge/interest in the Project	30 November 2021
Public advertisement providing notification of assessment and opportunity to register interest for consultation.	2 December 2021
Provision of letter (via email or post) to identified Aboriginal parties requesting registrations of interest	1 December 2021
Methodology letter sent via email to the representative Aboriginal Parties with Expression of Interest for fieldwork	17 January 202
Fieldwork – in field consultation	02 May 2022 – 08 May 2022 11 July 2022 – 15 July 2022
Draft ACHAR provided to RAPs for review and comment	22 August 2022 – 19 September 2022

A copy of the draft ACHAR was provided to all registered Aboriginal parties with an invitation to review and comment on all aspects of the document. The registered Aboriginal parties were invited to comment on any aspect of the ACHAR, noting that information on cultural significance and any recommendations provided from an Aboriginal cultural perspective would be documented in the final ACHAR. The comments received from the RAPs are included in **Appendix H** of the ACHAR which was finalised in September 2022.

5.7 Ongoing and future engagement

Ongoing engagement with the community and stakeholders would be continued during the EIS exhibition and assessment phase. This engagement would include:

- A community drop-in session during exhibition of the EIS to inform the wider community of Project benefits, impacts and proposed management measures
- Undertake tailored consultation with Host, Associated and Non-associated landowners to ensure residents are informed of the nature and magnitude of predicted impacts; measures to mitigate predicted impacts and to ensure provision of timely access to Project staff to discuss the findings if required
- Distribution of information on benefits generated by the Project via regular updates and documentation on the Proponent's website and community newsletters
- The process for receiving and responding to community complaints, including the management response, would be detailed prior to construction in the Project Construction Environmental Management Plan (CEMP)
- Regular announcements which notify impacted stakeholders of upcoming work activity during Project construction
- Establishment of a Community Consultative Committee
- Ongoing meetings and updates with Council, local businesses and other special interest groups.

6. Assessment of impacts

Chapter 7 to **Chapter 21** provides a summary of the assessments of the potential environmental and social impacts associated with the construction, operation and decommissioning of the Project. Each has been undertaken in accordance with the Project SEARs (SSD-41743746) and EPBC referral (2022/09214). **Appendix B** and **Appendix C** lists out where each requirement is addressed in the EIS. The specialist technical assessments used to inform the chapters are included in **Appendix E** to **Appendix V**.

For the technical reports a broader Project area was considered, defined as the property boundaries of Project Host landowners (i.e. landowners that have entered into agreements with Virya Energy to have WTGs or associated infrastructure on their properties, refer **Section 2.3**). This broader Project area includes sections of land have been excluded from hosting Project infrastructure to accommodate existing agricultural and lambing practices in consultation with Host Landowners, and as recognised in Landowner consents (refer to **Appendix A**).

The key environmental issues for the Project are identified in the SEARs (SSD-41743746) as reproduced in **Appendix B** and are summarised as follows:

- **Landscape and visual**
- **Noise and vibration**
- **Biodiversity**
- **Heritage**, including:
  - **Aboriginal heritage** (cultural and archaeological)
  - **Historic heritage**
- **Traffic and transport**
- **Water and soils**, including
  - Risk of dust generation (i.e. air quality)
- **Land** including consideration of existing land uses, compatibility of the development, and impact on agricultural resources and production
- **Hazards and risks** including an assessment of the following:
  - Aviation safety with consideration of potential wake / turbulence issues, impacts to air traffic routes, radar interference and communication systems, navigation aids, use of emergency helicopter access and other aerial activities
  - Telecommunications
  - Health including an assessment of electromagnetic fields
  - Bush fire risk
  - Battery Storage including a preliminary risk screening and a Preliminary Hazard Analysis
  - Blade throw
- **Social impact**
- **Economic**
- **Waste** including identification, quantification, and classification of likely waste streams.

Other issues which are described in the EIS including greenhouse gas which are presented in **Chapter 20**.

7. Landscape and visual amenity

This section summarises the findings of the Landscape and Visual Impact Assessment (LVIA) (**Appendix E**) prepared for the Project in response to the SEARs.

7.1 Assessment methodology

The methodology for the assessment was in accordance with the Wind Energy: Visual Assessment Bulletin (the Visual Bulletin) (DPE, 2016b) and involved the following:

- **Visual baseline study** to establish existing landscape and visual conditions, including:
  - Identification of Sensitive Land Use Designations (SLUD)
  - Assessment of scenic quality classes, landscape character and key landscape features –
    - Scenic quality classes (refer to **Table 7-1**) are categorised based on relative presence or absence of key landscape features which are known to be associated with community perceptions of high, moderate or low scenic quality
    - Landscape character units are defined by land use, land cover and topography (described in **Section 7.3.2**)
  - Analysis of public and private viewpoints and sensitivity level – shown in **Table 7-2** with the sensitivity levels for each dwelling provided in **Table 7-5**
  - Analysis of visibility distance zones for each viewpoint – Noted for each viewpoint included in the Performance Objectives Evaluation (refer to **Figure 7-1**)
  - Wind resource categories – mapped showing the relative wind resources of the proposed development area expressed as relative ranges of average wind strength
  - Other wind farms and large-scale infrastructure projects (considered in **Section 21.4.4**)
- **Analysis of Zones of Visual Influence** (ZVI) – The ZVI diagram is used to identify theoretical areas of the landscape from which WTGs or parts of the WTGs would be visible; and to provide an overview of where the Project may be visible from surrounding view locations. These are very conservative in nature since the existing structures and vegetation screening are not considered, and the visibility of WTGs in cloudy or other weather conditions is also not considered in the calculations. Each ZVI has a corresponding set of visual performance objectives which helps to establish different visual objectives and different levels of landscape protection for the Project.
- **Analysis of Visual Influence Zones** (VIZs) – VIZs are associated with areas of different visual significance. Each visual influence zone has a corresponding set of visual performance objectives that provide guidance on the level of landscape protection and level of assessment required. The VIZs are determined using information from the visual baseline study and consideration of the viewpoint sensitivity, visibility distance zones and ZVIs. Each visual influence zone has a corresponding set of visual performance objectives including different visual objectives and levels of landscape protection for the assessment and determination of the Project, such as:
  - VIZ1 is associated with the highest level of visual significance, VIZ2 has a moderate significance, and VIZ3 refers to landscapes with the lowest level of visual significance
  - Only VIZ2 and VIZ3 are relevant for the Project
- **Visual performance evaluation against objectives** – Relevant objectives for VIZ2 and VIZ3 are provided in **Table 7-3** for all Non-associated dwellings
- Potential for visual amenity impacts associated with aviation hazard lighting
- Site photography – Carried out on site visits in February and August 2022
- Development of mapping and photomontages from public viewpoints and wireframes from Non-associated dwellings

- Recommendation of overall mitigation measures to avoid or minimise visual amenity and lighting impacts.

Table 7-1 Scenic quality classes[1]

Landscape features	High Scenic Quality	Moderate Scenic Quality	Low Scenic Quality
Landform	Wider floodplains with meandering channels, billabongs, levees and low dunes. Large overflow lakes with large lunettes.	Alluvial fans with distributary channels and floodplains, undulating plains with depressions.	Large expanses of indistinctly dissected or unbroken landforms that provide little illusion of spatial definition or landmarks with which to orient.
Vegetation	Strongly defined patterns with combinations of forest, river and creekside vegetation and saltbush across backplains with white cypress on dunes. Distinctive stands of vegetation that may create unusual forms, colours or textures in comparison to surrounding vegetation.	Predominantly open forest or woodland combined with some natural openings in patterns that offer some visual relief. Floodplain vegetative stands that exhibit a range of size, form, colour, texture and spacing.	Extensive areas of similar vegetation, such as grasslands, pasture or with very limited variation in colour and texture.
Waterform	Visually prominent lakes, reservoirs, rivers, streams and swamps.	Intermittent streams, lakes, rivers, swamps and reservoirs.	Waterform absent.

[1] The scenic quality classes have been derived from the landscape character for the Murrumbidgee Subregion of the Riverina Bioregion (based on Interim Biogeographic Regionalisation for Australia Version 7)

Table 7-2 Viewpoint sensitivity level and description

Sensitivity level	Travel routes and use areas
Level 1 Sensitivity (High)	• Residential areas and rural villages (defined as land zoned R1, R2, R3, R4, R5 and RU5 in the Standard Instrument Local Environmental Plan) • Recreation, cultural or scenic sites and viewpoints of National or State significance • Any buildings, historic rural homesteads/residences on the State or local Government Heritage List.
Level 2 Sensitivity (Moderate)	• Rural dwelling • Tourist and visitor accommodation (defined in the Standard Instrument Local Environmental Plan) • Recreation, cultural or scenic sites and viewpoints of regional significance.
Level 3 Sensitivity (Low)	• Interstate and state passenger rail lines with daily daylight services • State highways, freeways and classified main roads, classified tourist roads • Land management roads with occasional recreation traffic • Walking tracks of moderate local significance or infrequent recreation usage • Other low use and low concern viewpoints and travel routes • Navigable waterways.

YANCO DELTA WIND FARM | **LANDSCAPE AND VISUAL IMPACT ASSESSMENT**

Viewer sensitivity level – Distance zone	Scenic quality class		
	High	Moderate	Low
Level 1 Viewpoints			
Near Foreground 0 – 500 m	VIZ1	VIZ1	VIZ1
Mid Foreground 500 m – 1 km	VIZ1	VIZ1	VIZ1
Far Foreground 1 – 2 km	VIZ1	VIZ1	VIZ1
Near Middleground 2 – 4 km	VIZ1	VIZ2	VIZ2
Far Middleground 4 – 8 km	VIZ2	VIZ2	VIZ2
Near Background 8 – 12 km	VIZ2	VIZ2	VIZ2
Mid Background 12 – 20 km	VIZ2	VIZ2	VIZ3
Far Background 20 – 32+ km	VIZ2	VIZ2	VIZ3
Level 2 Viewpoints			
Near Foreground 0 – 500 m	VIZ1	VIZ1	VIZ1
Mid Foreground 500 m – 1 km	VIZ1	VIZ1	VIZ1
Far Foreground 1 – 2 km	VIZ1	VIZ1	VIZ2
Near Middleground 2 – 4 km	VIZ2	VIZ2	VIZ2
Far Middleground 4 – 8 km	VIZ2	VIZ2	VIZ3
Near Background 8 – 12 km	VIZ2	VIZ3	VIZ3
Mid Background 12 – 20 km	VIZ2	VIZ3	VIZ3
Far Background 20 – 32+km	VIZ3	VIZ3	VIZ3
Level 3 Viewpoints			
Near Foreground 0 – 500 m	VIZ1	VIZ1	VIZ2
Mid Foreground 500 m – 1 km	VIZ2	VIZ2	VIZ2
Far Foreground 1 – 2 km	VIZ2	VIZ2	VIZ3
Near Middleground 2 – 4 km	VIZ2	VIZ3	VIZ3
Far Middleground 4 – 8 km	VIZ2	VIZ3	VIZ3
Near Background 8 – 12 km	VIZ3	VIZ3	VIZ3
Mid Background 12 – 20 km	VIZ3	VIZ3	VIZ3
Far Background 20 – 32+ km	VIZ3	VIZ3	VIZ3
Areas Not Visible	VIZ3	VIZ3	VIZ3

Note:

- Column 1 codes represent a combination of the viewer sensitivity level (1-high, 2-moderate, 3-low) and the distance zones
- Columns 2 – 4 indicate visual influence zones varying by row according to the combination of viewer sensitivity level-distance zone and scenic quality class.

CAMBIUM GROUP

Source: Wind Energy - Visual Assessment Bulletin, NSW Government (2016), Cambium Group (2022).

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Figure 7-1 Visual influence zone matrix

Table 7-3 Visual performance objectives

Visual performance objectives	Relevant objectives for VIZ2	Relevant objectives for VIZ3
Visual Magnitude Visual magnitude is a key visual parameter in the preliminary assessment tool.	• Manage impacts as far as practicable, justify residual impacts, and describe proposed mitigation measures below the black line. • Consider screening between the blue line and the black line	Consider screening below the black line
Landscape Scenic Integrity The landscape scenic integrity criterion assesses the extent to which the current landscape character and scenic quality of the visual catchment would be maintained given a proposed landscape alteration, such as a wind energy project. In the moderate scenic quality class, wind energy projects should not cause significant modification of the visual catchment. Turbines may be visually apparent and could become a major element in the landscape.	• Wind turbines should not cause significant modification of the visual catchment. • Turbines may be visually apparent and could become a major element in the landscape but should not dominate the existing visual catchment.	N/A
Key Feature Disruption The key features disruption parameter describes proposed wind turbines that are likely to disrupt or interrupt the central line of sight and/or the central focal viewing field surrounding it, when seen from a viewpoint looking toward the identified key features of a landscape.	• Minimise impact of wind turbines or ancillary facilities that result in the removal or visual alteration/disruption of identified key landscape features. This includes any major or visually significant landform, waterform, vegetation or cultural features that have visual prominence or are focal points.	N/A
Multiple Wind Turbine Effects The effects of multiple wind turbines visible from individual viewpoints as part of the Project, as well as the cumulative landscape and visual impacts must be considered having regard to existing and approved wind energy projects located within 8 km of the Project.	Avoid views to the proposed, existing and approved turbines within eight kilometres from Level 1 and Level 2 viewpoints, exceeding the following thresholds, or provide detailed justification: • Level 1 (high sensitivity) – wind turbines visible within the effective horizontal views of two or more 60° sectors • Level 2 (moderate sensitivity) – wind turbines visible within the effective horizontal views in three or more 60° sectors	
Aviation Hazard Lighting CASA may determine, and subsequently advise a proponent and relevant planning authorities, whether night-lighting is required. If lighting is needed, there is a requirement to minimise visual impacts	Aviation hazard lighting (AHL) must meet the requirements of Australian Standard AS 4282 – 1997 and any prescribed or notified CASA requirement. Shield all AHL within two kilometres from any dwellings. Avoid strobe lighting.	

7.1.1 Study area

The assessment considers three distance thresholds for the purpose of the visual assessment, including:

- Visual magnitude thresholds (**Figure 7-2**):
  - Black threshold line – Indicates where turbines may potentially have significant visual magnitude impacts based on their relative height and their distance from viewpoints. For this Project, the black line threshold is 3.6 kilometres from WTGs
  - Blue threshold line – Added for this visual assessment to allow more detailed assessment. For this Project, the blue line threshold is 5.3 kilometres from WTGs
- For the assessment of Multiple Wind Turbine Effects, the LVIA reviews cumulative landscape and visual impacts located within eight kilometres of WTGs.

Further, the assessment has also considered a range of view locations up to 10 kilometres from the WTGs including dwellings and key locations to confirm the WTGs would not be significantly visible and that existing tree cover is able to provide effective screening.

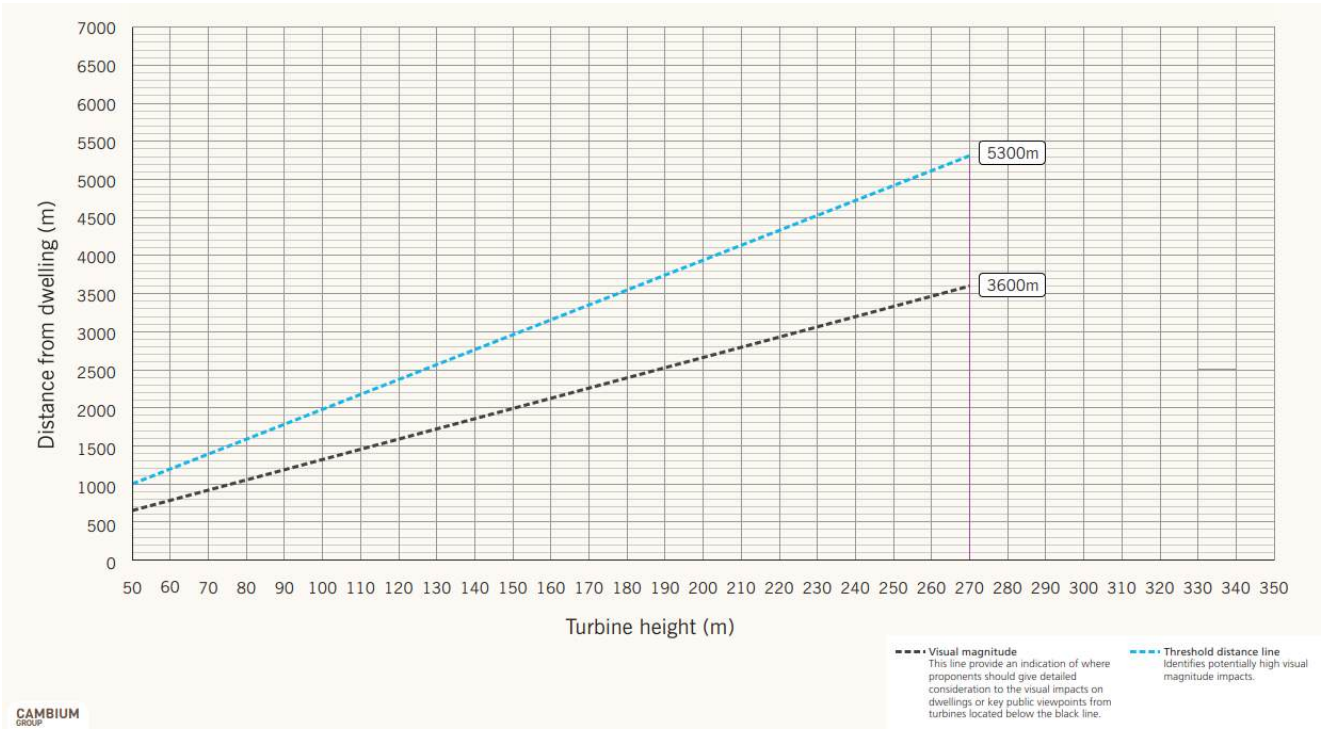


Figure 7-2 Visual magnitude thresholds for visual assessment

7.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- Wind Energy: Visual Assessment Bulletin (the Visual Bulletin) (DPE, 2016b)
- Conargo LEP
- Jerilderie LEP.

7.3 Existing environment

7.3.1 Sensitive Land Use Designations

Only RU1 – Primary Production, under both the Conargo LEP and the Jerilderie LEP, occurs within the Project area (refer to **Section 2.2.1**). Other SLUDs and land use zones surrounding the Project area include (refer to **Figure 7-3**):

- E1 – National Parks and Nature Reserves
- RE1 – Public Recreation
- SP2 – Infrastructure
- R5 – Large Lot Residential (beyond 10 km)
- IN1 – General Industrial.

7.3.2 Landscape character and scenic quality

The six landscape character units within and surrounding the Project area and their scenic quality rating are provided in **Table 7-4**. The general locality of the landscape character units are shown in **Figure 7-4**. Further description of each landscape character unit is provided in **Appendix E**.

Table 7-4 Landscape character unit and scenic quality

Landscape character unit	Overview	Scenic quality assessment
1 – Township	Townships and localities, generally flat landscapes, built structures such as dwellings, commercial buildings and public facilities	Moderate
2 – Agricultural (cultivated)	Extends beyond townships and localities, are often associated with creeks and irrigation channels, contains constructed elements such as roads and tracks, silos and sheds, rural dwellings and homesteads	Low to Moderate
3 – Creek and billabong	Creeks and smaller ephemeral drainage lines, visually marked in the landscape by trees growing along the waterways, meandering in a generally east to west direction, with built structures largely absent	Moderate to high
4 – Transmission line corridor	A transmission line corridor extends east to west through the north portion of the Project area, crossing over open pasture	Low
5 – Road corridor	Roads form small-scale built elements within the landscape. Larger road corridors connect townships and localities north and south of the Project, whereas the local tracks and largely unsealed roads provide access to rural dwellings and farms.	Low to moderate
6 – Floodplain and backplain	Generally flat and visually large-scale landscapes that extend across the Project area toward distant horizon lines, often containing meandering channels, floodplain, dunes, overflow lakes and swamps, areas of vegetation and pasture	Moderate

7.3.3 Wind resource categories

A Wind Resource Map for the Project and the surrounding area has been prepared for the Project, refer to **Figure 7-5**.

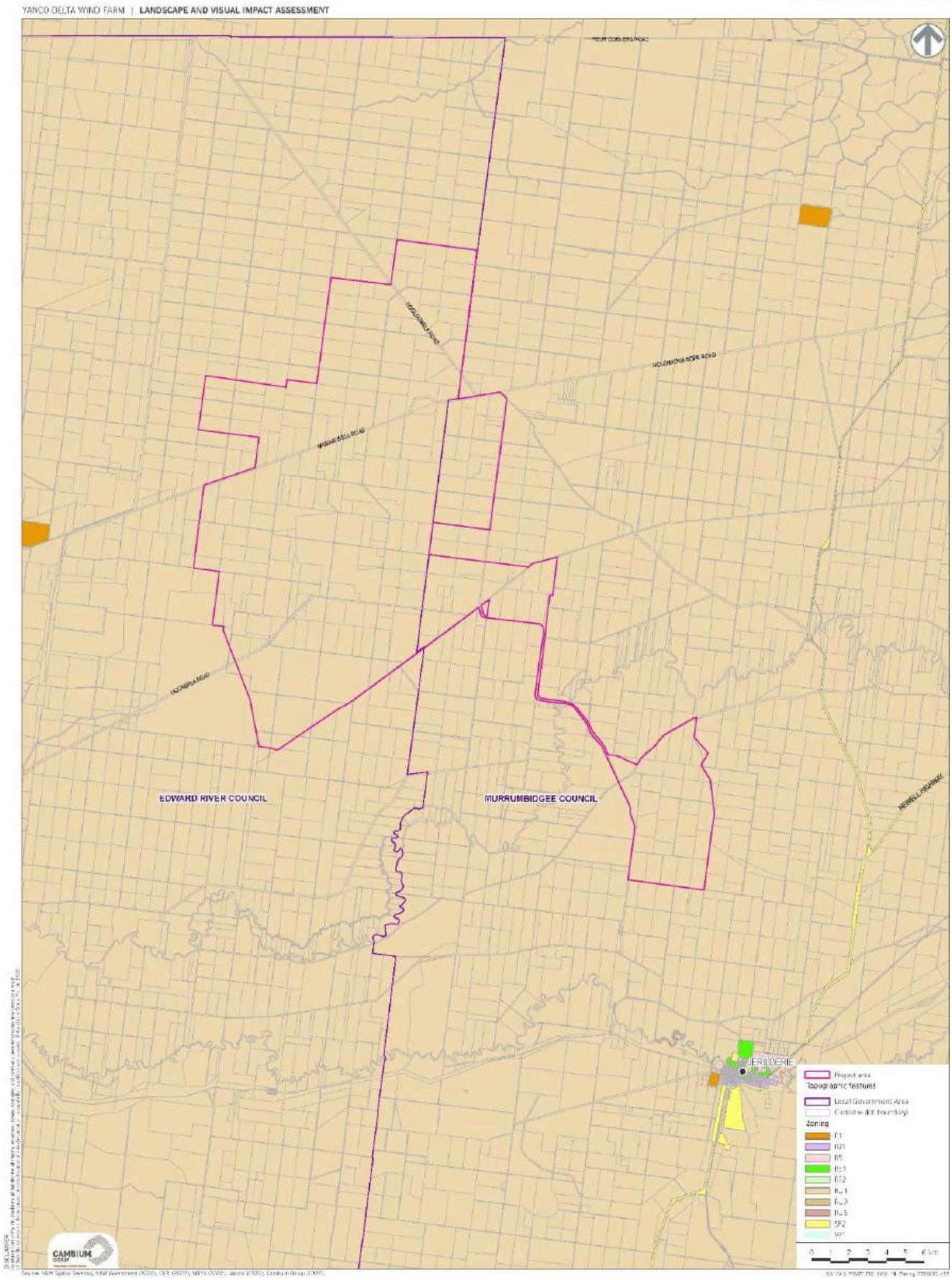


Figure 7-3 Land zoning within and surrounding the Project area

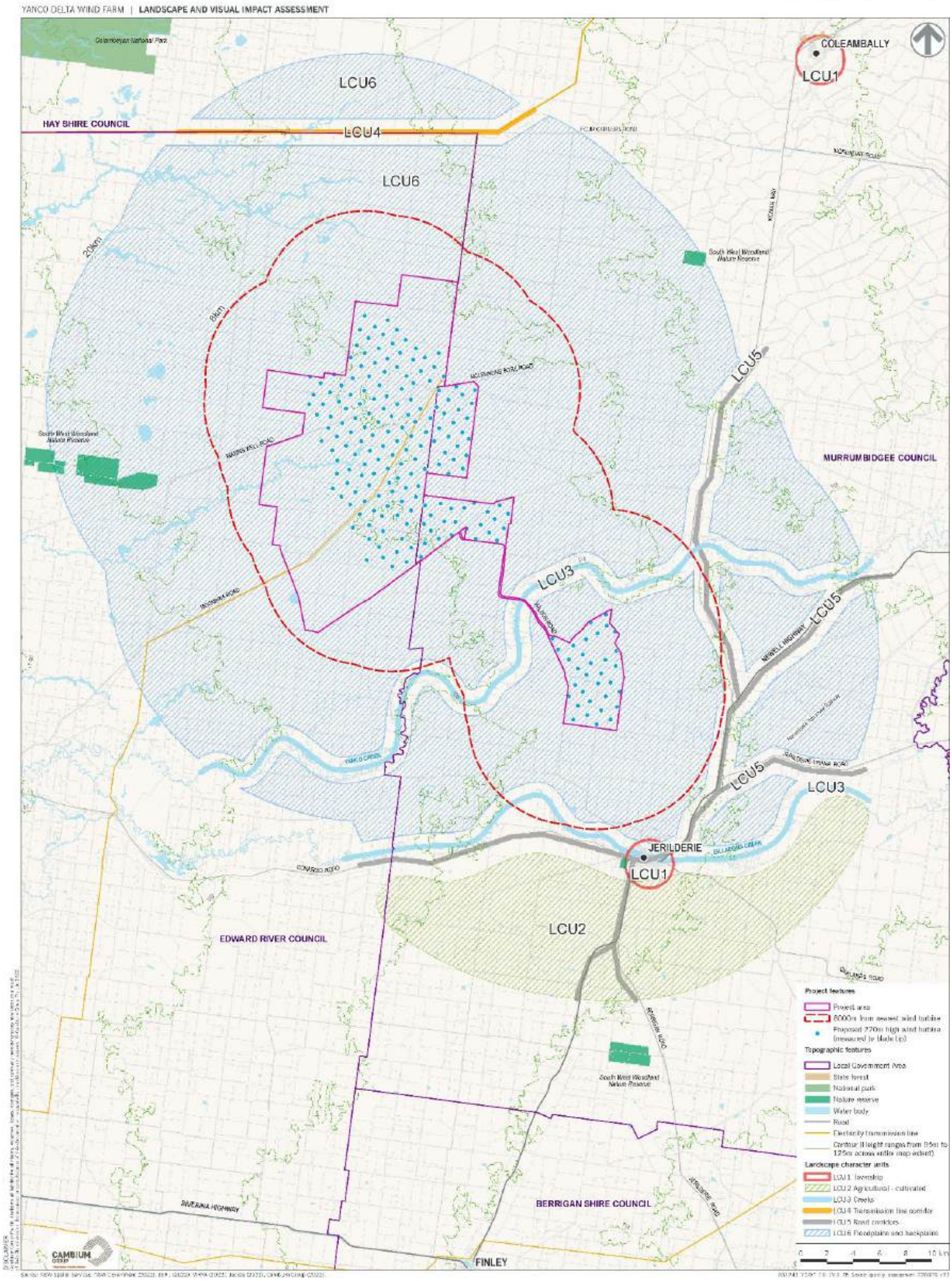


Figure 7-4 Landscape character units relevant to the Project area

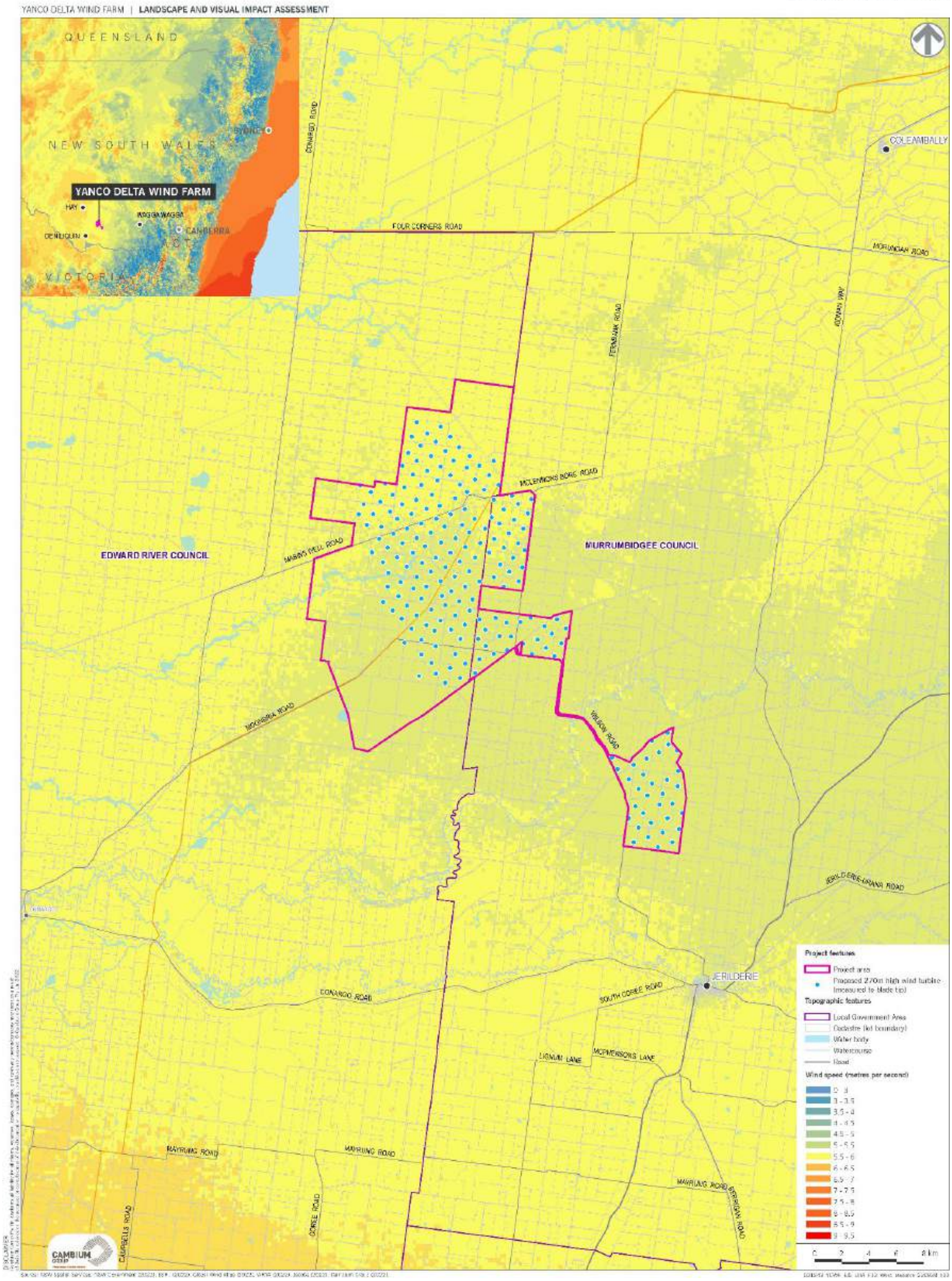


Figure 7-5 Wind resources categories

7.3.4 Zones of Visual Influence

ZVI diagrams indicate that the most extensive and continuous area of visibility toward the Project WTGs would occur where the tips of the WTG blades are visible above surrounding vegetation. However, the views towards the tips are likely to become less noticeable at reasonably short distances from the Project, due to screening from existing vegetation at various locations. The ZVI for the Project is shown in **Figure 7-6**.

Areas of landscape which are likely to offer views toward WTGs generally occur within private property and across tracts of unoccupied rural landscape.

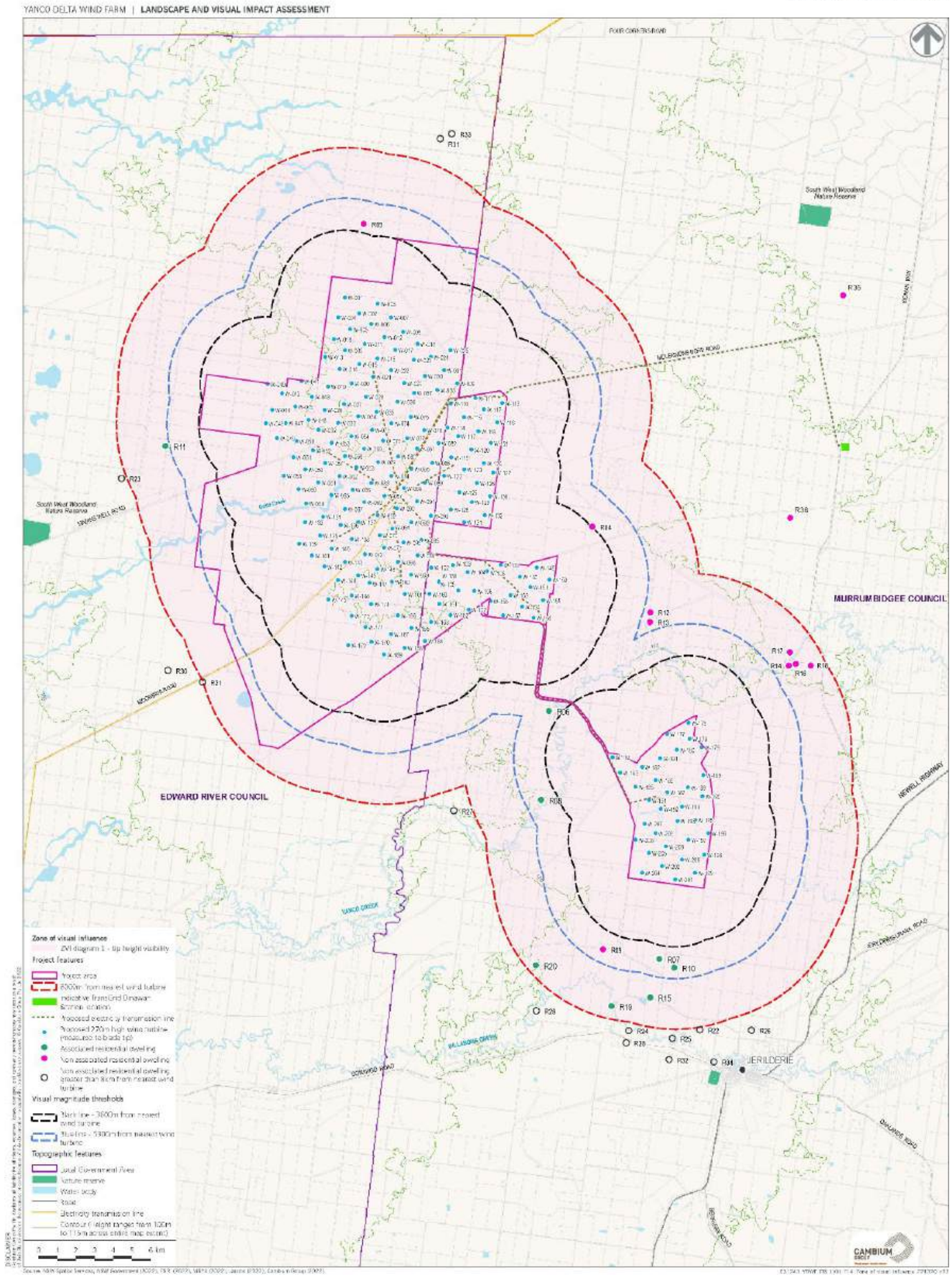


Figure 7-6 Zone of Visual Influence (blade tip)

7.3.5 Visual Influence Zones and viewpoint sensitivity

There are no dwellings within the black line threshold (3.6 kilometres). The representative view locations used for the visual assessment have been assigned either VIZ2 or VIZ3, as shown in **Table 7-5**. **Table 7-5** also shows the sensitivity level of each view location, as well as the scenic quality and closest WTG ID of these representative views. The location of Non-associated dwellings and key public view locations considered as part of the assessment are shown in **Figure 7-7**.

Table 7-5 VIZ analysis (dwellings within and beyond 5.3 kilometres of a WTG)

Representative view location	Sensitivity level	Closest WTG (km)	Closest WTG ID	Scenic quality class	VIZ
Dwellings below the blue line (< 5.3 km)					
R04	Level 2	3.64	W-153	LCU6 – Moderate	VIZ2
R05	Level 2	4.06	W-001	LCU6 – Moderate	VIZ2
R09	Level 2	4.60	W-205	LCU6 – Moderate	VIZ2
Dwellings above the blue line (> 5.3 km to 8 km)					
R12	Level 2	5.68	W-153	LCU6 – Moderate	VIZ2
R13	Level 2	5.77	W-177	LCU6 – Moderate	VIZ2
R14	Level 2	6.17	W-177	LCU3 – Moderate	VIZ2
R16	Level 2	6.55	W-177	LCU3 – Moderate	VIZ2
R17	Level 2	6.60	W-177	LCU3 – Moderate	VIZ2
R18	Level 2	7.21	W-177	LCU3 – Moderate	VIZ2
Dwellings beyond 8 km MWTT threshold to 10 km					
R21	Level 2	8.04	W-173	LCU6 – Moderate	VIZ3
R22	Level 2	8.14	W-202	LCU3 – Moderate	VIZ3
R23	Level 2	8.27	W-046	LCU6 – Moderate	VIZ3
R24	Level 2	8.45	W-202	LCU3 – Moderate	VIZ3
R25	Level 2	8.50	W-202	LCU3 – Moderate	VIZ3
R26	Level 2	8.94	W-200	LCU6 – Moderate	VIZ3
R27	Level 2	8.96	W-185	LCU3 – Moderate	VIZ3
R28	Level 2	9.19	W-202	LCU3 – Moderate	VIZ3
R29	Level 2	9.30	W-205	LCU3 – Moderate	VIZ3
R30	Level 2	9.39	W-176	LCU6 – Moderate	VIZ3
R31	Level 2	9.42	W-003	LCU6 – Moderate	VIZ3
R32	Level 2	9.64	W-202	LCU3 – Moderate	VIZ3
R33	Level 2	9.91	W-003	LCU6 – Moderate	VIZ3
R34	Level 2	9.97	W-202	LCU3 – Moderate	VIZ3

7.3.6 Aviation hazard lighting and light sources

As the Project area is predominantly agricultural, there are areas of local lighting sources associated with rural dwellings and agricultural buildings, however, this is unlikely to be visually prominent. Lighting from vehicles travelling along the local roads and highways are also a source of temporary light.

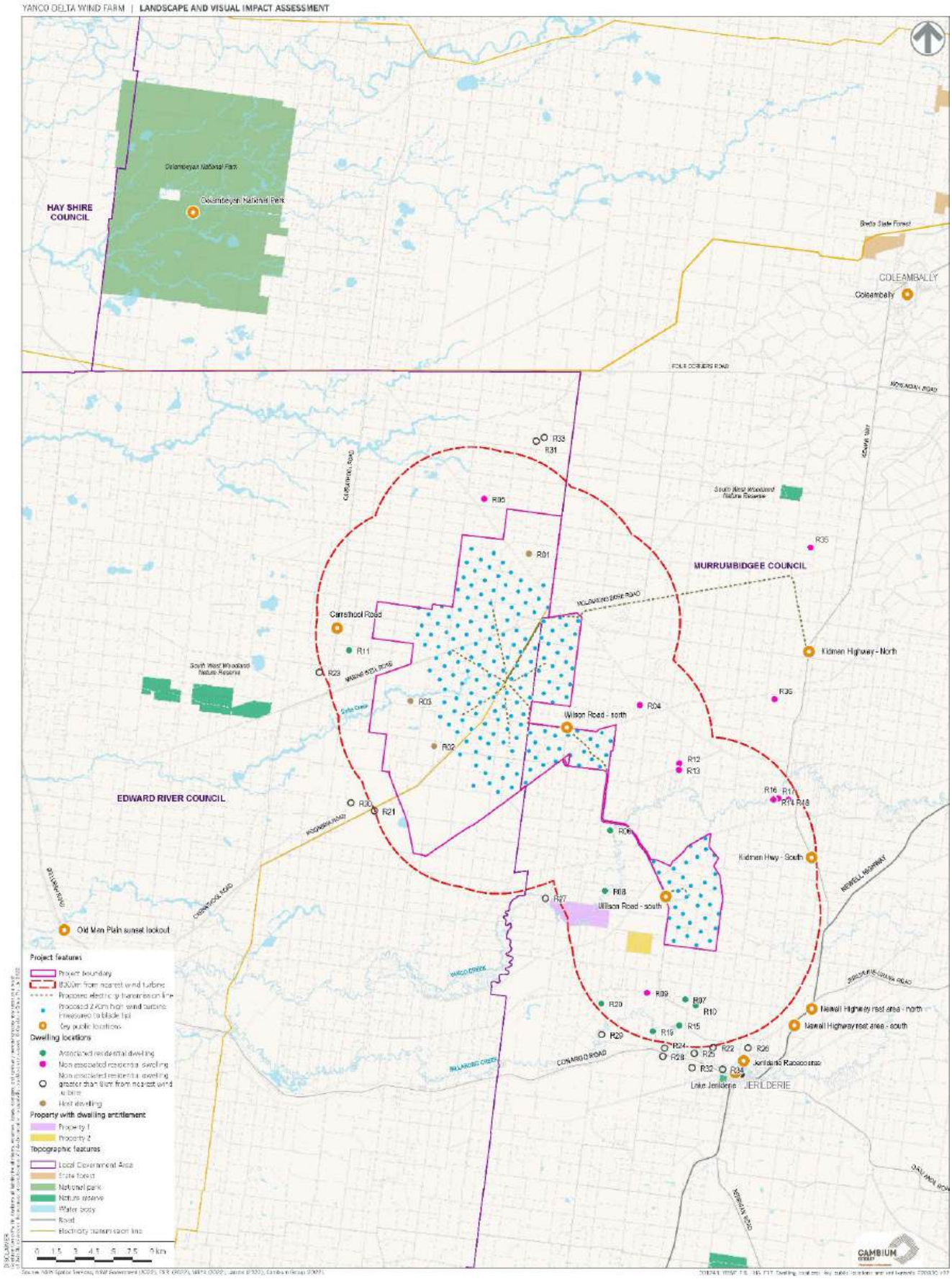


Figure 7-7 Non-associated dwelling locations and key public viewpoints

7.4 Potential construction impacts

Potential visual impacts during Project construction could occur as a result of:

- Ongoing detailed site assessment, including sub-surface geotechnical investigations
- Excavation and earthworks
- Various civil works to upgrade local roads, access tracks and site access
- Construction facilities, including a construction compound, portable structures and laydown areas
- Various construction and directional signage
- Construction machinery and activities associated with Project elements.

Construction traffic on highways and local roads would also result in temporary visual impacts along the road corridors.

Construction activities would be temporary in nature and typically restricted to various discrete areas within the Project area. Further, construction areas will be progressively rehabilitated (refer to **Table 9-14**) As such, construction activities are unlikely to result in an unacceptable level of visual impact.

7.5 Potential operational impacts

7.5.1 Visual impact on dwellings within 8 km

As detailed in **Section 7.3.5** and shown in **Figure 7-7**, there are no dwellings within the black line threshold (3.6 kilometres). The VIZ analysis has considered the three dwellings within the blue (5.3 km) and black line (3.6 kilometres), as well as six dwellings between the blue line and the eight kilometre buffer (shown as dashed red line in **Figure 7-7**).

A summary of visual impacts on dwellings is provided in **Table 7-6**. At all dwellings, all performance objectives listed in **Table 7-3** would be met.

Wireframe diagrams were prepared that that compare the existing visual landscape with the proposed changes at Non-associated dwellings. An example of a wireframe diagrams from the closest Non-associated dwelling (R04) is shown in **Figure 7-8** and **Figure 7-9**.

It is important to note that wireframe diagrams are modelled with ground contours and do not illustrate the location, height or extent of existing vegetation, such as trees that may filter/screen views from dwellings or their immediate curtilage toward wind turbines. Existing vegetation, visible in the aerial photo dwelling location image, would likely filter/ screen views toward a significant number of wind turbines illustrated in the wireframe diagram. Wind turbines within background views from the dwelling (in excess of eight kilometres) would potentially be screened by existing vegetation at around 2 metres to 3 metres in height between 10 metres to 20 metres distance from the dwelling, as well as taller vegetation further from the dwelling.

The full set of wireframe diagrams from Non-associated dwellings are provided in **Appendix E**.

The effects of Aviation Hazard Lighting is further considered in **Section 7.5.5** and the effects of ancillary electrical infrastructure on viewpoints is considered in **Section 7.5.6**.

The Project would not result in a significant impact upon landscape scenic values or quality from these dwellings.

Table 7-6 Dwellings between blue line and 8 km visual impact summary and mitigation

ID	VIZ	Number of 60-degree sectors	Impact summary	Mitigation measures
Dwellings below the blue line (< 5.3 km)				
R04	VIZ2	2 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-153) would be located 3.64 km (Near Middleground) away • Multiple Wind Turbine Tool (MWTT) diagram results: – No WTGs would be visible below the black line – 6 WTGs would be visible (discounting vegetative screening) between the black and blue line – Additional WTGs extending up to 8 km beyond the blue line south west to north west of the dwelling • Lightly scattered tree cover around and beyond the dwelling may offer some filtering of views toward WTGS from the dwelling and curtilage areas • Whilst WTGs may be visible, the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line • Vegetation screening at the dwelling (between the blue line and the black line) will be offered to the landowner in accordance with the Bulletin.
R05	VIZ2	1 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-001) would be located 4.06 km (Far Middleground) away • MWTT diagram results: – No WTGs would be visible below the black line – 5 WTGs would be visible (discounting vegetative screening) between the black and blue line – Additional WTGs extending up to 8 km beyond the blue line south of the dwelling • Tree cover around and beyond the dwelling may offer some screening of views toward WTGs from the dwelling and curtilage areas • Whilst WTGs may be visible the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line • Vegetation screening at the dwelling (between the blue line and the black line) will be offered to the landowner in accordance with the Bulletin.

ID	VIZ	Number of 60-degree sectors	Impact summary	Mitigation measures
R09	VIZ2	1 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-205) would be located 4.6 km (Far Middleground) away • MWTT diagram results: – No WTGs would be visible below the black line – 1 WTGs would be visible (discounting vegetative screening) between the black and blue line – Additional WTGs extending up to 8 km beyond the blue line north east of the dwelling • Lightly scattered tree cover around and beyond the dwelling may offer some filtering and screening of views toward WTGs from the dwelling and curtilage areas • Whilst WTGs may be visible the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line • Vegetation screening at the dwelling (between the blue line and the black line) will be offered to the landowner in accordance with the Bulletin.
Dwellings above the blue line (> 5.3 km to 8 km)				
R12 / R13	VIZ2	2 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-153) would be located 5.68 km (distance descriptor) away • MWTT diagram results: – No WTGs would be visible below the black line or blue line – Additional WTGs extending up to 8 km beyond the blue line west and south of the dwelling • Lightly scattered tree cover around and beyond the dwelling may offer some filtering of views toward WTGs from the dwelling and curtilage areas • Whilst WTGs may be visible the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line
R14 / R16	VIZ2	1 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-177) would be located 5.77 km (Far Middleground) away • MWTT diagram results: – No WTGs would be visible below the black line or blue line – Additional WTGs extending up to 8 km beyond the blue line south west of the dwelling • Lightly scattered tree cover around and beyond the dwellings may offer some filtering of views toward WTGs from the dwelling and curtilage areas • Whilst WTGs may be visible the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line

ID	VIZ	Number of 60-degree sectors	Impact summary	Mitigation measures
R17	VIZ2	1 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-177) would be located 6.6 km (Far Middleground) away • MWTT diagram results: – No WTGs would be visible below the black line or blue line – Additional WTGs extending up to 8 km beyond the blue line south west of the dwelling • Tree cover around and beyond the dwelling may offer some filtering of views toward WTGs from the dwelling and curtilage areas • Whilst WTGs may be visible the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line
R18	VIZ2	1 Compliant with the Multiple Wind Turbine Effects performance objectives	• Closest wind turbine (W-177) would be located 7.21 km (Far Middleground) away • MWTT diagram results: – No WTGs would be visible below the black line or blue line – Additional WTGs extending up to 8 km beyond the blue line south west of the dwelling • Lightly scattered tree cover around and beyond the dwelling may offer some filtering of views toward WTGs from the dwelling and curtilage areas • Whilst WTGs may be visible the potential for visual impact is not significant and largely mitigated by distance	• No mitigation measures are proposed below the black line

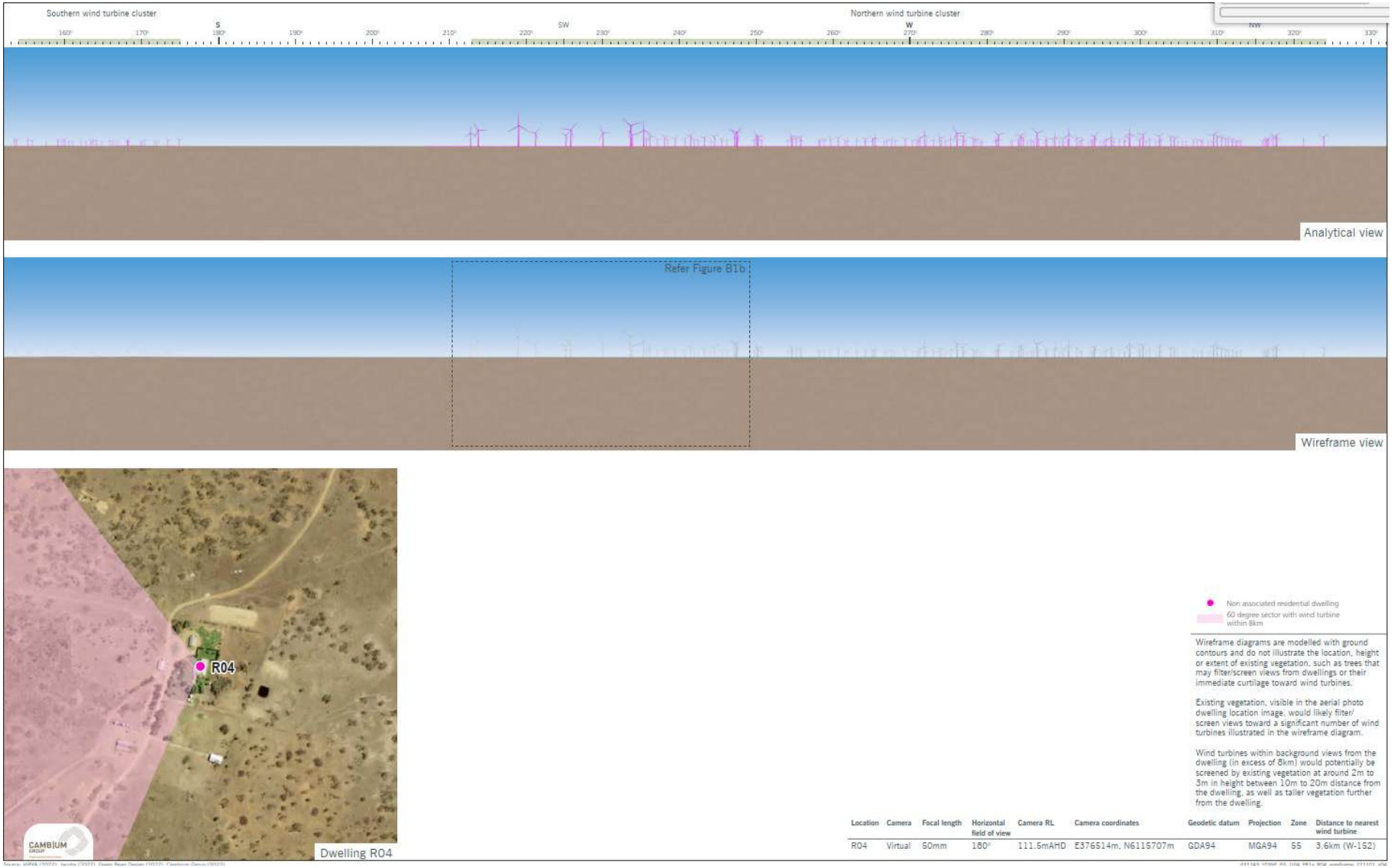
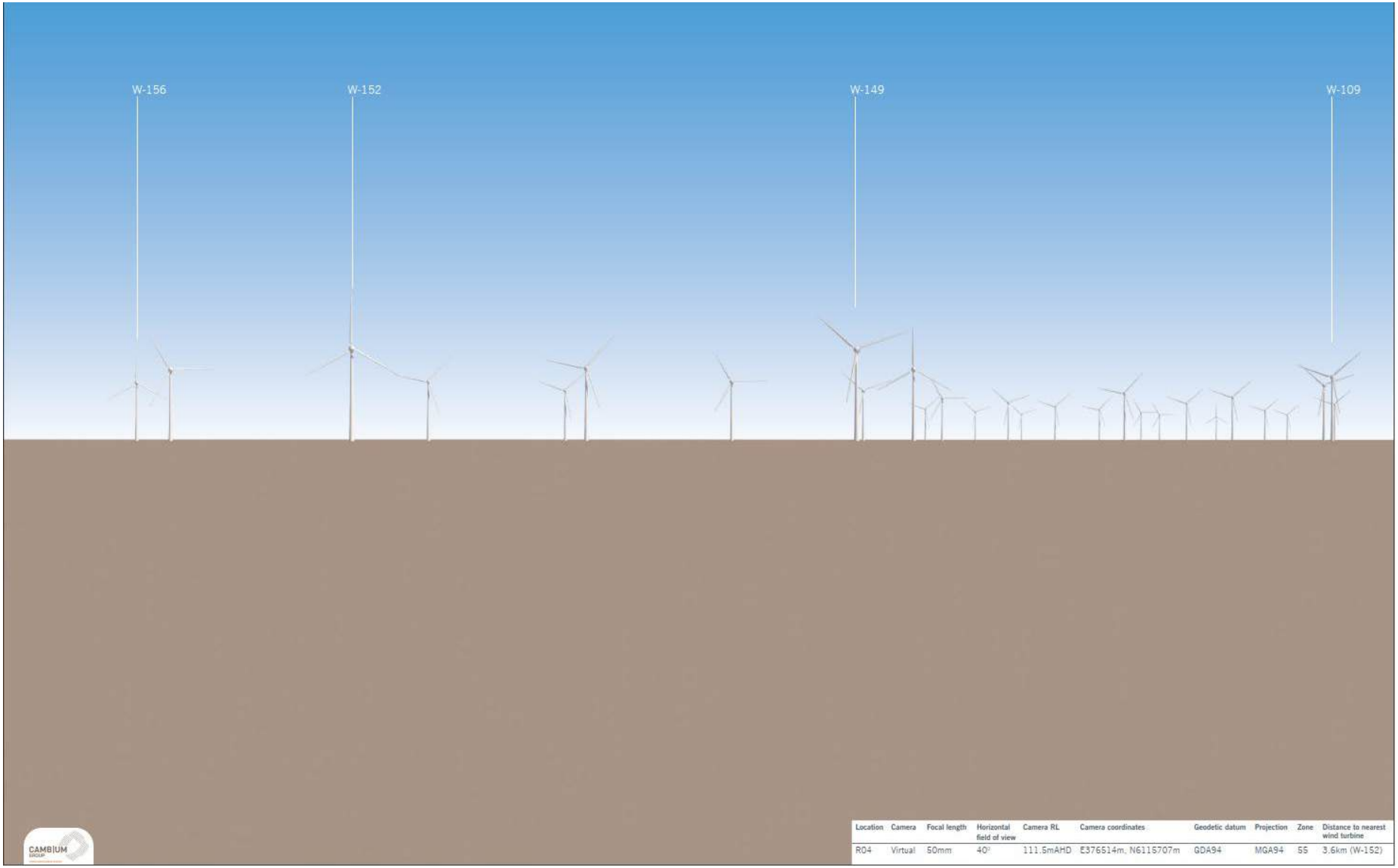


Figure 7-8 Wireframe diagram from closest Non-associated dwelling (R04)



Location	Camera	Focal length	Horizontal field of view	Camera RL	Camera coordinates	Geodetic datum	Projection	Zone	Distance to nearest wind turbine
R04	Virtual	50mm	40°	111.5mAHD	E376514m, N6115707m	GDA94	MGA94	55	3.6km (W-152)

Figure 7-9 Detailed view of wireframe diagram from closest Non-associated dwelling (R04)

7.5.2 Dwellings beyond 8 km

There are 14 dwellings located beyond the eight kilometre Multiple Wind Turbine Tool threshold and up to a distance around 10 km from a WTG. In accordance with the Visual Bulletin (DPE, 2016b) and Visual Influence Zone Matrix (**Figure 7-1**), each of the dwellings beyond eight kilometres is within Visual Influence Zone 3 category.

No visual Landscape Scenic Integrity or Key Feature Disruption performance objectives apply to view locations in a VIZ3 category. In addition, there are no performance objectives noted for VIZ3 view locations regarding Multiple Wind Turbine effects.

The Project would not result in a significant visual impact upon these dwelling.

7.5.3 Dwelling entitlement

There are two properties with potential dwelling entitlements that would be within eight kilometres of the proposed WTGs (refer to **Figure 7-7**). There are no existing dwellings located on either property.

7.5.4 Visual impact on key public viewpoints

Early community consultation activities identified key landscape features nominated by the community, including Jerilderie Racecourse and Lake Jerilderie (refer to **Section 5.4.2**).

A total of seven public viewpoints were assessed as part of this assessment against the visual performance objectives, however, only visual magnitude is considered relevant (refer to **Table 7-7**). The photomontage from the intersection of Kidman Way at Newell Highway to the Project is provided in **Figure 7-10** and **Figure 7-11**, showing the indicative changes to the landscape during Project operation. A full set of photomontages are provided in **Appendix E**.

The Project is not considered to result in an alteration or disruption to views from key viewpoints toward significant landform, vegetation or visually prominent cultural features. While WTGs would be visible from key public view locations, their overall scale would not dominate the landscape.

Table 7-7 Key public view locations visual impact summary and mitigation

Public view location	VIZ	Distance to the nearest WTG	Performance objective notes	Visual significance
Kidman Way	3	7 km	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ 3 view location.	• Views toward the wind farm would be occasionally screened by tree cover alongside and beyond the road corridor • Views from moving vehicles would be temporary and short term in nature • Visual significance would be low
Carrathool Road	3	6.16 km	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ3 view location.	• Views toward the wind farm would be occasionally screened by tree cover alongside and beyond the road corridor • Views from moving vehicles would be temporary and short term in nature • Visual significance would be low
Local (unsealed) roads	1	Less than 500 m	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ 1 view location.	• Views from a small number of roads would be direct and proximate to WTGs • Views would be direct, but short term and transitory and largely impact associated landowners accessing agricultural and land or travelling between properties • Visual mitigation along local road corridors is not considered practical • Visual significance would be moderate to high
Jerilderie Racecourse (to grandstand)	3	10 km	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ3 view location.	• Views from Lake Jerilderie Racecourse would be largely screened by tree cover surrounding the racetrack • Visual significance would be low
Lake Jerilderie (and parks)	3	9.9 km	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ3 view location.	• Views from Lake Jerilderie and surrounding parkland/recreation areas would be largely screened by tree cover alongside the Billabong Creek corridor • Visual significance would be low

Public view location	VIZ	Distance to the nearest WTG	Performance objective notes	Visual significance
Jerilderie township	3	10.3 km	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ3 view location.	• Views from the Jerilderie township would be largely screened by tree cover alongside the Billabong Creek corridor • Visual significance would be low
Coleambally township	3	35 km	The wind farm is compliant with the Bulletin performance objectives as applicable to a VIZ3 view location.	• Long distance views toward the wind farm would be screened by vegetation and tree cover beyond the township • Visual significance would be negligible

Figure 7-10 Photomontage from Kidman Way at Newell Highway

Figure 7-11 Detailed view from Kidman Way at Newell Highway

7.5.5 Aviation hazard lighting and light sources

The main potential light sources associated with the Project would include:

- Low intensity night lights for the BESS, collector and central primary substations, construction compound and operation and maintenance facility
- Night time obstacle lights mounted on some WTGs.

Strobe lighting is not proposed to be installed on the WTGs or within the Project area.

As the visibility of the BESS, central primary and collector substation and control room would be largely minimised and partially screened through existing vegetation, it is unlikely that the light spill from these sources would be visible from distant dwellings.

Night time lighting associated with the Project would not have a significant visual impact on the majority of public viewpoints.

A lighting plan has not been developed for the Project as there are no dwellings within two kilometres of a WTG. In any event, lighting measures have been proposed to avoid light spill from ancillary facilities (**Section 7.7**). Further, screen planting, where proposed as a visual mitigation measure, would also screen views toward WTGs with obstacle lighting.

7.5.6 Ancillary electrical infrastructure

No performance objectives relevant to ancillary electrical infrastructure are noted in the Visual Bulletin.

Ancillary electrical infrastructure, including substations, internal electrical reticulation and proposed transmission line, would not be visible from the Non-associated dwellings listed in **Table 7-6.**

As the visibility of the BESS, central primary and collector substations would be largely minimised and partially screened through existing vegetation, it is unlikely that light spill from these sources would be visible from most surrounding receiver locations including distant dwellings.

Views from vehicles would be transitory and short term and would not result in significant visual effects.

7.6 Potential decommissioning impacts

Decommissioning impacts are expected to be largely similar to the construction impacts outlined in **Section 7.4**. If decommissioned, the Project area would be rehabilitated to its pre-construction condition and all the above-ground infrastructure including WTGs would be removed. As a result, the Project area's visual amenity would be restored, and the landscape character would be returned to the existing condition from the dwellings and key public viewpoints.

7.7 Environmental management measures

Proposed measures to manage and/or mitigate landscape and visual impacts from the Project are detailed in **Table 7-8**.

Table 7-8 Landscape and visual environmental management measures

Impact	Ref	Environmental management measure	Timing
Visual impact to dwellings	LV1	Vegetation screening will be offered to Non-associated landowners within the blue and black line in accordance with the Visual Bulletin. Tree and shrub planting mixes will be selected in agreement with landowners.	Prior to construction, construction, operation
Visual impacts during operation	LV2	Where appropriate, provide long term maintenance of vegetation within the Project to maintain visual filtering or screening.	Construction
	LV3	The materials and colour finished used for Project elements will be chosen to minimise visual impacts, including the use of non-reflective finishes.	Detailed design
	LV4	All Project elements will be maintained and repaired where required with any damaged or missing elements replaced in a timely manner.	Operation
Lighting	LV5	Where temporary lighting is required, temporary light spill beyond the construction site will be avoided.	Construction
	LV6	Design of security lighting throughout the wind farm, collector substations and the BESS and central primary substation will be minimised to decrease the contrast between the Project and the surrounding night time environment. Where possible, motion detectors will be used to activate the lighting	Detailed design
	LV7	Night lighting of ancillary infrastructure will be limited to low-level lighting for security, night time maintenance and emergency purposes.	Operation

8. Noise and vibration

This section summarises the findings of the Noise and vibration technical report (**Appendix F**) prepared for the Project in response to the SEARs.

8.1 Assessment methodology

The methodology for the assessment involved the following:

- Model set up – this included the following tasks:
  - Identification of key sources of noise emissions expected during construction and operation of the WTGs and ancillary infrastructure
  - Identification of key features of the existing environment including surrounding land uses and sensitive receivers within a study area (refer to **Section 8.1.1**), terrain features, prevailing local meteorological conditions and background noise levels
  - Selection of 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
  - Confirmation of the Project details 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 as well as details for the ancillary infrastructure during operations
- Execution of noise model – this assists in predicting potential noise levels at the identified surrounding sensitive receivers
  - The noise impacts from the Project were predicted using the SoundPLAN 8.2 acoustic modelling software
  - Within the noise modelling software, construction noise and operational ancillary infrastructure noise was predicted using the CONCAWE noise propagation algorithm
  - For the operational wind turbine noise, noise levels were predicted using the ISO9613-2 noise propagation algorithm
- Impact assessment – Evaluation of noise impacts was carried out based on a comparison of predicted noise levels against noise management levels and criteria determined for the Project
- Qualitative cumulative impact assessment – The potential for cumulative noise impacts generated by the Project and other nearby developments was assessed based on distances and predicted impacts of the other developments
- Mitigation measures – Recommendations were developed to mitigate or otherwise effectively manage potential impacts during construction and operation of the Project, as required.

Detailed assumptions used in the noise model are provided in **Appendix F**.

8.1.1 Study area

Noise sensitive receivers are defined as a noise-sensitive land use (such as a residence, school, church or recreation area) at which noise from a development can be heard. Sensitive noise receivers were identified within an eight kilometre buffer from the WTGs and within five kilometres from the proposed transmission line to ensure a robust assessment of noise and vibration impacts of the Project.

The noise and vibration study area is shown in **Figure 8-1**.

8.1.2 Criteria

The assessment criteria in **Table 8-1** has been used for this assessment to determine the noise and vibration impacts of the Project.

Table 8-1 Assessment criteria

Noise and Vibration Source	Criteria	Description
N/A	Rating background level (RBL)	Though not a criterion, the rating background levels (RBLs) are used in the determination of an appropriate criteria for addressing noise impacts. Guidance from the Noise Policy for Industry (NPI) (NSW EPA, 2017) was adopted to determine the appropriate background noise levels for assessment. Table 2.1 of the NPI defines the 'Minimum assumed rating background noise levels (RBLs)', which are the lowest RBLs to be adopted for an assessment under the policy. In the absence of actual monitoring data, the following minimum assumed RBLs have been adopted as the RBLs for all identified receivers: Day (7am – 6pm) – 35 dB(A) Evening (6pm – 10pm) – 30 dB(A) Night (10pm – 7am) – 30 dB(A)
Construction	Construction Work	Based on the Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change, 2009) the following noise management levels were applied for construction noise: • Standard Construction Hours: • Day RBL (35 dB(A)) + 10 dB(A) = 45 dB(A) • Day Outside Standard Construction Hours: • Day RBL (35 dB(A)) + 5 dB(A) = 40 dB(A) • Evening Outside Standard Construction Hours: • Evening RBL (30 dB(A)) + 5 dB(A) = 35 dB(A) • Night Outside Standard Construction Hours: • Night RBL (30 dB(A)) + 5 dB(A) = 35 dB(A) • 'Highly Noise Affected' (Standard Construction Hours Only) = 75 dB(A).
	Sleep disturbance	• The ICNG adopts guidance from the Road Noise Policy (RNP) (DECCW, 2011). Where noise levels from a construction (or industrial) source at a residential receptor at night exceeds the following, a maximum noise level event assessment should be undertaken: • $L_{Aeq,15min}$ 40 dB(A) or the RBL + 5 dB(A), whichever is greater, and/or • L_{AFMax} 52 dB(A) or the RBL +15 dB(A), whichever is greater. • Based on the above and the RBLs adopted for the assessment, the sleep disturbance criterion for the Project are as follows: • $L_{Aeq,15min}$ 40 dB(A) • L_{AFMax} 52 dB(A).
	'Annoying' noise characteristics	Equipment that has the potential to produce a tonal noise, an impulsive noise or any other type of noise defined by the ICNG as 'particularly annoying', the noise level for that particular equipment would receive a + 5 dB(A) penalty. As per guidance from the NPI (NSW EPA, 2017), the penalty for impulsive noise (i.e. the hammers, packers, and compactors) would only

Noise and Vibration Source	Criteria	Description
		be applied during night periods. The penalty for tonal noise (i.e. road saws and grinders) would apply for all periods.
	Vibration	Section 7 of the Construction Noise and Vibration Guideline (CNVG), (Roads and Maritime Services, 2016) provides guidance for safe working distances to achieve human comfort (Assessing Vibration: a technical guideline, (DECC, 2006) and cosmetic building damage (BS7385-2:1993) criteria for a range of different plant and equipment. These setback distances have been adopted to assess 'Human Comfort' and 'Cosmetic Damage' vibration impacts.
WTGs	WTG operation	The Wind Energy: Noise Assessment Bulletin (Noise Bulletin) (DPE, 2016c) sets baseline criteria to be adopted in the absence of background monitoring data. Additionally, the Noise Bulletin allows negotiable criteria for receivers associated with the Project. Based on this, the following criterion has been adopted for assessment: • Non-associated receivers: 35 dB(A) • Associated and Host receivers: 45 dB(A).
	Tonality	Where any tones above the criterion provided in the Noise Bulletin are predicted at any residences, a +5 dB(A) correction would be applied to the predicted noise level.
	Low frequency noise	Where predicted noise levels greater than 60 dB(C) are predicted at a noise sensitive receiver, a +5 dB(A) correction would be applied to the predicted noise level.
Industrial noise	Ancillary infrastructure operation	The NPI details the process for adopting 'Project Noise Trigger Levels (PNTLs) for the Project based an 'intrusiveness' and 'amenity' level. Based on these levels, the following PNTLs have been adopted for the assessment: • Day (7am – 6pm): 40 dB(A) • Evening (6pm – 10pm): 35 dB(A) • Night (10pm – 7am): 35 dB(A).
	Tonality	Where any tones above the criterion provided in the NPI are predicted at any residences, a +5 dB(A) correction would be applied to the predicted noise level.
	Low frequency noise	Where the C-weighted noise contribution at a receiver is 15 dB greater than the A-weighted contribution at a noise receiver, and any of the third octave noise levels presented in Table C2 of Fact Sheet C of the NPI are exceeded at the noise receiver, then a +5 dB(A) correction would be applied to the predicted noise level.
Traffic Noise	Road traffic (construction and operation)	• The RNP sets out traffic noise criteria for: • Freeway/arterial/sub-arterial roads: – Day - LAeq, (15 hour) 60 dB(A), Night - LAeq, (9 hour) 55 dB(A) • Local roads: – Day - LAeq, (1 hour) 55 dB(A), Night - LAeq, (1 hour) 50 dB(A).

8.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- Wind Energy: Noise Assessment Bulletin (DPE, 2016c)
- Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- NSW Road Noise Policy (RNP) (DECCW, 2011)
- Noise Policy for Industry (NPI) (NSW EPA, 2017)
- Assessing Vibration: A technical guideline (DECC, 2006)
- British Standard 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting (BS 6472-1: 2008)
- Australian Standard 2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives (AS 2187.2-2006)
- British Standard 7385: 1990 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration (BS 7385-2: 1993)
- DIN 4150-3 Vibrations in buildings – Part 3: Effects on structures (DIN 4150-3: 2016)
- Construction Noise and Vibration Guideline (CNVG) (RMS, 2016).

8.3 Existing environment

8.3.1 Background noise

Background noise monitoring was not conducted for the Project. As such, guidance from the NPI (NSW EPA, 2017) was adopted to determine the appropriate background noise levels for assessment. The usage of the minimum assumed rating background noise levels is considered a conservative assumption. However, as the Project area and the immediate surrounding areas are generally rural and undeveloped, the minimum levels are considered to be an appropriate representation of the local acoustic environment. The minimum assumed rating background noise levels adopted for the assessment are detailed in **Table 8-2**.

Table 8-2 Assumed RBLs at all receivers

Location	Rating background noise level (L_{A90} dB(A))		
	Day (7:00 am to 6:00 pm)	Evening (6:00 pm to 10:00 am)	Night (10:00 pm to 7:00 am)
All receivers	35	30	30

8.3.2 Noise sensitive receivers

A total of 22 noise sensitive receivers were identified within the study area, 20 near the WTGs and two near the proposed transmission line. The status of the noise receiver (i.e. associated or Non-associated with the Project) and the location of the nearest WTG or proposed transmission line is presented in **Table 8-3** and **Table 8-4**, respectively.

All receivers are residential buildings and shown in **Figure 8-1**. Dark green cells indicate Host Receivers, light green cells indicate Associate Receivers and red cells indicate Non-associated Receivers.

Table 8-3 Noise sensitive receivers relevant to the Project

Receiver	Classification	Nearest turbine	Nearest turbine distance (m)
R01	Host Receiver	W-008	2030.2
R02	Host Receiver	W-142	2062.4
R03	Host Receiver	W-134	2660.3
R04	Non-associated Receiver	W-153	3642.8
R05	Non-associated Receiver	W-001	4061.6
R06	Associated Receiver	W-185	4203.7
R07	Associated Receiver	W-202	4338.2
R08	Associated Receiver	W-185	4457.1
R09	Non-associated Receiver	W-205	4599.2
R10	Associated Receiver	W-202	4714.6
R11	Associated Receiver	W-046	5512.8
R12	Non-associated Receiver	W-153	5680.1
R13	Non-associated Receiver	W-177	5770.9
R14	Non-associated Receiver	W-177	6171.9
R15	Associated Receiver	W-202	6446.6
R16	Non-associated Receiver	W-177	6545.6
R17	Non-associated Receiver	W-177	6607.3
R18	Non-associated Receiver	W-177	7212.1
R19	Associated Receiver	W-205	7307.1
R20	Host Receiver (outside of Project area)	W-205	7535.0

Table 8-4 Noise sensitive receivers adjacent to the transmission line

Receiver	Classification	Distance to transmission line (m)
R35	Non-associated Receiver	2667.7
R36	Non-associated Receiver	4631.7

8.3.3 Vibration sensitive receivers

Certain receivers and structures, such as medical centres, precision industry and heritage structures are typically more susceptible to vibration and are subject to more stringent criteria. The assessment identified the following:

- Nearest medical centre to the Project is Jerilderie Medical Centre which is located approximately 10 kilometres south-east of the Project area
- The closest listed-heritage item to the Project is The Yanko Station Store, located approximately 6.5 kilometres from the Project area
- No precision industries have been identified within the vicinity of the Project area.

At these distances, it has been predicted that no vibration impacts from the Project would be experienced by these receivers.

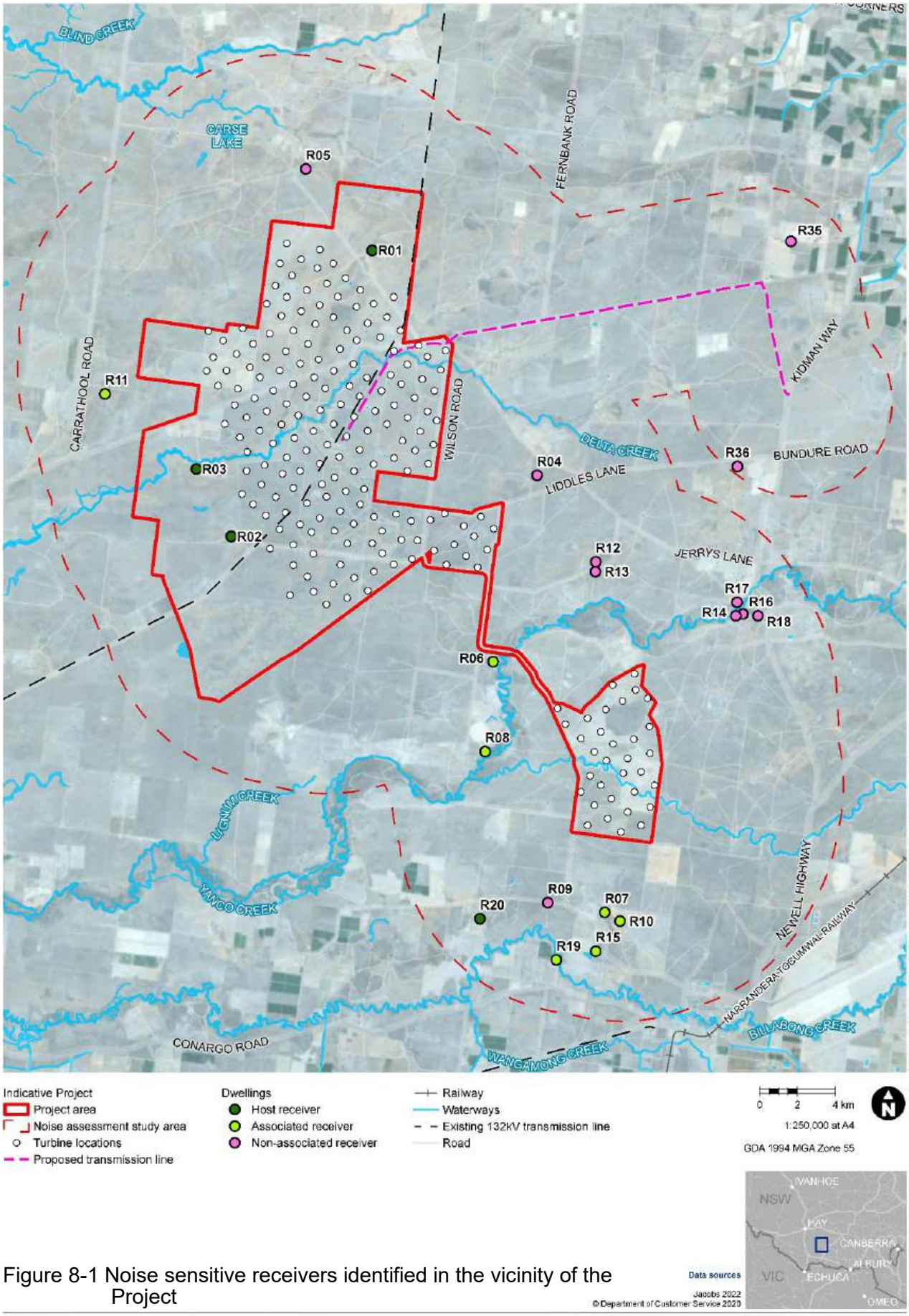


Figure 8-1 Noise sensitive receivers identified in the vicinity of the Project

8.4 Potential construction impacts

The construction noise and vibration impact assessment was based on the construction activities/schedule and construction hours described in **Section 3.4**.

Sound power levels were estimated for the significant noise-generating phases of Project construction. Sound power levels for each construction phase were determined by developing an inventory of noise producing equipment and the estimated numbers of equipment based on the work taking place. The construction noise and vibration inventory applied for the assessment is provided in **Appendix F**.

The construction noise assessment assumes all plant and equipment for each activity being operated concurrently while located closest to each individual receiver, which would be a conservative approach that estimated the worst-case scenario. The actual construction noise levels would be lower than the predicted noise levels.

8.4.1 Construction noise

Estimated noise levels were predicted from the anticipated noise levels generated during each construction phase of the Project. These noise levels were then compared with the NMLs (refer to **Table 8-1**) to understand which receivers might be the most affected during each construction phase.

During standard construction hours, the assessment identified the following:

- Noise levels greater than the NMLs have been restricted to the Host and Associated Receivers, with no Non-associated Receivers predicted to experience noise greater than the NML
- Construction phases 2, 4 and 7 are the stages that have been predicted to impact receivers with noise greater than the NML. All other construction phases have been predicted to have no receivers experience noise greater than the NML
- R01, R02 and R06 are the closest receivers to the majority of work and, as such, are consistently the receivers experiencing the greatest construction noise levels from the Project. Noise at R01 may be up to 6 dB(A) over the NML, while noise at R06 may also be up to 5 dB(A) greater than the NML.

During day time hours outside of standard construction hours, the assessment identified the following:

- Noise levels greater than the NMLs have been restricted to the Host and Associated Receivers, with no Non-associated Receivers predicted to experience noise greater than the NML
- Construction phases 2, 3, 4 and 7 are the stages that have been predicted to impact receivers with noise greater than the NML. All other construction phases have been predicted to have no receivers experience noise greater than the NML
- R01, R02 and R06 are the closest receivers to the majority of work and, as such, are consistently the receivers experiencing the greatest construction noise levels from the Project. Noise at R01 may be up to 11 dB(A) over the NML, noise at R02 may be up to 4 dB(A) over the NML, while noise at R06 may be up to 10 dB(A) greater than the NML.

During evening and night time hours outside of standard construction hours, the assessment identified the following:

- Noise levels greater than the NMLs have been restricted to the Host and Associated Receivers, with no Non-associated Receivers predicted to experience noise greater than the NML

- Construction phases 2, 3, 4, 5 and 7 are the stages that have been predicted to impact receivers with noise greater than the NML. All other construction phases have been predicted to have no receivers experience noise greater than the NML
- R01, R02, R03 and R06 are the closest receivers to the majority of work and, as such, are consistently the receivers experiencing the greatest construction noise levels from the Project. Noise at R01 may be up to 16 dB(A) over the NML, noise at R02 may be up to 9 dB(A) over the NML, noise at R03 may be up to 5 dB(A) over the NML while noise at R06 may be up to 15 dB(A) greater than the NML

8.4.2 Sleep disturbance

While the majority of construction work is expected to be done in standard hours, there is the potential for some work to be conducted at night. When construction is done at night, residents at receivers have the potential to experience sleep disturbance.

Key sleep disturbance findings include:

- Construction phase 4 has been predicted to impact R01 with noise up to but not exceeding the sleep disturbance criteria
- Likewise, construction phase 7 has been predicted to impact R06 with noise up to but not exceeding the sleep disturbance criteria
- All other construction phases have been predicted to produce noise lower than the sleep disturbance criteria at all receivers.

8.4.3 Construction traffic noise

Noise from construction traffic would increase the overall traffic noise by more than 2 dB along the majority of roads in the primary route for construction vehicles However, due to the distances between receivers and the roads, the overall noise level would be lower than the assessment criterion.

At Kidman Way and Jerilderie Street, where receivers are closer to the road and construction traffic is expected to be a significant noise contributor, construction traffic noise has been predicted to be greater than the RNP (NSW EPA, 2011) assessment criteria. These exceedances are shown in **Table 8-5**.

Table 8-5 Construction traffic noise level exceedances

Road	Time	Existing traffic noise level (dB(A))	Construction traffic noise level (dB(A))	Increase in noise level (dB)	Traffic noise criteria (dB(A))
Kidman Way	Day (7am – 10pm)	52.9	62.0	9.1	60
	Night (10pm – 7am)	55.7	59.9	4.2	55
Jerilderie Street	Day (7am – 10pm)	57.2	61.4	4.2	60

8.4.4 Construction vibration

Vibration impacts have the potential to occur during construction as a result of the usage of the vibratory roller, both of which would be employed during the access track construction and underground cabling work. For both of these, the nearest receiver is R06, located approximately 650 metres away. At these distances, no vibration impacts have been predicted.

8.5 Potential operational impacts

8.5.1 Wind turbine noise

The WTGs associated with the Project have been predicted to produce different sound power levels with wind speed. Other factors, including the size of the turbines will also influence noise. These factors, including the sound power levels and noise spectra associated with the turbines have been presented in **Appendix F**.

The noise levels predicted during operation at each of the sensitive receivers in the vicinity of the Project are presented in **Table 8-6**, including worst-case conditions (13 m/s cut-off). The key operational noise findings include:

- At all Non-associated Receivers, WTGs have not been predicted to produce noise impacts greater than the 35 dB(A) baseline criteria established in Wind Energy: Noise Assessment Bulletin (DPE, 2016c) ('the Noise Bulletin'), hence no mitigation has been deemed necessary for these receivers.
- Noise at R01 and R02, two Host Receivers, has been predicted to be 1dB(A) greater than 35 dB(A).

Detailed noise contour maps showing the predicted noise propagation are provided in Appendix D of **Appendix F**.

Table 8-6 Predicted WTG noise level at receivers

Receiver	Landowner type	Criteria (dB(A))	Noise level at wind speed (dB(A))											Exceedance of criteria?
			3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	Cutoff	
R01	Host Receiver	45	22	22	25	28	32	35	36	36	36	36	36	No
R02	Host Receiver	45	22	22	24	28	32	35	36	36	36	36	36	No
R03	Host Receiver	45	21	21	23	27	31	34	35	35	35	35	35	No
R04	Non-associated Receiver	35	17	17	19	23	27	30	31	31	31	31	31	No
R05	Non-associated Receiver	35	15	15	18	22	25	28	29	29	29	29	29	No
R06	Associated Receiver	45	15	15	17	21	25	28	29	29	29	29	29	No
R07	Associated Receiver	45	13	13	15	19	23	26	27	27	27	27	27	No
R08	Associated Receiver	45	14	14	16	20	24	27	28	28	28	28	28	No
R09	Non-associated Receiver	35	12	12	15	19	22	25	26	26	26	26	26	No
R10	Associated Receiver	45	12	12	15	19	22	25	26	26	26	26	26	No
R11	Associated Receiver	45	15	15	17	21	24	27	29	29	29	29	29	No
R12	Non-associated Receiver	35	14	14	16	20	24	27	28	28	28	28	28	No
R13	Non-associated Receiver	35	13	13	16	20	23	26	27	27	27	27	27	No
R14	Non-associated Receiver	35	11	11	14	17	21	24	25	25	25	25	25	No
R15	Associated Receiver	45	10	10	12	16	20	23	24	24	24	24	24	No
R16	Non-associated Receiver	35	11	11	13	17	21	24	25	25	25	25	25	No

Receiver	Landowner type	Criteria (dB(A))	Noise level at wind speed (dB(A))											Exceedance of criteria?
			3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	Cutoff	
R17	Non-associated Receiver	35	11	11	13	17	20	23	25	25	25	25	25	No
R18	Non-associated Receiver	35	10	10	13	16	20	23	24	24	24	24	24	No
R19	Associated Receiver	45	9	9	11	15	19	22	23	23	23	23	23	No
R20	Host Receiver (outside of Project area)	45	9	9	12	16	19	22	23	23	23	23	23	No

8.5.1.1 Low frequency noise

Low frequency noise occasionally associated with wind turbine noise may lead to noise impacts that are considered intrusive at receivers. No receiver has been predicted to experience noise levels greater than 60 dB(C) and as such no low frequency noise are anticipated, and no low frequency noise penalty has been adopted for the Project.

8.5.1.2 Tonal noise

Tonal impacts may occur where noise in a particular octave band is greater than the adjacent bands by a significant degree. Where a tone at a noise sensitive receiver, generated by a wind turbine is predicted to trigger the criteria, then a tonal noise penalty would apply.

The tonal assessment identified that no tonal noise impacts are predicted for any receivers, and no tonal noise penalty is required for the Project.

8.5.2 Ancillary infrastructure noise

8.5.2.1 BESS and substation noise

Noise produced by the BESS, collector and central primary substation (in particular the transformers proposed to be operated in the substations) have the potential to produce noise which may be noticeable at the nearby receivers. Details of the transformers, including the sound power levels and noise spectra have been presented in **Appendix F**.

Under both options for the central primary substation, all receivers experience noise well below the most stringent Project Noise Trigger Levels (35 dB(A)), with only four receivers (R01, R02, R03 and R04) predicted to receive noise 20 dB(A) or greater. As such, noise from the Project substations are not predicted to result in noise impacts which would lead to a non-compliance with the Project noise trigger levels as defined by the NPI.

8.5.2.2 Substation low frequency and tonal noise

As with WTGs, the substations may produce low frequency noise and tonal noise, both of which may result in a penalty to the overall noise levels.

It is predicted that the low frequency noise levels would not exceed the spectra level criteria in Table C2 of the NPI (NSW EPA, 2017). As such the low frequency noise level from substations would not require any penalty for either substation option.

Tonal impacts resulting from substations were assessed through the same method as assess tonal impacts from WTGs (refer to **Section 8.5.1.2**). No tonal noise impacts have been predicted at any Associated or Non-associated receivers for both substation options, and no tonal noise penalty needs to be applied for either option.

8.5.2.3 Other infrastructure

Cabling and transmission lines will also be installed as part of the Project. However, noting proximity to receivers of these components and the low level of noise that these components would emit, negligible noise impacts at receivers are anticipated.

8.5.3 Vibration

There would be no vibration impacts associated with the Project.

8.5.4 Road traffic

Traffic generated during operation would primarily be comprised of maintenance and inspection vehicles as well as delivery vehicles. Heavy vehicle movements are likely to be sporadic in nature and as required. Road traffic noise associated with vehicle movements during operation is anticipated to be negligible.

8.6 Potential decommissioning impacts

The activities and equipment adopted for the assessment of construction noise are an appropriate representation of the noise-producing activities during decommissioning, though the decommissioning will be undertaken under a shorter timeframe and hence noise and vibration impacts will be less temporally intensive. As such, the construction noise impacts summarised in **Section 8.4.1** above are an appropriate representation of decommissioning noise.

8.7 Environmental management measures

Proposed measures to manage and/or mitigate noise and vibration impacts from the Project are detailed in **Table 8-7.**

Table 8-7 Noise and vibration environmental management measures

Impact	Reference	Environmental management measure	Timing
Construction noise	NV1	A Construction Noise Management Plan will be developed to address noise where it is likely to be greater than the applicable NMLs.	Prior to construction
General construction and operational noise and vibration	NV2	A complaints line will be established for nearby residents to contact regarding noise from the construction and operation of the Project.	Prior to construction
General construction noise and vibration	NV3	Where reasonable and feasible, standard noise mitigation measures from the Construction Noise and Vibration Guidelines (RMS, 2016) will be adopted, including: • Wherever possible and safe, limit work to standard hours of construction • Select low-noise plant and equipment • Ensure equipment mufflers operate in a proper and efficient manner • Where possible, use quieter and less vibration emitting construction methods • Only have necessary equipment on-site and turn off when not in use • Where possible, concentrate noisy activities at one location and move to another as quickly as possible • Vehicle movements, including deliveries outside standard hours, would be minimised and avoided where possible • All plant and equipment is to be well maintained and, where possible, fitted with silencing devices • Use only the necessary size and powered equipment for tasks • Implement training to induct staff on noise sensitivities • Where possible, consider the application of less intrusive alternatives to reverse beepers such as ‘squawker’ or ‘broadband’ alarms • Consider the installation of temporary construction noise barriers or earth mounds for concentrated, noise-intensive activities • Where practicable, install enclosures around noisy mobile and stationary equipment as necessary • Where possible, avoid simultaneous operation of two or more noisy plant close to receivers • The offset distance between noisy plant and sensitive receivers would be maximised • Plan traffic flow, parking and loading/unloading areas to minimise reversing movements • Complete routine monitoring to evaluate construction noise levels and evaluate whether the mitigation measures in place are adequate or require revision	Prior to construction, construction, operation, decommissioning

Impact	Reference	Environmental management measure	Timing
General construction vibration	NV4	Where reasonable and feasible, standard vibration mitigation measures will be adopted from the Assessing Vibration: a technical guideline, (DECC, 2006), including: • Choosing alternative, lower-impact equipment or methods wherever possible • Scheduling the use of vibration-causing equipment at the least sensitive times of the day (wherever possible) • Locating high vibration sources as far away from sensitive receiver areas as possible • Sequencing operations so that vibration-causing activities do not occur simultaneously • Keeping equipment well maintained • Do not conduct vibration intensive work within the recommended safe setback distances • Informing nearby receivers about the nature of construction phases and the vibration-generating activities.	Prior to construction, construction, operation, decommissioning
Construction traffic noise	NV5	To minimise construction traffic noise, the following will be implemented where required: • Revising vehicle routes and scheduling to reduce heavy vehicle traffic along roads predicted to experience construction traffic noise impacts • Avoiding the use of compression brakes • Ensuring vehicles are adequately silenced before leaving or accessing the Project.	Prior to construction, construction, operation, decommissioning
Operational noise	NV6	Once the wind turbine, BESS and substation layouts are finalised and the final WTG, BESS and substation components and technology is selected, noise modelling will be revised and predicted noise levels will be updated to ensure it will comply with the criteria.	Detailed design
	NV7	In the event that turbine emissions are found to exceed the contracted values from the turbine supplier, the supplier will be required to implement measures to reduce the noise to the contracted value. This can include measures to rectify manufacturing defects or appropriate control settings. The determination of the control settings should be performed through a noise assessment, considering the potential controls required at each turbine to address noise non-compliances most effectively. It is noted that the turbines selected feature 'Low Noise Operations' modes, which could be utilised to manage the settings and noise levels of the turbines where it has been identified as necessary.	Detailed design
	NV8	An Operational Noise Management Plan will be developed and will include: • Demonstration of compliance with noise criteria • Noise testing procedures • Reporting details and timeframes.	Prior to operation

Impact	Reference	Environmental management measure	Timing
	NV9	Noise monitoring will be undertaken in accordance with the NSW Noise Assessment Bulletin to ensure compliance with criteria.	Operation
Cumulative noise impacts	NV10	Work schedules and timings will be discussed with the proponents of other nearby developments to gain an understanding of when noisy work may take place concurrently. Should respectively project schedules and work priorities change, proponents will seek to commit to regular meetings to ensure all proponents are aware of the changes.	Prior to construction, construction
	NV11	Where possible, work will be scheduled to occur at different times of the day to prevent multiple noisy activities from taking place at the same time.	Construction
	NV12	Where possible, schedule work to take place at different locations within the Project to prevent noisy activities from taking place in close proximity to one another which will limit the amplification of the noise.	Construction

9. Biodiversity

This section summarises the findings of the Biodiversity Development Assessment Report (BDAR) (**Appendix G**) prepared for the Project in response to the SEARs, and the supplementary SEARs in line with the EPBC referral (2022/09214) for the Project (**Appendix C**).

9.1 Assessment methodology

The methodology for the assessment was undertaken in accordance with the Biodiversity Assessment Method (BAM) and involved the following:

- Review of existing information – includes database searches, relevant ecological reports to the Project area, relevant vegetation, geology and soil mapping and spatial data
- Field surveys across the study areas (refer to **Section 9.1.1** and **Section 9.1.2**), including:
  - Rapid plant community type (PCT) mapping
  - Vegetation integrity assessment – 82 plots were completed
  - Targeted flora survey – guided by the methodology and effort described in Surveying threatened plants and their habitats
  - Targeted fauna surveys – undertaken where potential habitat was identified within the subject land
- Category 1 land – As much of the Project area is unmapped on the Native Vegetation Regulatory Map, the assessment identified land that met criteria for Category 2 - Regulated Land and Category 1 - exempt Land. This also included Category 2 Sensitive Regulated land and Category 2 Vulnerable Regulated land
- Native vegetation mapping within the landscape buffer – Up to date aerial imagery and State Vegetation Type Map: Riverina Region Version v1.2 - VIS_ID 4469 (DPIE, 2016) was used to map native vegetation across the Project area; and supplemented with rapid vegetation mapping survey
- PCT mapping – Type and distribution of PCTs within the Project area were identified and mapped in accordance with the BioNet Vegetation Classification database (DPE, 2022). Each PCT was divided into vegetation zones, where each zone contains the same PCT and has a similar condition state. Each PCT was also assigned to the relevant corresponding Threatened Ecological Community (TEC) where applicable
- Vegetation integrity assessment – A plot-based full floristic survey and vegetation integrity (VI) assessment was carried out in the biodiversity study area using plots and mid-lines, which provided a representative assessment of the vegetation integrity of the vegetation zones
- Threatened species habitat assessment – Biodiversity Assessment Method Calculator (BAM-C) was used to derive an initial list of candidate species and supplemented with database searches; a species was predicted as requiring assessment if that species meets all relevant criteria
- Aquatic assessment – Following a likelihood of occurrence assessments for aquatic ecology, potential impacts to aquatic ecosystems were identified and a risk assessment approach has been adopted for determining the magnitude of risks to aquatic ecosystems within the aquatic assessment study area
- Identification of prescribed impacts – Defined as impacts that are in addition to, or instead of, impacts from clearing native vegetation, done in accordance with Section 8.3 of the BAM
- Assessment of prescribed impacts for wind farm developments – This included research, bird utilisation survey, bat activity survey, species movement patterns and protected animals collision risk assessment
- Assessment for Matters of National Environmental Significance – Assessment of significance have been conducted for threatened species, populations and communities that were recorded

in the Project area during field surveys or were identified as having a moderate or higher potential to occur in the Project area based on the presence of habitat
- Impact avoidance and minimisation – Project design and location was reviewed and altered to avoid and minimise impacts
- Assessment of direct, indirect, prescribed, uncertain and cumulative impacts
- Serious and irreversible impacts (SAII) assessment – Evaluation of threatened entities against principles and criteria set out in subsection 9.1.2 of the BAM for each species
- Recommendations to avoid, minimise and/or mitigation potential impacts to biodiversity and monitoring programs
- Determination of offsets required for the Project.

The limitations for the vegetation and targeted species surveys are presented in the BDAR (refer to **Appendix G**).

9.1.1 Study areas

The biodiversity assessment focused on the following study areas (refer to **Figure 9-1**):

- **Disturbance footprint** – As defined in **Section 3.2**, the maximum extent of physical disturbance during construction and operational activities
- **Biodiversity study area** – Disturbance footprint with a 10 metre buffer, and is the area in which the vegetation integrity assessment and targeted surveys were carried out to confirm PCT mapping and presence of threatened flora species
- **Subject land** – Biodiversity study area with a 500 metre buffer
- **Landscape buffer** – Subject land with an additional 500 metre buffer, in accordance with Section 3.1 of the BAM
- **Habitat buffer** – the area of a habitat buffer (flora or fauna) applies to species credit species to define a species polygon show areas to minimise disturbance/avoid clearing.
- **Aquatic assessment study area** – Disturbance footprint with a 500 metre buffer to account for potential upstream and downstream impacts.

9.1.2 Survey effort

A summary of survey effort for the biodiversity assessment is presented in **Table 9-1**.

Table 9-1 Summary of survey effort, dates and locations

Biodiversity survey	Date	Location of survey
Vegetation		
Rapid PCT assessment and mapping	27-31 October 2021	Study area (all project components)
	8-12 August 2022	Study area (all project components)
Vegetation integrity assessment	15-19 August 2022	Study area (all project components)
Flora species		
Targeted flora surveys	21-30 September 2021	Study area (all project components)
	15-20 November 2021	
	23-27 November 2021	
	17 January 2022	
	5-9 September 2022.	

Biodiversity survey	Date	Location of survey
Fauna species		
Bird and bat utilisation survey	November 2021, February 2022, May 2022 and July 2022	Landscape buffer
Nest tree survey	November 2021, February 2022, May 2022 and July 2022	Fauna buffers
Nocturnal survey	11-14 July 2022 and 18 August 2022	Fauna buffers (100m)
Diurnal observations – nest trees	November 2021 August and September 2022	Fauna buffers
Amphibian surveys	17-21 January 2022	Landscape buffer

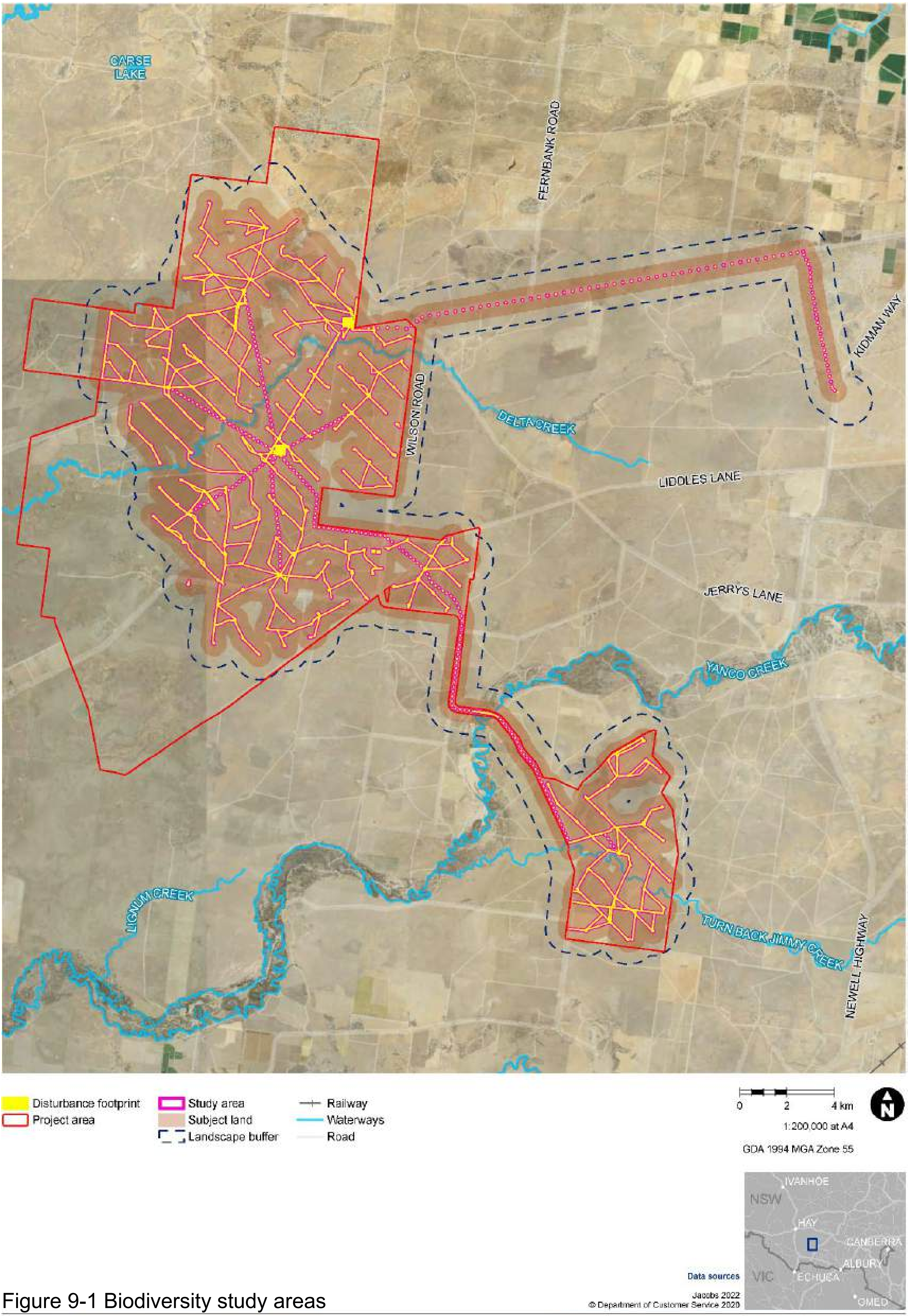


Figure 9-1 Biodiversity study areas

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9.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- EPBC Act
- EP&A Act
- EP&A Regulation
- The Biodiversity Assessment Method (BAM) (DPIE, 2020)
- BC Act and the Biodiversity Offsets Scheme (BOS)
- FM Act
- Policy and guidelines for fish habitat conservation and management – Update 2013 (DPI, 2013c)
- Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge, 2003)
- The Aquatic Ecology in Environmental Impact Assessment – EIA Guideline (Smith, 2003)
- Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (DPIE, 2020d)
- 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH, 2018)
- *Local Land Services (LLS) Act 2013*
- Risk Assessment Guidelines for Groundwater Dependant Ecosystems (Serov et al., 2012).

9.3 Existing environment

9.3.1 Landscape features

Table 9-2 summarises the relevant biodiversity landscape features identified within and surrounding the Project area.

Table 9-2 Biodiversity landscape features

Landscape feature	Details
Interim Biogeographic Rationalisation for Australia (IBRA) bioregions and subregions	• Murrumbidgee IBRA sub-region • Riverina IBRA bioregion
NSW landscape Regions (Mitchell landscapes)	• Murray Source-bordering Dunes • Murray Depression Plains • Murray Lakes, Swamps and Lunettes • Murray Scalded Plains • Murray Channels and Floodplains
Rivers and streams	The Project area is within the Murrumbidgee catchment and key waterways include: • Delta Creek • Yanco Creek • Turn Back Jimmy Creek. All three waterways have been deemed sensitive receiving environments. In addition to the mapped waterways, the Project area exhibits some minor drainage depressions that hold water during rainfall and flooding, and flow in a south-westerly direction

Landscape feature	Details
Wetlands	• No Ramsar Wetlands or Important Wetlands would be located within the Project area
Connectivity of habitat	• The entire landscape has good habitat connectivity with particularly important areas along narrow intact riparian zone along Delta and Yanco Creek, which contains remnant woodland • No formally mapped biodiversity corridors • 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; which provide dependable links for birds, microbats, and large macropods within existing sheep and cattle grazing practices • 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 provide important linkages for wildlife movement in the landscape
Areas of geological significance	• No areas of geological significance have been identified within the Project area or immediate surrounds • Landscape is flat with river channel and floodplain features dominant and the complexities of geomorphology and surface sediment distribution all reflect past climates and different river discharge regimes • The dominant geological formation in the Project area is the Cainozoic Shepparton Formation (Czs), deriving from sediments deposited during the Plio-Pleistocene Epoch (5,000,000 to 12,000 years ago)
Soil landscapes	Soil landscape mapping is available from eSpade for the southern half of the Project area and predominantly includes: • Jerilderie (jex) – Broad level plains on alluvium deposits from the Riverine Plains • Coleambally (clo) – Undulating sand plains deposited from re-worked alluvium, sand ridges and swales present • Yancobong (ybz) – Confined alluvial floodplains and channels from Billabong Creek and Yanco Creek, and their paleo channels
Soil hazard features	• Soils in southern half of the Project area have a high potential for erosion via wind and/or water • Areas within the Project area have a high potential for land salinity, and a moderate overall salinity hazard
Acid sulfate soils	There is the potential for Acid sulfate soils (ASS) to be encountered in small areas, in the vicinity of waterbodies and water courses within the Project area, however, the groundwater table is unlikely to be lowered or impacted by the Project
Areas of outstanding biodiversity value (AOBV)	One AOBV within the Project area – 'Threatened species or communities with potential for serious and irreversible impacts' associated with the Plains-wanderer important habitat mapping and 'Protected Riparian Land'.
Native vegetation extent	The landscape buffer is 35,893 ha in size and contains approximately 30,703 hectares (86%) of native vegetation. This is assigned to the >70% BAM vegetation cover class.

9.3.2 Excluded impacts

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. As such, preliminary mapping of Category 1 - Exempt Land was undertaken to identify locations in the Project area that require endorsement from DPE.

Due to the long history of agriculture in the Project area, some of the landscape has been disturbed or modified over the course of 150 years, mainly from grazing and fire wood collection during drought periods, as well as large areas of cropping.

Indicative areas of Category 1 - Exempt Land have been mapped in the Project area based on the observations and analysis of clearing in non-woody vegetation:

- Historical and current aerial imagery
- Large scale ploughing of paddocks for cultivation
- Existing constructed vehicle tracks
- Location of farm dams with major earthworks
- Anecdotal dialogue from landholders.
- Consultation with BCS.

There is an extensive network existing farm tracks across the Project area. Many of these tracks vary in condition, width and use by landholders. Many tracks are not constructed and have compacted over time with regular use or have regenerated with native grassland with irregular use. Due to the difficulty in mapping the variety of track types and conditions, the majority of tracks have been classed as native vegetation and assigned to vegetation zone based on observed vegetation mapping.

A map of Category 1 – Exempt Land is shown in **Figure 9-2**.

A full description of the methodology to determine excluded impacts is provided in Appendix M of **Appendix G** (BDAR).

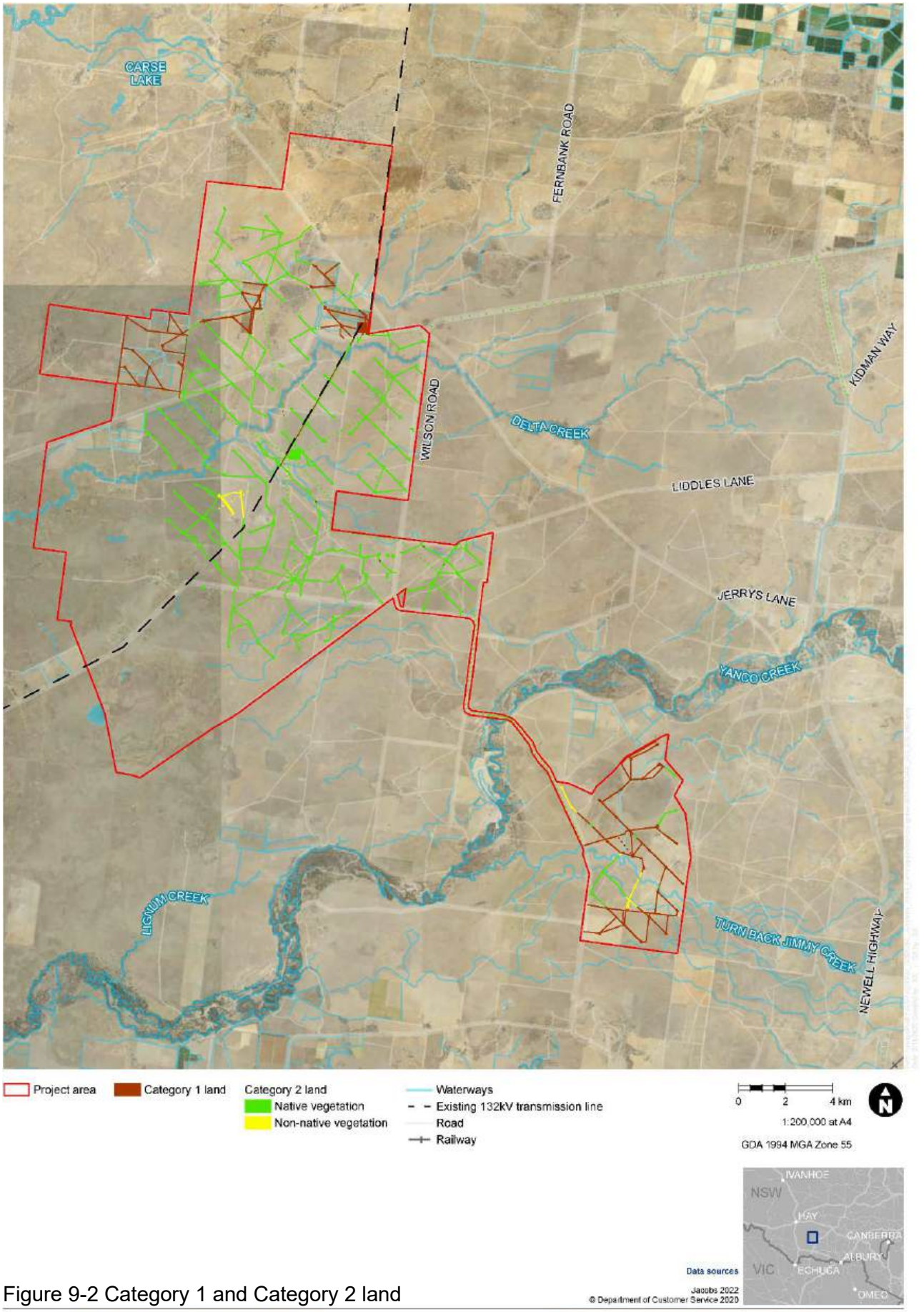

Figure 9-2 Category 1 and Category 2 land

9.3.3 Native vegetation

Within the disturbance footprint there is 173.39 hectares of native vegetation, comprised of 10 plant community types (PCTs) that vary in condition and patch size (refer to **Table 9-3** and **Figure 9-3**).

There is 60.29 hectares of non-native vegetation that is established on the cropping land that is regularly ploughed and cultivated. These areas are dominated mainly by exotic annual grasses (*Lolium* spp, *Hordeum* spp.) and a diversity of exotic forbs (*Arctotheca calendula*, *Medicago* spp., *Hypochaeris* spp.) with no native plant species observed.

Table 9-3 PCTs and vegetation zones within disturbance footprint

Plant community type[1]		Vegetation zone		Area (ha)
PCT 7	River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	1	Low to Moderate	1.10
PCT 9	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion	2	Low to Moderate	0.22
PCT 13	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	3	Moderate to Good	0.58
		4	Low to Moderate	0.11
PCT 17	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	5	Moderate to Good	1.86
PCT26	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	6	Moderate to Good_grassy	27.00
		7	Low to Moderate_grassy	1.40
		8	Moderate to Good_shrubby	2.10
		9	Low to Moderate_shrubby	0.59
PCT28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	10	Low to Moderate	10.28
PCT44	Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion (PCT44)	11	Moderate to Good	32.99
		12	Low to Moderate	3.15
PCT45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	13	Moderate to Good	1.42
		14	Low to Moderate	0.81

Plant community type[1]		Vegetation zone		Area (ha)
PCT46	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	15	Moderate to Good	31.29
		16	Low to Moderate	13.32
		17	Moderate to Good_Cottonbush	23.49
		18	Low to Moderate_Cottonbush	22.51
PCT160	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	19	Moderate to Good	0.03
Total				**173.39**

[1]In some cases, the vegetation in the Project area does not strictly meet the definition of a PCT as per the BioNet Vegetation Classification database so the vegetation has been allocated to the PCT with which it most closely aligns.

9.3.4 Threatened ecological communities

There are four threatened ecological communities (TECs) listed under the BC Act or EPBC Act within the disturbance footprint (refer to **Table 9-4** and **Figure 9-4**).

Table 9-4 Threatened ecological communities within the disturbance footprint

TEC name	BC Act Status	EPBC Act Status	Associated PCT	Area (ha)
BC Act				
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	EEC	-	PCT 26 (zone 6,7,8,9)	31.09
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	EEC	-	PCT 28 (zone 10)	10.28
EPBC Act				
Weeping Myall Woodlands	-	EEC	PCT 26 (zone 6,7,8,9)	29.69
Natural Grasslands of the Murray Valley Plains	-	CEEC	PCT 44 (zone 11) PCT 45 (zone 13) PCT46 (zone 15, 17)	88.33

CEEC = critically endangered ecological community, EEC = endangered ecological community

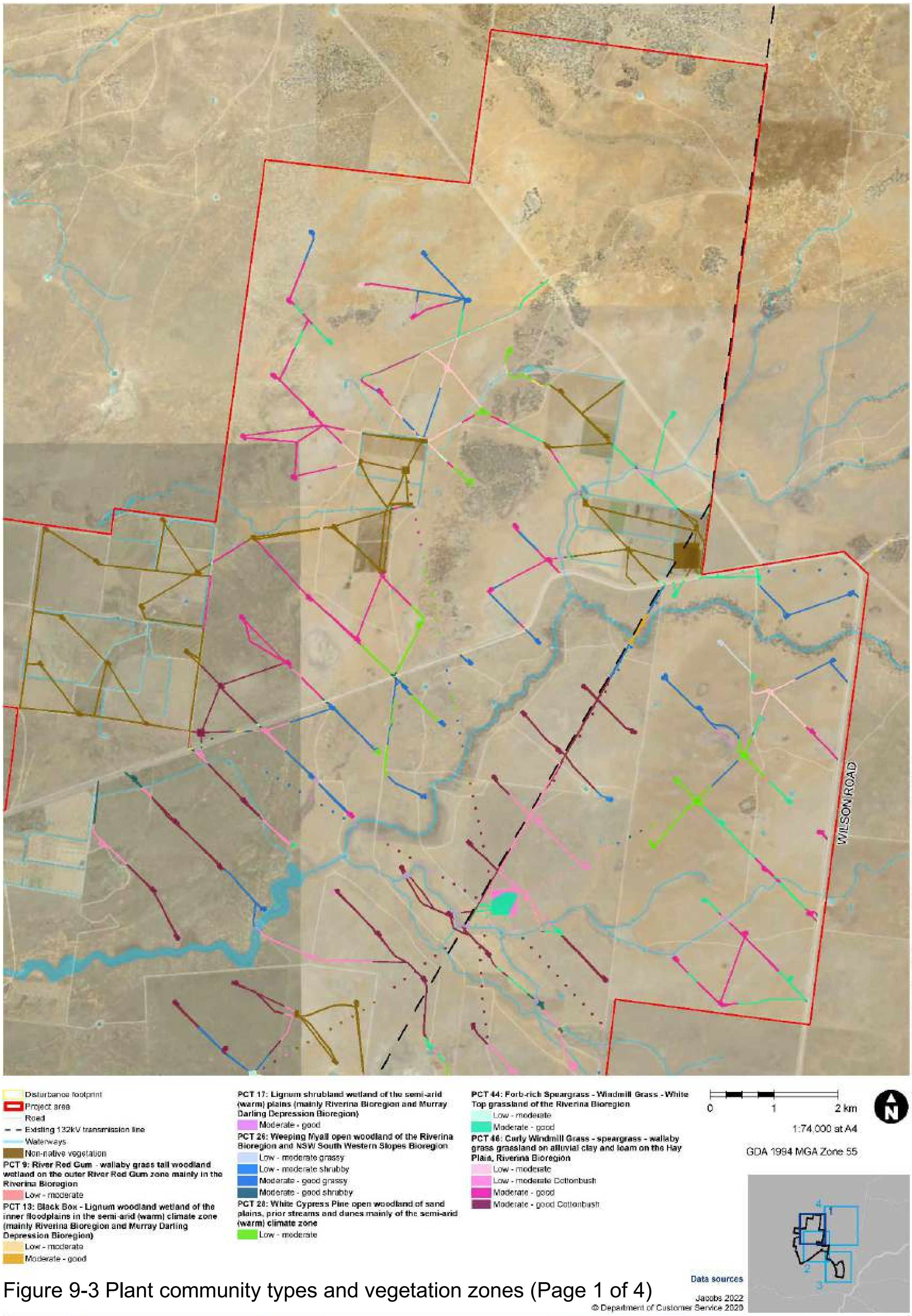

Figure 9-3 Plant community types and vegetation zones (Page 1 of 4)

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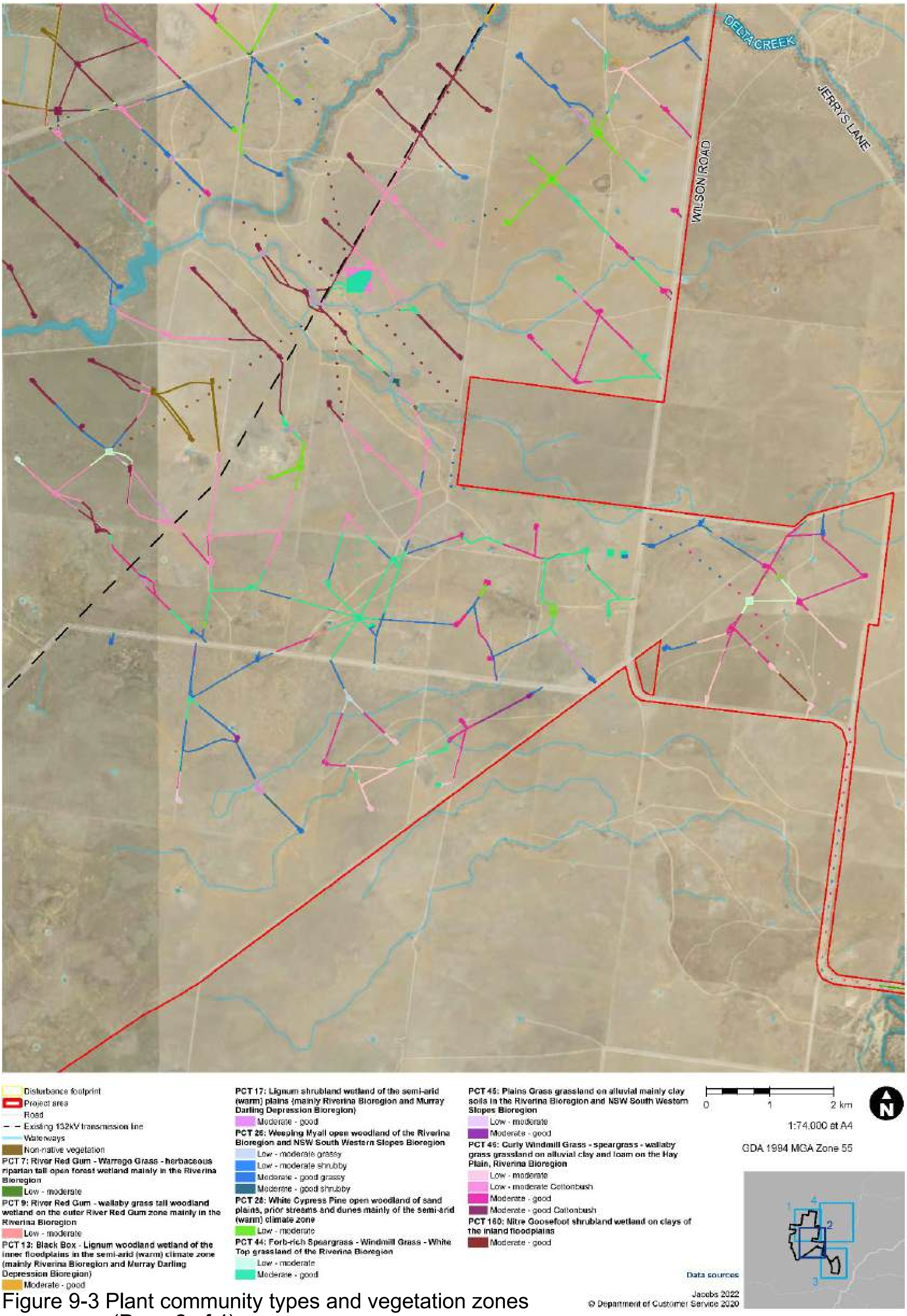

Figure 9-3 Plant community types and vegetation zones (Page 2 of 4)

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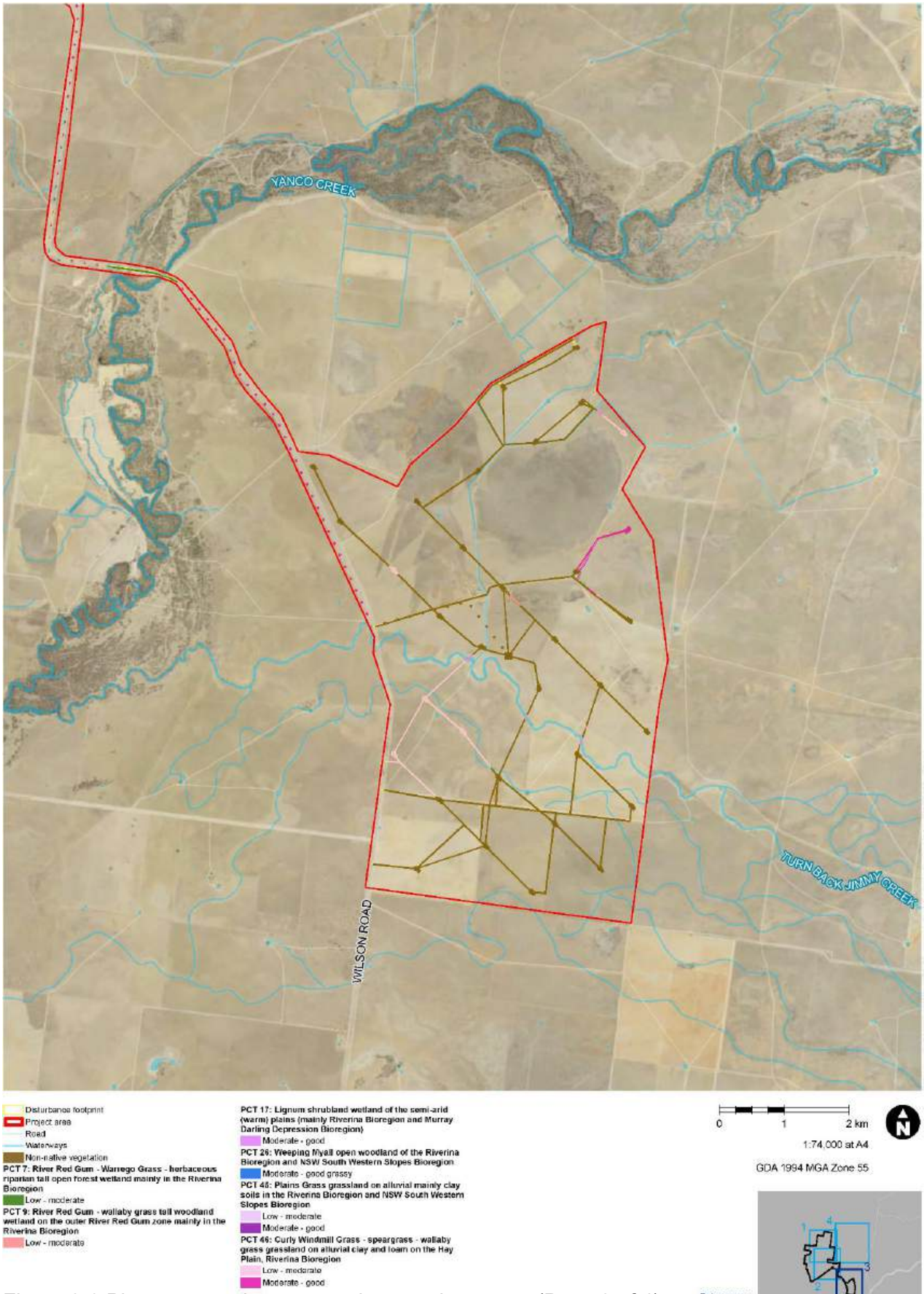


Figure 9-3 Plant community types and vegetation zones (Page 3 of 4)

Figure 9-3 Plant community types and vegetation zones (Page 4 of 4)

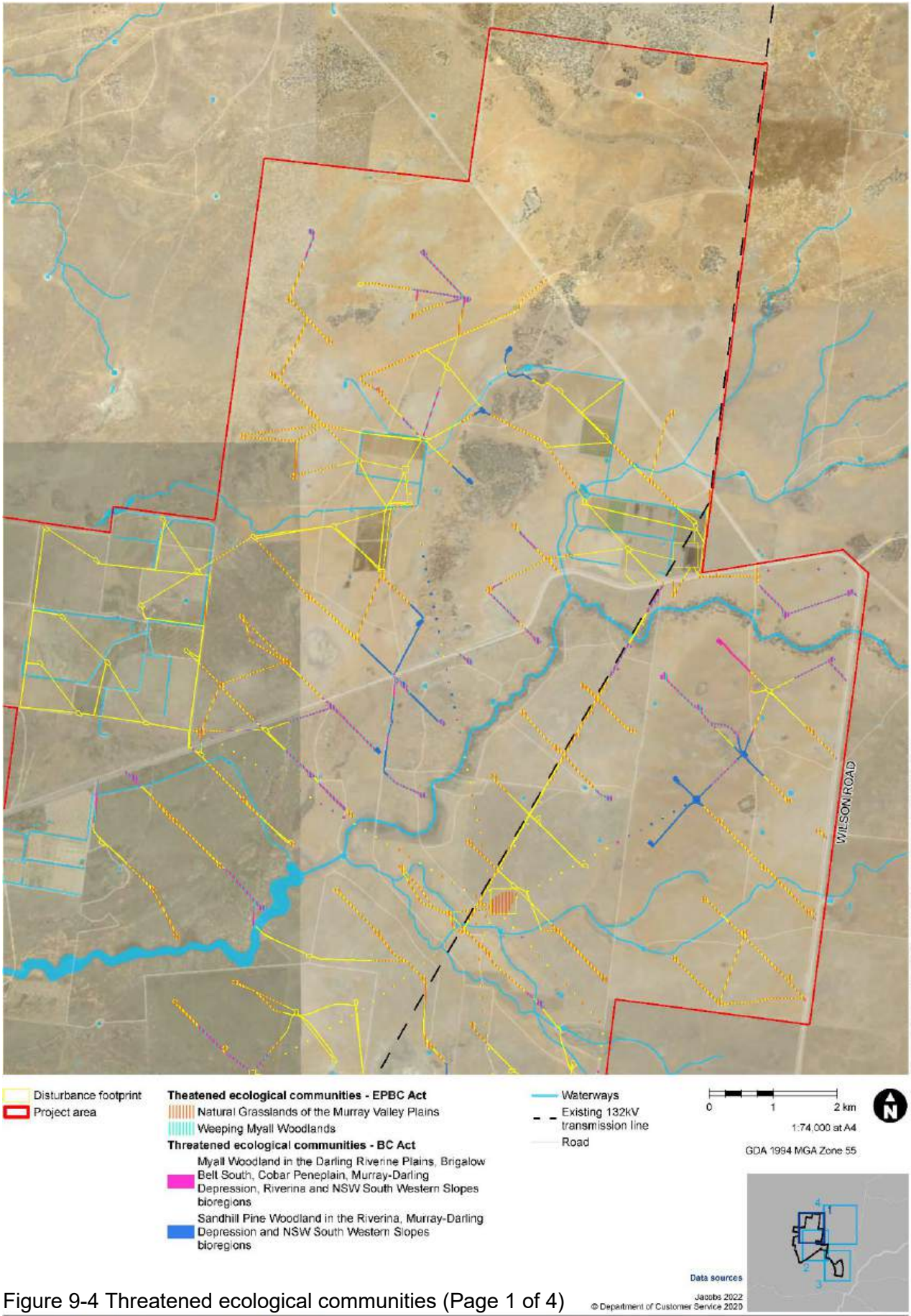


Figure 9-4 Threatened ecological communities (Page 1 of 4)

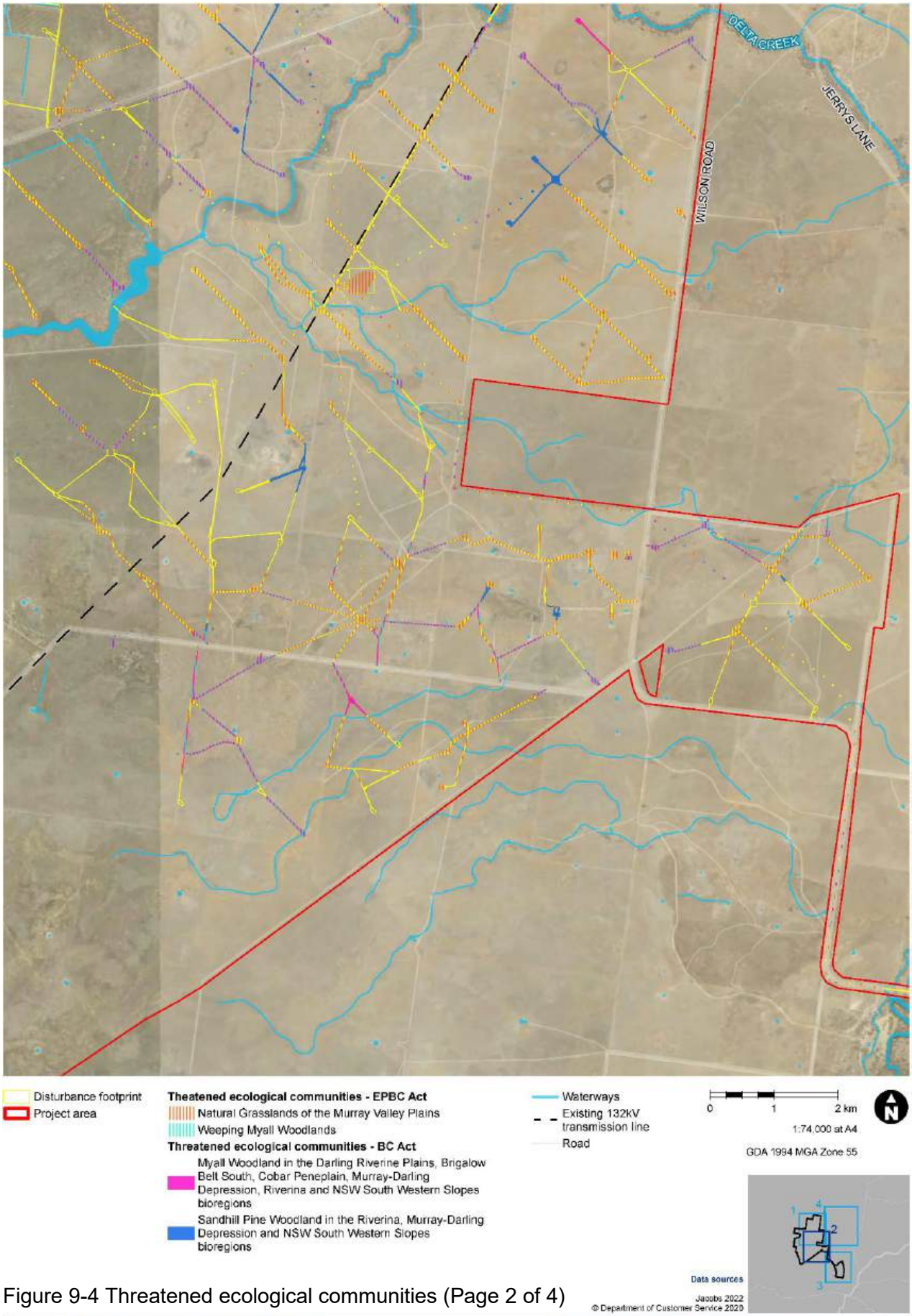


Figure 9-4 Threatened ecological communities (Page 2 of 4)

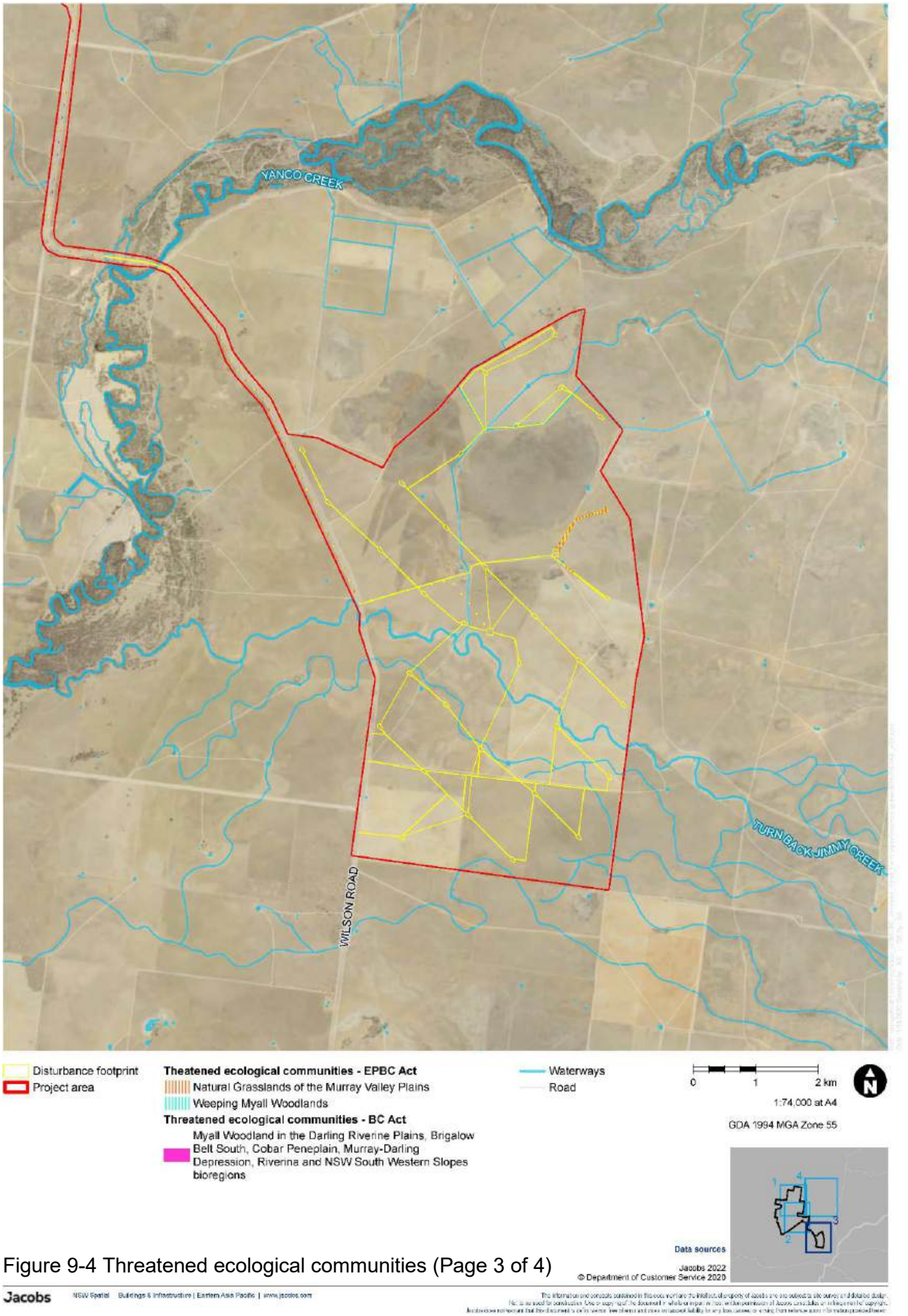


Figure 9-4 Threatened ecological communities (Page 3 of 4)

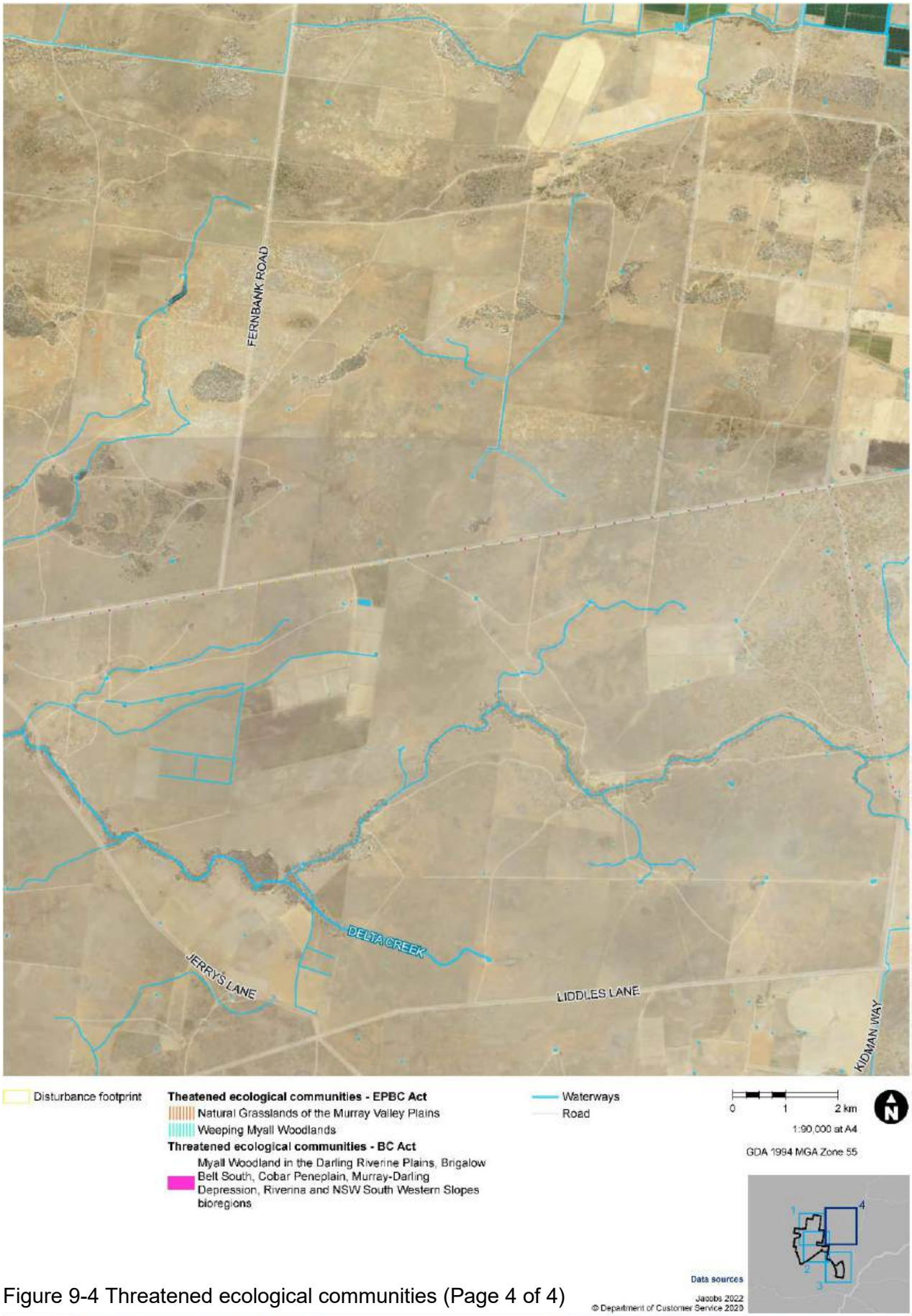


Figure 9-4 Threatened ecological communities (Page 4 of 4)

9.3.5 Groundwater dependent ecosystems

The level of groundwater dependence for ecological communities in the disturbance footprint is listed in **Table 9-5**.

Table 9-5 Level of groundwater dependence

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	PCT 7: River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	High potential GDE - from regional studies
	PCT 9: 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
	PCT 13: Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression	Low potential GDE - from regional studies
	PCT 26: Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	Low potential GDE - from regional studies
	PCT 28: White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Low potential GDE - from regional studies
	PCT 17: Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Low potential GDE - from regional studies
	PCT 44: Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion	Low potential GDE - from regional studies
	PCT 45: Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Low potential GDE - from regional studies
	PCT 46: Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	Low potential GDE - from regional studies
	PCT 160: 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, 2022).

9.3.6 Threatened species

9.3.6.1 Threatened flora species and habitat

Surveys were conducted in September 2021, November 2021, January 2022 and September 2022 which satisfies the requirements detailed in Section 5.3 of the BAM for all threatened flora species identified. Fifteen threatened plant species were targeted during surveys of the study area. Two threatened plant species were found within the study area during targeted surveys including:

- *Swainsona murrayana* (Slender Darling Pea) – listed vulnerable under BC Act and EPBC Act
- *Swainsona sericea* (Silky Swainson-pea) listed vulnerable under BC Act.

Not all areas of suitable habitat for threatened flora were surveyed during the targeted surveys due to restricted access to properties from inclement weather (e.g. flood event in November 2021 and September 2022) and modifications in the design to avoid social and environmental constraints. The area of native vegetation within the disturbance footprint that was not able to be traversed comprises 41 hectares or 16% of the disturbance footprint.

In accordance with Section 5.1.2 (1), Section 5.2.4 (2), Section 5.3 (1b) and Section 10.1.1 (3) of the BAM, the assumption of presence is required where adequate survey cannot be undertaken. Although the preference is not to assume presence for a Project where possible, the BAM is considered to recognise that this is not always able to be achieved. As such, the remaining areas of suitable habitat that we not traversed are assumed to be habitat for 14 candidate species associated with the relevant PCTs, including:

- *Austrostipa wakoolica*
- *Brachyscome muelleroides*
- *Brachyscome papillosa*
- *Caladenia arenaria*
- *Convolvulus tedmoorei*
- *Cullen parvum*
- *Lepidium monoplocoides*
- *Leptorhynchos orientalis*
- *Maireana cheelii*
- *Pilularia novae-hollandiae*
- *Sclerolaena napiformis*
- *Swainsona murrayana*
- *Swainsona plagiotropis*
- *Swainsona sericea* (Where populations were confirmed these individuals were avoided. Other habitat not surveyed is assumed)

The location of threatened flora species is shown in **Figure 9-5**.

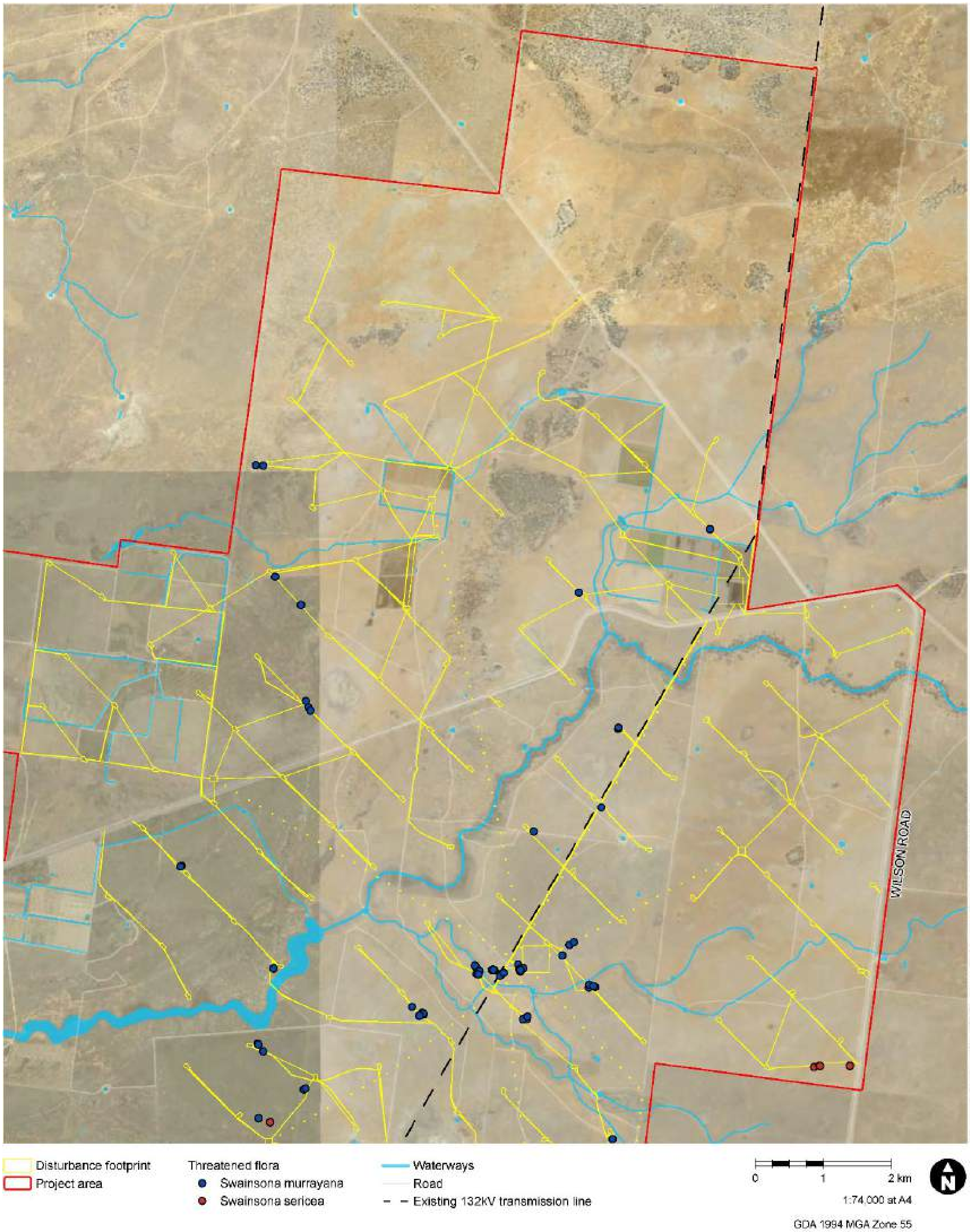
9.3.6.2 Threatened fauna species and habitat

A total of 11 threatened or protected species were recorded within the subject land during field surveys, including:

- Spotted Harrier
- White-fronted Chat
- Dusky Woodswallow
- Little Eagle
- Square-tailed Kite
- Grey-crowned Babbler
- Superb Parrot
- Diamond Firetail
- Flame Robin
- Black Falcon
- Varied Sitella.

Southern Myotis and Yellow-bellied Sheathtail-bat are assumed to be present in areas with suitable habitat. Echolocation calls from Anabat devices for these species could not be positively

confirmed. Plains-wanderer has important habitat in the subject land. Observations of two calling birds were recorded during diurnal surveys, however this species has a very similar call to Painted button Quail (*Turnix varius*) and identification could not be fully confirmed. The location of threatened species is shown in **Figure 9-6**.



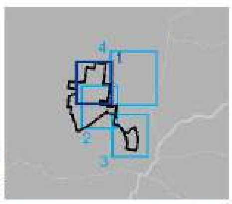


Figure 9-5 Threatened flora recorded during field surveys (Page 1 of 4)

Data sources
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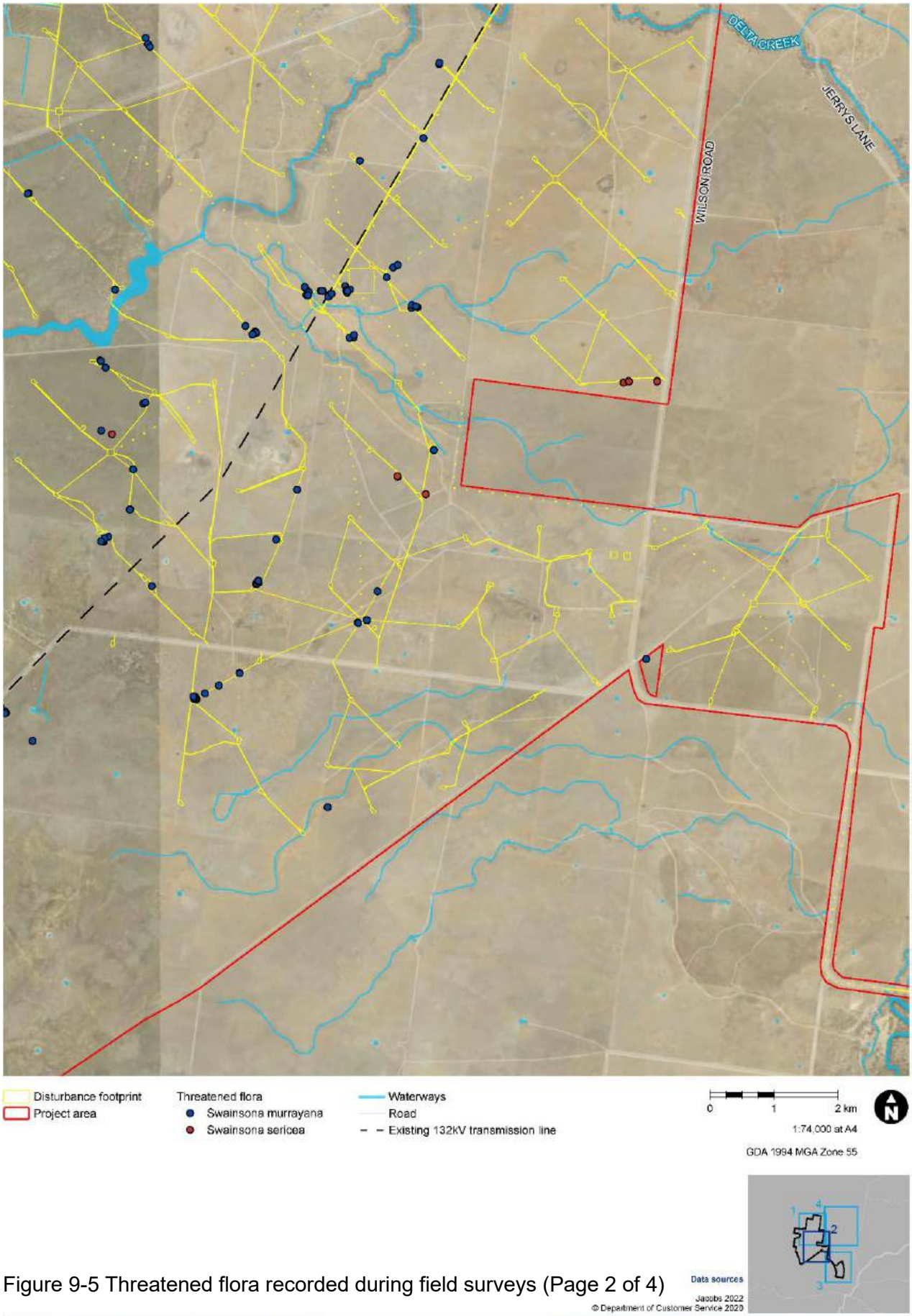


Figure 9-5 Threatened flora recorded during field surveys (Page 2 of 4)

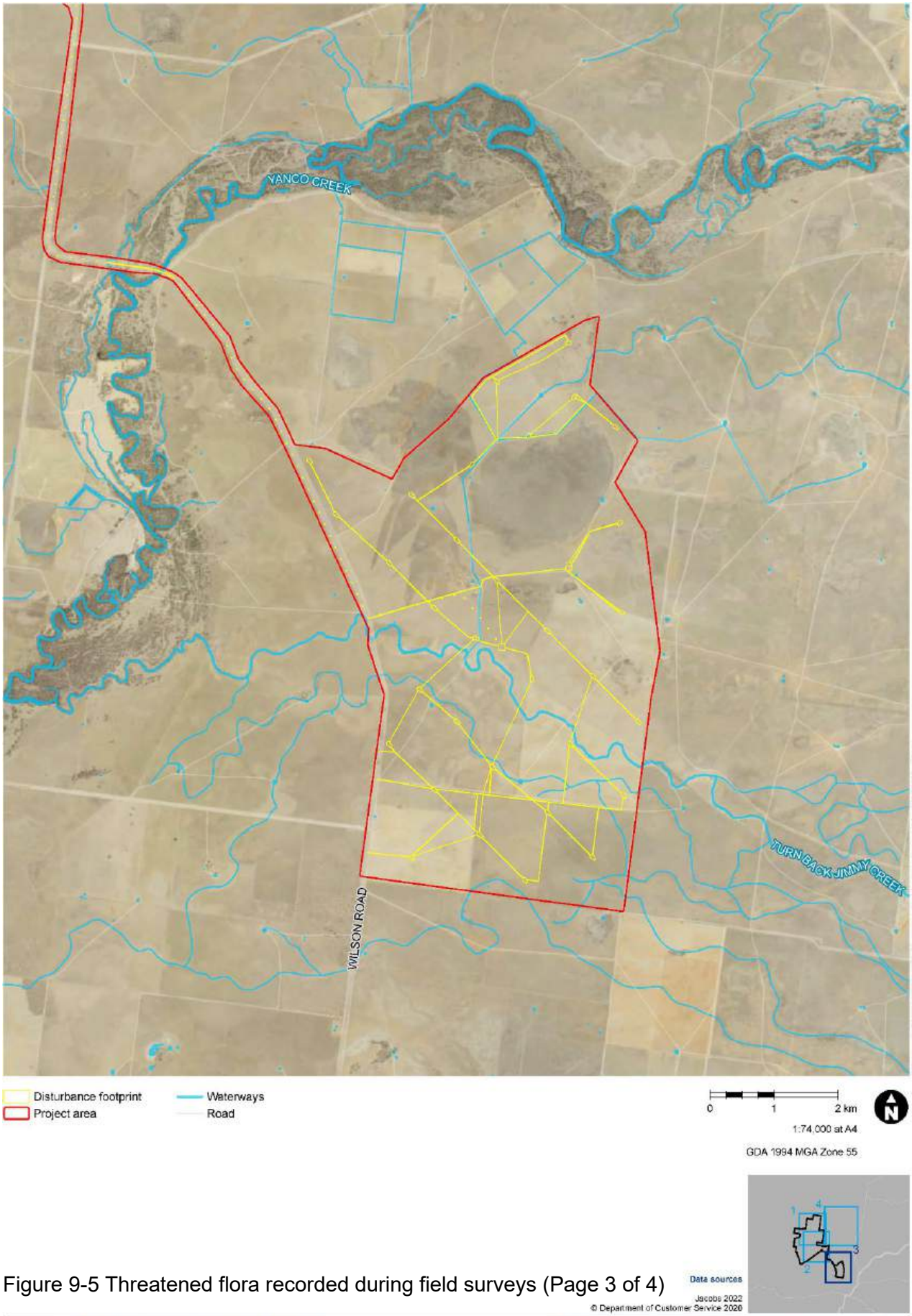
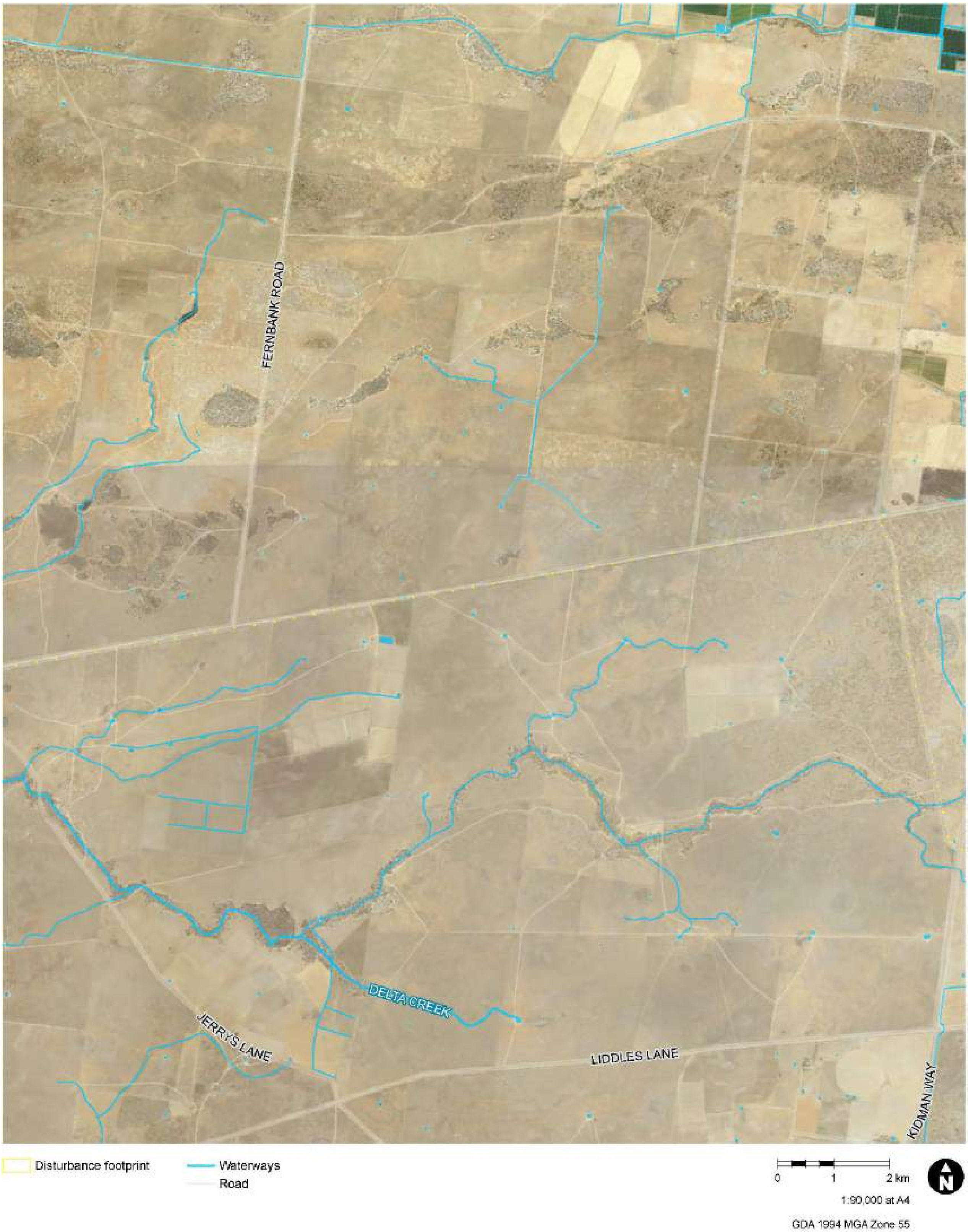


Figure 9-5 Threatened flora recorded during field surveys (Page 3 of 4)



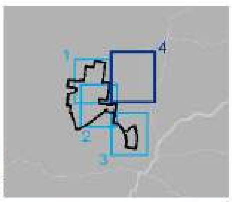


Figure 9-5 Threatened flora recorded during field surveys (Page 4 of 4)

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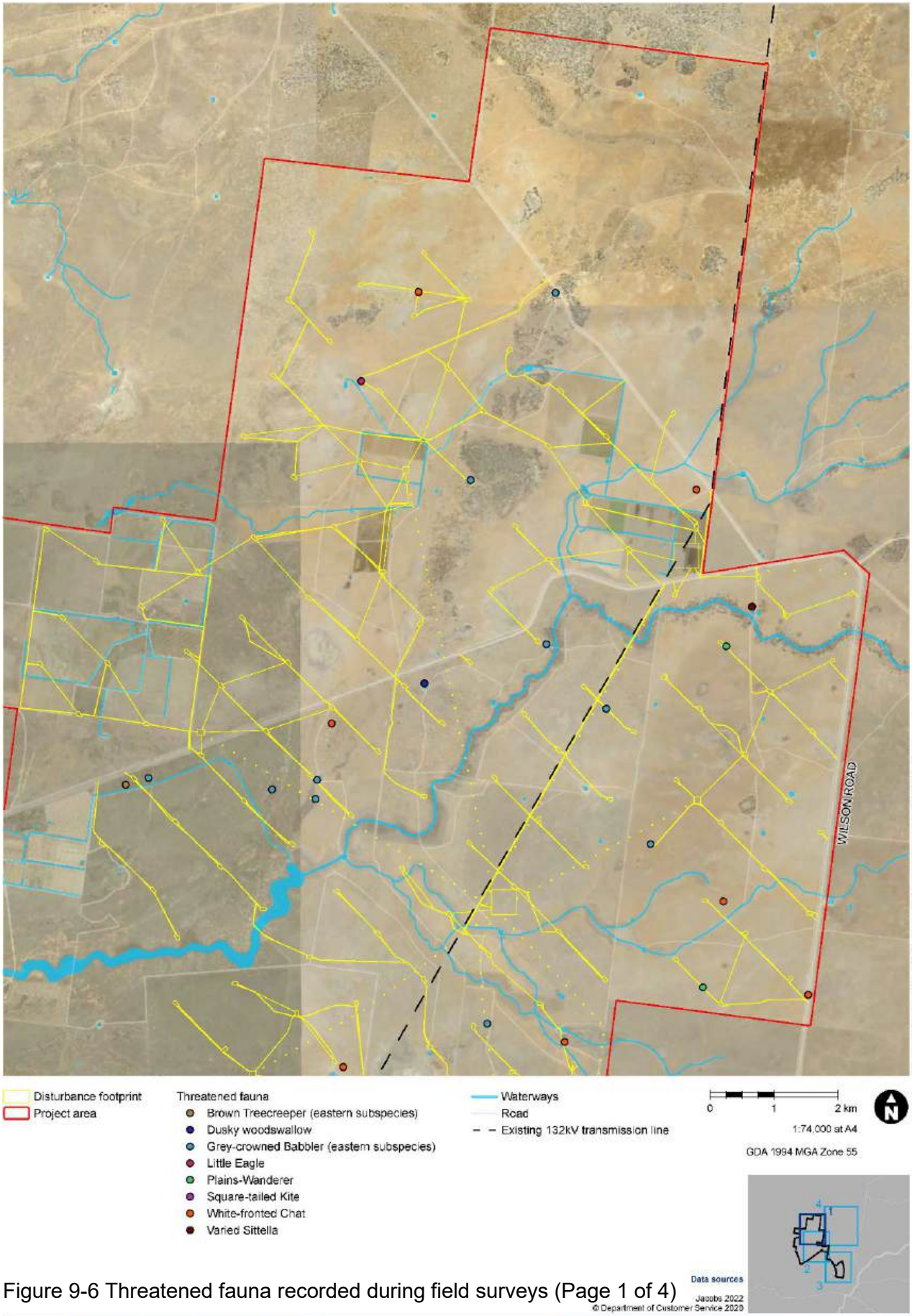

Figure 9-6 Threatened fauna recorded during field surveys (Page 1 of 4)

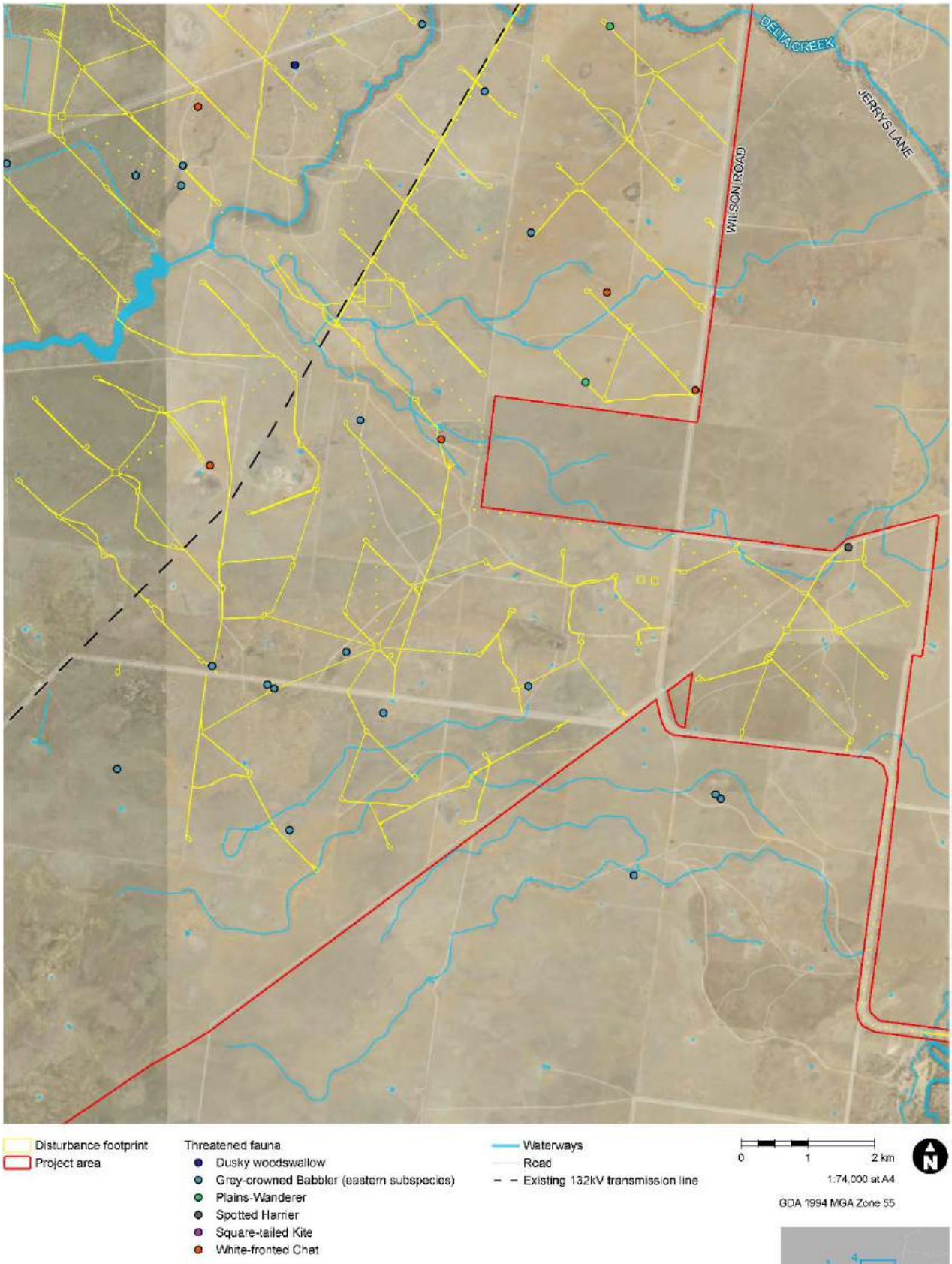

Figure 9-6 Threatened fauna recorded during field surveys (Page 2 of 4)

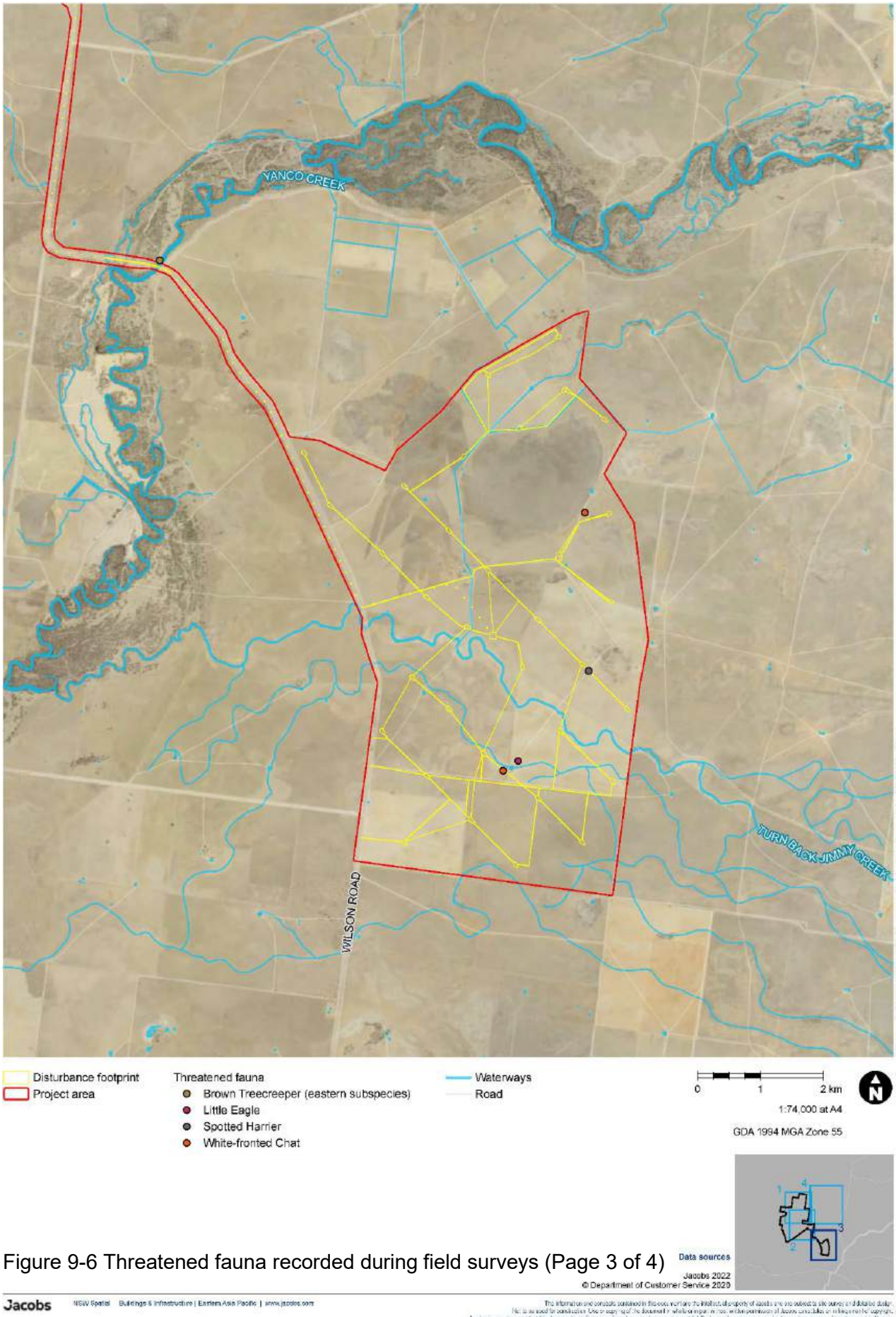

Figure 9-6 Threatened fauna recorded during field surveys (Page 3 of 4)

Figure 9-6 Threatened fauna recorded during field surveys (Page 4 of 4)

9.3.7 Aquatic ecology

All three waterways have been deemed sensitive receiving environments. Determination of SREs has considered the following:

- Key Fish Habitat – Yanco Creek and Turn Back Jimmy Creek (discussed further in **Chapter 13**)
- Threatened aquatic species – listed in **Table 9-6**
- Threatened aquatic ecological communities – Project area lies wholly within the Lower Murray River Drainage System EEC.

Table 9-6 Threatened aquatic species

Species	EPBC Act	FM Act	Likelihood and occurrence
Murray Cod *Maccullochella peelii*	V	-	Possible Large-bodied channel specialist. Prefers deeper waters of main channel of River Murray and larger tributaries. Yanco Creek is mapped as predicted habitat (DAWE, 2022) however available habitat is not considered suitable and there are no records of species within proximity of the Project (ALA, 2022; DPE, 2022).
Silver Perch *Bidyanus bidyanus*	CE	V	Possible Main channel specialist. Typically inhabits deeper flowing waters of the River Murray and larger tributaries. Delta Creek, Yanco Creek and Turn Back Jimmy Creek are mapped as predicted habitat for this species (DPI, 2022), however available habitat is not considered suitable and there are no records of species within proximity of the Project (ALA, 2022; DPE, 2022).
Flathead Galaxias *Galaxias rostratus*	CE	CE	Possible Species prefer still or slow-moving water bodies such as wetlands and lowland streams. Delta Creek, Yanco Creek and Turn Back Jimmy Creek are mapped as predicted habitat for this species (DPI, 2022). Habitat may be suitable in Yanco Creek in proximity of the Project, and in Delta Creek and Turn Back Jimmy Creek when water is present. There are no records of species within proximity of the Project (ALA, 2022; DPE, 2022).
Trout Cod Maccullochella macquariensis	E	E	Possible Large-bodied channel specialist. Prefers deeper waters of main channel of River Murray and larger tributaries. No records within the study area based on survey evidence or database searches (ALA, 2022; DPE, 2022), however the species has been recorded in the Murrumbidgee River upstream. No further assessment required.
Macquarie Perch *Macquaria australasica*	E	E	Possible No records within the study area based on database searches (ALA, 2022; DPE, 2022). The species has potential to occur within the study area (DAWE, 2022), however the available aquatic habitat is not preferred for this species. No further assessment required.

CE = critically endangered, E = endangered, V = Vulnerable

9.3.8 Matters of National 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. Matters relevant and applicable to this assessment include:

- World heritage properties – Not present in the subject land
- National heritage places – Not present in the subject land
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed) – Not present in the landscape buffer
- Nationally threatened species (refer to **Table 9-13**):
  - Eight flora species are known or have a moderate to high likelihood occurring in the Project area
  - Seven fauna species are known or have a moderate to high likelihood occurring in the Project area
- Nationally ecological communities – Six EPBC Act listed TECs may occur or are likely to occur within the Project area; of these, two TECs were recorded in the Project area:
  - Natural Grasslands of the Murray Valley Plains – critically endangered ecological community under EPBC Act (known to occur)
  - Weeping Myall Woodlands - endangered ecological community under EPBC Act (known to occur)
- Migratory species – 12 migratory or marine species are considered moderately likely to occur in, or adjacent to, the Project area based on the presence of suitable habitat.

9.3.9 Weeds, pathogens and pests

The Project area generally lacks large outbreaks of perennial exotic species. Exotic vegetation is mostly restricted to irrigated land with crops and/or ploughed paddocks. 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 weed species in the Project area are Bathurst burr (*Xanthium spinosum*) and African Boxthorn (*Lycium ferocissimum*). Many infestations are controlled by local farmers. African Boxthorn is a Weed of National Significance (WoNS) and was commonly recorded in the northern sections of the Project area.

Predator and pest species such as foxes, dogs, cats, pigs, and rabbits have been reported in the Project area during the ecological surveys.

9.4 Impact avoidance and minimisation

Efforts have been taken to avoid and minimise impacts on biodiversity in accordance with Section 7 of the BAM. A key part of management of biodiversity for this Project is the application of the ‘avoid, minimise and offset’ hierarchy as follows:

- Avoid and minimise impacts as the highest priority incorporating effective and feasible mitigation measures
- Offset where residual, significant unavoidable impacts will occur (if required).

The avoidance and minimisation measures used for direct, indirect and prescribed impacts of the Project are described in **Section 1.5** and **Section 3.10**.

During the development of the Project, considerable attention and flexibility was given to the avoidance of the important local habitats. The outcomes of the constraints assessment, ongoing field surveys and advice from BCS identified the following key biodiversity values that have been avoided and impacts minimised to the greatest extent possible:

- Plains-wanderer (SAII) important area mapping
- Natural Grasslands of the Murray Valley Plains CEEC
- SAII entities
- Threatened flora populations (such as *Swainsona murrayana* and *Swainsona sericea*)
- Eucalypt woodland with hollow bearing trees
- Paddock trees with large stick nests, typically for Wedge-tailed Eagle and other raptor species,
- Creeks/riparian areas, low lying areas with Lignum/Nitre Goosefoot swamps, and wetlands (if any)
- Proximity of disturbance footprint to known biodiversity conservation sites.

Further details on the avoidance and mitigation strategy relating to biodiversity values is provided in **Appendix G** (BDAR).

Impacts to connectivity and species movement cannot be avoided in this landscape and given the proposed removal of vegetation along a linear infrastructure and WTGs. Grassland fragmentation and creation of new edges has potential to interrupt wildlife movement passages for grassland specialists such as Plains-wanderer. This would be most notable during construction, when species would be discouraged from moving through the Project area.

9.5 Potential construction impacts

9.5.1 Potential direct impacts

Direct impacts to biodiversity during construction would be associated with native vegetation clearing and habitat removal.

9.5.1.1 Native vegetation clearing

While the Project design has avoided and minimised large areas of native vegetation clearing including in areas classified as non-native vegetation, the Project will result in the direct removal of native vegetation (173.39 hectares) comprised of 10 PCTs and four TECs listed under the BC Act and EPBC Act (refer to **Section 9.3.3** and **Section 9.3.4**). Native vegetation clearance for access tracks and road upgrades within the Project area are included in the calculations above.

Road upgrades

Road upgrades within the Project area were assessed as part of the study area. The field assessment found that very small areas of native vegetation may require disturbance in the Project area at the junctions of Moonbria Lane/Wilson Road, Liddles Lane/Wilson Road and Jerrys Lane/ Liddles Lane. These roads have wide man-made embankments and swales that are maintained by Council to drain water from the roads. As a result, these roads are considered to be Category 1 – Exempt Land within the envelope of the roads and biodiversity values do not need to be assessed, except prescribed impacts where relevant.

For preliminary locations for road upgrades outside of the Project area, these locations have been assessed as part of a desktop review in Section 2.3 of the BDAR and included review of regional biodiversity maps. Road upgrades outside of the Project area are not expected to impact on biodiversity values. Based on the desktop assessment and review of aerial imagery, the proposed

works occur within road envelopes and not within vegetated areas. The identification of prescribed impacts was also reviewed at these locations.

9.5.1.2 Threatened species habitat removal

Threatened flora

The estimated total clearing of native vegetation will result in the direct removal and permanent loss of habitat assumed to be occupied by threatened flora species described in **Table 9-7**. In areas with suitable habitat for threatened flora where targeted surveys were not undertaken, habitat is assumed present in associated PCTs. Further details on species polygons and assumed areas of habitat are provided in **Appendix G**.

Table 9-7 Removal of threatened flora habitat

Species	Occupation/use of habitat	Habitat removed (ha)
Swainsona murrayana	Confirmed[1]	32.12
Austrostipa wakoolica	Assumed	19.57
Brachyscome muelleroides	Assumed	23.57
Brachyscome papillosa	Assumed	23.60
Caladenia arenaria	Assumed	1.49
Convolvulus tedmoorei	Assumed	12.27
Cullen parvum	Assumed	35.29
Lepidium monoplocoides	Assumed	12.92
Leptorhynchos orientalis	Assumed	25.75
Maireana cheelii	Assumed	25.75
Pilularia novae-hollandiae	Assumed	14.43
Sclerolaena napiformis	Assumed	25.75
Swainsona plagiotropis	Assumed	28.94
Swainsona sericea	Assumed[2]	27.24

[1] Area includes combined impact for confirmed populations and habitat with assumed presence
[2] Where populations were confirmed these individuals were avoided. Other habitat not surveyed is assumed

Threatened fauna

The estimated total clearing of native vegetation will result in the direct removal and permanent loss of habitat that was confirmed to be occupied and utilised by the following threatened fauna described in **Table 9-8**.

Further details on species polygons and assumed areas of habitat are provided in **Appendix G**.

Table 9-8 Removal of threatened fauna habitat

Species	Occupation/use of habitat	Habitat removed (ha)
Southern Myotis	Confirmed	0.9
Plains-wanderer	Assumed	1.78

A large number of hollow-bearing trees and stick nests were recorded in the Project area, mainly in Eucalypt woodland patches and scattered Cypress Pine trees. Two medium sized hollow bearing trees are located in the disturbance footprint for cabling and will be avoided during construction. As such, there would be no impacts to hollow-bearing trees are anticipated.

9.5.2 Potential indirect impacts

Direct impacts to biodiversity during construction are summarised in **Table 9-9**. These potential impacts would be short term in nature. Though indirect impacts cannot be quantified, the potential for indirect impacts can be minimised through the application of stringent mitigation measures and monitoring the performance of these (refer to **Section 9.13**).

Table 9-9 Potential indirect impacts during construction of the Project

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impacts
Changed hydrology and sedimentation	Riparian zones and aquatic habitat for Murray Cod and Silver Perch	Yanco Creek, Delta Creek and Turn back Jimmy Creek, as well as isolated depressions and minor drainage lines	Transport of sediment into waterways	• The nature and location of Project construction work is unlikely to substantially modify the hydrological regime or cause serious erosion to impact on biodiversity • Large areas of clearing would mostly be restricted to proposed locations of WTGs, substations and the BESS which are situated away from important waterways and drainage lines • Greatest risk is displaced sediment entering Yanco Creek via the floodplain during construction of transmission line along Wilson Road This could result in impacts to the aquatic habitat for Murray Cod and Silver Perch and Flathead Galaxias. However, the placement of poles is small scale and ground cover vegetation will eventually recover • A risk assessment undertaken for impacts to aquatic habitat and found all to be very low or low.
Weed invasion and risk of pathogens	Native vegetation associated with seven PCTs and habitat for threatened species adjoining the cleared areas. Indirect impacts of relocating spoil.	The extent of the indirect disturbance buffer adjacent to the Project is uncertain and subject to monitoring and assessment	Negative changes to the structure and function of the adjoining vegetation	• There is potential for new weed species to be introduced and spread into native vegetation and habitat not directly impacted by the Project given the nature of permanent and partial impacts across a very large Project area • Weeds can indirectly decrease the value of native vegetation, including TECs and threatened species habitat • The exact distance from the disturbance footprint that weeds may become established in adjoining vegetation is uncertain, but is predicted to potentially up to 50 m
Increase in predator and pest animal populations	Threatened fauna, and common fauna, particularly small mammal groups and ground dwelling birds such as Plains-wanderer	Throughout the Project area	Decline of threatened fauna populations such as Plains-wanderer	A number of factors suggest the Project could lead to a short-term increase in predator and pest species activity at least during the construction phase,as: • The Project would involve increased human activity in a remote location that currently experiences low levels of human activity, this presence may mean more opportunity for food waste and waste disposal, encouraging scavenging

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impacts
				• Removal of vegetation and habitat will lead to the temporary displacement of native fauna from occupied habitat and present greater opportunity for predation by feral predators exploiting this situation and may lead to increased activity and abundance of predators during Project construction
Noise, vibration, and light pollution	Threatened fauna	The extent of the indirect disturbance buffer from the easement is uncertain	Disturbance to breeding activity	• There would be increased noise and vibration levels in the study area and immediate surrounds due to vegetation clearing, ground disturbance, machinery and vehicle movements, and general human presence (refer to **Chapter 8** (noise and vibration)) • This could potentially disturb resident fauna and may disrupt foraging, reproductive, or movement behaviours of the short construction life-cycle (e.g. during breeding season of hollow-dependent fauna species, some individuals may be disturbed) • Noise impacts are likely to be temporarily localised to the construction areas and immediate surrounds and moving as the construction progresses, as such, are not considered likely to have a significant, long-term, impact on wildlife populations outside the area of impact • As there would be no planned night works (note during winter, lighting may potentially be required in the early mornings and late afternoons) there is not likely to be substantial impacts on fauna
Dust pollution	Native vegetation and threatened species	The extent of the indirect disturbance buffer from the easement is uncertain	Negative changes to the structure and function of the adjoining vegetation	• Elevated levels of dust that may become deposited onto the foliage of vegetation, particularly during hot and dry conditions, has the potential to temporarily reduce the process of photosynthesis and transpiration and cause abrasion and radioactive heating resulting in reduced growth rates and decreases in overall health of the vegetation. Consequently, changes in the structure and composition of plant communities and consequently the grazing patterns of fauna may occur. • Some level of dust is likely to be generated due to substantial earthworks, vegetation clearing, vehicle movements and during adverse weather conditions (i.e. high wind)

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impacts
				• Deposition of dust on foliage is likely to be highly localised, intermittent, and temporary (particularly during the wetter seasons) and is therefore not considered likely to be a major impact of the Project
Contaminant pollution	Aquatic habitat	Yanco Creek, Delta Creek and Turn back Jimmy Creek	• Direct physical trauma to flora and fauna that come into contact with contaminants • Decline on habitat condition for aquatic species	• Localised release of contaminants (i.e. hydraulic fluids, oils, drilling fluids, etc.) into the surrounding environment (including drainage lines) may accidentally occur • Accidental release of contaminants is likely to be localised • Control measures will include ensuring that accidental spills are immediately reported and remediated, contaminated water will be separated from stormwater and will be managed in a process water system and on-site signage will be provided to identify contaminated topsoils of relevant

9.6 Potential operational impacts

9.6.1 Potential direct impacts

There would be no additional clearing if vegetation of habitat required during operation. As such, there would be no potential impacts to biodiversity during Project operation.

9.6.2 Potential indirect impacts

Potential indirect impacts to biodiversity during operation are summarised in **Table 9-10**. Though indirect impacts cannot be quantified, the potential for indirect impacts can be minimised through the application of stringent mitigation measures and monitoring the performance of these.

Further details on potential indirect impacts are provided in **Appendix G**.

Table 9-10 Potential indirect impacts during operation of the Project

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impact
Inadvertent impacts on adjacent vegetation and threatened species habitat: edges effects	Native vegetation associated with 10 PCTs, four TECs and habitat for threatened species adjoining the cleared areas	The extent of the indirect disturbance buffer adjacent to the Project is uncertain and subject to monitoring and assessment	• Negative changes to the structure and function of the adjoining vegetation • Reduced viability of the vegetation, and gradual decline in vegetation integrity and habitat value for TECs and species • Displacement of resident threatened fauna through increased risk of exposure, and loss of shade or shelter, in turn interrupting movements and availability of breeding habitat	• A 10 m buffer has been applied to study area capture impacts of edge effects • Species at greatest risk are likely to include Plains-wanderer and threatened flora species • Most indirect impacts are likely to affect open grassland or open woodland which are already susceptible to abiotic factors • Much of the vegetation within the cabling alignments and underneath transmission line poles will regenerate and be maintained during operation as low shrubs and intact ground layer • Further assessment may be required where Plains-wanderer or in-situ threatened flora populations are known or expected to occur • Any impacts determined post-construction will be reported as part of the BMP adaptive management strategy
Changed hydrology and sedimentation	Riparian zones and aquatic habitat for Murray Cod and SilverPerch	Yanco Creek, Delta Creek and Turn back Jimmy Creek, as well as isolated depressions and minor drainage lines	Transport of sediment into waterways	• Risk to aquatic ecology associated with changes in water quality associated with the establishment of new permanent impervious surfaces, the use of internal access tracks to, from and between WTGs and decommissioning activities • Key pollutants of concern would be sediments (and possibly nutrients if bound to sediment) and contaminants such as hydrocarbons • Relatively flat topography would not result in an increased risk of erosion or subsequent downstream sedimentation as a result of minor increase in impervious surfaces due to the presence of roads, WTG foundations and operational facilities • Risk to water quality from driving on unsealed tracks can include the creation and transport of dust due to vehicle movements and erosion of roads if not

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impact
				appropriately maintained, potentially leading to transport of sediment to downstream waterways, and subsequently impact on aquatic ecosystems • Risk assessment identified these as low risks
Weed invasion and risk of pathogens	Native vegetation associated with seven PCTs and habitat for threatened species adjoining the cleared areas. Indirect impacts of relocating spoil.	The extent of the indirect disturbance buffer adjacent to the Project is uncertain and subject to monitoring and assessment	Negative changes to the structure and function of the adjoining vegetation	• Level of traffic would be minor and associated with maintenance and management of vegetation, as such, weed spread would be typically limited • Extent of weed spread and reduced vegetation integrity from the Project edge is unknown and will require monitoring
Increase in predator and pest animal populations	Threatened fauna, and common fauna, particularly small mammal groups and ground dwelling birds	Throughout the Project area	Decline of threatened fauna populations such as Plains-wanderer	• Slight increased human activity in a remote location that currently experiences low levels of human activity, this presence may mean more opportunity for food waste and waste disposal, encouraging scavenging
Collisions and electrocution of fauna with transmission lines	High risk species of birds and bats	Along the length of transmission line	Loss of resident pairs, particularly raptors and disturbance to breeding activity	• Increased risk of bird and bat electrocution, particularly to raptors, from the Project as a new transmission line introduced into the environment • Transmission lines can be used as a resource by fauna, being used for perching, nesting, roosting, and scavenging of electrocuted birds • Proposes transmission structures are unlikely to be used as a significant resource for nesting as no evidence of structures being used as a nest site was observed during the survey

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impact
Noise and lighting	Threatened fauna	The extent of the indirect disturbance buffer from the easement is uncertain	Disturbance to breeding activity	• Noise impacts during operation are expected to be minimal and localised to WTGs, substation, and BESS • Substations and BESS would require security lighting at all hours of the night, including interior and exterior lighting; this would be installed in a manner that aims to minimise light spill to areas beyond the substation boundary fence • Small amount of light pollution would be projected into the surrounding vegetation that may potentially affect nocturnal fauna by interrupting their life cycle, such as the Plains-wanderer, microbats and Barn Owl. • Amount of light spill is expected to be very low and the area around the substations and BESS are already exposed to some level of disturbance from the road and existing easement • Nocturnal animals present likely to habituate over the long-term • Some species such as light tolerant microchiropteran bats may benefit from the lighting due to increased food availability (e.g. insects attracted to lights) around these areas. However, this may also cause a risk of collision with barbed wire security fences. • Impact of the residual light spill is unlikely to significantly affect any nocturnal species in the area
Changed fire regimes during operation	Native vegetation and threatened species	Surrounding landscape including biodiversity stewardship sites	Negative changes to the structure and function of the adjoining vegetation Direct mortality of fauna	• Fire behaviour not expected to worsen in the landscape, nor create a major ignition risk • WTGs may attract lightning strike (one of the major causes of fire in the region) but likelihood of fires in the landscape due to lightning strike would decrease as a result of inbuilt lightning protection • Current land management practices (grazing sheep on native grassland) would continue throughout the

Indirect impact	Impacted entities	Extent	Consequence	Potential Project impact
				Project area throughout operation to ensure there are no large contiguous stretches of high fuel hazard
Contaminant pollution	Aquatic habitat	Yanco Creek, Delta Creek and Turn back Jimmy Creek	Decline on habitat condition for aquatic species	• Control measures will include ensuring that accidental spills are immediately reported and remediated, contaminated water will be separated from stormwater and will be managed in a process water system and on-site signage will be provided to identify contaminated topsoils if relevant.

9.7 Potential decommissioning impacts

The potential impacts to biodiversity associated with the decommissioning of the Project would be similar to those during construction. These would be at a smaller scale and shorter duration though. Mitigation measures proposed to manage these impacts are detailed in **Section 9.13**.

9.8 Entities at risk of serious and irreversible impacts

The concept of serious and irreversible impacts (SAII) is fundamentally about protecting threatened entities that are most at risk of extinction from potential development.

The four principles for determining SAII are outlined in clause 6.7 of the Biodiversity Conservation Regulation 2017. The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community. The principles include:

- Principle 1- species or ecological community currently in a rapid rate of decline
- Principle 2 – species or ecological community with a very small population size
- Principle 3 – species or area of ecological community with very limited geographical distribution
- Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable.

Entities at risk of an SAII relevant to the Project and as identified by the BAM-C are provided in **Table 9-11**. All threatened entities have been evaluated against the principles and criteria set out in subsection 9.1.2 of the BAM for each species.

As described in **Section 9.3.6.1**, not all areas of suitable habitat for threatened flora were surveyed during the targeted surveys due to restricted access to properties from inclement weather (e.g. flood event in November 2021 and September 2022) and modifications in the design to avoid social and environmental constraints. As such, the remaining areas of suitable habitat that we not traversed are assumed to be habitat for four threatened species listed in **Table 9-11**, in accordance with the BAM requirements (Section 5.1.2 (1), Section 5.2.4 (2), Section 5.3 (1b) and Section 10.1.1 (3) of the BAM). The full SAII assessments are provided in **Appendix G** (BDAR).

Table 9-11 Entities at risk of SAII

Species	Reason for inclusion in the assessment
Claypan Daisy *Brachyscome muelleroides*	• Principle 3 – species or area of ecological community with very limited geographical distribution • Only a single significant known population exists at Morundah Station in NSW (about 20,000) about 65 kilometres east of the Project area • A total of 23.57 hectares of suitable habitat (habitat area not surveyed with suitable habitat) occurs within the disturbance footprint and would be impacted directly, which equates to about 13.1% of the area of occupancy for the species (1,000 hectares) within NSW. The species was not able to be confirmed by survey, and this impact represents assumed presence in suitable habitat. If present, a population would occupy a small portion of this area. • The Project would not have a significant impact on this species
Sand-hill Spider orchid *Caladenia arenaria*	• Principle 3 – species or area of ecological community with very limited geographical distribution • The species is currently only known from two locations in NSW and has a with a total population of about 25 individuals in 2021 • The species has limited capacity to regenerate after a decline

Species	Reason for inclusion in the assessment
	• A total of 1.49 hectares of suitable habitat (habitat area not surveyed with suitable habitat) occurs within the disturbance footprint and would be impacted directly, which equates to about 1.028% of the area of occupancy for the species (1000 hectares) within NSW. The species was not able to be confirmed by survey and this impact represents assumed presence in suitable habitat. If present, a population would occupy a small portion of this area • The Project would not have a significant impact on this species
Bindweed *Convolvulus tedmoorei*	• Principle 2 – species or ecological community with a very small population size • Populations sizes in NSW are estimated to be between <50 individuals to <250 individuals where threats are known • It is difficult to estimate the decline in the species population size in NSW due to a lack of ecological and distributional information • A total of 12.27 hectares of suitable habitat (habitat area not surveyed with suitable habitat) occurs within the disturbance footprint and would be impacted directly. The species was not able to be confirmed by survey and this impact represents assumed presence in suitable habitat. If present, a population would occupy a small portion of this area
Plains-wanderer *Pedionomus torquatus*	• Principle 1 – species or ecological community currently in a rapid rate of decline • The vast majority (>99%) of records of Plains-wanderers in NSW now come from an area of the western Riverina • There is estimated to be only 300 birds remaining in NSW • The Project would directly impact on around 1.78 hectares of mapped habitat for the species, which equates to 0.0054 % of the area of occupancy (33,000 hectares) in NSW for the species.

9.9 Potential prescribed impacts

Prescribed impacts are impacts that are in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. Prescribed impacts are often difficult to quantify or offset as they often affect unique biodiversity values that are often irreplaceable. There potential prescribed impacts associated with the Project are summarised in **Table 9-12**.

Potential prescribed impacts that were deemed to be negligible in impact, these are omitted from **Table 9-12**. Further details on prescribed impacts are provided in **Appendix G**.

Table 9-12 Potential prescribed impacts

Criteria for potential impact of the Project	Relevance	Potentially threatened impacted taxa	Impact summary	Detailed impact assessment required?
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Connectivity of threatened species habitat within the Landscape buffer has been historically impacted by land uses such as grazing and logging and has resulted in a fragmented landscape. Woodland areas are generally restricted to the riparian corridors, however natural grasslands persist across most of the Landscape buffer. The introduction of turbines, linear transmission line routes and access tracks would impact connectivity for various threatened species in terrestrial and aerial habitats. Nevertheless, woodland areas have been avoided considerably through the design process	Parrots, raptors, waterbirds, owls, microbats	Moderate	• Loss of native vegetation and habitat has potential to affect landscape connectivity permanently or temporarily during operation • The Project would increase levels of fragmentation within the region, it would not, however, occur to the extent where species or communities are significantly impacted
Movement of threatened species that maintains their lifecycle	Several threatened species, including migratory species, utilise different habitats across the landscape for their lifecycle. The introduction of turbines, linear transmission line routes and access tracks would impact connectivity for various threatened species across the landscape in terrestrial and aerial habitats. However, due to the location of key landscape resources in surrounding areas (ie. large wetlands), the Project is not anticipated to considerably impact the lifecycle of threatened species due to movement constraints.	Migratory species	Minor	• Grassland fragmentation and creation of new edges has the potential to interrupt wildlife movement passages for grassland specialists such as the Plains-wanderer, which would be most notable during construction, when species would be discouraged from moving through the Project area. • The predicted level of isolation from the Project is not likely to be enough to prevent the breeding and dispersal of plant pollinators • Functional connectivity for many species would remain in the Project area.

Criteria for potential impact of the Project	Relevance	Potentially threatened impacted taxa	Impact summary	Detailed impact assessment required?
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	There are several waterways within the Project area including Delta Creek, Yanco Creek and Turn Back Jimmy Creek. Additionally, the Project area is a floodplain with flooding and temporary inundation occurring in various areas during high rainfall events. The Project is not expected to have a considerable impact on hydrological processes that sustain threatened species and TECs. Many riparian areas have been avoided through the design process	N/A	Minor	• Short term reductions in water quality and mobilisation of fine sediments into watercourses within and adjacent to the disturbance footprint during construction and operation is unlikely to result in any long-term detrimental impacts to the aquatic environments • Discharge of fine sediments and contaminants are likely to be short 'pulse' events and the fine sediments would be rapidly flushed out of the system • Likely result is negligible impact to threatened species such as the Murray Cod and Silver Perch and Flathead Galaxias
Wind turbine strikes on protected animals	The WTGs and associated infrastructure would have various impacts on protected fauna species. Impacts to aerial species include direct strike and potentially barotrauma.	Parrots, raptors, waterbirds, owls, microbats, migratory species	Moderate	• Project has been designed to position WTGs at locations at least 100 m away from biodiversity habitat features that attract interactions with protected fauna and threatened fauna • Six species have been assessed to have a high risk rating, and 14 with medium risk; the remaining are low risk; none of which are SAII entities
Vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community	Vehicular activity within the Study area and on external roads accessing the site will increase during construction. Once the Project has been constructed, vehicle movements will be considerably reduced. However, it is not considered likely that this would result in a significant number of vehicle strikes on threatened species or parts of a TEC.	Ground-dwelling birds	Minor	• Vehicle collision is a direct impact that reduces local population numbers and is a common occurrence in Australia • There are a range of known and potential threatened fauna (mainly birds) that are part of TECs in the study area with possible risk of vehicle strike • It is also likely that the newly created access tracks through the habitats will provide an attraction point to some species increasing the potential for vehicle strike

9.10 Potential impacts on MNES

The impacts to all EPBC listed TECs and threatened species are discussed in **Section 9.5** to **Section 9.8**. The conclusion of each assessment of significance under the EPBC Act for threatened entities are presented in **Table 9-13**. It should be noted that even with the assumption of presence, the assessment has concluded that there are no threatened flora species under the EPBC Act that are likely to be significantly impacted as a result of the Project.

Management measures to mitigate biodiversity impacts are provided in **Section 9.13**.

Table 9-13 Summary of assessment of significance findings for threatened entities

EPBC listed entity	*Assessment of significance questions (EPBC Act)									Important population	Likely significant impact
	1	2	3	4	5	6	7	8	9		
Threatened ecological communities											
Natural Grasslands of the Murray Valley Plains	Y	N	Y	N	N	Y	Y	NA	NA	NA	Yes
Weeping Myall Woodlands	Y	N	N	N	N	N	Y	NA	NA	NA	No
Threatened flora											
Austrostipa wakoolica	Y	N	N	N	N	N	N	N	N	NA	No
Caladenia arenaria	Y	N	N	N	N	N	N	N	N	NA	No
Lepidium monoplocoides	Y	N	N	N	N	N	N	N	N	NA	No
Sclerolaena napiformis	Y	N	N	N	N	N	N	N	N	NA	No
Swainsona murrayana	Y	N	N	N	N	N	N	N	N	Yes	No
Swainsona plagiotropis	Y	N	N	N	N	N	N	N	N	NA	No
Brachyscome muelleroides	Y	N	N	N	N	N	N	N	N	NA	No
Brachyscome papillosa	Y	N	N	N	N	N	N	N	N	NA	No
Maireana cheelii	Y	N	N	N	N	N	N	N	N	NA	No
Threatened fauna											
Plains-wanderer	Y	Y	Y	Y	Y	Y	N	N	Y	NA	Yes
Swift Parrot	N	N	N	N	N	N	N	N	N	NA	No
Regent Honeyeater	N	N	N	N	N	N	N	N	N	NA	No
Painted Honeyeater	N	Y	N	N	N	N	N	N	N	No	No
Superb Parrot	N	Y	N	N	N	N	N	N	N	No	No
White-throated Needletail	Y	N	N	N	N	Y	N	N	Y	No	Yes
Southern Bell Frog	N	N	N	N	N	N	N	N	N	NA	No
Silver Perch	N	N	N	N	N	N	N	N	N	NA	No
Murray Cod	N	N	N	N	N	N	N	N	N	NA	No
Trout Cod	N	N	N	N	N	N	N	N	N	NA	No
Macquarie Perch	N	N	N	N	N	N	N	N	N	NA	No
Flathead Galaxias	N	N	N	N	N	N	N	N	N	NA	No

9.11 Potential impacts to migratory species

There are uncertainties around the number of individuals White-throated Needletail, Rainbow bee-eater and Fork-tailed Swift likely to use the airspace in the Project area and ability to estimate impacts on an ecologically significant proportion of their population at a national and international scale. As a result, the Project has potential to have a significant impact on White-throated Needletail, Rainbow bee-eater and Fork-tailed Swift due to the uncertainties around the number of individuals occupying the air space at risk of blade strike collision.

9.12 Uncertain impacts

In some instances the extent, duration and consequence of the impact is uncertain and the management and monitoring of these is important and is a focus of the mitigation and monitoring strategy outlined in the following section of the BDAR. These uncertain impacts may include:

- Weed invasion (refer to **Section 9.6.2**) – The distance of this edge effect has been predicted (between 20-50 m), however, this is largely unknown and the degree to which vegetation integrity declines is unknown
- Measures proposed to mitigate potential impacts on certain populations of threatened species (such as the Plains-wanderer, *Swainsona murrayana* and *Swainsona sericea*) (refer to **Section 9.13**) – The effectiveness of these should be monitored and tested relative to undisturbed habitats not impacted by the (control areas). Corrective actions will apply where mitigation measures are found to be ineffective and impacts are identified beyond set performance thresholds
- Collision and electrocution of animals (refer to **Section 9.6.2**) – A Bird and Bat Adaptive Management Plan (BBAMP) will be prepared to measure any impacts on bird and bats species to address the prescribed impacts associated with blade strike and powerline collisions and will develop trigger levels designed to manage impacts during the operation of the Project.

The management of these uncertain impacts requires the development of an adaptive management plan with the aim of adjusting actions based on results to achieve specified outcomes.

9.13 Environmental management measures

Proposed measures to manage and/or mitigate biodiversity impacts from the Project are detailed in **Table 9-14**. Additional measures to mitigate biodiversity impacts are included in the following sections:

- Manage changes to surface runoff regimes resulting in sedimentation due to the removal of habitat (**Section 13.7**)
- Mitigate fire risk during operation (**Section 16.4.5**)
- Mitigate light and noise and vibration impacts during night works (**Section 7.7**, **Section 8.7**)
- Manage dust pollution (**Section 14.7**)
- Manage contaminant pollution (**Section 13.7**).

Table 9-14 Biodiversity environmental management measures

Impact	Reference	Environmental management measure	Timing
Avoid and minimise biodiversity impacts	BIO1	Where reasonable and feasible, the Project design will be refined to: • Avoid and minimise the loss of vegetation and habitat – Threatened species habitat buffers and nest tree buffers show locations of known or potential threatened species habitat that will be avoided and minimised during detailed design • Minimise impacts to fauna movements across the landscape • Minimise the impact of predation on displaced fauna. Access track and cabling corridors will be established with consideration to terrain (e.g. utilisation of the existing tracks and flat areas on slightly higher elevations) to minimise newly created tracks, tracks through depressions and additional vegetation clearing.	Detailed design, prior to construction
Avoid and minimise biodiversity impacts	BIO2	Habitat buffer maps (refer to Section 6.4 of the BDAR) will inform the induction of construction and maintenance teams as required for the CEMP and OEMP.	Prior to construction, prior to operation
Avoid impacts to aquatic biodiversity	BIO3	Final design for access tracks across waterway crossings (including creeks and drainage lines) will implement a design option to ensure stream flow is unaffected.	Detailed design
Removal of native vegetation, TECs and habitat	BIO4	A Biodiversity Management Plan (BMP) will be prepared and approved prior to construction. The BMP will: • Be prepared by a qualified ecologist in consultation with and endorsed by NSW Biodiversity, Conservation and Sciences (BCS) • Include a plan for implementing, evaluating and reporting on the effectiveness of all mitigation measures outlined in the Project BDAR, but not be limited to these measures • Involve an overarching framework that will be based on SMART principals (Specific, Measurable, Achievable, Realistic, Timebound) • Focus on monitoring the performance of proposed measures and informing an adaptive management approach based on performance triggers for remedial action or additional offsets where further impacts are identified • Detail required mitigation actions for the Project for all biodiversity, including indirect, prescribed and uncertain impacts • Include a program to monitor, evaluate and publicly report on the outcomes of a biodiversity monitoring program • Stipulate objectives for monitoring, and how baseline data will be captured and represented.	Pre-clearing, construction
	BIO5	An Operational Biodiversity Management Plan will be prepared. The Plan will:	Operation

Impact	Reference	Environmental management measure	Timing
		• Be prepared by a qualified ecologist in consultation with and endorsed by BCS • Include a plan for implementing, evaluating and reporting on the effectiveness of all mitigation measures outlined in the Project BDAR, but not be limited to these measures • Focus on monitoring the performance of proposed measures and informing an adaptive management approach based on performance triggers for remedial action or additional offsets where further impacts are identified • Detail required mitigation actions for the Project for all biodiversity, including indirect, prescribed and uncertain impacts • Include a program to monitor, evaluate and publicly report on the outcomes of a biodiversity monitoring program • Stipulate objectives for monitoring, and how baseline data will be captured and represented.	
	BIO6	A Rehabilitation Plan will be prepared and approved prior to clearing, in consultation with BCS. The Rehabilitation Plan will inform the implementation of rehabilitation within the Project. Such areas will be identified in the final detailed design and will also include areas disturbed during construction that are not required to be maintained or cleared for the operation of the Project, such as trenches for cabling and transmission lines. The plan will include: • Implementation of soil erosion prevention, re-establishment of local expression of the original/adjacent plant community type, use local native plant species and habitat and outline the details of rehabilitation objectives and how their outcomes for success will be measured, locations, target landforms and plant community types • Restoration of riparian vegetation (i.e. weed control) will be implemented to protect and improve key habitat areas, where relevant • A program for adaptive monitoring of specific success measures and reporting and include a Trigger Action Response Plan (TARP); including notification to BCS that remedial actions have been triggered and agreement about the response • Landscaping of pervious surfaces using native indigenous species only • Soil loss will be prevented by immediate stabilisation of exposed surfaces (e.g. use of Jute mesh and/or soil binder) • Ongoing maintenance of the rehabilitation work will be required, including management of weeds and pathogens • Topsoil and subsoil generated during construction will be stockpiled separately on-site to be used for rehabilitation. Stockpiles will be managed according to best management practices (Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004).	Prior to construction, construction, operation

Impact	Reference	Environmental management measure	Timing
	BIO7	Pre-clearing Process – the BMP will provide detail of necessary mitigation measures for harm to live animals and threatened hollow dependent fauna during/all pre-clearing survey and translocation activities. The pre-clearing process will include two stages: • Stage 1: – Will include survey and translocation of any fauna from the disturbance footprint into areas of retained vegetation prior to construction – May include detailed markup of threatened species locations and their translocation such as *Swainsona murrayana* – All work will be carried out by qualified ecologists • Stage 2: – Will include final inspections of the disturbance footprint immediately before the construction activity commences to check and physically mark any important habitat features that need to be considered when identifying exclusion zones – Document, mark and record the location of large stick nests, habitat/hollow-bearing trees, and threatened flora. The outcomes of the pre-clearing inspections will be reported to BCS prior to the commencement of vegetation clearing. The report will include any fauna relocated or euthanised, including name of qualified/licensed handler, species, location notes, and release location and method.	Pre-clearing
	BIO8	Exclusion Zones – The boundary of the clearing limits for the disturbance footprint will be clearly marked on site by a surveyor before vegetation clearing commences. Specific exclusion zones (habitat buffers) will include known areas of threatened flora populations (*Swainsona murrayana* and *Swainsona sericea*) and the edge of the clearing boundary will be marked with high visibility fencing and signage.	Pre-clearing, construction, operation
	BIO9	Staged Habitat Removal – The staged habitat removal process will minimise direct impacts on fauna by providing them with an opportunity to vacate hollows and relocate naturally. The first stage will involve clearing of non-habitat first (e.g. shrubs, regrowth, ground cover and non-habitat trees) and allowing at least 24 hours to allow fauna to vacate habitat before the second stage of removing habitat trees. The process will include: • Avoiding clearing during times when hollow-dependent fauna are breeding • Contacting vets and wildlife carers before works commence • Ensuring that licensed wildlife carers and/or ecologists are on site during habitat removal • Ensuring wildlife carers and/or ecologists are present during removal of habitat trees • Ensuring that habitat trees are felled carefully, using equipment that allows habitat trees to be lowered to the ground with minimal impact • A procedure for the ethical handling of injured or displaced fauna is to be documented in the BMP • Recording the effort and outcomes of the habitat removal process • Saving and reusing cleared material for rehabilitation and habitat	Construction

Impact	Reference	Environmental management measure	Timing
		• Preparing an 'Unexpected threatened species finds procedure' to be implemented during construction and operation that will apply to all activities that have potential to impact upon threatened flora and fauna species which have not already been assessed and approved. Any threatened entities found in a location previously unknown during construction or operation must be immediately notified to BCS • Preparing a Fauna handling and rescue procedure to be implemented during construction and operation.	
	BIO10	Clearance of native vegetation and habitat prior to start of daily construction to ensure there is no wildlife present. This will involve: • An on-foot pre-clearing survey by a suitably qualified ecologist • A regular drive through sweep of areas planned for construction by the contractor's environmental representatives. If an animal is located within the construction area during work, the Delivery Manager and Project Management Site Representative are to be notified immediately. All work must immediately cease within the immediate area of the find and a local wildlife rescue or an ecologist will be required for assistance where necessary.	Construction
Increase in weeds and disease pathogens in adjacent vegetation	BIO11	Weed monitoring and control programs will be prepared in consultation with BCS and documented in the BMP. Any deviation from measures approved by DPE are to be raised and approved. Additional monitoring and control measures for introduced plant introduction and spread will be implemented at and around locations used for sediment control structures. Monitoring of exotic plants with waterborne propagules and a Trigger Action Response Plan for control must be undertaken along drainage lines outside the Project in locations where runoff drains from the Project, and from locations where sediment control has failed. The program will include adaptive management strategies for priority weed species during construction, and early operational phase. The details of the monitoring program will be determined during the preparation of the BMP and follow the principles outlined in Section 12.2 of the BDAR.	Prior to construction, construction, operation
	BIO12	All weeds will be identified, mapped, and removed before clearing for construction, and location of weed and sprayed area will be recorded for use in ongoing weed monitoring and management programs, particularly for *Lycium ferocissimum*.	
	BIO13	A vehicle and machinery hygiene strategy will be prepared and implemented during construction and operation. The strategy will include specific locations, timing and methods for removing soil and plant matter from vehicles and machinery. Ensure vehicle and machinery hygiene measures in the strategy are applied during construction and operation.	
	BIO14	During the clearing works, weeds will be disposed and managed appropriately to stop the spread of weed species.	
	BIO15	Wash down stations will be constructed at suitable locations to wash down vehicles and employee shoes to stop the spread of weeds, pathogens (including agricultural weeds, amphibian chytrid fungus, *Phytophthora cinnamomi* and exotic rust fungi) and the introduction of new species.	
Increase in predatory and pest species	BIO16	Personal waste / refuse generated during construction or operation will be stored appropriately in inaccessible bins and disposed in an appropriate waste facility.	Construction, operation

Impact	Reference	Environmental management measure	Timing
	BIO17	A feral animal monitoring program will be developed and implemented as described in Section 12.2 of the BDAR based on performance triggers for adaptive management. It will be important to share data with landholders. Increased predator activity will trigger the need for predator control based on performance measures to be outlined in the BMP. Control will be done in consultation with Host Landowners.	
Impacts of wind farm strikes on protected animals Increase in risk of electrocution and EMF exposure	BIO18	A Bird and Bat Adaptive Management Plan (BBAMP) will be prepared to measure any impacts on bird and bats species. The plan is a key mitigation measure to address the prescribed impacts associated with blade strike impacts and will develop trigger levels designed to manage impacts during Project operation . The plan will provide guidance for developing a framework for monitoring impacts, including baseline and ongoing monitoring. The BBAMP will utilise the bird survey data for this Project to identify specific bird and bat species that are at risk of collision with overhead cabling and power lines or the transmission line and electrocution. For higher risk species, a strategy will be developed in consultation with BCS focused on identifying key sections of overhead cabling and power lines or the transmission line where mitigation is required and will include deploying bird divertors, with day/night reflectors within approved buffer distance. This will be appropriate for diurnal and nocturnal birds. The plan will include the following in consultation with BCS: • Regular monitoring in overhead cabling and power lines or the transmission line easements for evidence of bird / bat collision (intervals to be determined in consultation with BCS) • Monitoring of taller structures for evidence of raptor nest building • Developing target trigger for number of high risk species incidents • Deploying species specific bird / bat divertors / flappers / reflectors in areas where a defined number of incidents have occurred. • Identifying locations for specific measures and the monitoring method for testing effectiveness.	Construction, operation
Fragmentation resulting in reduced connectivity	BIO19	The barbed wire / razor wire fencing installed around the central primary substation and collector substation switchyards will have improved visibility measures installed, such as adding visible objects to the fence, for example metal tags, tapping or cloth material on the existing barbed wire to increase visibility and act as a deterrence technique for in flight fauna.	Construction
Wildlife impacts from vehicle strike	BIO20	Vehicle movements on newly formed access tracks will be limited to 40 km/h speed limit to reduce the risk of vehicle strike to fauna.	Construction, operation

9.14 Biodiversity credit requirements

The Project would have direct impacts on 173.39 hectares of native vegetation within the disturbance footprint, and would require the following offsets:

- 5,854 ecosystem credits (refer to **Table 9-15**)
- 13,675 species credits (refer to **Table 9-16**).

Indirect impacts are subject to the efficacy of implemented environmental controls. These are mitigated through effective environmental management during construction and associated with adaptive management. The monitoring program will be designed to verify the extent of indirect impacts, identify where additional mitigation of indirect impacts is required. Any substantial loss in future VI that cannot be mitigated will need to be reflected in the future offset obligation.

Project impacts and offset obligations will be revised throughout the life of the Project through the monitoring program. Where there is opportunity to modify the clearing extent and the potential biodiversity impact post-approval, this will be done as part of the detailed design and analysis of operational management requirements.

A Biodiversity Offset Strategy to meet the offset obligation will be developed post-approval and consider a range of offsetting options. Where feasible, offsets would be secured within the Project area in the form of a Biodiversity Stewardship Agreement (BSA). Ongoing discussions with landowners and further survey work would determine the feasibility of an on-site BSA. Where this is not feasible off-site credits would be sourced. Where off-site credits aren't available, the Proponent would pay directly into the Biodiversity Conservation Trust Fund.

Table 9-15 Ecosystem credit requirements

Plant community type		Ecosystem credits
PCT 7	River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion	16
PCT 9	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion	3
PCT 13	Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	15
PCT 17	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	76
PCT26	Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	794
PCT28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	145
PCT44	Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion (PCT44)	1773
PCT45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	80
PCT46	Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion	2949
PCT160	Nitre Goosefoot shrubland wetland on clays of the inland floodplains	1
Total		**5854 credits**

Table 9-16 Species credit requirements

Name of threatened species	BC Act status	EPBC Act status	Species credit
Threatened flora species			
Austrostipa wakoolica (A spear-grass)	E	E	459
Brachyscome muelleroides (Claypan Daisy)	V	V	1567
Brachyscome papillosa (Mossgiel Daisy)	V	V	1045
Caladenia arenaria (Sand-hill Spider Orchid)	E	E	31
Convolvulus tedmoorei (Bindweed)	E	-	831
Cullen parvum (Small Scurf-pea)	E	-	1718
Lepidium monoplocoides (Winged Peppercress)	E	E	336
Leptorhynchos orientalis (Lanky Buttons)	E	-	1102
Maieana cheelii (Chariot Wheels)	V	V	1102
Pilularia novae-hollandiae (Austral Pillwort)	E	-	579
Sclerolaena napiformis (Turnip Copperburr)	E	E	1102
Swainsona murrayana (Slender Darling Pea)	V	V	1331
Swainsona plagiotropos (Red Darling Pea)	V	V	1232
Swainsona sericea (Silky Swainson-pea)	V	-	1123
Threatened fauna species			
Myotis Macropus (Southern Myotis)	V	-	18
Pedionomus torquatus (Plains-wanderer)	E	CE	99
Total			**13,675 credits**

10. Aboriginal heritage

This section summarises the findings of the Aboriginal cultural heritage assessment report (ACHAR) (**Appendix H**) prepared for the Project in response to the SEARs.

10.1 Assessment methodology

The methodology for the assessment involved the following:

- Identification and consultation with Aboriginal stakeholders who may hold cultural knowledge of the area (refer to **Section 5.6**)
- Desktop investigation of the existing environmental and cultural heritage context relevant to the Project
- Developing a predictive model based on background research to identify areas with high archaeological potential to contain Aboriginal objects
- Delineation of survey units for targeted site inspection based on landform elements identified by the predictive model
- A preliminary vehicular site inspection was carried out in 02 to 08 May 2022 with RAPs
- An archaeological survey was carried out from 11 to 15 July 2022 on foot by a team of archaeologists and RAPs
- Significance assessment of Aboriginal sites, considering social value, historic value, scientific value and aesthetic value.
- Impact assessment to determine type and degree of impacts to Aboriginal cultural heritage items as a result of the Project
- Desktop assessment of the proposed road upgrades
- Recommendations to mitigate or effectively manage potential Project impacts.

10.1.1 Study area

The Aboriginal cultural heritage study area is defined as a 100 metre buffer from the disturbance footprint (refer to **Figure 10-1**).

10.1.2 Survey methodology

The study area was divided into four survey units, based on landform elements identified during the generation of the predictive model (refer to **Section 10.3.3**). A sample survey is acceptable, with justification, under the Code of Practice. Full coverage survey of each survey unit was not practicable due to dense and impenetrable vegetation, safe access constraints and overall size of the disturbance footprint. As a result, two surveys were carried out – a vehicular survey and an archaeological survey on foot.

The preliminary vehicular site inspection was carried out in 02 to 08 May 2022 with RAPs to:

- Confirm the findings of the predictive model
- Inspect where impacts would occur
- Identify whether or not Aboriginal objects are or are likely to be present
- Identify whether or not the Project is likely to harm Aboriginal objects.

The archaeological survey was carried out on foot by a team of archaeologists and Aboriginal representatives. Portions of each survey unit or ‘sample areas’, shown in **Figure 10-3** were subject to survey.

Further information on the archaeological survey methodology is provided in **Appendix H**.

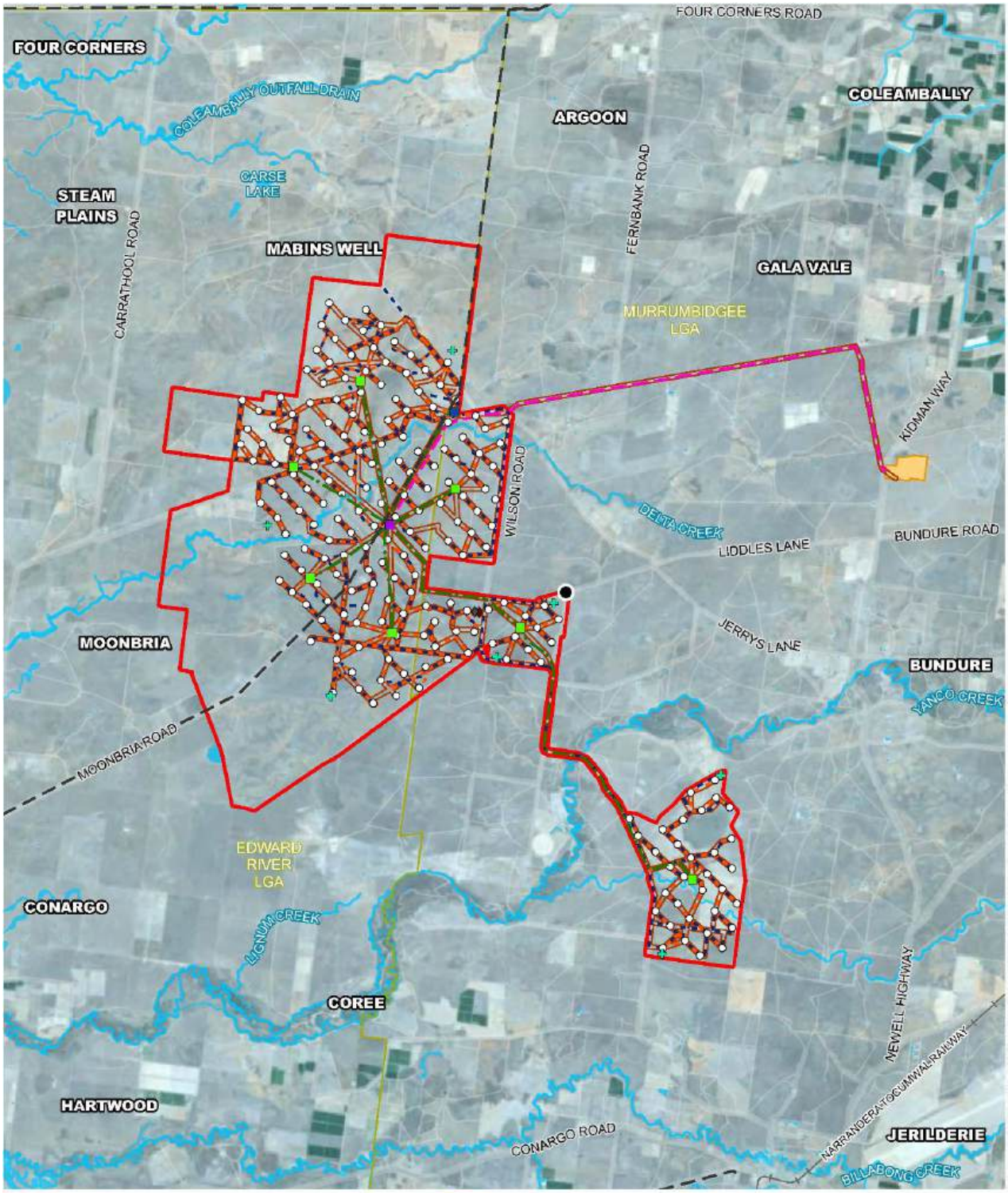

Figure 10-1 Aboriginal cultural heritage study area

10.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Native Title Act 1993*
- *National Parks and Wildlife Act 1974*
- *Native Title Act 1994*
- *Aboriginal Land Rights Act 1983*
- EPBC Act
- EP&A Act
- Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW, 2010b)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010c)
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW, 2010d)
- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011).

10.3 Existing environment

10.3.1 Archaeological context

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 Aboriginal cultural heritage 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 lack of topographic, environmental or landscape features within the Aboriginal cultural heritage 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.

10.3.2 Desktop review

10.3.2.1 Database searches

A search of the Aboriginal Heritage Information Management System (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.

There are three AHIMS registered sites located within the Aboriginal cultural heritage study area:

- Tooleybuc Bridge PAD (AHIMS ID 55-1-0038)
- PEC-E-G2 (AHIMS ID 55-1-0052)
- PEC-E-43 (AHIMS ID 55-1-0053).

Further interrogation of the AHIMS site card for the Tooleybuc Bridge PAD (AHIMS ID 55-1-0038) revealed 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 Aboriginal cultural heritage study area and therefore does not pose a constraint to the Project. The location of PEC-E-G2 (AHIMS ID 55-1-0052) and PEC-E-43 (AHIMS ID 55-1-0053) are shown in **Figure 10-3**.

No places listed on the National, Commonwealth or LEP heritage lists are located in the Aboriginal cultural heritage study area.

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.

10.3.2.2 Literature review

There have been several archaeological surveys focused on mounds and burials conducted across the wider Murray Valley and Murrumbidgee Region, including the following:

- Buchan, R 1974, Report on an Archaeological Survey in the Murray Valley, New South Wales 1973-1974, Unpublished report to NPWS
- Edmonds, V 1996a, An Archaeological Survey of the Benerembah Irrigation District Stage 4 Drainage, West of Griffith, Unpublished report to Booth Associates
- Edmonds, V 1996b, An Archaeological Survey of the Pinelea Drainage Basin, near Finley, southwestern NSW, Unpublished report to Kinhill Engineers Pty Ltd, Sydney
- Hamm, G 1995, An archaeological assessment of Telecom's proposed optical Fibre Cable routes. Darlington
- McIntyre, S 1985, Archaeological Survey of the Proposed Darlington Point to Deniliquin 132kV Transmission Line, Unpublished report to the Electricity Commission of NSW
- Navin Officer Heritage Consultants 2009, Deniliquin to Moama 132kV Transmission Line Route Aboriginal and Historical Archaeological Assessment, Unpublished Report
- NGH Environmental 2016, Aboriginal Heritage Due Diligence Assessment: Kyalite Stables Deniliquin Due Diligence, Unpublished report to the Edward River Council
- OzArk 2008, Indigenous heritage assessment: Proposed Mulwala to Finaley 132kV Line Upgrade, NSW, Unpublished report to GHD Wagga Wagga on behalf of Country Energy.
- Simmons, S 1980, 'Site survey of the floodplains between the Murray and Wakool Rivers, NSW', Records of the Victorian Archaeological Survey, vol. 10

The above studies contribute to an understanding of the nature of Aboriginal occupation in the region and development of predictive statements listed in **Section 10.3.3**.

10.3.3 Predictive model

Based on the outcomes of the desktop review, the following predictive statements for the potential for archaeological deposits within the Aboriginal cultural heritage study area were identified:

- It is likely that scarred trees will be present within the Aboriginal cultural heritage 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 feature subsurface artefact deposits but are likely to feature Aboriginal objects on the ground surface.

A predictive model was prepared based on the above statements, which was used to inform the four survey units and sample areas (refer to **Section 10.3.5**).

10.3.4 Cultural heritage values

General discussions with RAPs at the Project area have led to the identification of various key elements that make up cultural values within the landscape of the Project area. Added to this, Mr James Ingram of Bidya Marra Consultancy provided the following information about cultural values in an email dated 8 September 2022:

> *During my time employed with Riverina Local Land Services I was responsible for the rehabilitation of a area known as Dry Lake. Dry Lake is located on the Maude Road between the Sturt Hwy and the township of Moulmein. Dry Lake was traditionally fed by the Abercrombie Creek and was the traditional homeland of the Kerrie Kerrie , Jothi Jothi , Cre Cre clans of the Great Nation of Wiradyuri. The Dry Lake boundary is between the borders of the Murray LS & Riverina LS boundaries and it is upon this boundary that exist between 30 to 35 skeletons of Wiradyuri people.*
> *The Hay Aboriginal Working Party carried out the rehabilitation on the Riverina LS side of what is a Travelling Stock Reserve (Dry Lake TSR Maude Road)*
> *It is unknown what rehabilitation works were carried out by the Murray LS.*
>
> *Given the location of the proposed Delta Windfarm to Dry Lake I cannot stress the importance of being vigilant as the Dry Lake burial site is not the only ancestral burial site in and around this area. It is a well know fact almost the Wiradyuri the the township of Coleambally is built on a burial site.*
> *Highly significant Boundary & Ceremonial trees are located near and around Morundah designating Mens & Women areas.*

The Project will do everything to ensure that no ancestral remains or other culturally significant items will be harmed as a result of the Project and will endeavour to work with all RAPs to ensure that this is the case.

No other responses have been received to date (29 September 2022) on the draft ACHAR from other RAPs. However, any future responses will be addressed as they are received.

The identified cultural heritage values from the Project area are identified in the **Table 10-1**.

Table 10-1 Identified Aboriginal cultural heritage values from the Project area

Cultural heritage values	Description
Resource gathering locations and techniques	Indigenous communities note that fish, plants and other foods are still collected throughout the region. The primary resource gathering locations, and the techniques used, are known and passed down through the generations.
Campsites	Indigenous people identify campsites as culturally significant as they provide a link to the ancestral past. Identifying significant resource zones, pathways taken by their ancestors through the landscape and communication between other groups. The identification of hearths indicates that people were camping and cooking within the Project area.
Culturally modified or scarred trees	Scarred trees are of great importance to knowledge holders as they are of sacred and ceremonial importance. European land use and agricultural practices has resulted in scarred trees can often be the only remaining markers for ceremonial sites and burials in the landscape. It is also noted that scarred trees may be located at junctions, ceremonial sites or other significant points in the landscape. Although no scarred trees were identified within the Project area, the existence of boundary and ceremonial trees around Morundah attest to the fact that they would likely have been present in, or close to, the Project area in the past.

Cultural heritage values	Description
Transit routes/pathways through the landscape and songlines	Aboriginal people place cultural value through the pathways and routes that their ancestors would have taken. These pathways connect ceremonial and spiritual sites as well as a connection route for trading and meeting with neighbouring tribes. No comments have been provided by Aboriginal stakeholders as to potential transit routes / pathways or songlines relevant to the Project area, however, this does not mean that they do not exist.
Water courses, water holes, springs, and waterfalls	Permanent water bodies are culturally significant as a central location for the gathering of people, resource collection and camping.
Plants and animals	Flora and fauna are not only seen as resources but hold cultural significance in spiritual and ceremonial values. No commentary has been received from Aboriginal stakeholders on significant fauna/ floral resources relevant to the Project area.
Burial sites	Burial sites are of great importance and their protection is a high concern to Aboriginal people as the locations of burials are rarely documented. There have been no known locations that have been identified within the confines of the Project area, however, the presence of ancestral burials at Dry Lake and Coleambally is noted.
Post contact sites	Post-contact sites are places that have gained significance to Aboriginal people since the arrival of European settlers. Defined an as an area where Indigenous people would of have had deep interaction with settlers. Contact sites predominantly depict an altering and destructive process, as European settlers left destruction and death in their wake. No post-contact sites are known to occur within the Project area.
Massacre sites	These sites are highly significant and share great importance to Aboriginal people. No massacres sites are known to be within, or within close proximity to the Project area.
Astronomy	Indigenous Australians are the world's oldest astronomers, presenting an unprecedented knowledge of the stars over the span of thousands of years of observation. Astronomy was used by indigenous Australians to develop calendars and navigate the land. Each tribe lived according to the cycle of the stars, which influenced what they hunted and ate, and where they travelled.

10.3.5 Archaeological survey results

A total of eight previously unregistered sites were identified during the archaeological survey, as shown in **Table 10-2** and **Figure 10-3**.

The location of survey units and survey areas discussed in **Section 10.1.2** are shown in **Figure 10-3**.

Table 10-2 Survey result summary

Site number	Location	Feature(s)	Survey unit	Landform
Yanco Delta PAD 01	C Bull area 2 (outside study area)	PAD	1	Flat
Yanco Delta AS PAD 01	D Bull area 3	Artefact, PAD	2	Flat
Yanco Delta AS PAD Hearth 01	K Robertson area 1	Artefact, PAD, Hearth	2	Flat
Yanco Delta AS PAD 02	C Hearth area 1	Artefact, PAD	2	Flat
Yanco Delta AS Hearth 01	P Robertson area 1	Artefact, Hearth	2	Flat
Yanco Delta AS Hearth 02	K Robertson area 2	Artefact, Hearth	2	Flat
Yanco Delta AS 01	C Bull area 3	Artefact	3	Terrace
Yanco Delta Hearth 01	Delta area 2	Hearth	4	Terrace

10.3.6 Significance assessment

A significance assessment was carried out for the two registered AHIMS sites and the eight unregistered sites discovered during the archaeological survey (refer to **Table 10-3**).

Based on the aesthetic, historic and social context of the identified Aboriginal objects, the study area is considered to be of moderate cultural heritage significance. The Aboriginal objects present within the study area are tangible expressions of Aboriginal life prior to contact and have potential to connect the contemporary community with traditional practices that have been disrupted by colonial activity.

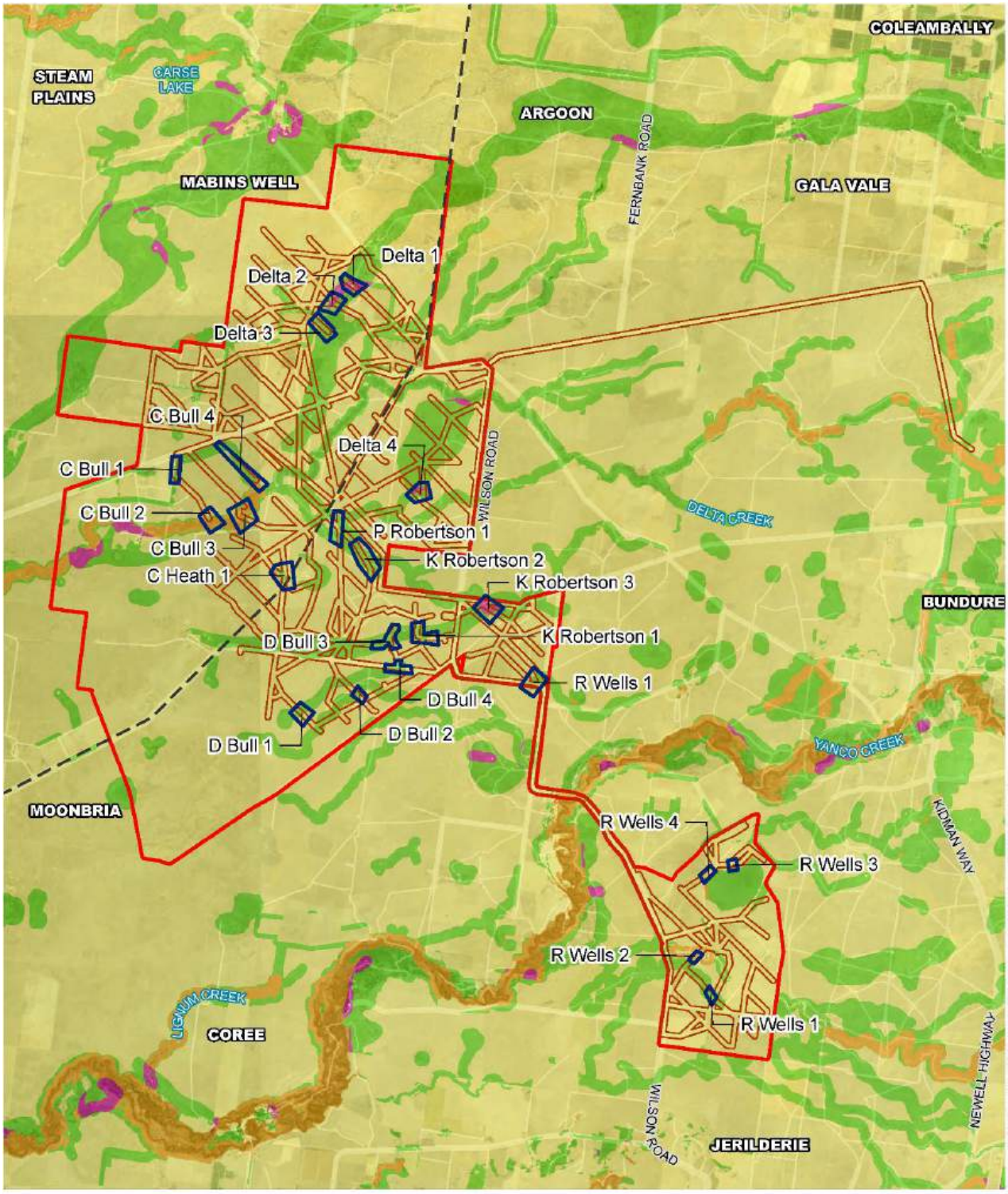

Figure 10-2 Survey units

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Figure 10-3 Location of registered AHIMS sites and unregistered sites within the study area

Table 10-3 Significance assessment of area of archaeological potential of sites within the study area

Site name (AHIMS ID)	Description	Research potential	Representative value	Rarity	Education potential	Overall significance assessment
Registered AHIMS sites						
PEC-E-G2 (AHIMS ID 55-1-0052)	A surface artefact scatter considered common within the region. The site does not feature a potential archaeological deposit (PAD) and is likely to have been disturbed.	Low	Low	Low	Low	Low
PEC-E-43 (AHIMS ID 55-1-0053)	A surface artefact scatter considered common within the region. The site does not feature a PAD and is likely to have been disturbed.	Low	Low	Low	Low	Low
Unregistered sites						
Yanco Delta PAD 01	No Aboriginal objects have been identified and the scientific value of this PAD cannot be accurately assessed until further archaeological investigations are carried out.	Unknown	Unknown	Unknown	Unknown	Unknown
Yanco Delta AS PAD 01	As the full nature and extent of Aboriginal objects have not been identified, the value of the site features cannot be determined until further archaeological investigations are carried out.	Unknown	Unknown	Unknown	Unknown	Unknown
Yanco Delta AS PAD Hearth 01	As the full nature and extent of Aboriginal objects have not been identified, the value of the site features cannot be determined until further archaeological investigations are carried out.	Unknown	Unknown	Unknown	Unknown	Unknown
Yanco Delta AS PAD 02	As the full nature and extent of Aboriginal objects have not been identified, the value of the site features cannot be determined until further archaeological investigations are carried out.	Unknown	Unknown	Unknown	Unknown	Unknown

Site name (AHIMS ID)	Description	Research potential	Representative value	Rarity	Education potential	Overall significance assessment
Yanco Delta AS Hearth 01	A hearth likely to contain datable material such as charcoal. The site is consistent with regional examples of hearths.	Moderate	Moderate	High	Moderate	Moderate
Yanco Delta AS Hearth 02	A hearth likely to contain datable material such as charcoal. The site is consistent with regional examples of heaths.	Moderate	Moderate	High	Moderate	Moderate
Yanco Delta AS 01	A surface artefact scatter considered common within the region. The site does not feature a PAD and is likely to have been disturbed.	Low	Low	Low	Low	Low
Yanco Delta Hearth 01	A hearth likely to contain datable material such as charcoal. The site is consistent with regional examples of heaths.	Moderate	Moderate	High	Moderate	Moderate

10.4 Potential construction impacts

Project development and design refinement has focussed on avoiding impacts to Aboriginal archaeological heritage where possible (refer to **Section 1.5** and **Section 3.10**). As a result, the Project was amended following archaeological survey to avoid the four Aboriginal PADs (Yanco Delta PAD 01, Yanco Delta AS PAD 01,Yanco Delta AS PAD Hearth 01 and Yanco Delta AS PAD 02). There would be no impact to these PADs.

Where possible, impacts to the remaining Aboriginal sites would be avoided with micro-siting of Project elements during detailed design, to allow them to be conserved in situ. **Table 10-4** and **Figure 10-4** provides information on the potential causes of harm to the remaining sites within the Project area.

Table 10-4 Potential causes of harm

Site name (AHIMS ID)	Cause of harm	Comment
Yanco Delta AS Hearth 01	Overhead powerline	Disturbance would be in discrete locations for the power line poles. Detailed design will aim to avoid this site through micro-siting pole locations
Yanco Delta AS Hearth 02	Internal cabling and access track	Existing access track will be used where possible to minimise or avoid harm. Detailed design will aim to avoid this site through micro-siting of access tracks/ internal cabling.
Yanco Delta AS 01	Internal cabling and access track	This location seeks to utilise the existing access track over Delta Creek at this location. The existing track will be to minimise or avoid harm.
Yanco Delta Hearth 01	Access track	Existing access track will be used where possible to minimise or avoid harm. Detailed design will aim to avoid this site through micro-siting of access tracks.
PEC-E-G2 (AHIMS ID 55-1-0052)	Transmission line	Disturbance would be in discrete locations for the transmission line poles. Detailed design will aim to avoid this site through micro-siting transmission line pole locations. However, the site was unable to be relocated during survey, as a result of erosion activities
PEC-E-43 (AHIMS ID 55-1-0053)	Transmission line	Disturbance would be in discrete locations for the transmission line poles. Detailed design will aim to avoid this site through micro-siting transmission line pole locations. However, the site was unable to be relocated during survey, as a result of erosion activities

Test excavations were not undertaken as part of this assessment as the final design location of access tracks, internal cabling and power line/ transmission line poles meant that there are opportunities to avoid impacts to Yanco Delta AS Hearth 01; Yanco Delta AS Hearth 02; Yanco Delta AS 01; and Yanco Delta Hearth 01. As such, it is considered preferred to avoid impacts to Aboriginal sites during detailed design as test excavations would ultimately cause harm to Aboriginal sites which otherwise may have been avoided. This approach is considered in accordance with the requirements of Part 6 of the *National Parks and Wildlife Act 1974*.

Similarly, as PEC-E-G2 (AHIMS ID 55-1-0052) and PEC-E-43 (AHIMS ID 55-1-0053) were recorded on an area of sheet erosion and could not be relocated due to erosion activities, it was decided that testing was not necessary in this area.

A summary of the assessed impacts in accordance with the Code of Practice is included in **Table 10-5** below.

Table 10-5 Summary of potential impacts

Site name (AHIMS ID)	Type of harm	Degree of harm	Consequence of harm
Yanco Delta PAD 01	None	None	None
Yanco Delta AS PAD 01	None	None	None
Yanco Delta AS PAD Hearth 01	None	None	None
Yanco Delta AS PAD 02	None	None	None
Yanco Delta AS Hearth 01	Direct	Partial	Partial loss of value
Yanco Delta AS Hearth 02	Direct	Partial	Partial loss of value
Yanco Delta AS 01	Direct	Partial	Partial loss of value
Yanco Delta Hearth 01	Direct	Partial	Partial loss of value
PEC-E-G2 (AHIMS ID 55-1-0052)	Direct	Total	Total loss of value
PEC-E-43 (AHIMS ID 55-1-0053)	Direct	Total	Total loss of value

10.4.1 Proposed road upgrades

Based on the list of proposed upgrades in **Table 3-6**, a desktop assessment of the potential road upgrades was carried out to identify any impacts to Aboriginal heritage.

A search of the AHIMS database identified that there are also no registered AHIMS sites within or adjacent to any of the proposed locations (closest is 1.6 kilometres away; refer to **Table 10-6**). Additionally, they are situated in areas that have been, or are likely to have been, subject to previous disturbance, largely as a result of road construction activities.

Further, a review of the predictive model at each location identified that the likelihood for Aboriginal objects is low (Survey unit 1) to moderate (Survey unit 2). The archaeological survey undertaken for the Project area to test the results of this model indicated that the results of the predictive model were largely accurate.

Prior to the submission of the response to submission report, an assessment of each proposed road upgrade location will occur. This assessment will include a visual inspection and may require sub-surface testing, if appropriate. The assessment will be undertaken in conjunction with the RAPs identified for this Project.

10.5 Potential operational impacts

No operational impacts to Aboriginal heritage sites are anticipated as a result of the Project.

10.6 Potential decommissioning impacts

No decommissioning impacts to Aboriginal heritage sites are anticipated as a result of the Project.

Table 10-6 Aboriginal heritage assessment of proposed road upgrades

Intersection	Proposed works	Distance from registered AHIMS	Survey Unit	Aboriginal assessment
Intersection of Newell Highway with Conargo Road, Jerilderie	Temporary removal of road signs and street lighting.	N/A	N/A	Impacts here are unlikely to exceed the current road footprint and will not involve extensive sub-surface disturbance. No further assessment is warranted here
Intersection of Newell Highway and Kidman Way	Minor earthworks to provide level roadside environment to support the path of travel	1.67 km	Survey unit 2	While there would be on-ground impacts outside the current road footprint, which is a sealed road (implying a level of previous sub-surface disturbance associated with road construction), they would be minimal and it is likely that the existing road construction will have affected them to a certain degree.
Intersection of Kidman Way and Jerrys Lane	Additional hardstand would be required to accommodate the vehicle swept path. In addition, extension and protection of existing culvert to sustain vehicle loads would likely be required.	4.79 km	Survey unit 1	Kidman Way is a sealed road, with implications of a level of previous sub-surface disturbance associated with road construction. Jerrys Lane is an unsealed road, which may have less subsurface disturbance. Impacts outside the existing road footprints would be relatively minimal. The closest registered site is 4.79 km away. This, added to being located within Survey Unit 1 mean that it is considered unlikely that Aboriginal objects are present.
Jerrys Lane/ Liddles Lane	Vegetation clearing / trimming and road widening as required along Liddles Lane to provide a clear path of travel. The unsealed road will also require consideration regarding surface treatment and drainage upgrades to ensure all weather access is achievable.	8.64 km	Survey unit 1	Both Jerrys Lane and Liddles Lane are unsealed roads, which may have lower levels of subsurface disturbance than sealed roads. Impacts outside the existing road footprints are relatively minimal. The closest registered site is 8.64 km away. This, added to the location within Survey Unit 1 mean that it is considered unlikely that Aboriginal objects are present.

Intersection	Proposed works	Distance from registered AHIMS	Survey Unit	Aboriginal assessment
Wilsons Road/Liddles Lane	Vegetation clearing / trimming and road widening as required along Wilson Road to provide a clear path of travel. The unsealed road will also require consideration regarding surface treatment and drainage upgrades to ensure all weather access is achievable.	14.20 km	Survey unit 2	Both Wilsons Road and Liddles Lane are unsealed roads, which may have lower levels of subsurface disturbance than sealed roads. The closest registered site is 14.2 km away. It is likely that disturbance associated with road operation may exceed the current road footprint to a certain degree.
Wilsons Road/ Moonbria Road	Vegetation clearing / trimming and road widening as required along Moonbria Road to provide a clear path of travel. The unsealed road will also require consideration regarding surface treatment and drainage upgrades to ensure all weather access is achievable.	16.16 km	Survey unit 1	Both Wilsons Road and Moonbria Lane are unsealed roads, which may have lower levels of subsurface disturbance than sealed roads. Impacts outside the existing road footprints are relatively minimal. The closest registered site is 16.16 km away. This, added to the location within Survey Unit 1 mean that it is considered unlikely that Aboriginal objects are present.
Moonbria Road	Minor adjustments	16.89 km	Survey unit 1	Moonbria Road is an unsealed road, therefore, it may have lower levels of subsurface disturbance than sealed roads. Impacts outside the existing road footprint is relatively minimal. The closest registered site is 8.64 km away. This, added to the location within Survey Unit 1 mean that it is considered unlikely that Aboriginal objects are present.

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 10-4 Location of Aboriginal sites and Project design (Page 1 of 2)

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 10-4 Location of Aboriginal sites and Project design (Page 2 of 2)

10.7 Environmental management measures

Proposed measures to manage and/or mitigate Aboriginal heritage impacts from the Project are detailed in **Table 10-7**.

Table 10-7 Aboriginal heritage environmental management measures

Impact	Reference	Environmental management measure	Timing
Impacts on Aboriginal sites	AH01	A Cultural Heritage Management Plan (CHMP) will be developed to provide guidance on the procedure for the identification of unexpected Aboriginal objects, the long-term management of Aboriginal objects retrieved from surface collection of artefacts and any preliminary excavations that may need to occur	Prior to construction
Impacts on Aboriginal sites	AH02	Where harm to Yanco Delta AS Hearth 01, Yanco Delta AS Hearth 02, Yanco Delta AS 01, Yanco Delta Hearth 01, PEC-E-G2, and PEC-E-43 is unavoidable salvage will be completed under the authorisation of the Minster's Conditions of Approval	Prior to construction
Human remains	AH03	If suspected human remains are located during any stage of the Project, work will stop immediately, and the NSW police and Coroner's Office will be notified. NSW Heritage will be notified if the remains are found to be Aboriginal	Construction, operation, decommissioning
Impacts on unknown Aboriginal sites	AH04	If changes are made to the Project to include impacts outside the disturbance area as delineated in the ACHAR, further archaeological investigation will be conducted.	Prior to construction, construction
Potential impacts associated with road upgrades	AH05	Prior to the submission of the 'response to submission report' for the Project, an assessment of each proposed road upgrade location will occur. This assessment will include a visual inspection and may require sub-surface testing, if appropriate. The assessment will be undertaken in conjunction with the RAPs identified for this Project.	Prior to response to submission report

11. Historic heritage

This section summarises the findings of the Historical heritage technical report (**Appendix I**) prepared for the Project in response to the SEARs.

11.1 Assessment methodology

The methodology for the assessment involved the following:

- Establishing the study area and visual impact study area for the assessment
- Desktop assessment literature review of heritage registers and lists, heritage reports and other source material
- Field survey by heritage consultants to identify any additional potential heritage items or areas of archaeological potential. Field survey was carried out on foot and from vehicle from 1 to 4 May 2022 and 18 to 22 July 2022
- Preparation of significance assessments, including statements of significance for any unlisted heritage items or areas of archaeological potential
- Preparation of a Statement of Heritage Impact (SoHI) for identified potential items and consideration of cumulative impacts.

11.1.1 Study area

This assessment assesses impacts to historical heritage in the context of two study areas (refer to **Figure 11-1**):

- **Study area** – Disturbance footprint with a 50 metre buffer from the outermost WTGs and transmission line; intended to capture and address any potential physical impacts (direct and indirect) to heritage significance as a result of the Project
- **Visual impact study area** – An eight kilometre buffer from the disturbance footprint of the outermost WTGs; intended to capture and address any potential visual impacts to heritage significance as a result of the Project.

The location of these two areas is shown in **Figure 11-1**.

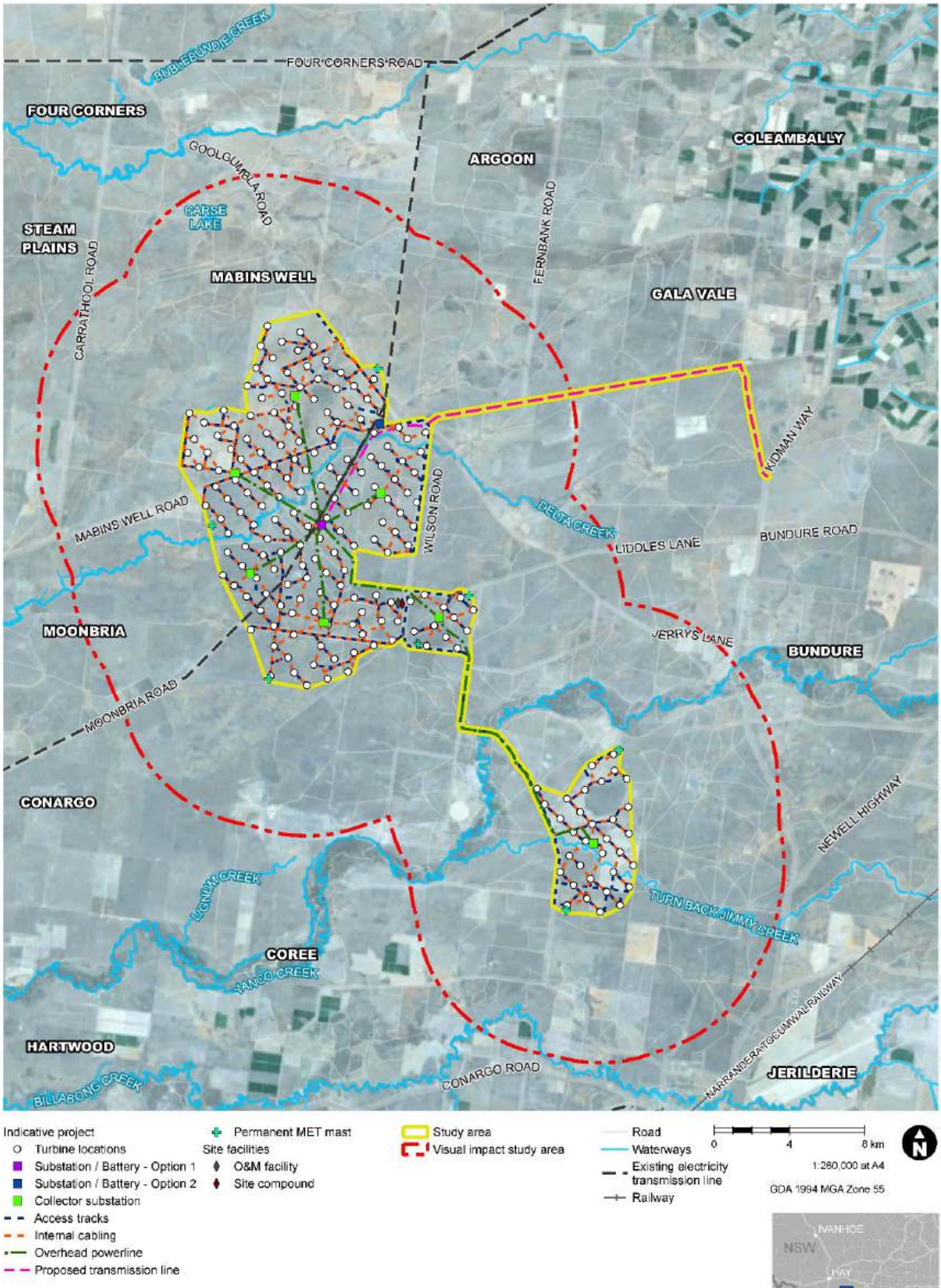

Figure 11-1 Historical heritage study area and visual impact study area

11.1.2 Impact levels

For the impact assessment, different categories of impacts are considered as follows:

- **Direct impact** – planned, intentional physical change occurring to a heritage item from Project activities, resulting in significant reduction of the historical heritage values of the item
- **Potential direct impact** – incidental physical impact that results in a significant reduction of the historical heritage values of the item
- **Potential indirect impact** – secondary impact to a heritage item that could occur as a consequence of Project activities.

To assess the level of impact, the following criteria are considered (refer to **Table 11-1**):

- The scale of the proposed work and its impact
- The intensity of the proposed work and its impact
- The duration and frequency of the proposed work and its impact.

Table 11-1 Definition of level of historical heritage impacts

Two of more characteristics	Scale	Intensity	Duration/frequency
Major	Medium – large	Moderate – high	Permanent / irreversible
Moderate	Small – medium	Moderate	Medium – long term
Minor	Small / localised	Low	Short term / reversible
Negligible	Little or no physical impact; or little or no impact on heritage significance from physical impacts; or potential physical impacts can be prevented through implementation of management measures (e.g. reduction of vibration)		

11.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- EPBC Act
- EP&A Act
- *Heritage Act 1977*
- Conargo LEP 2013
- Jerilderie LEP 2012
- Charter for Places of Cultural Significance (Burra Charter) (Australia ICOMOS, 2013)
- NSW Heritage Manual (NSW Heritage Office, 1996a)
- Assessing Heritage Significance (NSW Heritage Office, 2001)
- Investigating Heritage Significance (draft guideline) (NSW Heritage Office, 2004)
- Statements of Heritage Impact guidelines (NSW Heritage Office, 2002)
- EPBC Act Significant impact guidelines 1.2 (Department of Sustainability, Environment, Water, Population and Communities, 2013)
- NSW Wind Energy: Visual Assessment Bulletin for State Significant Wind Energy Development (DPE, 2016b).

11.3 Existing environment

11.3.1 Historical context

The non-aboriginal history of the region surrounding the Project dates back to the 1800s. It is associated with early European exploration and transportation developments. Pastoralism has historically been the predominant land use in the region irrespective of changes in property boundaries and/or ownership. The first non-Aboriginal explorer to the region was Charles Sturt, who explored the route of the Murrumbidgee River in 1829. Early graziers settled along the upper reaches of the Murrumbidgee River, and Surveyor-general Major Thomas Livingston Mitchell also explored and opened the plains of central and western Victoria to settlers in 1836.

Settlement was officially permitted in the region after the *Crown Lands Occupation Act 1836*, and early cattle runs were soon established. By 1841, there were 147 cattle stations in the District of Murrumbidgee. The Murrumbidgee District was subdivided into smaller pastoral allotments by 1860. The Project area appears to be located in the vicinity of several cattle stations – Mary's Creek Run, the Moonbra Run, and several Yanko properties.

Many of the roads that exist today appear to have been established in the late 1800s. The major railways and coach routes surrounding the Project area link Jerilderie and Deniliquin, Deniliquin and Hay, Hay and Whitton.

By 1923, mapping of the region indicates that larger sections of land were subdivided into small allotments. The majority of the landowners across the Project area had comprised of several individuals or companies who owned large areas of land. In addition to waterways, water bodies and roadways, features across the Project area include typical rural features such as wells, dams, tanks and travelling stock and cattle reserves, along with homestead complexes and woolsheds.

11.3.2 Historical heritage register search

There are no listed historical heritage items located within the study area.

One listed historical heritage item is located within the landscape study area, The Yanko Station Store/ The Yanko Store, listed as State significant on the SHR (02439) and 'local significance' on the Jerilderie LEP 2012 (I19). This heritage item is located 6.5 kilometres from the nearest WTG (refer to **Table 11-2** and **Figure 11-2**).

11.3.3 Field survey results

Following desktop review, 45 potential historical heritage items were identified and investigated on foot during the field survey. As a result of field survey, seven of the 45 items were considered potential heritage items and subject to further detailed significance assessment and archaeological assessment (refer to **Section 11.3.4**).

These potential heritage items, along with The Yanko Station Store, are presented in **Table 11-2** and shown in **Figure 11-2**.

Table 11-2 Known and potential historical heritage items identified for significance assessment

Item no	Name	Location	Description
1	The Yanko Station Store	Within visual impact study area	Late-Victorian style rural outbuilding that is part of the Yanko Homestead group 'State significant' on the SHR (02439) and 'local significance' on the Jerilderie LEP 2012 (I19)
2	Moonbria Homestead group including Woolshed	Within visual impact study area	Homestead group that includes large historic homestead building, Woolshed, associated farm buildings, site of potential historic pub
3	Waringah Homestead group including Woolshed	Within visual impact study area	Homestead group that includes a number of buildings/structures and a historic woolshed. Elements in various states of disrepair/dereliction
4	Delta North homestead – group	Within visual impact study area	Homestead group that includes a C1950s weatherboard dwelling and associated farm buildings of a range of ages Other potential elements of heritage significance include two small structures/farm hand/workers accommodation
5	Potential historic artefact scatter	Study area	Site of historic research/archaeological potential Old, rusted car and potential historic camp/artefact scatter
6	Potential remains of historic camp	Study area	Site of historic research/archaeological potential Old, rusted car and potential historic camp/ /artefact scatter
7	Potential site of old Cobb & Co horse exchange	Study area	Site of historic research/archaeological potential Evidenced by scattered building materials, artefacts
8	Goolgumbla Station Homestead group	Within visual impact study area	Goolgumbla Station homestead group which research indicates may have some historic significance Unable to visit due to access restrictions

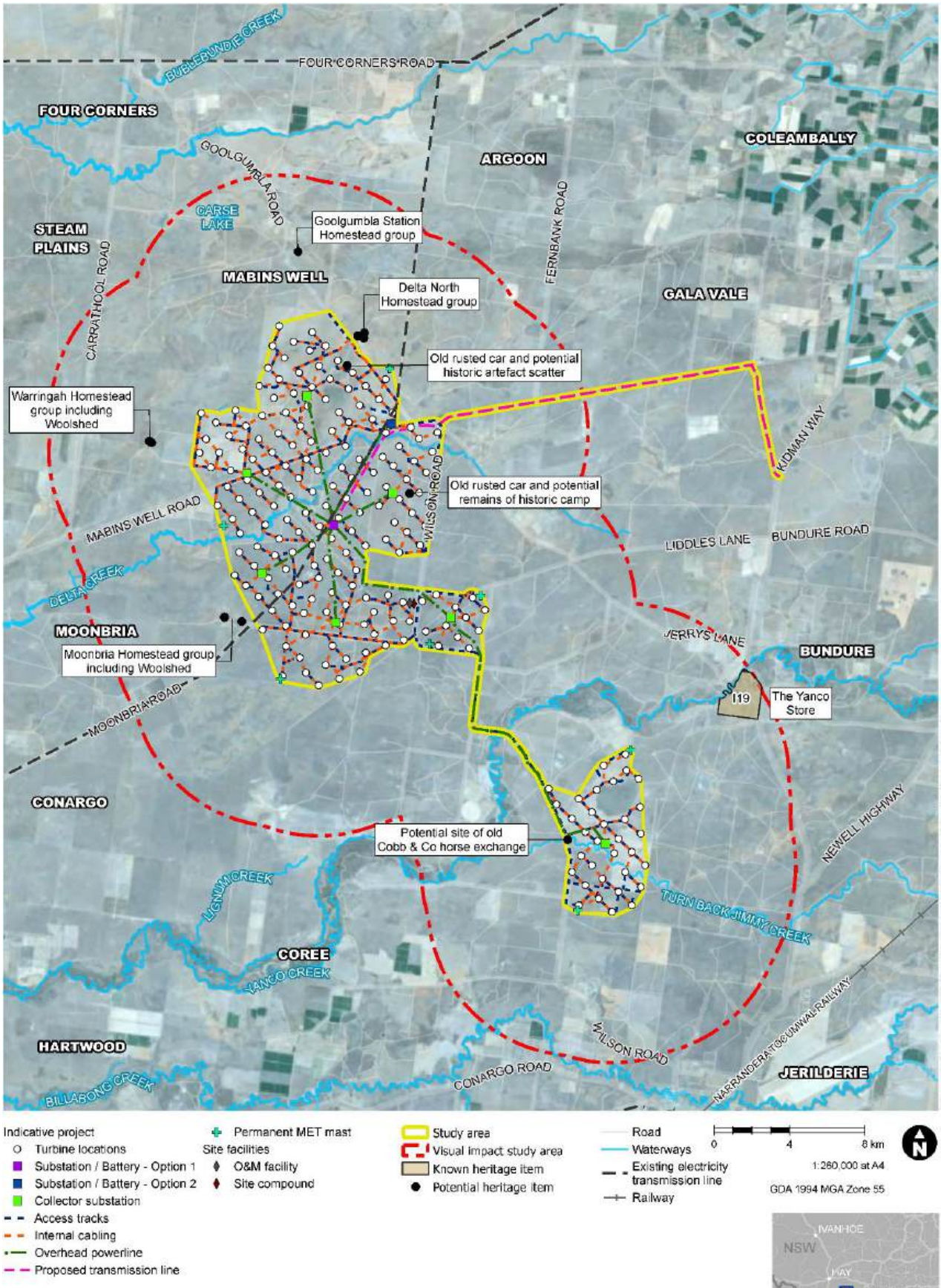

Figure 11-2 Known and confirmed potential heritage items following field survey

11.3.4 Significance assessment

A statement of significance has been provided for each of the known and potential heritage items identified during the field survey. The statements are summarised in **Table 11-3**. Five of the seven potential heritage sites were found to meet the threshold for local heritage significance. Potential sites assessed as not meeting the thresholds for either local or State heritage are shown in grey. These sites are not considered further in the assessment.

Further information is provided in the Historical heritage technical report (**Appendix I**).

Table 11-3 Summary of heritage significance of heritage items

Item no	Item name	Statement of significance	Significance
1	The Yanko Station Store (SHR 02039)	• Item is of State significance for its historical, rarity and representative values • Demonstrates the various needs of late 19th century pastoral life, including as a general store, accountant and cashier office, post and telegraph office • Provided key social, commercial, communication and justice needs of the remote station	This heritage item is of **State heritage significance.**
2	Moonbria Homestead group including Woolshed	• Demonstrates the evolution of the pastoral industry in NSW • Demonstrates the various needs of late 19th century and early 20th century pastoral life • Demonstrates the principal characteristics of sheep shearing establishments in rural NSW built in the 1880s and successively adapted to changing shearing technologies	This heritage item is considered to meet the threshold for **local heritage significance.**
3	Waringah Homestead group including Woolshed	• Demonstrates the evolution of the pastoral industry in NSW • Has the potential to yield information about late 19th century / early 20th century pastoral life and sheep farming practices • Demonstrates the principal characteristics of sheep shearing establishments in rural NSW built in the 1880s and successively adapted to changing shearing technologies	This heritage item is considered to meet the threshold for **local heritage significance.**
4	Delta North Homestead – group	• May help to demonstrates the evolution of the pastoral industry in NSW and the various needs of twentieth century pastoral life • The integrity of the group has been degraded and is not considered to be complete as a complex. Given the age of the homestead (c1950s onward) it likely that this is not the original dwelling as the homestead. It is not considered to be a good representative example of a Homestead group in this region.	This site does not meet the thresholds for either local or State heritage significance.

Item no	Item name	Statement of significance	Significance
5	Potential historic artefact scatter	• The site is not associated with any particular event of note and although it may loosely represent the cultural identify of Australian stockmen and graziers, is unlikely to provide any significant material expression of that cultural identity. • The site does not appear to contain any well-preserved or rare examples of technologies or occupations and was likely used only briefly (although potentially repeatedly)	This site does not meet the thresholds for either local or State heritage significance.
6	Potential remains of historic camp	• The site has the potential to yield historical and archaeological information which may include basic structural elements, rubbish dumps, cesspits and other material culture. It is not expected to have any associated wells or cisterns due to its proximity to one of the historical station tanks. • Archaeological investigation of the site has the potential to provide information that relates to the historical theme of Agriculture, which could contribute to our understanding of twentieth (and potentially nineteenth) century operation of pastoral stations such as Moonbria	This heritage item is considered to meet the threshold for **local heritage significance.**
7	Willandra Wells Yanco property: Potential site of old Cobb & Co horse exchange	• The site may yield historical and archaeological information related to the establishment and operation of a wayside wine shanty and coach stop and may contain remnants such as footings, other structural elements, rubbish dumps, cesspits, stabling etc. • Archaeological investigation has the potential to provide information that relates to the historical themes of Commerce and Transport which could contribute the understanding of the development and 'opening up' of the local area following the establishment of early pastoral concerns	This heritage item is considered to meet the threshold for **local heritage significance.**
8	Goolgumbla Station homestead group	• Demonstrates the change in the area relating to European colonisation in the mid 19th century and the introduction of a significant land use – namely sheep farming and the wool industry, with this land use having been introduced at this site by Sir Samuel McGaughey who was a well-known pioneer of the Australia sheep industry • There is potential for archaeological remains and deposits to be present at the site. These have the potential to provide information about the operation of a (sheep) Station in the 18th and early 19th centuries and the lives of the owners and other people living at and visiting the property around this time. Comparisons with other homestead groups (including woolsheds) can also be made.	This heritage item is considered to meet the threshold for **local heritage significance.**

11.4 Potential construction impacts

There are no known heritage items located in the disturbance footprint of the Project.

Two potential heritage items (Item 6 and Item 7, both archaeological sites) are located within the study area. These are located 300 metres and 150 metres, respectively, from the disturbance footprint and any ground disturbance, however. An exclusion zone will be established around the potential heritage curtilage of each potential heritage item to avoid accidental physical impacts. As such, negligible heritage impacts are anticipated for Item 6 and Item 7.

No impacts to the other potential heritage items, including visual impacts, are anticipated during Project construction.

11.5 Potential operational impacts

During Project operation, there is potential for indirect visual impacts to the rural setting of homestead groups (complexes) (Item 1, Item 2, Item 3 and Item 8) as a result of large-scale infrastructure, such as WTGs and the proposed transmission line.

The approximate location of Project elements to these known and potential heritage items are listed in **Table 11-4**.

Table 11-4 Distances of heritage items from nearest WTGs and transmission line

Item no	Heritage item name	Closest WTG location	Transmission line
1	The Yanko Station Store	6.5 km	11 km
2	Moonbria Homestead group including Woolshed	2.1 km	7.5 km
3	Waringah Homestead group including Woolshed	2.7 km	11 km
8	Goolgumbla Homestead group	3.7 km	10.7 km

Overall, given the physical separation between the known and potential heritage items and Project elements and the implementation of management measures, the potential for indirect visual impacts on heritage items would be negligible to minor.

11.6 Potential decommissioning impacts

If decommissioned, the Project area would be rehabilitated to its pre-construction conditions. The decommissioning process would generally involve the removal of above ground infrastructure, including WTGs, electrical infrastructure and maintenance buildings unless required for the future land use of the Project area.

If the Project is decommissioned, the existing setting of the heritage items would be restored, and any potential indirect visual impacts resolved/removed.

11.7 Environmental management measures

Proposed measures to manage and/or mitigate historical heritage impacts from the Project are detailed in **Table 11-5**.

Table 11-5 Historical heritage environmental management measures

Impact	Ref	Environmental management measure	Timing
General historical heritage impacts	HH1	A Historical Heritage Management Plan (HHMP) will be prepared prior to construction in consultation with Heritage NSW. As a minimum, the HHMP will include the following: • A list, plan and maps with GIS layers showing the location of identified heritage items both within, and near, the disturbance footprint • Procedures to be implemented during construction to avoid or minimise impacts on items of heritage significance including protective fencing • A procedure for the unexpected discovery of human skeletal remains as per the Skeletal remains: guidelines for the management of human skeletal remains (NSW Heritage Office 1998).	Prior to construction
	HH2	Historical heritage awareness training will be provided for contractors prior to start of construction work to ensure understanding of potential heritage items that may be impacted by the Project, and the procedure required to be carried out in the event of discovery of historical heritage materials, features or deposits; or the discovery of human remains.	Construction
	HH3	The location of each heritage item will be considered when finalising the design and siting of the WTGs, transmission line, access tracks and other associated ancillary and operational infrastructure.	Detailed design
Impacts to Item 6 and Item 7	HH4	The following items will be avoided and will be demarcated within a 50-metre buffer around the item extent: • Item 6: Potential remains of historic camp • Item 7: Potential site of old Cobb & Co horse exchange.	Prior to construction, construction
Impacts to heritage items	HH5	Should design of the Project not avoid impacts to heritage associated with Item 6 and Item 7, archaeological investigations will be completed prior to any work that have the potential to impact upon the potential archaeology of heritage items. Test Excavations will be completed in accordance with the relevant sections (139(4)) of the Heritage Act, the guideline 'Relics of local heritage significance: a guide for archaeological test excavation' published by Heritage NSW and the Archaeological Assessments: Archaeological Assessment Guidelines (NSW Heritage Office, 1996).	Detailed design, prior to construction
Visual impact to heritage items (Item 1, 2, 3 and 8)	HH6	Screening vegetation will be considered at each heritage item to minimise views of Project infrastructure from the heritage item. Consideration of materials and finishes of components of the Project will also be considered to minimise visual impacts.	Detailed design

12. Traffic and transport

This section summarises the findings of the Traffic and transport technical report (**Appendix J**) prepared for the Project in response to the SEARs.

12.1 Assessment methodology

For the purpose of this assessment, a single 'trip' is defined as consisting of two one-way movements. A 'movement' is defined as a single, one-way, vehicle pass-through. The methodology for the assessment involved the following:

- Establishing a study area for the assessment, including OSOM route (refer to **Section 12.1.1**)
- Traffic volumes on the Newell Highway (A39) and Sturt Highway (A20) were obtained from the TfNSW permanent classifier station. Given an absence of data, traffic counts were undertaken on both Liddles Lane and Kidman Way (B87) (near the intersection) on Wednesday 4 May 2022 to collect information on traffic volumes, direction and vehicle type
- Road network capacity and performance assessment noting the following
  - A mid-block capacity assessment and a turn warrant assessment was used to determine the performance of the road network with and without vehicles associated with Project construction, operation and decommissioning
  - The criteria for evaluating road performance used in this study is Level of Service (LoS) (refer to **Section 12.1.2**)
  - Given the WTGs for the Project have a design life of 30 years, the Project has been assumed to occur up until the year 2057. Accordingly, 2057 has been selected as the assessment year for the operational mid-block capacity assessment as it encompasses the greatest background traffic growth and therefore presents as the worst-case scenario
  - Similarly, for the purposes of the decommissioning mid-block capacity assessment, decommissioning is assumed to occur 30 years after the commercial operations of the Project (2057)
- Public transport operations analysis - proposed changes were analysed to determine impacts on public transport customers, including routes and stop infrastructure
- Cycleways and footpaths analysis - proposed changes were analysed to determine potential impacts on access as well as availability of pedestrian and cycling infrastructure during Project construction, operation and decommissioning
- Analysis of safety issues and trends associated with the roads forming part of the proposed access routes to the Project
- OSOM vehicle Analysis – OSOM requirements were analysed and an OSOM route study was carried out and included a swept path analysis of intersections to identify the modifications or upgrades required to accommodate OSOM movements
- Cumulative impact assessment - a qualitative analysis of the performance of the road network was undertaken with vehicle movements generated by other major projects expected to be occurring concurrently with the Project using currently publicly available information
- Environmental management measures – measures to manage potential impacts including required road upgrades and other traffic control measures were recommended.

12.1.1 Study area

The study area for this traffic and transport impact assessment is shown in **Figure 12-1** and comprises the transport network servicing the Project. It includes the roads which form part of the proposed access routes for construction, operation and decommissioning vehicles. These roads include Jerrys Lane, Liddles Lane, Kidman Way (B87), Newell Highway (A39) and Sturt Highway (A20).

The OSOM route study additionally considers impacts to roads located outside of the study area that form part of the proposed OSOM haulage route between the GeelongPort and the Project (refer to **Figure 12-1**).

12.1.2 Level of service

LoS is a qualitative measure that describes the operational conditions within a traffic stream and the perception of these by motorists and / or passengers. LoS ranges from A (best) to F (worst) (refer to **Table 12-1**). In rural areas, LoS C can be considered a minimum desirable standard; a deterioration of the LoS under this level would imply that remedial measures to maintain the existing LoS should be sought.

Table 12-1 Level of Service definitions and criteria for mid-block sections

		Volume-to-capacity (V/C) threshold		
LoS	**Description**	**Two-lane highway**	**Local road[1]**	**Town[2]**
A	LOS A is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.	0.32	0.24	0.22
B	LOS B is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is little less than that of the Level of Service A.	0.50	0.38	0.35
C	LOS C is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	0.71	0.55	0.51
D	LOS D is close to the limit of stable flow but is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.	0.91	0.77	0.73
E	LOS E occurs when traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause a traffic-jam.	1.00	1.00	1.00
F	LOS F describes unstable flow. Such conditions exist within queues forming behind bottlenecks. The projected flow rate can exceed the estimated capacity of a given location. Flow break-down occurs and queuing and delays result.	>1.00	>1.00	>1.00

Source: Adapted from the Guide to Traffic Management Part 3: Traffic Studies and Analysis (Austroads, 2017)

Notes:

[1] Where free flow speed is taken as between 60 km/h and 80 km/h

[2] Where free flow speed is taken as 50 km/h

12.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant legislation, policy and guidelines:

- EP&A Act
- *Roads Act 1993*
- Future Transport Strategy 2056 (TfNSW, 2018a)
- Guide to Traffic Generating Developments (Version 2.2) (Roads and Traffic Authority, 2002)
- EIS Guidelines – Roads and Related Facilities (Department of Urban Affairs and Planning, 1996)
- NSW Planning Guidelines for Walking and Cycling (Department of Infrastructure, Planning and Natural Resources, 2004)
- Guide to Traffic Management Part 3: Traffic Studies and Analysis (Austroads, 2017)
- Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments (Austroads, 2020)
- Supplements to Austroads Guides (Roads and Maritime Services, 2013)
- 2026 Road Safety Action Plan (TfNSW, 2021)
- Heavy Vehicle Access Policy Framework (TfNSW, 2018b).

12.3 Existing environment

12.3.1 Road network

Access to the Project would be via a network of local council and State managed roads, including Liddles Lane, Jerrys Lane, Wilson Road, Kidman Way (B87), Newell Highway (A39) and Sturt Highway (A20), as described in **Table 12-2** and shown in **Figure 12-1**.

Table 12-2 Surrounding road network near the Project

Road	Description
Liddles Lane	• 19 kilometre unsealed local road • Extends in the east-west direction between Kidman Way (B87) and Wilsons Road • located approximately 19 km north of the southern terminus of Kidman Way (B87) and connects to Kidman Way (B87) and Wilsons Road via uncontrolled T-intersections • No posted speed limit • Predominately used for local access to land zoned RU1 – Primary Production and associated dwellings • Previously graded to a width of approximately 18 metres, however, light vegetation is generally present on both sides of the road due to the very low traffic volumes present • Managed by Murrumbidgee Council
Jerrys Lane	• 11 kilometre unsealed local road • Extends in the east-west direction between Kidman Way (B87) and Liddles Lane. • Located approximately 13 km north of the southern terminus of Kidman Way (B87) and connects to Kidman Way (B87) and Liddles Lane via uncontrolled T-intersections • No posted speed limit • Predominately used for local access to land zoned RU1 – Primary Production and associated dwellings • Managed by Murrumbidgee Council

Road	Description
Wilson Road	• 48 kilometre local road • Generally extends in the north-south direction between Jerilderie and Argoon • Unsealed north of Moonbria Road • No posted speed limit • Predominately used for local access to land zoned RU1 – Primary Production and associated dwellings • Managed by Murrumbidgee Council and Edward River Council
Kidman Way (B87)	• 644 kilometre sealed State road • Provides north-south connectivity throughout the Riverina and Far West regions of NSW • The southern terminus of Kidman Way (B87) intersects with the Newell Highway (A39) via a priority controlled ('Give way') T-intersection located 16 km north of Jerilderie. The northern terminus of Kidman Way (B87) intersects with the Sturt Highway (A20) via a priority controlled ('Give way') T-intersection • Near the Project, Kidman Way is a single carriageway road with one lane in each direction • Posted speed limit of 100 km per hour • Features relatively narrow, sealed shoulders on both sides • Managed by TfNSW
Newell Highway (A39)	• 1,060 kilometre sealed State road • Forms part of the National Land Transport Network. • Generally extends parallel to the coast of NSW, approximately 400 km inland • Functions as the principal route for freight and passenger movements between Queensland and Victoria • Near the Project, Newell Highway (A39) is a single carriageway road with one lane in each direction • Posted speed limit of 110 km per hour which reduces to 50 km per hour near the township of Jerilderie • Managed by TfNSW
Sturt Highway (A20)	• 950 kilometre sealed State road • Functions as the major interstate corridor for freight and passenger movements between Adelaide to Sydney • Forms part of the Australian National Highway Network • Generally comprises a single carriageway with one lane in each direction • Connects to Kidman Way (B87) via a priority controlled ('Give way') T-intersection located to the north of the Project. • Posted speed limit of 110 km per hour • Managed by TfNSW

12.3.2 Heavy vehicle haulage routes

Near the Project, Kidman Way (B87), Newell Highway (A39) and Sturt Highway (A20) all permit 25/26 metre B-double and 4.6-metre-high vehicles (TfNSW, 2022). These roads are also part of the NSW OSOM load carrying vehicles network (which permits eligible vehicles operating under the Multi-State Class 1 Load Carrying Vehicles Mass Exemption Notice and the Multi-State Class 1 Load Carrying Vehicles Dimension Exemption Notice). Roads forming part of the NSW OSOM load carrying network near the Project are shown in **Figure 12-1**.

Heavy vehicle access to the Project from the north would be via the Sturt Highway (A20) and Kidman Way (B87). Heavy vehicle access to the Project from the south is expected to be via Newell Highway (A39), Kidman Way (B87) and Liddles Lane.

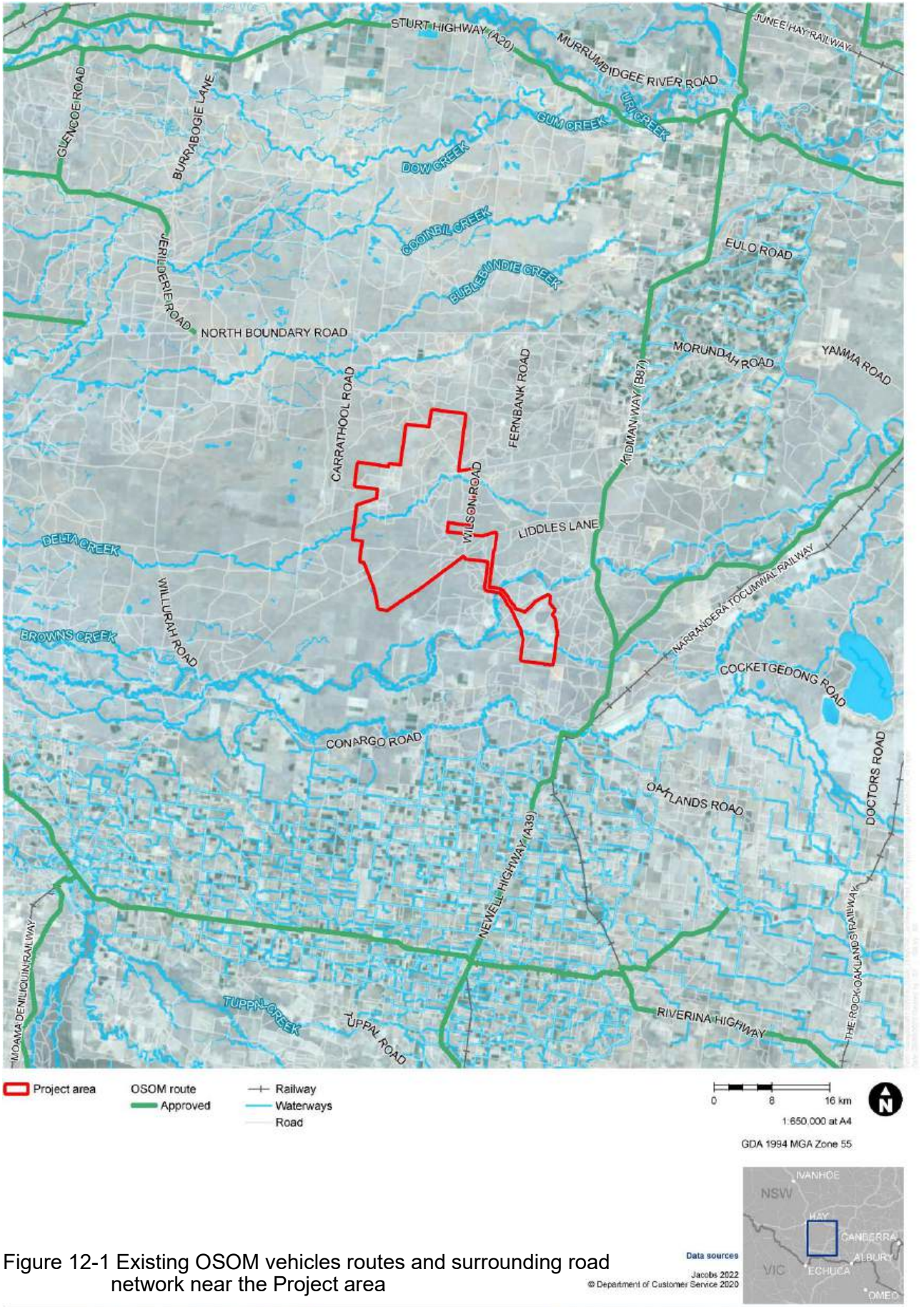

Figure 12-1 Existing OSOM vehicles routes and surrounding road network near the Project area

12.3.3 Existing traffic conditions

The traffic conditions for roads near the Project area are described in **Table 12-3**.

Table 12-3 Roads near the Project

Road	Source	Average	Peak	Heavy vehicles
Liddles Lane	Traffic counts were undertaken on Liddles Lane near Kidman Way (B87) on Wednesday 4 May 2022.	The counts indicate traffic volumes on the road are very low, with two light vehicles travelling in the eastbound direction and two light vehicles travelling in the westbound direction on an average weekday.	N/A given low volumes	None recorded
Kidman Way (B87)	Traffic counts were undertaken on Kidman Way (B87) near Liddles Lane on Wednesday 4 May 2022.	Approximately 700 vehicles travel along the road on an average weekday.	The counts indicate the road has a morning peak from 10:00 am to 11:00 am and an evening peak from 4:00 pm to 5:00 pm. Near Liddles Lane, peak hour volumes on Kidman Way (B87) typically range between 64 and 77 vehicles.	Heavy vehicles account for about 39% of the total traffic.
Newell Highway (A39)	Traffic volumes on the Newell Highway (A39) were obtained from the TfNSW permanent classifier station (ID JRDSTC) located to the south of the Project, 330 metres east of Showground Road, Jerilderie (TfNSW, 2022).	Approximately 1,720 vehicles travel along the road on an average weekday.	The road has a morning peak from 11:00 am to 12:00 pm and an evening peak from 2:00 pm to 3:00 pm. Near Showground Road, peak hour volumes on Newell Highway (A39) is about 134 vehicles.	Heavy vehicles account for about 50% of the total traffic.
Sturt Highway (A20)	Traffic volumes on the Sturt Highway (A20) were obtained from the TfNSW permanent classifier station (ID NNDSTC) located to the north-east of the Project, 190 metres north of Innisvale Road, Euroley (TfNSW, 2022).	Approximately 1,210 vehicles travel along the road on an average weekday.	The road has a morning peak from 9:00 am to 10:00 am and an evening peak from 3:00 pm to 4:00 pm. Near Innisvale Road, peak hour volumes on the Sturt Highway (A20) typically range between 87 and 104 vehicles.	Heavy vehicles account for about 46% of the total traffic.

Traffic volumes travelling on the local road network are greater on weekdays compared to weekends, with Fridays experiencing the overall highest cumulative network volume. A breakdown of the number of vehicles travelling on the local road network by the day of week is shown in **Figure 12-2**. Traffic volumes for Liddles Lane are not included due to low volumes.

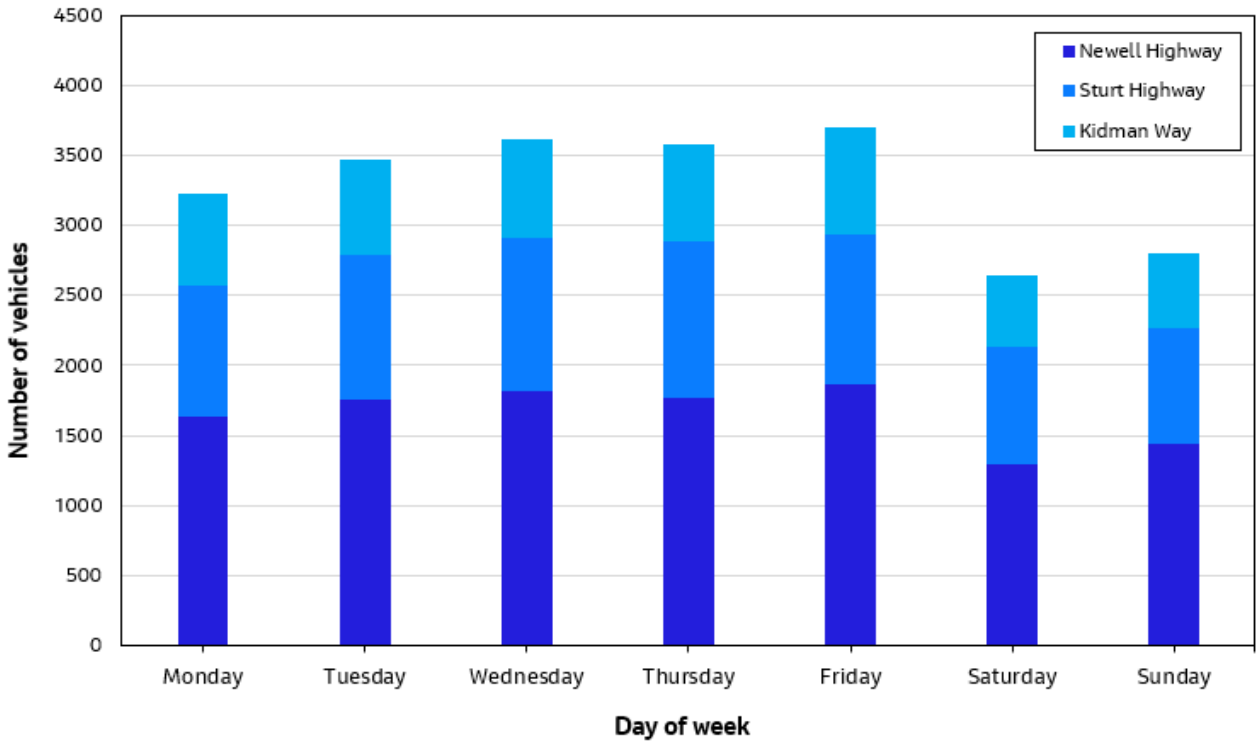

Figure 12-2 Traffic volumes on the local road network by day of week

Data source: Transport for NSW Traffic Volume Viewer, April 2022

12.3.4 Existing road performance

A mid-block capacity assessment was undertaken to assess the existing capacity and performance of roads near the Project area, with results shown in **Figure 12-2** for the morning and evening peaks. The results of the mid-block capacity assessment indicate that all roads currently operate satisfactorily at a Level of Service (LoS) A. These results indicate that the network is currently operating well within its capacity, This is primarily due to the low volumes present.

Table 12-4 Existing road performance in 2022 for roads near the Project

Road	Peak period	Direction of travel	Volume (pcu/hr)	Volume-to-capacity ratio (V/C)	LoS
Liddles Lane	AM	Eastbound	<5	<0.01	A
		Westbound	<5	<0.01	A
	PM	Eastbound	<5	<0.01	A
		Westbound	<5	<0.01	A
Jerrys Lane	AM	Eastbound	<5	<0.01	A
		Westbound	<5	<0.01	A
	PM	Eastbound	<5	<0.01	A
		Westbound	<5	<0.01	A

Road	Peak period	Direction of travel	Volume (pcu/hr)	Volume-to-capacity ratio (V/C)	LoS
Kidman Way (B87)	AM (10:00 am to 11:00 am)	Northbound	33	0.02	A
		Southbound	56	0.03	A
	PM (4:00 pm to 5:00 pm)	Northbound	61	0.04	A
		Southbound	48	0.03	A
Newell Highway (A39)	AM (11:00 am to 12:00 pm)	Northbound	95	0.06	A
		Southbound	107	0.06	A
	PM (2:00 pm to 3:00 pm)	Northbound	102	0.06	A
		Southbound	109	0.06	A
Jerilderie Street	AM (11:00 am to 12:00 pm)	Northbound	95	0.11	A
		Southbound	107	0.12	A
	PM (2:00 pm to 3:00 pm)	Northbound	102	0.11	A
		Southbound	109	0.12	A
Sturt Highway (A20)	AM (9:00 am to 10:00 am)	Eastbound	62	0.04	A
		Westbound	64	0.04	A
	PM (3:00 pm to 4:00 pm)	Eastbound	81	0.05	A
		Westbound	61	0.04	A

12.3.5 Road safety

A review of crash data (2016 to 2020) was undertaken to provide an assessment of safety issues and trends associated with the proposed access and haulage routes to the Project. Crash data for was sourced from TfNSW's Centre for Road Safety database (TfNSW Centre for Road Safety, 2022).

A total of 39 crashes were reported on roads near the Project. Approximately 38% of crashes (15 crashes) occurred on the Newell Highway, 31% of crashes (12 crashes) occurred on the Sturt Highway and 31% of crashes (12 crashes) occurred on Kidman Way. The majority of crashes (54%) occurred at dawn, dusk or in darkness.

The majority of crashes that occurred near the Project area (51.3%) resulted in a towaway with no casualty. The breakdown of injury severity is shown in **Figure 12-3**. Approximately 28% of crashes in the area involved speeding and 23% involved fatigue as a contributing factor.

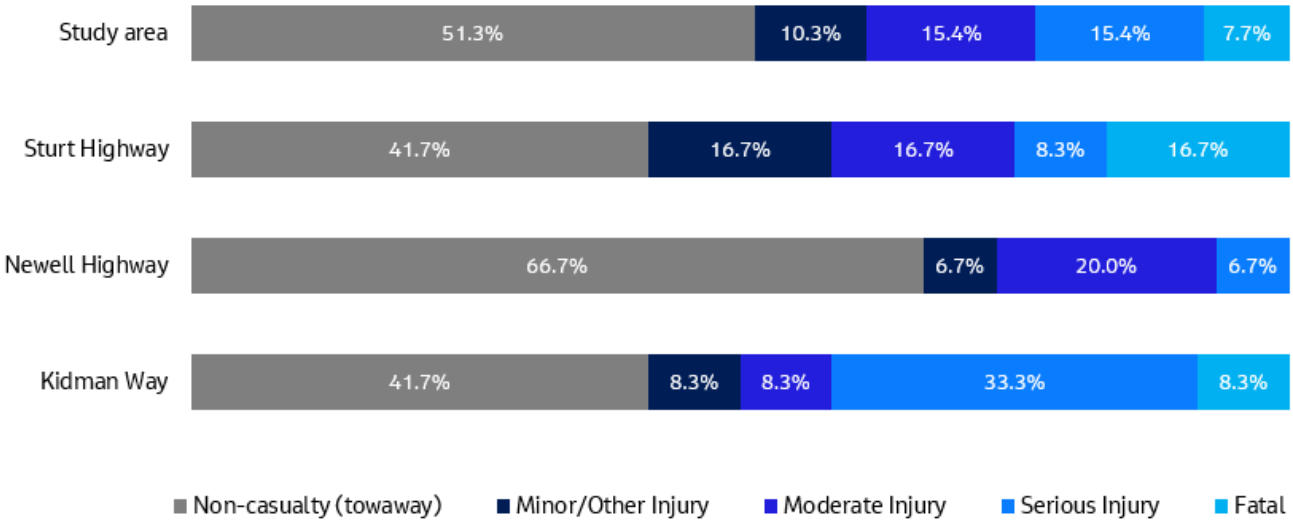

Figure 12-3 Crashes by injury severity

Data source: NSW Centre for Road Safety (2016-2020)

12.3.6 Public transport network

There are no active railway services near the Project and there are no formal pedestrian or cycling facilities near the Project area.

There are no local public bus services near the Project area. 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 Wagga to Echuca service operates at a frequency of one bus in each direction on Monday, Wednesday, Friday and Sunday. The Griffith to Melbourne service operates at a frequency of one bus in each direction per day. The nearest bus stop to the Project is located at the Service Station on Jerilderie Street near Smith Street, Jerilderie.

In addition to the regional coach services, a number of dedicated school bus services operate near the Project. These school bus services generally operate twice each weekday aligning with school start and finish times.

12.3.7 Pedestrians and cyclists

There are no formal pedestrian or cycling facilities provided in the study area with the exception of concrete footpaths located on both sides of Jerilderie Street within the township of Jerilderie.

12.3.8 Crown land

As discussed in **Section 2.2.1**, Crown land parcels near the Project area include Crown roads and Travelling Stock Routes (TSRs). Crown roads generally provide public access to privately owned and leasehold land, and TSRs are for use by travelling stock.

Crown roads and TSRs are shown in **Figure 2-4** and **Figure 2-5.**

12.4 Potential construction impacts

12.4.1 Main traffic generating activities

The main traffic generating activities associated with Project construction include staff travel of and the haulage of raw construction materials, turbine components and other specialist equipment to the Project area.

12.4.1.1 Construction workforce

The peak hours of traffic generation would be the hour prior to shift commencement (6am to 7am) and hour after shift end (6pm to 7pm). Construction staff are expected to commute daily to the Project from existing accommodation facilities within local townships. The origin of where construction workers are travelling from has been assumed based on the population of surrounding local townships and the distance between the local township and the Project. Based on these assumptions, 70% of construction workers are expected to access the Project via the Newell Highway (A39) and Kidman Way (B87) from the south. The remaining 30% of workers are expected to access the Project via Kidman Way (B87) from the north. The indicative number of workers commuting from each local township is shown in **Table 12-5**.

Table 12-5 Indicative origin of construction workers

Township / locality[1]	Population	Distance to Project (km)	Number of workers
Barooga	1820	114	11
Berrigan	1260	91	9
Carrathool	300	143	4
Cobram	6010	113	29
Coleambally	1330	51	13
Corowa	5500	156	26
Darlington Point	1020	80	9
Daysdale	190	114	4
Deniliquin	6880	85	34
Finley	2520	81	15
Jerilderie	1030	45	12
Koonoomoo	260	107	5
Leeton	11240	127	52
Oaklands	240	96	5
Tocumwal	2680	102	15
Urana	300	83	5
Whitton	500	106	5
Yanco	510	120	5
Yarrawonga	7930	133	37
Yarroweyah	550	127	5
Total			**300**

[1] *Based on townships identified in the Socio-economic impact assessment technical report (**Appendix V**)*

12.4.1.2 WTG components and specialist equipment

WTG components and other specialist equipment would be imported from overseas. The components are expected to be shipped to GeelongPort and then transported to the Project via the road network.

Each WTG is expected to involve the transportation of up to 19 individual components and demonstrated in **Table 12-6**. OSOM vehicles would be required to deliver the turbine components to the Project area. It is anticipated that a convoy of three OSOM vehicles would travel from GeelongPort to the Project overnight. In addition, two or three light vehicles would escort each convoy of OSOM vehicles. All OSOM movements would occur outside of peak traffic periods to minimise impacts on the road network. OSOM vehicle requirements and haulage routes are detailed in **Section 12.4.9**.

Table 12-6 Indicative quantity of turbine components to be transported to the Project

Turbine component	Description	Vehicle movements per WTG	Project quantity
Tower	Tapered tubular steel tower sections	Up to 7	1,470
Nacelle	Several modularised options are available to optimise transportation including: • 3 modules (heaviest module <89t) - Hub, nacelle and drive train • 4 modules (heaviest module <81t) - Hub, nacelle, drive train and transformer • 6 modules (heaviest module <59t) - Hub, nacelle, drive train, transformer and generator	Up to 6	1,260
Blades	Split blade design (two-pieces per blade, three blades per turbine) fiberglass infusion and carbon pultruded-moulded components	6	1,260
Total		**19**	**3,990**

Source: Siemens Gamesa Renewable Energy, 2021

12.4.2 Construction traffic generation and distribution

Traffic generated by the transportation of raw material and equipment was calculated using the quantities and volumes required to construct the Project and the available loading or cubic capacity of haulage vehicles. The following assumptions were developed in consultation with the Proponent to determine the number of trips generated by the transportation of raw materials and equipment during construction of the Project:

- Gravel required for the construction of internal access tracks would be 100% sourced internally from the on-site gravel pit(s)
- Concrete would be 100% sourced internally from the on-site concrete batch plants
- Water would be 100% imported, and is likely to be sourced through a commercial arrangement with Murrumbidgee Council
- Sand and other fine aggregates for concrete production would be 100% sourced internally from the on-site gravel pit(s)
- Gravel and other coarse aggregates for concrete production would be 100% sourced externally from local quarries. Multiple local quarry sources have been assumed, with deliveries predominately arriving via the road network from the south (30%/70% north/south directional traffic split assumed)

- Heavy machinery would be sourced locally from townships including Deniliquin and transported via low-loader. Heavy machinery is assumed to remain on-site for the duration of several assignments
- Other miscellaneous equipment (e.g. prefabricated site offices, fencing, portaloos, concrete batch plants) and materials (e.g. reinforcing steel, fuel, cement) would be sourced from local suppliers, with deliveries predominately arriving via the road network from the south (30%/70% north/south directional traffic split assumed).

Table 12-7 provides a summary of the anticipated traffic movements on the local and State road network as a result of the Project. The following assumptions were made in the calculation of average daily and peak hour trips:

- All light vehicle movements associated with construction staff travel to the Project would occur within one hour before shift start (6am to 7am on weekdays and 7am to 8am on Saturdays) and one hour after shift end (6pm to 7pm on weekdays and 1pm to 2pm on Saturdays)
- The traffic generation rate in the peak periods is expected to be one light vehicle per worker
- The majority of heavy traffic movements are expected to occur during standard working hours and would be distributed evenly within the time period
- OSOM vehicle movements assumed to occur as a convoy of three OSOM vehicles and would occur overnight.

Detailed calculations are provided in **Table 12-7**.

Table 12-7 Indicative average and peak construction traffic generation

Vehicle class	Daily trips		Peak hour trips	
	Average construction	Peak construction	Average construction	Peak construction
Light	385	610	190	300
Heavy	85	160	5	10
OSOM	6	6	0	0
Total	**476**	**776**	**195**	**310**

The expected distribution of vehicles on the local road network during the morning and evening peaks is shown in **Figure 12-4** and **Figure 12-5**, respectively.

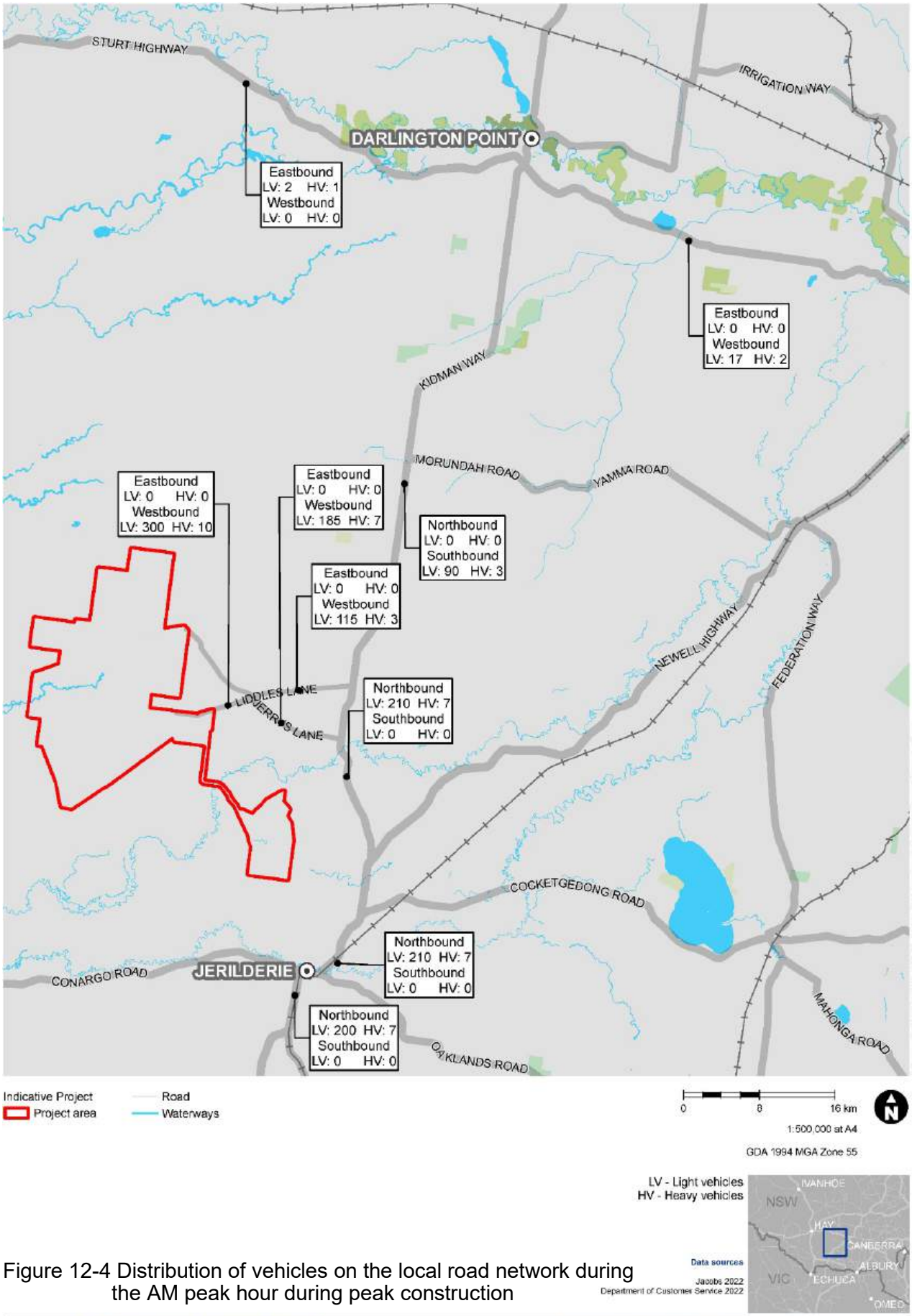

Figure 12-4 Distribution of vehicles on the local road network during the AM peak hour during peak construction

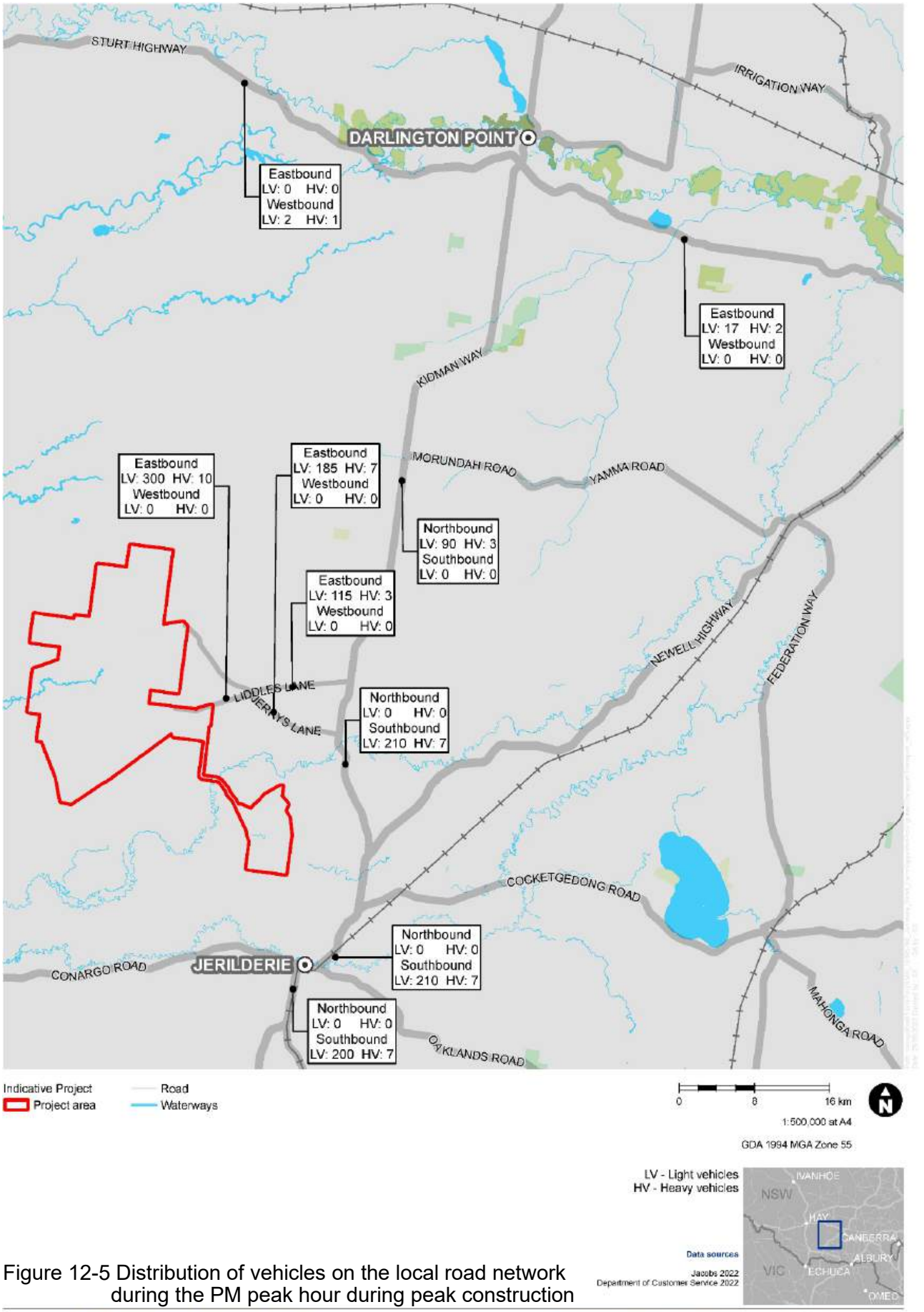

Figure 12-5 Distribution of vehicles on the local road network during the PM peak hour during peak construction

12.4.3 Road capacity and performance

A mid-block capacity assessment has been conducted for the periods from 6am to 7am and from 6pm to 7pm on weekdays, which represent the highest cumulative traffic volumes during Project construction and therefore represent a worst-case scenario.

The results of the mid-block capacity assessment show a 'with Project' and 'without Project' scenario. The results indicate:

- 2027 without Project - all roads would operate satisfactorily at a LoS A
- 2027 'with Project' (with vehicles associated with Project construction) – all roads near the Project area are expected to continue to perform at a LoS A, with two exceptions:
  - One section of Liddles Lane (west of Jerrys Lane) - decrease in LoS from A to B during the morning and evening peak hours, however the flow of traffic would remain within the zone of stable flow
  - One section of the Newell Highway located within the township of Jerilderie (Jerilderie Street) - decrease in LoS from A to B during the morning and evening peak hours, however the flow of traffic would remain within the zone of stable flow.

The capacity assessment identified that impacts to road performance would be minor and the existing road network is expected to have sufficient capacity to accommodate the traffic demand during the peak construction period of the Project.

12.4.4 Turn warrant assessment

Turn warrant assessments were performed using the morning peak period of construction traffic generation (6am to 7am) to determine whether traffic associated with Project construction would require a higher-order turn treatment in comparison to the forecast 2027 traffic volumes. This was done at the intersections of Kidman Way/Liddles Lane, and Kidman Way/Jerrys Lane. Morning peak traffic volumes have been used in the assessment as they present the hourly period with the greatest major road traffic volume. As such, this assessment represent a worst-case scenario.

The turn warrant assessment indicates that a basic left-turn and basic right-turn treatment is sufficient at the Kidman Way / Liddles Lane and Kidman Way / Jerrys Lane intersections under both the 'without Project' and 'with Project' scenarios. Therefore, construction traffic volumes would not trigger a higher-order turn treatment in comparison to the turn treatments at assessed intersections.

It is acknowledged that the results of this turn warrant assessment makes the following assumption:

- 80% / 20% Jerrys Lane/Liddles Lane traffic split for light construction vehicles travelling on Kidman Way in the northbound direction
- 20% / 80% Jerrys Lane/Liddles Lane traffic split for light construction vehicles travelling on Kidman Way in the southbound direction.

12.4.5 Site access arrangements

As discussed in **Section 3.6.7.1**, site access would be via a designated and upgraded access track from Liddles Lane, four kilometres east of Wilson Road. The site access would involve upgrades to existing roads in accordance with relevant guidelines.

Potential traffic impacts of the Project on site access arrangements would be negligible given low traffic volumes on this road (refer to **Table 12-3**).

12.4.6 Road safety

No crashes were reported at the Kidman Way / Liddles Lane and Kidman Way / Jerrys Lane intersections during the five-year period between 2016 and 2020. Additional vehicles using these intersections are unlikely to have an impact on future crash frequency due to overall low construction traffic volumes, and good available sight distances to key intersections near the Project area.

In addition, the turn warrant assessments (which are based on achieving a specific level of safety performance) indicate that the existing turn treatments would be suitable to accommodate the forecast traffic volumes generated by Project. Beyond these key intersections, all roads in the study area are expected to have sufficient spare mid-block capacity to accommodate additional traffic volumes generated by the Project without adversely impacting the operation or safety of the existing road network.

A Construction Traffic Management Plan (CTMP) and Driver Code of Conduct will be prepared to minimise the risks of speeding and fatigue, as well as other road safety risks and contributing factors. This will include details on appropriate driver induction, training, safety measures and protocols. All OSOM vehicle movements will be subject to a separate Transport Management Plan which will identify the potential impacts of OSOM vehicles on road safety and detail the relevant safety measures to be implemented, where required.

Project construction is not expected to have a significant impact on road safety. This is due to the relatively low historic rate of crashes in the area, the majority of traffic movements occurring outside of dark lighting conditions and the opportunity to manage contributing factors such as fatigue and speeding.

12.4.7 Public transport network

Impacts to regional coach or local school bus services are expected to be negligible given the available spare capacity of the road network and the occurrence of peak construction traffic movements outside of typical school travel periods and the timetabled coach services.

Project construction would not impact the operation of bus stops.

12.4.8 Crown land

Primary access to the Project would be via a designated and upgraded access track from Liddles Lane, four kilometres east of Wilson Road. As such, Crown roads would not be relied upon for access to the Project. However, sections of these Crown roads may be used for vehicular access to permanent ancillary infrastructure and temporary facilities. Authority to access and / or use Crown roads during the Project construction will be sought from the DPE in accordance with the *Crown Land Management Act 2016* and the NSW *Roads Act 1993*.

Impacts to other Crown road users are expected to be negligible.

12.4.9 OSOM traffic haulage routes

OSOM vehicles would be required to transport certain OSOM equipment to the Project during Project construction. Oversized equipment is expected to originate from GeelongPort and would generate the following OSOM vehicle movements:

- Up to 3,990 one-way OSOM vehicle movements to transport turbine components to the Project (refer to **Table 12-6**)
- Up to 10 one-way OSOM vehicle movements to transport prefabricated switchrooms structures / control buildings to the Project
- Up to 10 one-way OSOM vehicle movements to transport transformers to the Project.

All OSOM movements would occur overnight or outside of peak traffic periods to minimise impacts on the road network and would be accompanied by two or three light escort vehicles.

As shown in **Figure 12-6**, two OSOM vehicle routes have been assessed between the GeelongPort and the Project area. The final route would be refined in consultation with relevant road authorities.

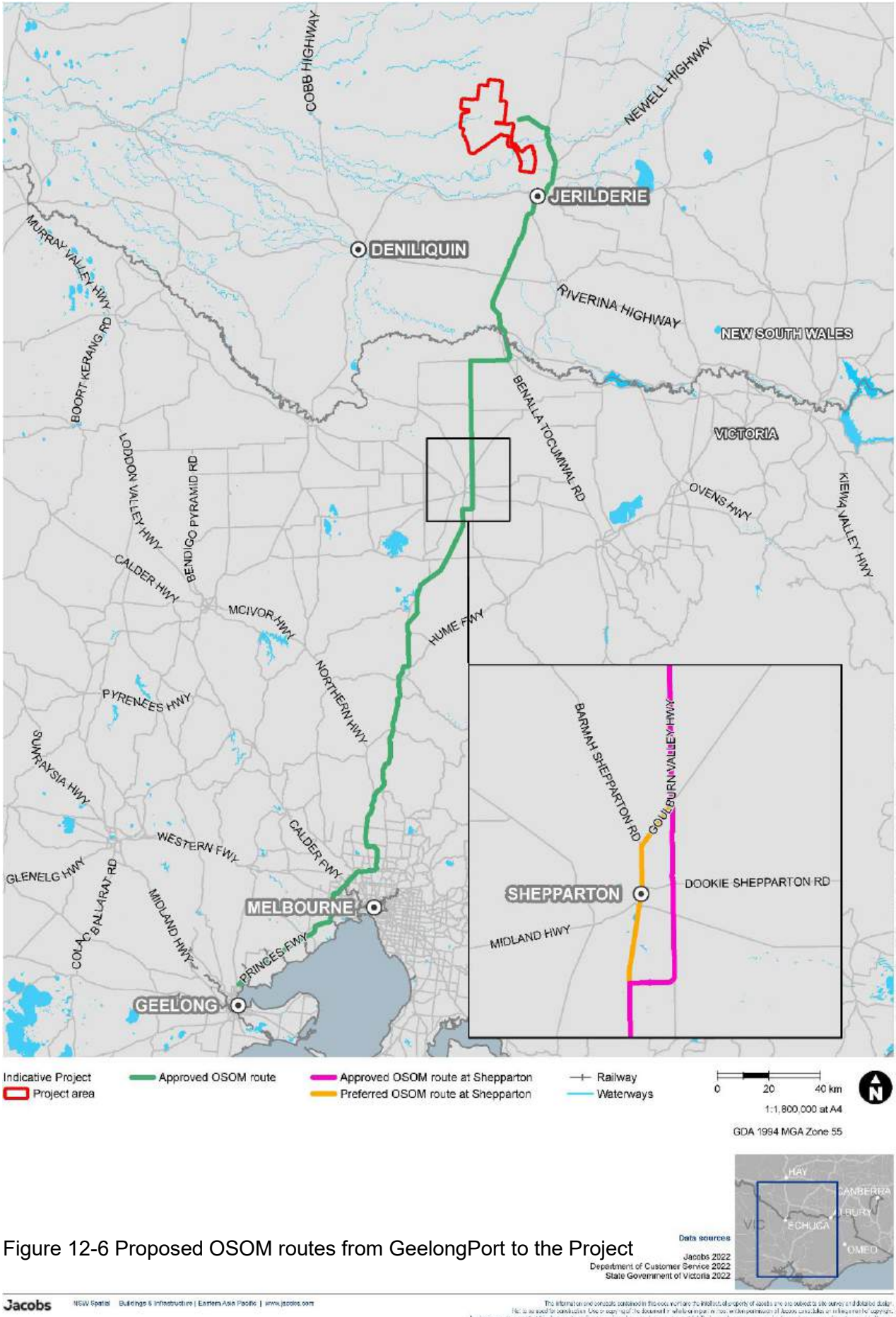

Figure 12-6 Proposed OSOM routes from GeelongPort to the Project

An OSOM route assessment was conducted to identify potential issues and pinch points on the proposed OSOM haulage routes from GeelongPort to the Project. In addition, a series of swept path assessments of intersections were undertaken using AutoTURN to identify locations where civil work or modifications would likely be required to facilitate the delivery of OSOM components to the Project.

As OSOM movements are anticipated to occur on this section of the route between 1am and 4am when traffic volumes on the road network are very low and would be accompanied by pilot vehicles, impacts to the road network and disruptions to other road users on this route are expected to be minimal.

A list of scheduled NSW road upgrades required are provided in **Section 3.6.7.2**.

12.5 Potential operational impacts

12.5.1 Operational traffic generation and distribution

Traffic generation resulting from Project operation e would be limited to a small number of traffic movements associated with specialist maintenance staff, functional tests and facility upkeep activities.

The operational workforce is anticipated to comprise up to 30 employees, generating up to 60 trips per day (30 movements to the Project and 30 movements from the Project per day). Operational staff would likely commute to the Project daily from local townships using a mix of light vehicles. The origin of staff is anticipated to be similar to construction workers, with 30% of workers expected to access the Project via Kidman Way (B87) from the north and 70% of workers expected to access the Project via the Newell Highway (A39) and Kidman Way (B87) from the south.

12.5.2 Road capacity and performance

A mid-block capacity assessment has been undertaken to assess the operational impacts of the Project on road capacity and performance. The results indicate that all roads would operate satisfactorily at a LoS A in 2057 without the operation of the Project. Under the ‘with Project’ scenario, all roads near the Project area are expected to continue to perform at a LoS A. Therefore, no impacts to road performance are anticipated and the road network is expected to have sufficient capacity to accommodate the future traffic demand during the operation of the Project.

12.5.3 Road safety

The operation of the Project is anticipated to have negligible impacts on road safety due to the low operational traffic volumes expected.

12.5.4 Public transport network

The operation of the Project would not impact on regional coach or local bus services.

12.5.5 Crown land

The operation of the Project may involve the use of Crown roads to access permanent ancillary infrastructure for testing and maintenance purposes. Impacts to other Crown road users and TSRs would be negligible given the very low existing traffic volumes and very operational traffic volumes generated by the Project.

12.6 Potential decommissioning impacts

Traffic generation associated with the decommissioning of the Project is anticipated to be less than number of trips generated by Project construction (refer to **Table 12-8**). As such, traffic generation has conservatively been assumed to be approximately 50% of traffic generated by Project construction.

Table 12-8 Indicative decommissioning traffic generation

Vehicle class	Daily trips		Peak hour trips	
	Average	Peak	Average	Peak
Light	195	305	95	150
Heavy	45	80	5	10
OSOM	3	3	0	0
Total	**243**	**388**	**100**	**160**

Impacts on public transport, pedestrians and cyclists, as well as road safety resulting from the decommissioning of the Project are anticipated to be consistent with the impacts identified for Project construction but for a shorter duration.

Potential impacts on road capacity and performance are outlined in the following section.

12.6.1 Road capacity and performance

A mid-block capacity assessment has been undertaken to assess the potential impacts of Project decommissioning on road capacity and performance.

The results of the mid-block capacity assessment for the 'without Project' (without any vehicles associated with the Project) and the 'with Project' (with vehicles associated with the decommissioning of the Project) scenarios indicate that all roads would operate satisfactorily at a LoS A in 2057 without any vehicles associated with the Project.

Under the 'with Project' scenario, all roads near the Project area are expected to continue to perform at a LoS A, with the exception of one section of the Newell Highway (A39) located within the township of Jerilderie (Jerilderie Street). The section of the Newell Highway (A39) within the township of Jerilderie would experience a decrease in LoS from A to B during the evening peak hour due to the temporarily reduced road capacity within the township. However, the flow of traffic would remain within the zone of stable flow. Therefore, the future road network is expected to have sufficient capacity to accommodate traffic demand during the decommissioning of the Project and impacts to road performance are anticipated to be minor.

12.7 Environmental management measures

Proposed measures to manage and/or mitigate traffic and transport impacts from the Project are detailed in **Table 12-9**.

Table 12-9 Traffic and transport environmental management measures

Impact	Reference	Environmental management measure	Timing
Impacts to the local road network	TT1	A Construction Traffic Management Plan (CTMP) will be prepared and will include: • Confirmation of haulage routes • Access to the Project, including entry and exit locations • Preferred times of transport to and from the Project to minimise impacts on the road network • Measures to minimise the number of workers using private vehicles • Management of oversize overmass (OSOM) vehicles • The maximum parameters of the materials to be transported to and from the Project • Site-specific traffic control measures (including signage) to manage and regulate traffic movement • Relevant traffic safety measures, including driver induction, training, safety measures and protocols • Requirements for, and placement of, traffic barriers • Requirements and methods to consult and inform the local community of impacts on the local road network due to the development-related activities • Consultation with Transport for NSW, Victoria Department of Transport, National Heavy Vehicle Regular (NHVR) and local Council • Consultation with the emergency services to ensure that procedures are in place to maintain safe, priority access for emergency vehicles • A response plan for any construction-related traffic incident • Monitoring, review and amendment mechanisms • Individual traffic management requirements at each phase of construction.	Prior to construction
	TT2	Group transport, such as buses for workstreams of more than 20 persons as well as ride sharing systems, will be implemented, where practical, to reduce the number of traffic movements on the local road network.	Construction, decommissioning
	TT3	Dedicated and demarcated parking areas for light and heavy vehicles will be provided. Vehicles associated with the Project will not be permitted to park on the surrounding public road network.	Prior to construction
	TT4	Heavy vehicle movements to and from the Project will be scheduled to minimise traffic disruption to the surrounding road network. This may include, but is not limited to: • Scheduling the movement of construction material, equipment and waste to occur outside of peak periods where practical • Scheduling heavy vehicle deliveries to be evenly dispersed as far as practical to minimise convoying or platoons and queuing outside the Project or on the road network.	Prior to construction, construction, operation, decommissioning
	TT5	A separate OSOM Transport Management Plan will be prepared and will include:	Prior to construction

Impact	Reference	Environmental management measure	Timing
OSOM vehicles		• Identification of the final OSOM route • Measures to provide an escort for the loads • Times of transporting to minimise impacts on the road network • Location of rest areas and require rest stops along the route • The maximum parameters of the materials to be transported to and from the Project • Communication strategy and liaising with emergency services and police • Any minor temporary civil infrastructure work which may be required to accommodate OSOM movements.	
	TT6	An oversized vehicle permit will be sought for all OSOM vehicle movements where required. The OSOM movements will be in accordance with the permit requirements and be outside of peak traffic periods where possible.	Prior to construction
	TT7	The OSOM route will be finalised in consultation with relevant road authorities prior to official NHVR application and will consider potential impacts to pavement and culverts at intersections along the route. The OSOM route assessment this will be assessed once the vehicle and load dimensions have been confirmed prior to transportation.	Prior to construction
	TT8	A dilapidation report will be submitted with the proposed design in reference to Austroads Design guidelines.	Prior to construction
	TT9	Where required, a NHVR exemption permit will be obtained for any parts of the final OSOM route which requires access through roads which are restricted or conditionally approved for OSOM vehicles.	Prior to construction
	TT10	Detailed 3D swept path assessments will be undertaken for intersections and proposed road upgrades in consultation with relevant road authorities. The design will be developed to the standard and satisfaction of the Victoria Department of Transport and NSW road authorities, including Murrumbidgee Council, Edward River Council and Transport for NSW, as appropriate under Section 138 of the NSW *Roads Act 1993*.	Prior to construction
Road safety	TT11	A Driver Code of Conduct will be prepared and be used to outline the rules and behaviours which drivers associated with the Project will be required to adhere to. The Driver Code of Conduct will outline arrangements for light and heavy vehicle drivers, including: • General requirements, including site induction requirements • Travelling speeds and safe driving practices, particularly through residential areas and school zones • Fatigue management • Adherence to designated haulage routes and heavy vehicle noise • Public complaint resolution and penalties and disciplinary action.	Prior to construction, construction, operation, decommissioning

Impact	Reference	Environmental management measure	Timing
	TT12	Public roads and Crown roads will not be obstructed by any materials, vehicles, skip bins or the like, under any circumstances.	Construction, operation, decommissioning
	TT13	'Trucks Turning' warning signs will be installed on both approaches to the intersection of Kidman Way / Liddles Lane and Kidman Way / Jerrys Lane to advise existing road users of the increased heavy vehicle volumes. The signs will be removed upon the completion of construction work.	Construction, decommissioning
	TT14	All vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or dirt particles depositing onto the roadway during travel to and from the Project.	Construction, decommissioning
	TT15	Speed reductions, use of fog lights during periods of low visibility, cessation of work and site shutdowns will be implemented as required during periods of adverse weather.	Construction, operation, decommissioning
Access	TT16	Affected parties including emergency services will be notified in advance of any disruptions to traffic and restriction of access impacted by Project activities.	Prior to construction, construction, operation, decommissioning

13. Water and soils

This section summarises the findings of the Surface water quality and groundwater technical report (**Appendix K**), Soils and contamination technical report (**Appendix L**) and Flooding and hydrology technical report (**Appendix L**) prepared for the Project in response to the SEARs.

13.1 Assessment methodology

The methodology for the assessment involved the following:

- Desktop review of databases and information to understand the existing environment and conditions, including:
  - Existing land uses and topography, geology, soils, hydrogeology and receiving environments, as well as climate, rainfall, existing water and groundwater data and contamination data
  - Available flood study reports
  - Council planning and policy documents to identify flood-related development controls including mitigation requirements
  - Historical data and historical aerial photographs between 1958 and 2021 where available
  - Key word searches for nearby areas and other major projects near the Project area
  - Identification of sensitive receiving environments (SREs) and the water quality criteria
- Flood modelling to determine flooding conditions for the existing case conditions for the 1% (Annual Exceedance Probability) AEP event and the probable maximum flood (PMF)
- Quantification of water demand and water supply arrangements
- Identification of potential construction, operation and decommissioning impacts related to:
  - Contamination during construction and operation
  - Water quality and quantity of surface and groundwater resources, and potential interaction with the water table
  - Other water users
  - Downstream waterways and SREs
  - Flooding – existing flooding conditions indicate that flooding impacts would be minor; as such, a qualitative construction and operational impact assessment has been undertaken
  - Relevant NSW Water Quality Objectives (DECCW, 2006)
  - Cumulative impacts from potential interaction with other projects
- Recommendation of environmental management measures to minimise potential impacts.

13.1.1 Study area

The following study areas were used for each of the disciplines:

- Surface water and groundwater study area – A 500 metre buffer around the Project area and transmission line (refer to **Figure 13-1**). This was adopted to encapsulate a conservative estimate for the maximum distance that sediments and pollutants may mobilise from a point source
- Flooding and hydrology study area – the extent of **Figure 13-2**, which was used to characterise the existing flooding and hydrological environment
- Soil and contamination study area – A one kilometre buffer around the Project area and transmission line to understand the existing environment and potential for contamination within the Project area (refer to **Figure 13-5**).

13.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant legislation, policy and guidelines:

- EP&A Act
- EPBC Act
- *Fisheries Management Act 1994*
- *Protection of the Environment Operations Act 1997*
- *Water Management Act 2000*
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)
- Australian Drinking Water Guidelines (National Health and Medical Research Council and Natural Resource Management Ministerial Council, 2011)
- Australian Rainfall and Runoff 2019 (Ball et al, 2019)
- Contaminated Land Guidelines. Consultants Reporting on Contaminated Land (NSW EPA, 2020)
- Floodplain Development Manual (NSW Government, 2005)
- 2007 Flood Planning Guideline (NSW Government, 2007)
- Flood Prone Land Package (DPIE, 2021c)
- Guidelines for riparian corridors on waterfront land (DPI, 2012a)
- Guidelines for watercourse crossings on waterfront land (DPI, 2012b)
- Guideline for controlled activities on waterfront land – riparian corridors (Natural Resources Access Regulator, 2018)
- Guidelines for Groundwater Quality Protection in Australia (Australian Government, 2013)
- Guidelines for Managing Risks in Recreational Water (National Health and Medical Research Council, 2008)
- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority (EPA), 1998)
- Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004)
- Murray-Darling Basin Plan (MDBA, 2012)
- Murrumbidgee Long-Term Water Plan Part A (Department of Planning, Industry and Environment, 2020a)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013)
- National Water Quality Management Strategy (Australian Government Initiative, 2018)
- NSW Aquifer Interference Policy (DPI, 2012c)
- NSW Water Quality and River Flow Objectives (DECCW, 2006)
- PFAS National Environmental Management Plan, Version 2 (HEPA, 2020).
- Policy & Guidelines for Fish Habitat Conservation and Management (DPI, 2013)
- Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).

13.3 Existing environment

13.3.1 Historical and current land use

The historical aerial photography review indicated that the Project area has remained largely under agricultural land use since the 1950s. There is evidence of the development of agricultural infrastructure and an increased presence of cropping/grazing in more recent decades. In 1958, a rectangular section of land was cleared resembling an airstrip, situated about five kilometres north-west of Yanco Creek, surrounding Wilson Road, Moonbria Road and Liddles Lane.

Further development to the Project area included the construction of numerous dams. A potential historical quarry pre-dating the available aerials is present approximately 1.2 kilometres to the west

of Wilson Road and 3.5 kilometres south of Mabins Well Road, bordered by vegetation. Erosion is also evident throughout the Project area, as are roads, tracks and gilgais (large depressions supporting potentially arid vegetation).

The existing land use and environment for the Project area is described in **Chapter 13**.

13.3.2 Rainfall and temperature

The nearest BOM weather station for rainfall and temperature data is the Yanco Agricultural Institute Weather Station (#74037) located approximately 80 kilometres northeast of the Project area. The average total rainfall for each calendar month from 1996 to 2021 was calculated and is summarised in **Table 13-1**. The available rainfall data shows there is only a moderate level of seasonality within the Project area, and that rainfall is typically low in most months. The average total annual rainfall is 407.1 millimetres.

Average monthly minimum and maximum temperature between 2000 and 2021 are also summarised in **Table 13-1**. The analysis indicates that the Project area is positioned within a temperate climatic region characterised by warm summers and cool winters.

Climate change predictions from 2000 to 2021 in the Murrumbidgee catchment suggest a decrease in spring rainfall but an increase in autumn rainfall is expected to occur. Summer rainfall is also expected to increase (DPIE, 2020c). Mean temperatures are also expected to increase across the region with the greatest increase during summer.

Table 13-1 Summary of climate recorded at Yanco Agricultural Institute Weather Station (#74037)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average Total Rainfall (mm)	27.2	37.7	44.6	23.7	27.4	40.7	34.5	35.7	34.0	31.2	40.5	29.9
Minimum temperature (°C)	19.0	18.3	15.4	11.7	7.7	5.7	4.9	5.1	7.6	10.6	14.4	16.2
Maximum temperature (°C)	34.2	32.4	28.9	24.3	19.0	15.2	14.5	16.3	20.5	24.9	28.9	30.8

13.3.3 Catchment and water sources

The Project would be located within the lower Murrumbidgee River Catchment in southern NSW. 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. Water sharing plans that apply to the Project and manage surface water are presented in **Table 13-2**.

Table 13-2 Water sharing plans and water sources for surface water management

Water Type	Water Sharing Plan	Water Source
Surface water	Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012	• Lower Billabong Anabranch Water Source • Murrumbidgee Western Water Source

13.3.4 Waterways

A summary of the important features of waterways within the Project area, including their Strahler Stream Order, have been described in **Table 19-1** and shown in **Figure 13-1**.

Table 13-3 Summary of key features of waterways and waterbodies identified as having potential to be impacted in the Project area

Waterway / waterbody	Stream order	KFH (DPI, 2022)	Stream type	Threatened species predicted habitat (DPI, 2022)	Relevant features
Delta Creek	2	No[1] – however is mapped as threatened species habitat	Ephemeral	Yes – Flathead Galaxias (critically endangered) Yes – Silver Perch (vulnerable)	• Drains south-west during significant rainfall, although does not connect to any downstream major channel unless the area is flooded • Wetland/swamp environment
Yanco Creek	9	Yes	Perennial	Yes – Flathead Galaxias (critically endangered) Yes – Silver Perch (vulnerable)	• Drains south-west toward Murray River • Well-defined channel • Large woody debris present • Riparian and in-stream vegetation present
Turn Back Jimmy Creek	3	Yes	Ephemeral	Yes – Flathead Galaxias (critically endangered) Yes – Silver Perch (vulnerable)	• Flood-runner between Colombo Creek and Yanco Creek • Minimal/no channel definition • Minimal/no riparian or instream vegetation • No other aquatic habitat features

[1] Delta Creek is predicted to be habitat for the Flathead Galaxias and Silver Perch (DPI, 2022). As such, in accordance with the DPI Fisheries (2013) Policy and Guidelines, It is classified as Type 1 - Highly Sensitive Key Fish Habitat. Despite the predicted distribution mapping, however, it is unlikely that the threatened species would occupy Delta Creek due to its ephemeral nature and lack of connection to larger waterways downstream. As such, we would argue that the waterway should not be considered predicted habitat for these species, and should not be considered KFH.

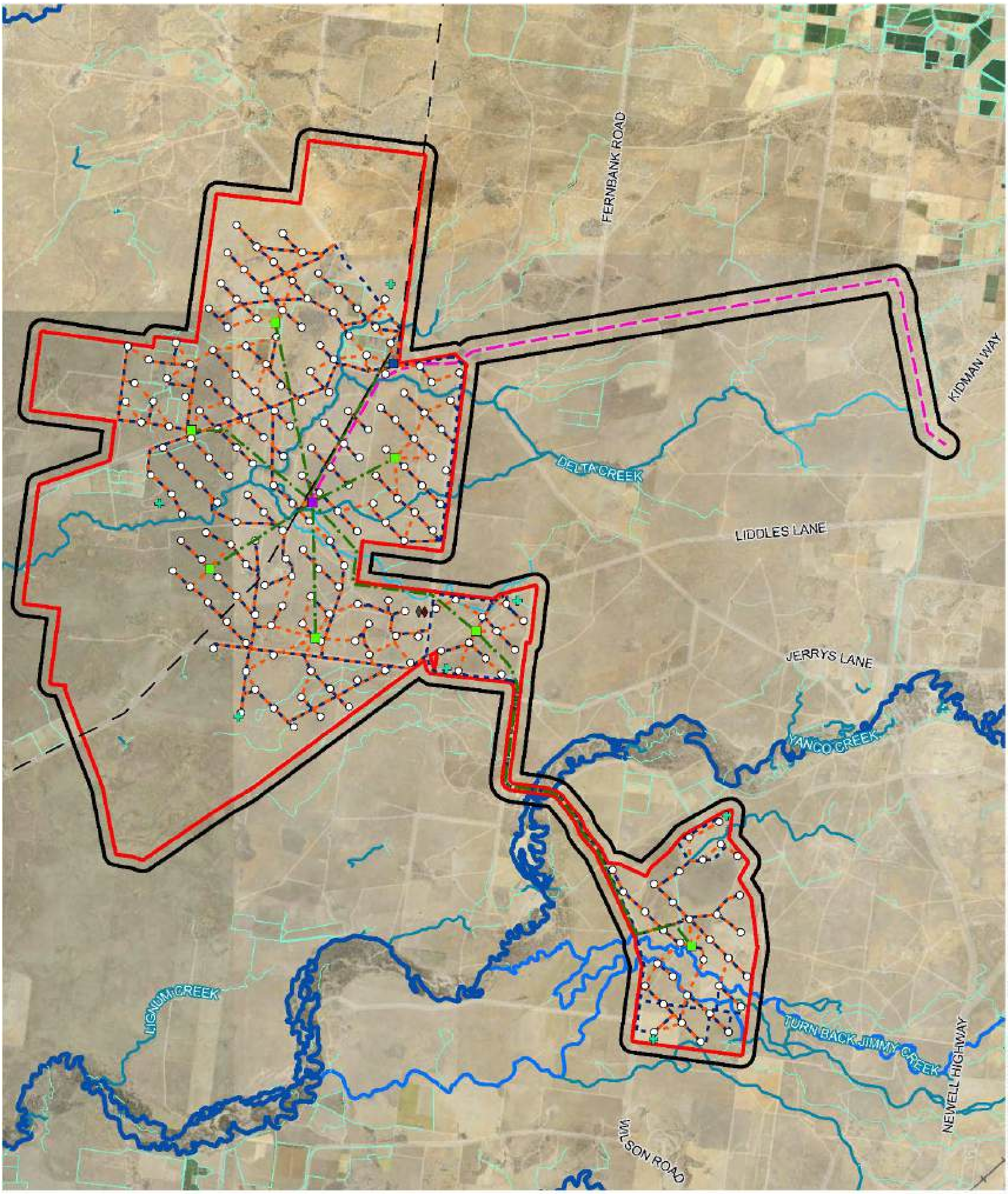

Figure 13-1 Waterways within and surrounding the Project area

13.3.5 Water quality

Available water quality data has been assessed from the 2010 State of the Catchments for the Murrumbidgee Region (DECCW, 2010a), the Water Quality Technical Report for the Murrumbidgee Surface Water Resource Plan Area (SW9) (DPIE, 2020e) and the Murrumbidgee Monitoring Evaluation and Research Program.

Median water quality results for the Yanco Creek as detailed in the Water Quality Technical Report for the Murrumbidgee surface water resource plan area (SW9) (DPIE, 2020e) are presented in **Table 13-4**. No water quality data currently exists for Delta Creek or Turn Back Jimmy Creek.

Table 13-4 Median water quality for Yanco Creek between 2007 and 2015 (DPIE, 2020d)

Indicator	Yanco Creek at Morundah (median)	Yanco Creek at Yanco Bridge (median)	Guideline
Total nitrogen (TN) (mg/L)	0.4	0.56	0.6[1]
Total phosphorus (TP) (mg/L)	0.059	0.074	0.05[1]
Turbidity (NTU)	58	78	35[1]
Total suspended solids (mg/L)	51	44	No guideline
Dissolved oxygen (DO) (% saturation)	95	79	80-110
pH	7.3	7.0	6.5-8
Electrical conductivity (EC) (µs/cm)	132	150	Median 162

Overall, the data suggests that nominated water quality objectives (WQOs) are only partially being achieved, including:

- Protection of aquatic ecosystems – Default guideline values (DGVs) not being met e.g. elevated total phosphorus and turbidity, as well as low dissolved oxygen
- Visual amenity and recreation (primary and secondary contact) – Turbidity which exceeded the nominated DGVs may impact on achieving these WQOs due to the reduction in water clarity
- Due to the absence of data for chemical contaminants, bacteriological indicators and algae protection of the remaining nominated WQO cannot be confirmed.

13.3.6 Sensitive receiving environments

The Project area lies wholly within the endangered ecological community (EEC) known as 'the Lower Murray River Drainage System' (Lower Murray River EEC). This includes Delta, Yanco and Turn Back Jimmy creeks. The Lower Murray River EEC occurs in a lowland riverine environment, characterised by meandering channels and wide floodplains. The land is generally flat to gently sloping. In their natural state, these lowland rivers experience extremely variable flows, ranging from floods to droughts. They provide a wide range of habitats for fish and invertebrates, including pools, runs or riffles, backwaters and billabongs, large woody habitats and aquatic plants. Floodplains also provide a mosaic of habitat types, including permanent and temporary wetland, and terrestrial habitats (DPI, 2007).

Delta, Yanco and Turn Back Jimmy creeks have been deemed sensitive receiving environments based on the presence of KFH (**Table 13-3**), threatened aquatic species (**Table 13-3**) and threatened aquatic ecological communities.

13.3.7 Flooding

Review of flood modelling of the existing flood conditions in and around the Project area indicated that the Project area is partially inundated in both the 1% AEP and PMF events. This flooding is generally characterised by flow velocities of less than 0.5 metres per second and depths of one to three metres along the three major creeks and abound one metre on the adjacent floodplains.

There are areas with higher flood depths, velocities and hazard levels in the areas surrounding Delta Creek and Turn Back Jimmy Creek in the Project area. Ponding and minor overland flow paths are also seen throughout other areas of the Project area.

An overview of the flood depths is presented in **Figure 13-2** and **Figure 13-3** for the 1% AEP and PMF events. Detailed mapping for the Project area for the 1% AEP and PMF events is provided in the Flooding and hydrology technical report (**Appendix L**).

13.3.8 Groundwater

13.3.8.1 Groundwater sources

The upper most groundwater source and water sharing plan is shown in **Table 13-5**. Additional groundwater sources and water sharing plans underly this. However, these deeper sources and plans are not applicable as Project work is not proposed at depths greater than three metres below ground level. As such, they are unlikely to influence these deeper groundwater systems.

Table 13-5 Water sharing plans and water sources for groundwater management in the study area

Water Type	Water Sharing Plan	Water Source
Groundwater	Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020 (NSW Government, 2020b)	Lower Murrumbidgee Shallow Groundwater Source

13.3.8.2 Groundwater systems

Project bores indicate alluvial groundwater systems are present in the Project area. The alluvium generally consists of clay and sand layers, with clay being more dominant. The thickness of sand layers is variable and ranges from less than five metres to approximately 50 metres.

The regional water table is relatively deep (about 20 to 25 metres below ground level (mbgl)) and uniform. However, a shallow borehole documented in the Project's preliminary geotechnical report (Jacobs, 2022c) located near the intersection of Moonbria Road and Wilson Road, encountered groundwater seepage at a depth of 4.8 mbgl. The ground surface in the Project area is very flat and situated on a floodplain with mapped GDEs, therefore, localised perched groundwater systems are considered likely to be present across relatively low lying parts of the Project area. However, the distribution and characteristics of these potential perched systems are not known.

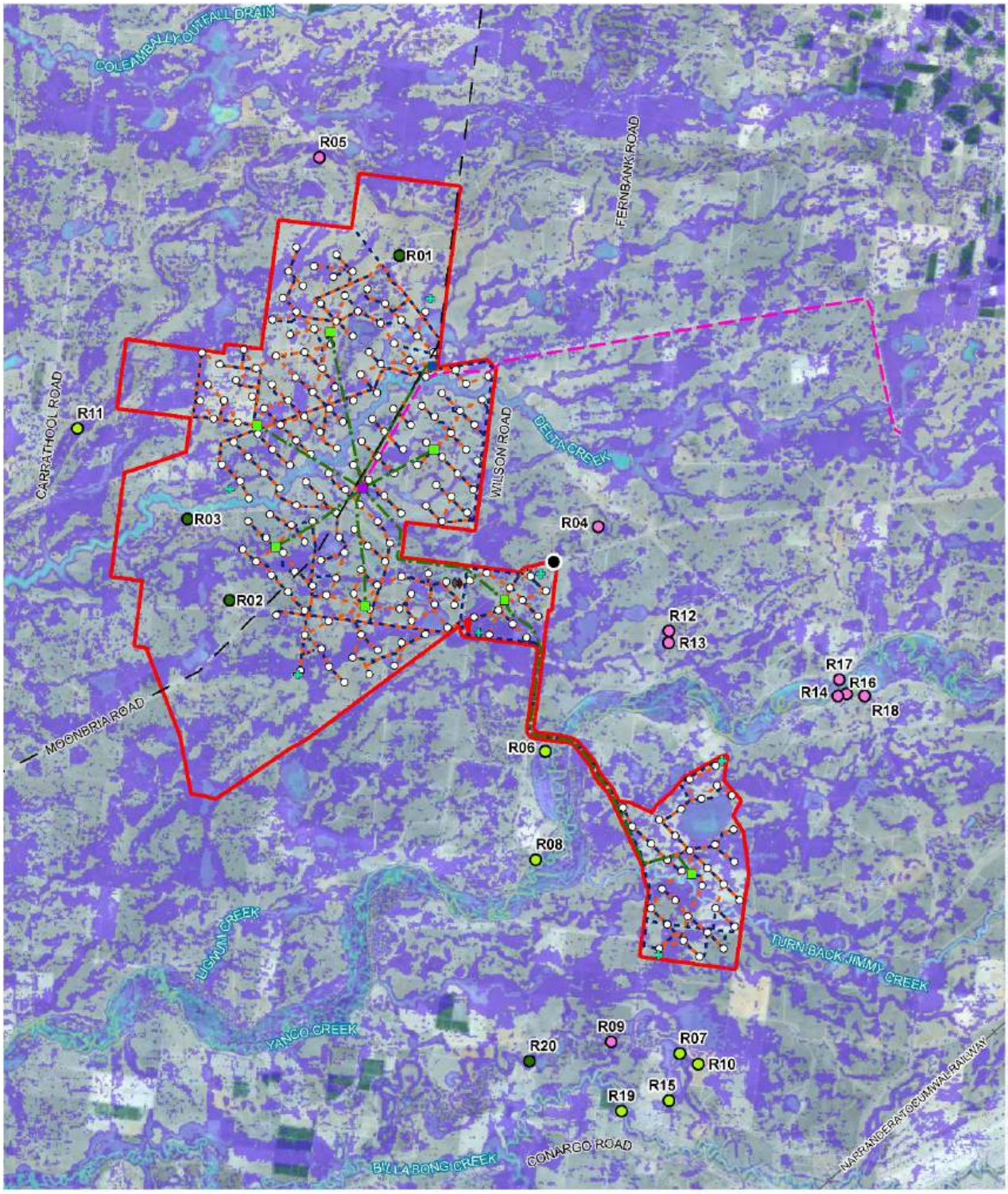

Figure 13-2 Existing flood depth – 1% AEP event

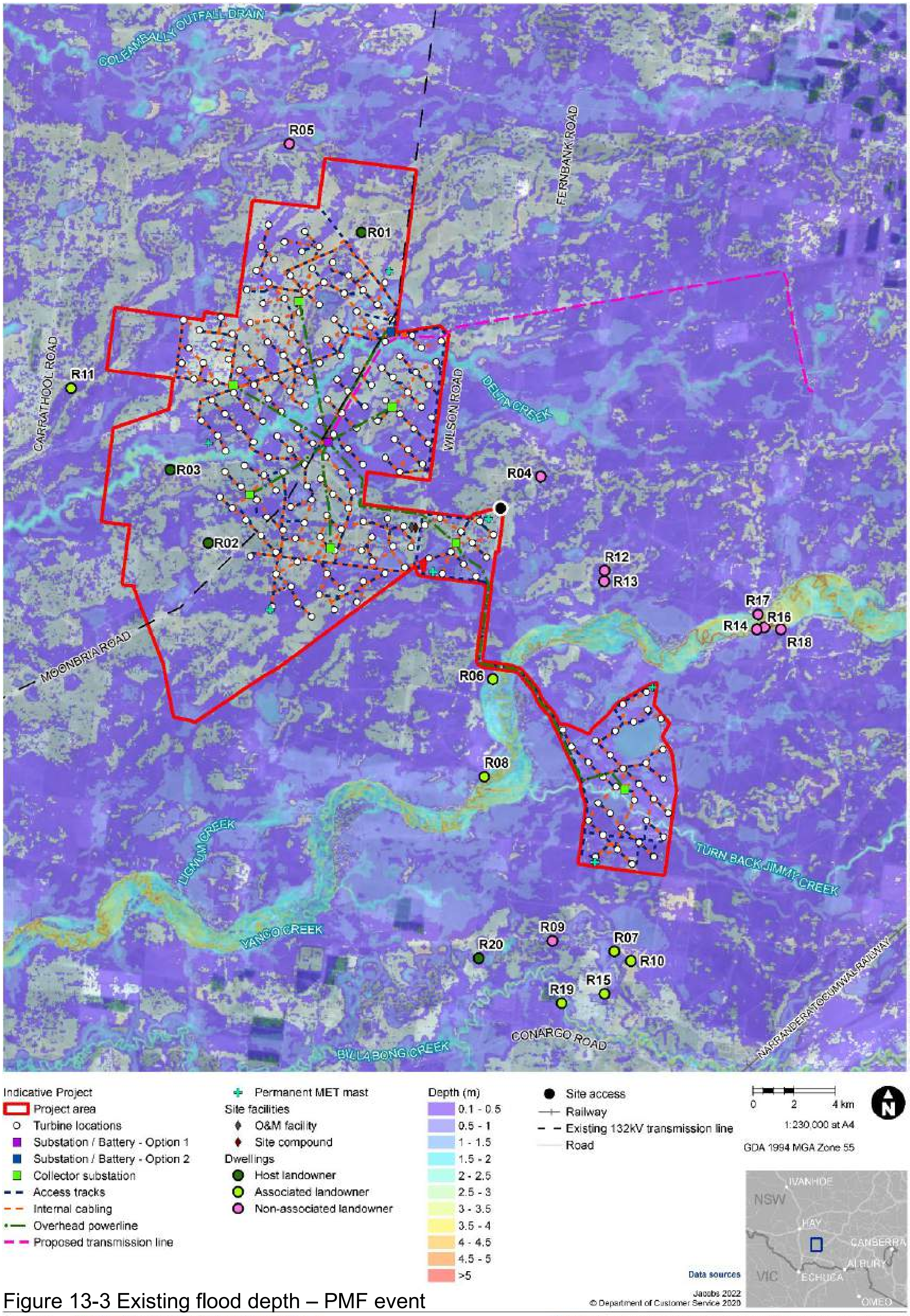

Figure 13-3 Existing flood depth – PMF event

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13.3.8.3 Registered groundwater bores

There are 108 registered groundwater bores within a 500 metre buffer around the Project area and transmission line (refer to **Figure 13-4**) with the following nominated usages according to the BOM Australian Groundwater Explorer (BOM, 2022a):

- Stock – 55 bores
- Monitoring – 16 bores
- Unknown –12 bores
- Household use – 10 bores
- Irrigation – 13 bores
- Exploration – 2 bores.

Groundwater levels from registered bores are generally between 20 mbgl and 25 mbgl. Overall, the groundwater levels, depths and gradients are relatively uniform and consistent throughout the Project area.

Given the Project area topography gently slopes from east to west, the western groundwater bores are anticipated to be hydraulically down gradient from proposed construction and operational activities. These include bores with potential sensitive beneficial usage such as for irrigation, stock and household uses and for water supply. Further details on specific bores are provided in Surface Water Quality and Groundwater Technical Report (**Appendix K**).

13.3.8.4 Groundwater dependent ecosystems

The water sharing plan for the Murrumbidgee Alluvial Groundwater Sources 2020 (NSW Government, 2020b) has mapped land in the vicinity of Yanco Creek as a High Priority GDE. Additionally, the water sharing plan maps small, isolated tracts of land within the northern and southern portions of the Project area as High Priority GDE. Small clusters of High Priority GDE are intersected by proposed Project access tracks and / or internal cables.

Further, Delta, Yanco and Turn Back Jimmy creeks are mapped as low potential aquatic GDEs according to the BoM's GDE Atlas (BOM, 2022b).

Based on the relatively deep and uniform regional water table depths, the potential GDEs and High Priority GDEs are considered unlikely to be relying on the regional water table. Instead, if reliant on groundwater, these are interpreted to be associated with perched groundwater systems situated in marshy areas which are recharged by rainfall and floodwaters.

Areas of terrestrial GDEs are also mapped throughout the Project area, and discussed further in **Chapter 9** (biodiversity).

13.3.9 Soils

13.3.9.1 Topography

The topography of the Project area is relatively flat with very gentle undulations, sloping gently down gradient from east to west. The ground surface typically lies between 100 and 114 metres AHD.

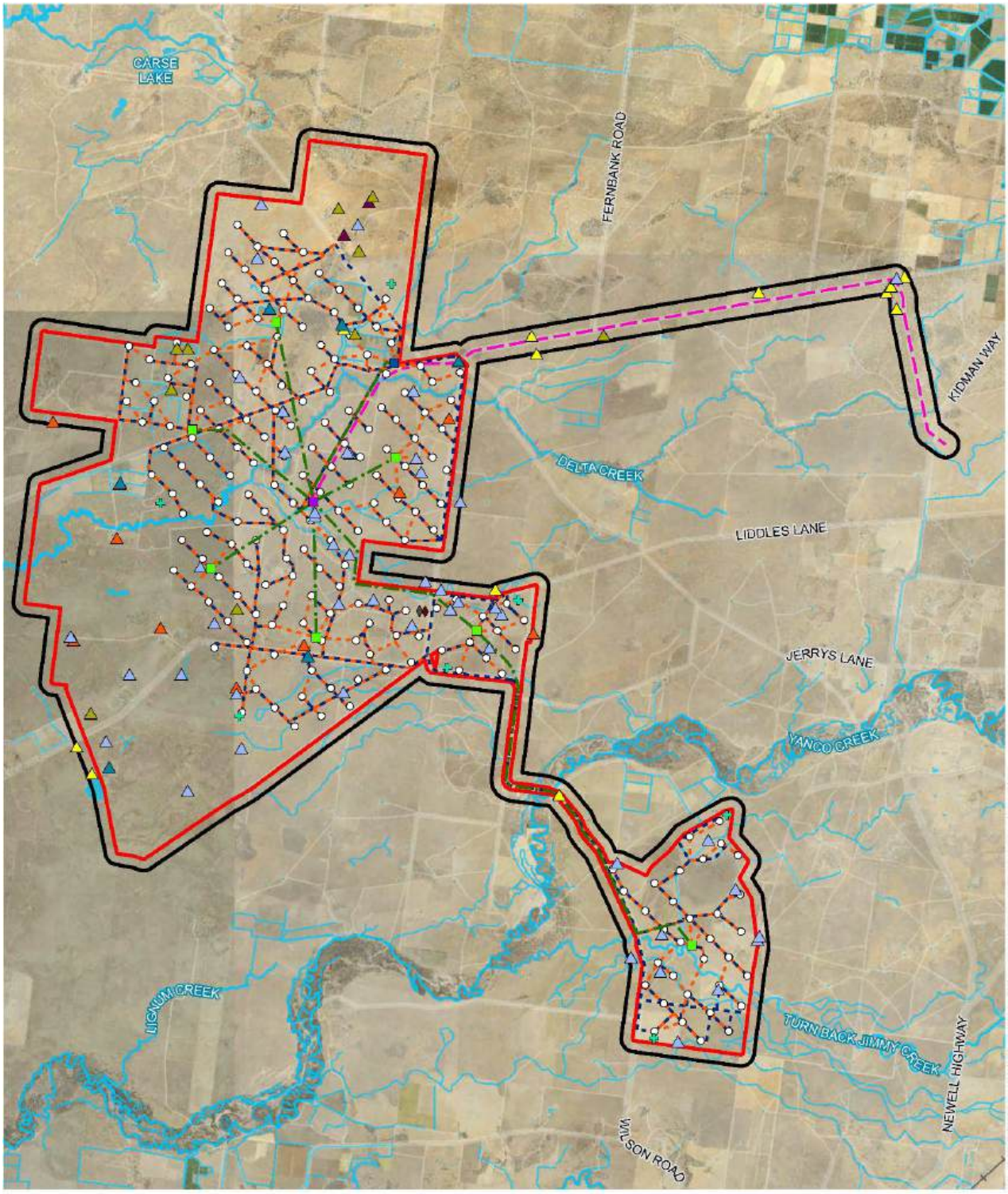

Figure 13-4 Registered groundwater bores within the groundwater study area (BOM, 2022a)

13.3.9.2 Geology

The dominant geological formation in the Project area is the Cainozoic Shepparton Formation (Czs), deriving from sediments deposited during the Plio-Pleistocene Epoch (5,000,000 to 12,000 years ago). The Cainozoic Shepparton Formation is found throughout the Riverina, between the Murray and Lachlan Rivers. These deposits represent the most recent infilling of the Tertiary Murray Basin and consist of poorly consolidated clay, alluvial sand, silt and gravel (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.

13.3.9.3 Soil landscapes

Soil landscape mapping (1:250,000 scale Soil Landscape Reconnaissance Maps for the Murray Catchment) is available from eSpade for the southern half of the Project area only (south of Moonbria) (DPIE, 2022) and includes predominantly three soil landscapes:

- Jerilderie (jex) – Broad level plains on alluvium deposits from the Riverine Plains
- Coleambally (clo) – Undulating sand plains deposited from re-worked alluvium, sand ridges and swales present
- Yancobong (ybz) – Confined alluvial floodplains and channels from Billabong Creek and Yanco Creek, and their palaeochannels.

Small pockets of the following soil landscapes are also present within the Project area:

- Currawarna (cww) – Slight undulation and gently inclined dunes of thick (>2 metres) windblown sand layers, underlain by thick alluvium
- Lake Gunbar (lgt) – Low-lying areas and depressions within the Riverine Plains, comprised of cracking clays, self-mulching and surface crusting surfaces
- Lake Urana (lky) – Ephemeral clay lake beds of varying size, with lunettes (ylw) east and north
- Yanga Lunettes (ylw) – Crescent-shaped dunes formed on the eastern margins of lake beds and water body relicts; calcareous soils dominate, with duplex and solodic soils present on lower slopes
- Niemur River (nmu) – Active inset floodplains and meander plains of the Niemur, Edward and Wakool Rivers and their tributaries and distributaries, extending from Lockhart in the east into the far west of the catchment
- Coleambally Variant A (cloa) – Level sandplains, with relicts of prior streams now infilled with shallow aeolian deposits.

The location and extent of each soil landscape is closely related to surface landform and topography. Soil landscapes across the Project area are presented in **Figure 13-5**.

13.3.9.4 Australian soil classification

Soil classifications within the Project area are shown in **Figure 13-6** and include:

- Chromosols – moderate agricultural potential with low acidity, moderate water-holding capacity
- Rudosols – low agricultural potential with strong acidity and low water-holding capacity
- Vertosols – high soil fertility and large water-holding capacity.

The Project area primarily consists of Cenozoic aged alluvial floodplain soils, with alluvial channel deposits, alluvial floodplain deposits and aeolian sand plains present in smaller areas (DPE Division of Resources and Geoscience, 2022).

Geotechnical investigations (Jacobs, 2022c) indicate the presence of predominantly grey, brown and red clays, with small areas of siliceous sands and red-brown earths. Sampling found primarily hard to very stiff clay soils, along with some sandy clay and dense silty sand present.

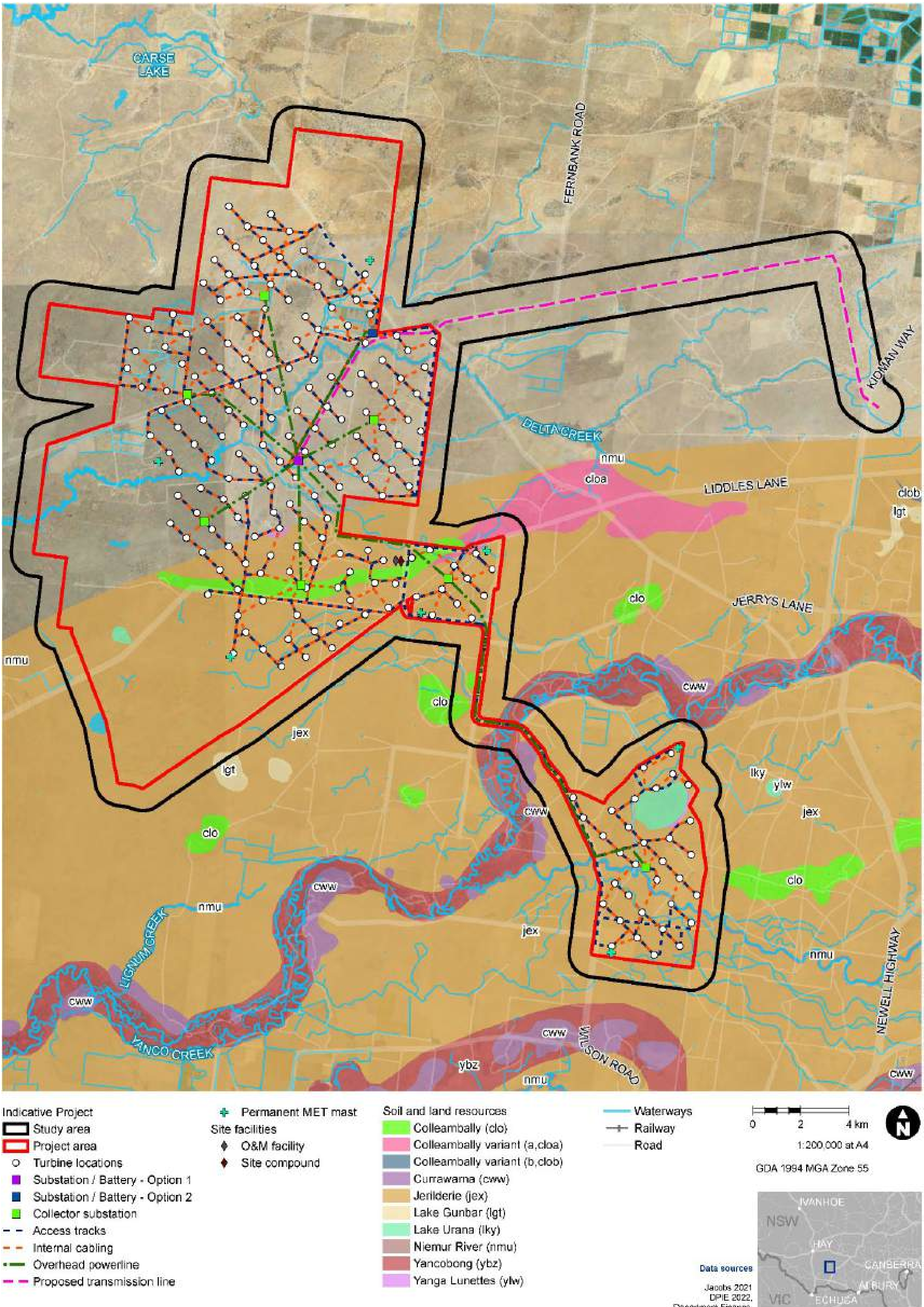

Figure 13-5 Soil landscapes

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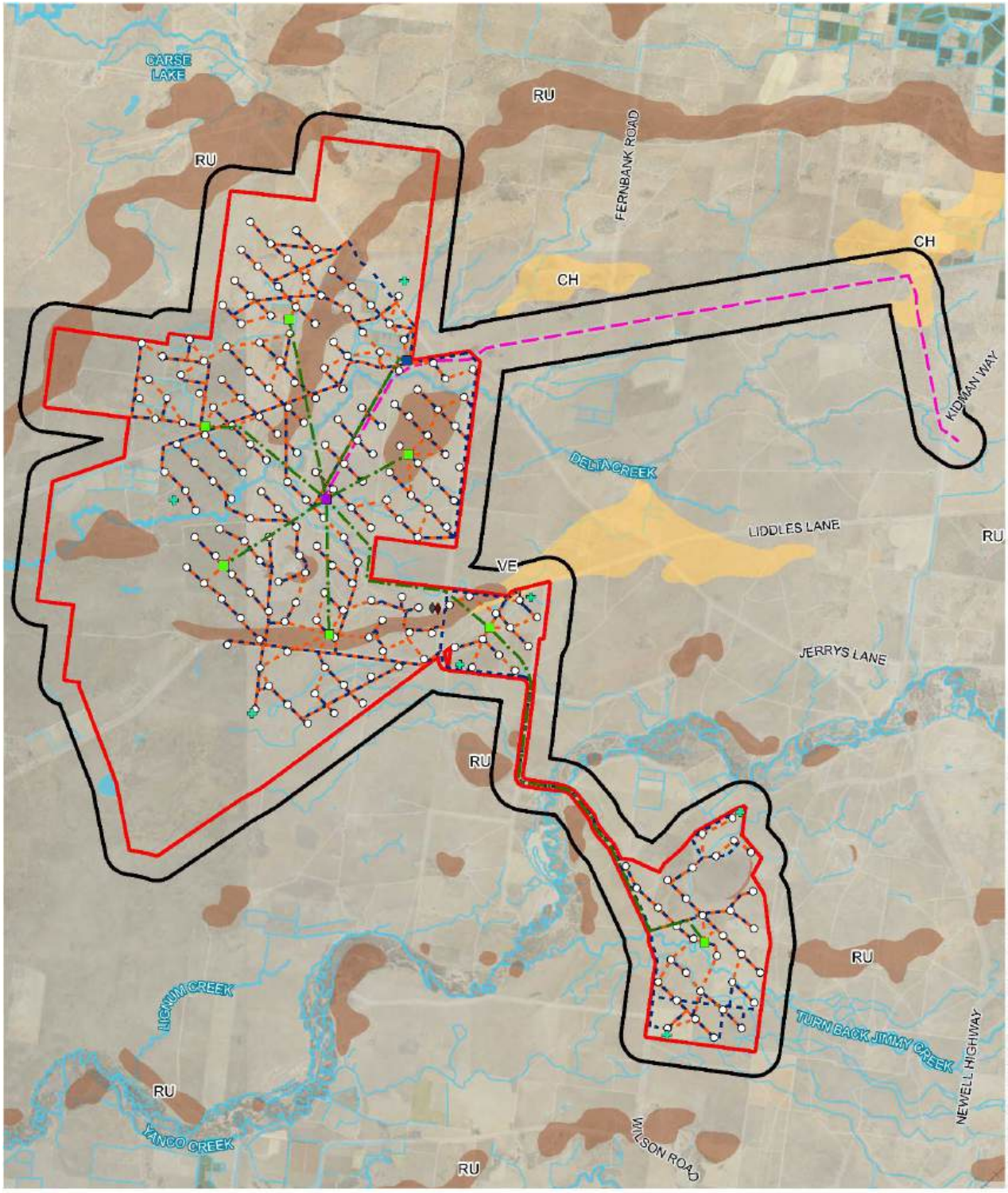


Figure 13-6 Soil classification

In addition, soils present within the Project area largely consist of Chromosols and Sodosols, with Vertosols common in low lying channels and depressions. There are also occurrences of Rudosols, and occasionally Kandosols, predominantly along Delta Creek.

13.3.9.5 Soil erodibility

Vertosols and cracking clays are erodible soil types. They may be more prone to erosion due to self-mulching processes whereby continual wetting and drying / shrinking and swelling at the near surface often causes the soil to break up, forming a mantle of sugar-cube size clay pieces which may be more susceptible to erosion. In addition, the deep cracking which is often observed at the near surface in vertosols during drier periods can promote water infiltration during overland flow events which could lead to scour and erosion.

The soils in the Project area are Emerson Class 1, which is the most dispersive category. Highly dispersive soils are taken up into suspension very readily upon contact with water during even very low flow velocity events. As such, these soils are often highly erodible.

13.3.9.6 Acid sulfate soils

The Project area is considered to have an extremely low and low probability of ASS occurrence. However, there are small sections of high ASS occurrence probability along Delta Creek and between Yanco Creek and Turn Back Jimmy Creek (refer to **Figure 13-7**).

13.3.9.7 Salinity

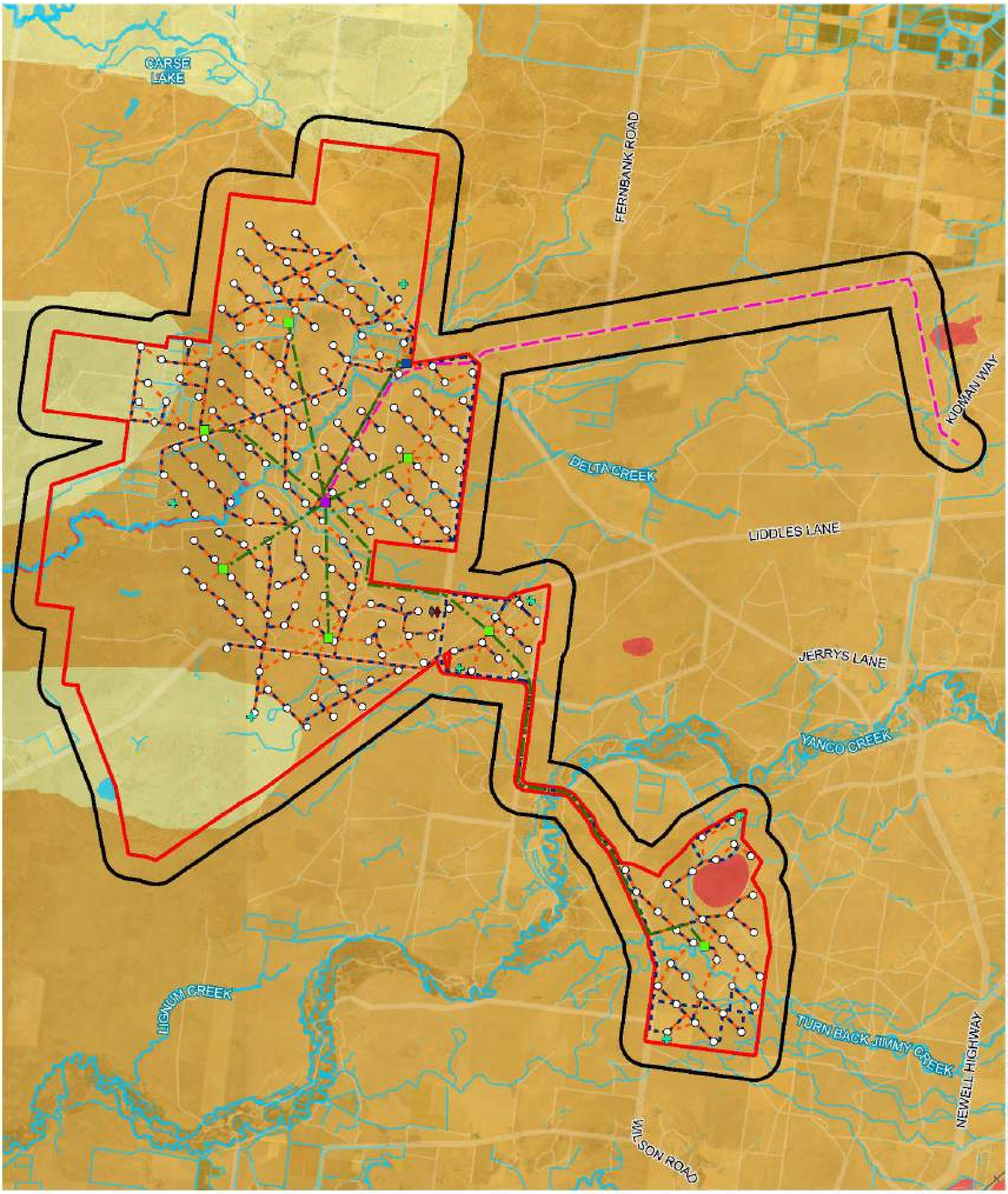
There are no current records of dryland salinity within the Project area, as indicated in the LotSearch report (Lotsearch, 2022). The Overall Salinity Hazard in the Hydrogeological Landscapes of New South Wales and the Australian Capital Territory Map (DPIE, 2022) characterises the soils within the disturbance footprint as a moderate overall salinity hazard. Soils within the Project area and along the transmission line showed a high potential for land salinity.

Salinity can be associated with sodic soils such as Sodosols, as well as Vertosols, Kurosols and Kandosols, which are present in the Project area. Areas of current or potential soil salinity may be encountered along the Project area where there is alluvium, waterlogged ground or shallow groundwater.

13.3.10 Contaminated land

A search was conducted on 27 April 2022 of the NSW EPA Contaminated Sites Record of Notices (under section 58 of the *Contaminated Land Management Act 1997*) and the list of contaminated sites notified to the NSW EPA (under section 60 of the *Contaminated Land Management Act 1997*). There were no sites registered with the NSW EPA within 500 meters of the Project area and the transmission line alignment that were either regulated, formerly regulated or had been notified.

There are no records of current Environment Protection Licences (EPLs) or licensed/delicensed activities within the Project area. Further, there were no records within the Project area for former gasworks, waste management and liquid fuel facilities, PFAS investigation and management programs, or defence sites.



Indicative Project
- Study area
- Project area
- Turbine locations
- Substation / Battery - Option 1
- Substation / Battery - Option 2
- Collector substation
- Access tracks
- Internal cabling
- Overhead powerline
- Proposed transmission line
- Permanent MET mast

Site facilities
- O&M facility
- Site compound

CSIRO - National acid sulfate soils probability of occurance
- A. High (>70%)
- B. Low (6% - 71%)
- C. Extremely low (1% - 5%)

- Waterways
- Railway
- Road

0 2 4 km
1:200,000 at A4
GDA 1994 MGA Zone 55

Data sources
Jacobs 2021
CSIRO 2022,
Department Finance, Services and Innovation 2020
© Department of Customer Service 2020

Figure 13-7 Acid sulfate soils

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There is little evidence of historical or current activities that would cause significant contamination risks within the Project area. Some activities that could potentially have caused low levels of contamination include:

- Agricultural and rural land use (e.g. pesticide / herbicide application, chemical storage, maintenance activities, waste disposal, dip sites)
- Quarrying (processing, plant, chemical storage, explosives)
- Airstrip (aircraft maintenance, refuelling, leaks and spills)
- Ground disturbance work for roads and tracks (importation of fill material of unknown quality).

13.4 Potential construction impacts

13.4.1 Surface water

While much of the proposed Project infrastructure has been designed to avoid waterways, some elements, such as access tracks and underground cables, cannot completely avoid waterways. **Table 13-6** indicatively lists the waterways that may be impacted by the Project. Most of these are unnamed ephemeral drainage lines.

Table 13-6 Waterways and crossings by proposed Project elements

Waterways	Intersected by
Delta Creek	Existing access tracks that would be widened
Unnamed drainage line to Delta Creek (south-east)	Underground cabling and access tracks in 8 locations
Unnamed drainage line to Delta Creek (north)	Underground cabling and access tracks in 12 locations
Yanco Creek	Wilson Road (existing road) that would be used as access track
Turn Back Jimmy Creek	Overhead wiring in 3 locations
Unnamed drainage line to Turn Back Jimmy Creek (south)	Underground cabling in 5 locations and access track in 2 locations
Unnamed drainage line to Turn Back Jimmy Creek (north)	Underground cabling and access tracks in 6 locations
Other unnamed drainage lines	A number of other unnamed drainage lines within the Project area would be intersected by proposed Project access tracks and underground cabling

Potential impacts to surface water quality include the following:

- Erosion and sedimentation, as a result of stockpiling and cabling activities, and construction of hardstand areas and access tracks
- Removal of vegetation, which could increase risk of erosion and sediment-laden runoff, and the risk of tannin leachate entering downstream waterways
- Stockpiling of topsoil and vegetation, which when not stabilised can result in material eroding away in windy/heavy rainfall conditions
- Transportation of excavated material and movement of heavy vehicles across exposed earth
- Accidental spills and litter
- Trenching and earthworks for internal cabling
- Concrete work for the WTG foundations
- Installation of transmission line.

Earthwork and soil disturbance have the potential to temporarily affect surface and downstream water quality. If mobilised downstream, however, impacts to surrounding waterways are considered unlikely to occur as construction runoff would be managed with the implementation of management measures outlined in **Section 13.7**.

At Delta Creek and surrounding tributaries, access tracks and underground cabling would utilise existing tracks where possible. Where this is not possible, trenching would be carried out for underground cabling. At other waterways, such as Yanco Creek and Turn Back Jimmy Creek and their associated tributaries, overhead cabling would be used as preference to trenching through waterways.

Instream work could present a risk to downstream water quality from the disturbance of the streambed and the mobilisation of sediments and other pollutants. This could result in poor water quality immediately downstream. Work occurring outside of these waterways can also indirectly impact downstream receivers via movement of sediment and pollutants via wind and rain.

Project construction would not result in controlled discharges to waterways nor would there be any water take from surface water during construction.

Overall, surface water impacts during construction of the Project are expected to be temporary and minor in nature following the implementation of management measures outlined in **Section 13.7**.

13.4.1.1 Waterfront land

The Project would involve trenching through waterways and other construction work within 40 metres of waterways. A controlled activity approval is not required, however, as it falls under the exemptions listed in Section 4.41 of the EP&A Act.

All waterway crossings would be constructed in accordance with the relevant guidelines, including Guidelines for Controlled Activities on Waterfront Land (Natural Resources Access Regulator, 2018). Construction runoff would be managed with the implementation of management measures outlined in **Section 13.7**.

13.4.2 Groundwater

Construction activities are not anticipated to intersect the regional water table. There would also not be any material groundwater take or extractions. Therefore, changes to regional groundwater system levels and flow directions are not anticipated to occur during Project construction. In addition, construction impacts are not anticipated for watercourse baseflow volumes, GDEs and registered bores.

As a result, potential impacts to groundwater are considered minimal due to the following:

- No Project induced drawdown is anticipated at existing surrounding registered bores
- Project induced drawdown is not anticipated at high priority GDEs
- The Project is unlikely to lower the groundwater's beneficial use category beyond 40 metres from the proposed activity
- The Project is unlikely to change groundwater salinity.

13.4.3 Soil erosion hazard

There is the potential for soils to be dispersed or transported to other locations within and beyond the Project area via water and/or wind erosion. Erodibility potential may also be increased in sodic, dispersive or reactive soils by construction activities such as excavation, and vehicle and machinery traffic movements. If high intensity rainfall or flooding events occur during construction, the likelihood of adverse water erosion effects would also increase.

Based on the soils assessment, soils present throughout the southern portion of the Project area have a high potential for erosion via wind and/or water. The generally flat nature of the Project area of low relief would help to limit erosion potential as overland flows that could contribute to scour and erosion will generally be of low velocity.

Work on erodible soil types (cracking clays and vertosols) and potential soil erosion hazards will be managed through appropriately designed site drainage and the implementation of appropriate management measures during construction (refer to **Section 13.7**).

13.4.4 Acid sulfate soils

There is the potential for ASS to be encountered in small areas, in the vicinity of waterbodies and waterways within the Project area. All potential impacts of ASS that may be identified can be managed. ASS investigations will be undertaken prior to construction activities in areas of high ASS potential as part of the pre-construction phase. Based on this, appropriate plans will be developed and implemented should ASS be identified.

13.4.5 Salinity

There is potential for salinity to be encountered in the Project area. Areas within the Project area have been noted to have a high potential for land salinity, and a moderate overall salinity hazard. Project construction, however, is unlikely to impact on the groundwater table and associated salinity impacts. Given there would be limited clearing of vegetation during construction this would also reduce the risk of rising water tables and, as a result, reduce the risk of salinity impacts.

13.4.6 Contamination

13.4.6.1 Soils

While there is low potential for contaminated soil to exist within the Project area, it may be encountered during construction activities which involve the disturbance of soils (i.e. site preparation and excavation). If contamination risks are not quantified and appropriately managed on site, construction activities have the potential to expose workers, the public and environmental receptors to contaminated soil. Should any potential soil contamination be identified, impacts will be managed subject to the implementation of appropriate management measures and/or remediation (refer to **Section 13.7**).

13.4.6.2 Surface water and groundwater

Groundwater in the Project area has a very low to low potential for contamination. The risk of encountering contaminated surface water is also considered to be low. Should any potential contamination of groundwater and surface water be identified, this will be managed subject to the implementation of appropriate management measures and/or remediation (refer to **Section 13.7**).

13.4.7 Flooding

The assessment identified the following key findings during construction:

- **WTGs** –16 of the proposed WTGs would experience flood depths between 0.3 and 1 metre in the 1% AEP flood event. Flow velocities at these locations would be relatively low (less than 0.5 metres per second in the PMF event). WTGs would be resistant to flooding at the base of the WTG towers; as such, they do not require relocating or raising to provide flood-proofing.
- **WTG Hardstand** – A minimal amount of filling and regrading would be undertaken to provide a level hardstand area for construction. Filling within the flood extent area may partially obstruct flows and potentially result in minor flood impacts.

- **Central primary substation/BESS** - Filling would be required to raise the central primary substation/BESS above the PMF for both Option 1 (0.3 metres) and Option 2 (0.8 metres).
- **Collector substation** – Filling would be required to ensure these are above the PMF level (0.2 metres and 0.7 metres). One collector substation, located on the floodplain of Turn Back Jimmy Creek, may have minor flooding impacts in the 1% AEP of 0.3 to 0.5 metres.
- **Construction compound** – The construction compound would have a flood protection level of the 1% AEP plus 0.5 metre freeboard. This is above the PMF and hence filling would not be required. Temporary construction facilities and material stockpile areas would be placed away from drainage lines and waterways (outside of the 1% AEP flood extent) and are unlikely to result in impacts to flooding.
- **Transmission line** –The proposed transmission line would cross several overland flow paths. There is minor risk of localised impacts to overland flows if the support towers are constructed within the overland flow paths. Impacts are expected to be minor, however, due to relatively shallow flows (up to 1 metre depth) and low flow velocities.
- **Access tracks** – Proposed access tracks that would cross ephemeral watercourses (refer to **Table 13-6**) would be raised above existing road levels and above the watercourse bed. This could result in increases in flood levels upstream of the crossings.
- **Gravel pits** – Depending on the location of the gravel borrow pits (e.g. if situated in flow paths or ephemeral watercourse), they may capture or redirect flows if appropriate management measures are not in place.
- **Existing dwellings** – Dwellings would not be affected by Project construction flooding impacts.

Overall, impacts around WTGs, filled hardstand areas and watercourse crossings are expected to be minor and localised and would not affect nearby dwellings. During Project construction, the potential for increased risk of flood impact due to stockpiling of materials and construction of access tracks would be managed by environmental management measures listed in **Section 13.7**.

13.5 Potential operational impacts

13.5.1 Surface water

There would be no impacts to waterways during Project operation.

Risks to surface water quality during Project operation are primarily associated with the establishment of the operation and maintenance facility. As the topography of the Project area is relatively flat, any increased runoff from impervious areas is expected to infiltrate into the adjacent catchment. The Project's operation and maintenance facility and Project access tracks would also have potential water quality risks if accidental spills or leaks occur.

With the implementation of management measures detailed in **Section 13.7**, the Project operation would not result in any significant risk of erosion, sedimentation or reduction in water quality.

13.5.2 Groundwater

The Project has limited potential to alter groundwater levels and flow directions during operation. This is because there are no mechanisms to cause significant changes in groundwater levels. Project operation and maintenance is not anticipated to intersect the regional water table. Therefore, material changes and impacts to groundwater quality, groundwater level and bores are not anticipated during Project operation.

13.5.3 Soils and contamination

During Project operation it is not expected that there would be a significant impact to soils from contamination, nor is it expected that contaminated soils would impact upon the operation of the Project.

It is not expected that the Project operation would intercept the regional groundwater table, therefore, it is unlikely that groundwater will be exposed during operation. contaminated surface water (if present) are not expected to impact upon the Project operation as on-site surface water is unlikely to be used as part of operational activities. The potential use of local water supply from private dams and bores would need to be with harvestable water rights and water access licencing conditions however is not anticipated to pose a contamination risk.

The management of minor spills, leaks, chemical storage and exposure to potential contamination (if present) during operation of the Project will be managed in accordance with the Project specific operational environmental management plan.

In addition, Project operation is not expected to result in soil erosion risks, ASS impacts and salinity impacts.

13.5.4 Flooding

The assessment identified the following key findings during operation:

- **WTGs** – Due to their relatively small diameter, only minor and localised impacts on flooding would be expected due to the WTGs impeding flood flows
- **Operation and maintenance facility** – The operation and maintenance facility would have a flood protection level of the 1% AEP flood level plus 0.5 metre freeboard. This site is also above the PMF
- **Permanent meteorological masts** – These would generally be sited in locations of shallow (less than 0.4 metres) flood depth and lower velocity flows in all events up to the PMF. They will be designed to withstand flood-flow forces. Due to their relatively small diameter, only minor and localised impacts on flooding would be expected due to the masts impeding flood flows
- **Hardstand areas** – There are expected to be minor and localised impacts on flooding due to partial obstruction of flows and loss of floodplain storage caused by filled hardstand areas for WTGs and substations
- **Existing farm dams** – Seven WTGs would be within 100 metres of existing farm dams. Several proposed access tracks and internal cabling routes are near existing farm dams. Potential impacts to flow paths and management measures (such as diversions) will be confirmed in consultation with landowners to avoid impacts to farm dams inflows
- **Erosion and scouring** – There would be minor risk of localised erosion and scouring of ground surfaces at drainage discharge areas and toe of hardstand fill areas during flood events
- Access tracks and transmission line – Similar to construction impacts discussed in **Section 13.4.7**.

Overall, there would be negligible impacts on any hydrological factors, as the increase in impervious areas (less than 0.2% of the entire Project area) on a catchment scale would be negligible. During operation, the potential for localised erosion and scouring would be managed by the proposed environmental management measures in **Section 13.7**.

13.6 Potential decommissioning impacts

The equipment required and activities undertaken for decommissioning would be similar to that used during Project construction. This would include delivery of decommissioning equipment to the Project area and use of the equipment, transport of materials and disposal of waste. Therefore, decommissioning of the Project would present a similar risk to water quality and groundwater as described in **Section 13.4** but at a reduced scale. It is considered reduced for the following reasons:

- Access tracks and laydown areas are already established and therefore no further disturbance would be required

- No concrete batching is required
- Buried infrastructure such as footings and cables would generally be retained in situ and therefore no need for significant earthworks and excavation
- Filled areas and hardstand surfaces would remain in place; drainage swales around the filled areas will be retained
- Project decommissioning would be shorter in duration to construction.

13.7 Environmental management measures

Proposed measures to manage and/or mitigate water and soils impacts from the Project are detailed in **Table 13-7**.

Table 13-7 Water and soils environmental management measures

Impact	Ref	Environmental management measure	Timing
Erosion and sedimentation	SW1	A Construction Soil and Water Management Plan (CSWMP) will be prepared. The CSWMP will include but not be limited to: • Measures to minimise/manage erosion and sediment transport both within the Project and offsite (including work on erodible soil types), including the requirements for the preparation of Erosion and Sediment Control Plan (ESCP) for construction • Measures to manage accidental spills, including the requirement to maintain materials such as spill kits • Measures to manage any potential acid sulfate soils (ASS) if found in excavated fill material in accordance with the NSW Acid Sulfate Soil Guidelines (Acid Sulfate Soils Management Advisory Committee, 1998) • Measures to manage potential tannin leachate • Measures to manage stockpiles • Details of surface water quality monitoring to be undertaken prior to, throughout and following construction (refer to SW4 for further information). Measures to ensure that all waterway crossings will be constructed in accordance with the Guidelines for Controlled Activities on Waterfront Land – riparian corridors (Natural Resources Access Regulator, 2018), Guidelines for watercourse crossings on waterfront land (DPI, 2012), Guidelines for riparian corridors on waterfront land (DPI, 2012) and Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).	Prior to construction, construction, decommissioning
Erosion and sedimentation	SW2	A construction ESCP will be prepared and will detail the specific erosion and sediment control measures to be implemented within the Project, in accordance with the principles and requirements of Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004). Scour protection and control measures will be identified in the CSWMP to reduce erosion and water quality impacts from increased sediment loads from ancillary sites and access tracks.	Prior to construction, construction
Disturbance	SW3	To avoid any impacts on water quality and threatened species, the following measures will be implemented: • Minimise the total area of bare earth exposed at any time • Employ interim rehabilitation strategies to minimise dust generation, soil erosion and weed incursion on parts of the Project that cannot yet be permanently rehabilitated • Where required, rehabilitate all areas of the Project that are not proposed for future disturbance as soon as is practicable following construction and decommissioning.	Construction, decommissioning

Impact	Ref	Environmental management measure	Timing
Water quality - monitoring	SW4	A surface water monitoring program will be implemented prior to, during and following construction and decommissioning. The monitoring program will include but not be limited to: • Visual assessment and routine monitoring of physico-chemical parameters and contaminants of concern at downstream SREs to ensure compliance with applicable guidelines during construction and decommissioning • Visual assessment of surface water quality control structures at least once a week and also following any heavy rain during construction and decommissioning, to ensure controls are operating effectively for their designed purpose.	Prior to construction, construction, decommissioning
Construction – Spills and litter	SW5	Project specific controls and procedures will be developed and implemented to reduce the risk of litter, spills and leaks entering downstream waterways and/or leaching into the soil and groundwater table. The CSWMP will include, but not be limited to, the following measures: • All fuels, chemicals and liquids will be stored on level ground away from waterways and will be stored in sealed bunded area within the construction compound • Refuelling and minor maintenance activities will be limited to designated areas with established spill capture and management controls • An emergency spill response procedure will be prepared • Regular visual water quality checks (for hydrocarbon spills/slicks, turbid plumes and other water quality issues) will be carried out at waterways in proximity to work • Installing and maintaining control measures such as silt fencing and gross pollutant traps.	Construction, decommissioning
Impacts of stockpiles	SW6	Stockpiles will be managed to minimise the potential for mobilisation and transport of dust, sediment and leachate in runoff. This will include: • Minimising the number of stockpiles, area used for stockpiles, and time that they are left exposed • Locating stockpiles away from drainage lines, waterways and area where they may be susceptible to wind erosion • Stabilising stockpiles, establishing appropriate sediment controls and suppressing dust as required.	Construction
Concrete works	SW7	Batch plants will be located on a concrete slab adjacent to the construction compound. To avoid ingress of concrete waste material into downstream waterways, the CEMP will outline procedures to capture, contain and appropriately dispose of any concrete waste from concrete work, including designated lined, bunded and controlled concrete washout areas.	Prior to construction, construction

Impact	Ref	Environmental management measure	Timing
Operation – stormwater runoff	SW8	Increased stormwater runoff during Project operation will be managed through: • The design of permanent drainage and water management, demonstrating the ability to meet Project performance outcomes of no pollution of water • Scour protection, control measures and maintenance of access tracks to reduce erosion and water quality impacts • Monitoring of receiving drainage channels and waterways downstream of discharge location to identify any evidence of channel erosion and scour.	Operation
Operation – Spills and emergency management	SW9	Project specific controls and procedures will be developed to reduce the risk of the release of potentially harmful chemicals from spills entering downstream watercourses such as: • Appropriate storage of equipment and hazardous substances during operation • Operational procedures for emergency response to spills and leaks from equipment or maintenance activities.	Operation
Water demand	SW10	Any water licences for the Project will be obtained in accordance with the *Water Management Act 2000*.	Prior to construction, construction
Impacts to High Priority GDEs	SW11	If, during detailed design, Project excavation is designed to exceed the current proposed maximum depth of 3 mbgl, potential impacts to GDEs will be re-assessed by a suitably qualified hydrogeologist.	Detailed design, construction
Acid sulfate soils	SW12	For excavation work that is required as part of construction and/or operation within or adjacent to areas of high ASS potential as detailed in **Figure 13-7** of the EIS, investigations will be undertaken to assess the presence of ASS or potential ASS (PASS). If ASS or PASS are identified during investigations, an appropriate ASS management plan will be developed and implemented prior to any excavation work to facilitate construction and/or operation are undertaken.	Prior to construction
Unexpected contamination	SW13	The CEMP will include an unexpected finds procedure in the event of unexpected contamination.	Prior to construction

Impact	Ref	Environmental management measure	Timing
Unexpected contamination	SW14	A visual inspection of the disturbance footprint will be completed prior to construction to confirm the findings of the Soils and contamination technical report. Inspection can be completed by any person with knowledge of the unexpected finds protocol to ensure no obvious signs of contamination are present where work will occur (i.e. staining, fly-tipped waste, odours etc.). Should indicators of contamination be observed during construction, the unexpected finds procedure will be followed: • Indicators of contamination must be documented, and an appropriate sampling program designed • Sampling program will be implemented, and a report on the existing contamination prepared • If contamination is present, further investigation, management and/or remediation will be required.	Prior to construction
Unexpected contamination	SW15	Should areas within the Project be upgraded to a moderate to very high contamination impact potential, as a result of an unexpected find/s and subsequent investigation/s, additional measures will be implemented in accordance with relevant guidelines as recommended by a qualified contamination consultant. These additional mitigation and management measures will be dependent on the outcomes from the subsequent investigations, which may include: • Remedial Action Plans • Involvement of an accredited Site Auditor, and issue of a Site Audit Statement and Site Audit Report • ASS Management Plan.	Prior to construction, construction
Impacts on mainstream and overland flooding	SW16	During detailed design, the Project will be further refined with the following considerations to minimise impacts to flooding where possible, including: • Minimising filling of WTGs, BESS and substations sites • Minimising encroachment of Project infrastructure into the 1% AEP flood extent • Design to manage flood impacts and flow conveyance at watercourse crossings • Power poles for the proposed transmission line will be located away from flow paths where possible.	Detailed design
	SW17	If upgrade of Wilson Road bridge crossing of Yanco Creek is required, design considerations to minimise hydraulic impacts including increases in flood levels will be made during detailed design.	Detailed design

Impact	Ref	Environmental management measure	Timing
Geomorphic impacts and scouring during flood and storm events	SW18	During detailed design, the Project will be further refined with considerations to minimise erosion, scouring and geomorphic impacts where possible, including: • Permanent operational infrastructure and landforms will be designed and implemented/formed to minimise any potential scour and erosion risks associated with surface water runoff • Appropriate scour protection will be provided at flow discharge areas, hydraulic structures and other identified at-risk locations.	Detailed design
Impacts on the Project resulting from flooding	SW19	The Project design will provide filling for any necessary infrastructure to above the PMF level for the central primary substation/BESS and collector substations.	Detailed design
Farm dams and surface water resources	SW20	During detailed design, the Project will be further refined with the following considerations to minimise impacts to surface water resources where possible: • Minimising changes to runoff and natural flow regime by minimising infrastructure in flow paths. • Constructing Project facilities, hardstand areas and access tracks in such a manner to reduction of inflows to farm dams and surface water resources • Provision of culverts/bridges at road crossings to maintain conveyance of low flows.	Detailed design, construction
	SW21	Potential impacts to flow paths associated with Project infrastructure in proximity to existing farm dams will be discussed and management measures (such as diversions) will be confirmed in consultation with landowners to avoid impacts to farm dams inflows. During detailed design, the Project will be further refined to relocate several access tracks and cabling routes where possible to avoid clashes with existing farm dams.	Detailed design
Flood and surface water quantity impacts from temporary construction work and facilities	SW22	Material stockpiles and construction facilities will be located outside the 1% AEP flood extent.	Construction
	SW23	Temporary access tracks will be constructed in such a manner to maintain existing drainage conditions and flow paths.	Construction
	SW24	Drainage swales and channels will be installed to convey runoff and flows around construction areas and gravel pits.	Construction

14. Air quality

This section summarises the findings of the Air quality technical report (**Appendix N**) prepared for the Project in response to the SEARs.

14.1 Assessment methodology

Dust emissions have the potential to cause air quality impacts if not properly managed. Based on the scale of the Project, the significance and impacts of dust from Project construction have been determined from a qualitative assessment that considers:

- The proximity of construction activities to sensitive receptors
- The assessment criteria
- The existing environment
  - Air quality conditions
  - Prevailing wind conditions
- The nature and scale of activities.

14.1.1 Study area

The study area for this assessment consists of the Project area, as well as the nearest sensitive receptors identified in **Section 14.3.2**.

14.1.2 Criteria

The two nearest DPE air quality monitoring sites to the Project area are:

- Beckwith Street, Wagga Wagga, approximately 150 kilometres east of the Project area
- Nowland Avenue/Moore Street, Albury, approximately 154 kilometres south-east of the Project area.

Based on surrounding industrial activities and higher annual PM10 levels, air quality data from the Wagga Wagga North station has been determined to be unrepresentative of the Project environment. Data from the Albury monitoring station has been used for this assessment.

The air quality indicators and assessment criteria applied for this assessment have been based on the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2016) and are shown in **Table 14-1**.

Table 14-1 NSW EPA air quality assessment criteria

Air quality indicator	Averaging period	Concentration
Particulate matter (PM_{10})	24-hour	50 µg/m^3
	Annual	25 µg/m^3
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3
	Annual	8 µg/m^3
Particulate matter (TSP)	Annual	90 µg/m^3
Deposited dust	Annual (maximum increase)	2 g/m^2/month
	Annual (maximum total)	4 g/m^2/month

14.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant legislation, policy and guidelines:

- EP&A Act
- *Protection of the Environment Operations Act 1997* (POEO Act)
- Protection of the Environment Operations (Clean Air) Regulation 2021 (Clean Air Regulation)
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA, 2016).

14.3 Existing environment

14.3.1 Land use

As described in **Section 2.2**, the Project area is zoned as RU1 – Primary Production under the Conargo Local Environmental Plan (LEP) 2013 and Jerilderie LEP 2012. The Project would be located on rural land with agricultural land use including for grazing, cropping and irrigated cropping.

The largest population centres nearby are Wagga Wagga, about 150 kilometres east of the Project area and Deniliquin, located 70 kilometres south-west of the Project area.

14.3.2 Sensitive receptors

Sensitive receptors for the Project are shown in **Figure 14-1**.

Figure 14-1 Air quality sensitive receptors

14.3.3 Existing air quality

Air quality in many parts of NSW, including the Riverina-Murray region, was adversely influenced by drought conditions between 2017 to 2019, lower than average rainfall and significant bush firebush fire activity. A deterioration in air quality conditions in recent years was not unique to the Central Tablelands and events beyond normal conditions have been identified as part of annual reviews of monitoring data.

A summary of the annual average PM_{10} and $PM_{2.5}$ from the Albury DPE monitoring station is provided in **Table 14-2**. The influence of drought conditions and bush firebush fire activity on air quality is evident in the DPE's monitoring data. This data clearly show an increase in PM_{10} and $PM_{2.5}$ concentrations at all rural and urban locations from 2017 to 2020, reflecting the onset of drought conditions, and increased bush firebush fire activity in 2019. The rolling annual average PM_{10} and $PM_{2.5}$ concentrations decreased rapidly in 2020 as rainfall increased.

No known monitoring of TSP is conducted near the Project area. Recent studies estimate the average PM_{10} concentrations are typically 40% of the TSP concentrations. Based on this relationship, the estimated TSP concentrations at the DPE monitoring locations are shown in **Table 14-2**. Concentrations are estimated to be much lower than the EPA assessment criterion. Even lower concentrations would be expected at and near the Project area.

Air quality criteria for deposited dust are usually set to protect against nuisance amenity impacts. No known monitoring of deposited dust is conducted near the Project area. Deposited dust levels have been estimated on the assumption that 90 $\mu g/m^3$ TSP can be related to 4 g/m^2/month deposited dust (refer to **Table 14-2**). Deposited dust levels are estimated to be much lower than the EPA assessment criterion. Even lower levels would be expected at and near the Project area.

Table 14-2 Summary of existing air quality data

Year	Annual average PM_{10} ($\mu g/m^3$)	EPA ($\mu g/m^3$)	Annual average $PM_{2.5}$ ($\mu g/m^3$)	EPA criterio criterio n n ($\mu g/m^3$)	Annual average TSP ($\mu g/m^3$)	EPA criterio n ($\mu g/m^3$)	Annual average TSP (g/m^2/ month	EPA criterio n (g/m^2/ month)
2014	15.9	25	-	8	39.8	90	1.8	4
2015	14.6		-		36.5		1.6	
2016	15.1		-		37.8		1.7	
2017	15.8		7.3		39.5		1.8	
2018	19.8		7.3		49.5		2.2	
2019	23.4		**10.1**		58.5		2.6	
2020	20.1		**11.1**		50.3		2.2	
2021	14.3		7.3		35.8		1.6	

Overall, concentrations of key air quality indicators would be expected to be lower within the study area than in areas of higher population densities.

14.3.4 Meteorology

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. Based on the data, winds are most dominant from the southwest and west.

14.4 Potential construction impacts

There are a number of emissions sources associated with Project construction, including:

- Excavation work
- Material handling and transportation
- Spoil handling and transportation
- Operation of the concrete batch plant and construction plant
- Equipment exhausts.

The assessment adopted a conservative approach and assumed that construction plant and equipment operating simultaneously across the Project area at any time. Construction methodology and timing would be confirmed by the construction contractor during detailed design.

Given that prevailing winds are generally from the southwest during the year, tending to become westerlies and northerlies during the winter, the following sensitive receptors have been identified in **Table 14-3**. However, most of these 'at risk' identified sensitive receptors during winter, south of the WTGs, would be located more than five kilometres away from the nearest proposed turbines

At these distances, it is likely that TSP and dust generated by Project construction would have dispersed or settled before reaching the receptors and would, therefore, likely have no impact on air quality.

Overall, there is expected to be a minimal impact to air quality from the Project construction following the implementation of management measures described in **Section 14.7**. This is due to the large Project area and the distance between sensitive receptors and the Project infrastructure.

Table 14-3 Sensitive receptors based on prevailing winds

Receiver	Classification	Nearest turbine	Direction from nearest turbine	Nearest turbine distance (m)
R01	Host Receiver	W-008	NE	2030.2
R04	Non-associated Receiver	W-153	NE	3642.8
R05	Non-associated Receiver	W-001	N	4061.6
R06	Associated Receiver	W-185	NW	4203.7
R07	Associated Receiver	W-202	S	4338.2
R09	Non-associated Receiver	W-205	S	4599.2
R10	Associated Receiver	W-202	S	4714.6
R12	Non-associated Receiver	W-153	E	5680.1
R13	Non-associated Receiver	W-177	E	5770.9
R14	Non-associated Receiver	W-177	E	6171.9
R15	Associated Receiver	W-202	S	6446.6
R16	Non-associated Receiver	W-177	E	6545.6
R17	Non-associated Receiver	W-177	E	6607.3
R18	Non-associated Receiver	W-177	E	7212.1
R19	Associated Receiver	W-205	S	7307.1

Dark green cells = Host Receivers, Light green cells = Associate Receivers, Red cells = Non-associated Receivers

14.5 Potential operational impacts

Emissions from the operation of the Project is limited to the following sources:

- Emissions generated from exposed surfaces
- Use of operational equipment for Project work
- Maintenance work on Project infrastructure including access tracks, hardstands, and laydown areas.

The blade tip for each WTG would be approximately 50 metres above ground-level, with the rotating turbines potentially causing downstream wake effects for some distance beyond the turbine. However, given the 50 metre clearance between the tip of the blade and the ground, it is unlikely for these wake effects to generate dust emissions during operation.

The ambient air quality is not anticipated to be impacted by Project operation. Sensitive receptors are not anticipated to be impacted during operation given their distance to proposed Project infrastructure.

14.6 Potential decommissioning impacts

Project decommissioning is likely to involve similar sources and levels of emission as construction. It is likely that air quality management and mitigation measures (such as dust suppression techniques) may have improved by the time decommissioning occurs in over 30 years. However, the same management and mitigation measures outlined for Project construction will apply to the decommissioning as a conservative measure.

14.7 Environmental management measures

Proposed measures to manage and/or mitigate air quality impacts from and to the Project are detailed in **Table 14-4**.

Measures to cover haulage loads leaving the Project and measures to reduce the extent of exposed areas are detailed in **Section 12.7** (traffic and transport) and **Section 13.7** (water and soils).

Table 14-4 Air quality environmental management measures

Impact	Reference	Environmental management measure	Timing
Dust	AQ01	Air quality management measures will be included in the CEMP for the Project, and would include but not be limited to: • Clearly marking haul routes • Watering and maintenance of haul routes • Vehicle speed restrictions • Prompt clean-up of any material spillage.	Prior to construction
	AQ02	Weather will be monitored to minimise activities during adverse dust conditions e.g., during hot and windy conditions	Construction, decommissioning

15. Land

This section summarises the findings of the Agricultural impact assessment technical report (**Appendix O**) prepared for the Project in response to the SEARs.

15.1 Assessment methodology

The methodology for the assessment involved the following:

- Desktop review of available information and data sources
- Site visits carried out between 12 -14 September 2022 to make observations on the land use, landform, soil types and agricultural productive capacity. All eight properties were visited, and landholders were interviewed to confirm:
  - Type of farming operation (size, enterprise mix)
  - Livestock carry capacity and crop yields
  - Potential impacts of the Project on farm operations
  - Any suggestions about how these impacts would be mitigation.
- Impact assessment including:
  - Site features relevant to agricultural production, such as existing infrastructure, soil types, climate and water availability
  - Surrounding land uses
  - Impacts on agricultural production
  - Agricultural commodities and production levels
  - Relative agricultural value to the region and state
- Land Use Conflict Risk Assessment (LUCRA) – comprising four steps (refer to **Section 15.1.2**):
  - Gather information about proposed land use change and associated activities
  - Evaluate the risk level of each activity
  - Identify risk reduction management strategies
  - Record LUCRA results
- Identification of mitigation measures.

15.1.1 Study area

The study area for the assessment included the following:

- Project region – Area covered by the Edward River and Murrumbidgee Councils
- Project area – As defined in **Chapter 6**; for ease of description in this chapter, each property has been labelled from Landowner 1 to Landowner 8 as shown in in **Figure 2-3**.

15.1.2 LUCRA

The risk evaluation and definitions are drawn from the Land Use Conflict Risk Assessment Guide (DPI, 2011). A Risk Ranking Matrix (**Table 15-1**) is used to rank the identified potential land use conflicts. The risk ranking matrix assesses the environmental, public health and amenity impacts according to the:

- Probability of occurrence
- Consequence of the impact.

The risk ranking matrix yields a risk ranking from a high of 25 to a low of 1. It covers each combination of five levels of ‘probability’ (a letter A to E as defined in **Table 15-2**) and five levels of ‘consequence’, (a number 1 to 5 as defined in **Table 15-3**) to identify the risk ranking of each

impact. A risk ranking greater than 10 (in pink below) is regarded as high and priority is given to those activities listed as high risk.

Table 15-1 Risk ranking matrix

	Probability					
Consequence		A	B	C	D	E
	1	24	24	22	19	15
	2	23	21	18	14	10
	3	20	17	13	9	6
	4	16	12	8	5	3
	5	11	7	4	2	1

Table 15-2 Probability definitions

Level	Descriptor	Description
A	Almost certain	Common or repeating occurrence
B	Likely	Known to occur or 'it has happened'
C	Possible	Could occur or 'I've heard of it happening'
D	Unlikely	Could occur in some circumstances, but not likely to occur
E	Rare	Practically impossible

Table 15-3 Consequence definitions

Level	Descriptor
1	**Severe** Severe and/or permanent damage to the environment Irreversible Severe impact on the community Neighbours are in prolonged dispute and legal action involved
2	**Major** Serous and/or long term impact to the environment Long terms management implications Serious impact on the community Neighbours are in serious dispute
3	**Moderate** Moderate and/or medium-term impact to the environment and community Some ongoing management implications Neighbour disputes occur
4	**Minor** Minor and/or short term impact to the environment and community Can be effectively managed as a part of normal operations Infrequent disputes between neighbours
5	**Negligible** Very minor impact to the environment and community Can be effectively managed as part of normal operations Neighbour disputes unlikely

15.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- *Biosecurity Act 2015*
- *Soil Conservation Act 1938*
- State Environmental Planning Policy (Primary Production and Rural Development) 2019 (Rural SEPP)
- Wind Energy Guideline for State significant wind energy development (DPE, 2016a)
- Agricultural Impact Statement technical notes – A companion to the Agricultural Impact Statement guideline (DPI, 2013a)
- Infrastructure proposals on rural land (DPI, 2013b)
- Land Use Conflict Risk Assessment Guide (DPI, 2011)
- Managing Biosecurity Risks in Land Use Planning and Development Guide (DPI, 2020)
- Australian Weeds Strategy 2017–2027 (Department of Agriculture and Water Resources, 2017).

15.3 Existing environment

15.3.1 Land use

Existing land use is defined broadly in **Section 2.2.1**. The land use as described below relates specifically to agricultural use of land within the Project area.

The majority of the Project area is currently used for dryland sheep grazing (Merinos for wool) supporting low stocking rates over large areas on semi-arid native pastures and shrubland. These farm operations are typical of the area and are described as a low input grazing system. There is some opportunistic agistment (mostly dairy heifers) taken by some landholders during good seasons. It is considered that the overall contribution of agistment opportunities over the longer term is minimal. The remaining land uses are:

- Mixed grazing and cropping – Covering approximately 3,000 hectares (representing approximately 13% of the Project area) of one property Landowner 8) in the Project area
  - 1000 hectares of this property is cropped each year (mostly dryland winter cereals)
  - Grazing area consists of dryland lucerne with approximately 250 hectares of native pastures
  - This property has a higher carrying capacity and agricultural productivity compared to the majority of the Project area
- Irrigable land with flood irrigation layouts – Across three properties (Landowners 1, 4 and 5)
  - Includes growing a range of crops including cotton, sorghum and winter cereals
  - Irrigation area on property of Landowner 1 is outside the Project area
  - Irrigation footprint for properties of Landowners 4 and 5 would be outside of disturbance footprint
- NSW government agricultural land use mapping for the Project area and surrounding land include:
  - Grazing native vegetation
  - Grazing modified pastures
  - Cropping
  - Irrigated cropping.

15.3.2 Soils

The soils within the Project area are described in **Section 13.3.9**. Land and soil capability refers to the physical capacity of land to sustain a range of land uses and management practices, including agriculture. Land capability within and surrounding the Project area is discussed in **Section 15.3.5**.

The background review of published available information including soil landscape mapping, as well as the laboratory results from the Project's preliminary geotechnical report (Jacobs, 2022c), indicate that the Project area has a high potential for erosion via wind / water. The relative uniformity of the site conditions and topographic setting, as well as relatively consistent laboratory test results, suggests a more detailed site soil survey is likely to arrive at the same conclusion and is unlikely to be beneficial at this time.

During additional geotechnical investigations, supplementary laboratory testing will be undertaken on geotechnical soil samples to confirm the findings of this assessment.

15.3.3 Water sources

All eight Host landowners utilise both catchment runoff and groundwater for livestock water supply. Very good water quality captured off the floodplain as runoff or pumped from the shallow aquifer as groundwater has been reported.

Livestock water is stored in catchment dams and/or pumped to header tanks and reticulated by pipelines to stock troughs. Stock water bores are generally equipped with solar pumps and irrigation bores use electric or diesel pumps. Three landowners have volumetric irrigation water licences to access the Lower Murray Shallow Groundwater aquifer under the Water Sharing Plan described in **Table 13-5**.

Water resources within the Project area is described in **Section 13.3**.

15.3.4 Infrastructure

Limited farm infrastructure is present in the Project area and includes:

- Livestock yards
- Shearing sheds
- Fencing – internal and boundary fencing: generally plain wire of 5–7 line cyclone or standard "sheep proof" fencing
- Other farm sheds
- Grain storage silos
- Water supply – catchment dams, windmills, stock and irrigation bores, solar and electric pumps, header tanks, reticulation pipes and water troughs
- Irrigation infrastructure – border check (flood) irrigation open channels and bays/check banks
- Access – farm tracks, gateways, and some fenced stock laneway systems.

15.3.5 Agricultural capacity

Agricultural capability is determined primarily according to the land's ability to sustainably support a particular type and intensity of use.

Without irrigation land in the Project area has low agricultural capability and poor drainage and flooding can impact on a site's agricultural productivity in some years. The landowners confirmed relatively low stocking rates and production potential on the predominantly dryland grazing land.

Landowners described four broad soil types with some modest differences in livestock carrying capacity, depending on seasons:

- Sand hills – Can support improved pasture such as lucerne in some years
- Red clay loams – Suitable for irrigated cropping and grazing
- Black-grey clays – Suitable for irrigated cropping and grazing
- Box swamps – In the drainage depression areas, suitable for grazing only.

NSW Land and Soil Capability (LSC) mapping provides a broadscale regional view of the dominant LSC in the Project area (refer to **Figure 15-1**). The predominant LSC is mapped as having moderate to severe limitations (i.e. Class 4 – Moderate capability land). Smaller areas associated with drainage features are mapped as having very severe limitation (i.e. Class 6 – Low capability land).

There are 1,427 hectares of NSW SSAL mapped within the Project area, as defined in **Table 2-1** (refer to **Figure 15-1**). Two properties (properties 4 and 5) contain areas of SSAL, representing approximately 6% of the Project area. These are areas that have been developed for flood irrigation of crops (cotton, winter cereals and summer fodder crops).

15.3.6 Production levels

The average stocking rate for the eight properties within the Project area has been assessed at approximately 2.1 dry sheep equivalents (DSE) per hectare. This is comparable to average stocking rates in regions with similar agricultural capability (and soils and rainfall). The total gross farm income from livestock was, therefore, estimated to be approximately $2.9 million per annum or $140 per hectare.

The dryland cropping system within the Project area is primarily winter cereals (wheat, barley and oats). In the absence of farm records, the average yield from the dryland cropping area was estimated based on Australian Bureau of Statistics (ABS) 2020-21 crop production data, which reports an average wheat yield of 3.3 tonnes per hectare. A generalised estimate of gross income from dryland winter cereals cropping in the Project area was estimated to be approximately 1.3 million per year.

15.3.7 Aerial spraying

Aerial spraying is undertaken on the cropping properties of Landowner 4 and Landowner 8 only. Landowner 8 uses aerial spraying infrequently and only in high winter/spring rainfall years, as they would not be able to apply sprays using non-aerial machinery and equipment due to the wet conditions. For the irrigation cropping on the property of Landowner 4 the use of aerial spraying is more frequent.

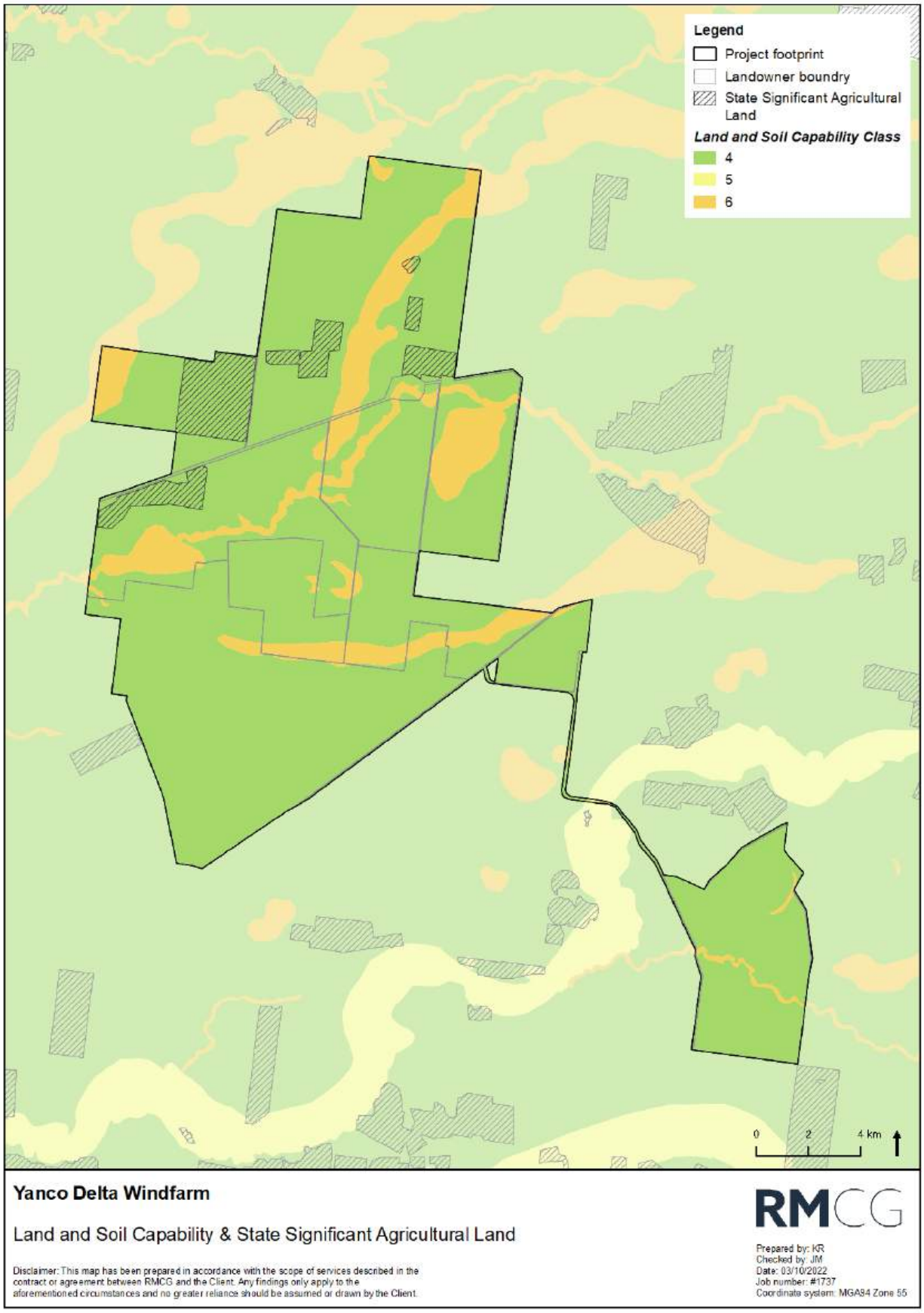


Figure 15-1 Land and Soil Capability (LSC) capability class and Significant Agricultural Land

15.4 Potential construction impacts

The main potential agricultural impacts of Project construction would include:

- Loss of agricultural land – Areas removed from production due to the installation of the infrastructure required for the Project
- Disruption to usual farm activities and practices primarily:
  - Sheep management and handling
  - Biosecurity protocol breeches
  - Interference with crop and pasture aerial spraying programs (autumn and springtime)
- Soil erosion.

These are discussed below.

15.4.1 Loss of agricultural land

The areas of agricultural land that would be removed from production during construction would total about 238 hectares. As the majority of impacts as a result of the loss of agricultural land would be during operation, this impact is discussed in **Section 15.5.1**.

The areas for the underground cabling would be reclaimed and returned into production after installation during the Project construction.

15.4.2 Disruption to farm activities

The disruption to usual farm activities has the potential to have a higher impact during Project construction primarily due to the extended time that there will be activity on the properties. The potential impacts, as described in the sections that follow, would be managed with mitigation measures proposed in **Section 15.8**.

15.4.2.1 Sheep management and handling

There is the potential for mobs of sheep could potentially escape from properties through boundary gates or be “boxed” with other mobs when internal gates are left open by construction personnel. Implementing protocols for the operation of gateways in consultation with Landowners would mitigate this risk.

Further, there is potential to disturb ewes during lambing season by construction activities. This could lead to losses, in particular maiden ewes are easily disturbed and can be separated from their lambs more easily. Implementing a construction program in consultation with the landowners that avoids paddocks with ewes that are lambing would mitigate this risk.

15.4.2.2 Biosecurity protocol breeches

There is the potential for disease and pests could be transferred between properties by construction contractor activities. If boundary gates are breeched by livestock there can also be biosecurity issues (e.g. transmission of lice, foot rot, ovine Johne’s disease). Implementing protocols for controlling biosecurity issues in consultation with Landowners would mitigate this risk.

15.4.2.3 Interference with aerial spraying programs

Impacts to aerial spraying during construction are expected to be minimal as only two of the eight Landowners practice aerial spraying, and only one regularly. The risk would be further mitigated by implementing a construction program in consultation with the landowners that avoid areas that would need to be sprayed.

15.4.3 Soil erosion

As discussed in **Section 13.4.3**, there is potential for soil erosion during construction of the Project.

It is recommended that further supplementary laboratory testing is undertaken on geotechnical soil samples to quantify potential for soil erosion. Relevant laboratory tests include: Emerson Class Number, Pinhole dispersion testing, Particle Size Distribution, Atterberg Limits, as well as sodicity and electrical conductivity chemical tests.

The assessed high potential for erosion in the Project area will be managed during construction to avoid erosion and gullying during heavy rainfall / flooding events through appropriately designed site drainage and the use of protection measures where flows are concentrated (refer to **Section 13.7** (water and soils). If high intensity rainfall or flooding events occur during construction, the likelihood of adverse water erosion effects would be expected to increase significantly.

15.5 Potential operational impacts

The Project would be located on land zoned as RU1 – Primary Production under both the Conargo LEP and the Jerilderie LEP. The Project would be compatible with this zoning.

Discussions with Host landowners identified four main potential agricultural impacts of Project operation which include:

- Loss of agricultural land – Areas removed from production due to the installation of the infrastructure required for the Project
- Impact to production levels – As a result of Disruption to usual farm activities and practices primarily:
  - Sheep management and handling
  - Biosecurity protocol breeches
  - Interference with crop and pasture aerial spraying programs (autumn and springtime)
- Improved property access – Proposed access tracks would improve property access during wet periods and be a positive for access to assist bushfire control
- Diversification of income – Added support to their agricultural enterprises.

15.5.1 Loss of agricultural land

The area removed from production, while commencing during construction, would continue to impact Host landowners throughout Project operation.

Losses of grazing and cropping production would be expected due to small areas of land removed from production within the disturbance footprint. However, generalised losses across the balance of the Project area are expected to be negligible as any potential impact on the wider operations of the farms can be mitigated (refer to **Section 15.8**).

Loss of income from no longer being able to graze sheep or crop on the relatively small areas hosting wind farm infrastructure will be the main direct impact. The estimated ongoing impact on agricultural production of the Project is outlined in **Table 15-4**.

The total gross value of the expected loss in agricultural production due to the Project is about $46,000 per year. Therefore, the impact of the Project on agricultural production during its operation is assessed to be minor.

Table 15-4 Estimated ongoing impact on agricultural production value

Enterprise component[1]	% farmed area	Land area (ha)	Gross value per ha	Total gross value per year (2020/21 prices)
Total dryland area	**100%**	**21,640**		**$4,169,000**
Grazing land	95%	20,640	$140/ha	$2,882,000
Dryland cropping land	5%	1,000	$1,287/ha	$1,287,000
Project impact - Land removed from production		238	$193/ha (average)	-$45,934

[1] No assessment was made on the impact on irrigated production because all proposed Project infrastructure would be located outside of the irrigation footprint. Realistically, irrigated production in this area is limited by water availability and would not be impacted by the Project.

It is noted that the impact assessment in relation to the loss of land from agricultural production has been assessed at the higher end because it has been assumed that:

- The area of underground cabling will be lost to agricultural production for the entire life of the Project
- The length of tracks matches the cabling length and therefore not allowing for any reduction in track area via the utilisation of existing farm tracks
- No benefit has been included with the additional tracks, although they will potentially provide improved access and management of the properties.

The total gross agricultural value for the Project region was in the order of $795 million in 2020-21. The estimated value of lost agricultural production from the Project area represents approximately 0.25% of the district agricultural value. For further comparison, this represents 0.01% of the region's agricultural land, based on ABS data. As such, the expected forgone agricultural output from the Project area is not considered to be significant at either a district or whole of region level.

15.5.2 Disruption to farm activities

The disruption to usual farm activities would have a lower impact during Project operation primarily due to the minimal maintenance activities proposed on the properties, and the small workforce. The potential impacts, as described in the sections that follow, would be managed with mitigation measures proposed in **Section 15.8**.

15.5.2.1 Sheep management and handling

Similar to construction, there is the potential for mobs of sheep could potentially sheep escape or boxing when internal gates are left open by maintenance personnel. Implementing protocols for the operation of gateways in consultation with Landowners would mitigate this risk.

Further, there is also potential ewes to be disturbed during lambing season by maintenance activities that could lead to losses. Implementing a maintenance program in consultation with the landowners that avoids paddocks with ewes that are lambing would mitigate this risk.

15.5.2.2 Biosecurity protocol breeches

Similar to construction, there is the potential for disease and pests could be transferred between properties during maintenance activities, or if boundary gates are breeched by livestock. Implementing protocols for controlling biosecurity issues in consultation with Landowners would mitigate this risk.

15.5.2.3 Interference with aerial spraying programs

Impacts to aerial spraying during operation are expected to be minimal as only two of the eight Landowners practice aerial spraying, and only one regularly. The risk would be further mitigated by consultation with relevant landowners on locations of infrastructure and an agreed set of protocols.

15.6 Potential decommissioning impacts

Decommissioning will be of shorter duration than construction but will involve similar levels of activity. At completion of decommissioning and rehabilitation, disturbed areas will be returned to agriculture.

Leaving the underground infrastructure in place will minimise further soil disturbance and disruption to farming activity. All retained underground infrastructure will be a minimum of 300 millimetres below the ground surface to enable agricultural activity to be resumed.

After removal of infrastructure, disturbed areas will be returned to pre-construction condition, or in consultation with landowners, to a standard required for intended future land use. Rehabilitation may include profiling, drainage, soil rehabilitation and regeneration of vegetation/ground cover.

It is expected that potential impacts will fall into two categories:

- Disruption to landholders during decommissioning activity – similar to the construction phase
- Legacy issues – relating to waste, contamination, biosecurity or retained infrastructure
  - These would be d or remediated as required under existing regulations and any legacy will be remnant
  - Any Project-introduced weeds, pests, pathogens or diseases that could not be controlled and eradicated during Project life would become the ongoing management responsibility of the Landowner
  - Compensation and or indemnity for any legacy issues would be negotiated with the relevant Landowners.

15.7 Land Use Conflict Risk Assessment

Four key conflict issues have been identified in relation to neighbouring agricultural properties (refer to **Table 15-5**), including:

- Dust (on vegetation/crops)
- Noise (disturbing stock)
- Erosion (causing downstream water quality issues)
- Biosecurity breach (leading to weed, disease or pest spread).

Each of these issues has been evaluated in relation to the disturbance footprint and all except a biosecurity breach have been determined to have low impact. Agricultural conflicts or impacts on production for neighbouring properties are also considered to be very low or absent.

Biosecurity breaches have the potential to significantly impact agriculture on a local and regional scale, but are unlikely to occur if a comprehensive biosecurity management plan is effectively implemented for the Project.

Management measures to mitigate on-site Project risks are provided in **Section 15.8**.

Table 15-5 Risk evaluation of activities that have the potential cause conflict

Activity	Risks	Probability	Consequence	Risk ranking	Risk Reduction measures	Probability	Consequence	Risk ranking
Dust on vegetation and crops	Potential of dust generation from machinery.	Possible (C)	Minor (4)	8	Use of a water cart and roller to suppress dust during dry and windy conditions	Unlikely (D)	Minor (4)	5
Noise disturbing livestock	Potential of noise generation from machinery. Potentially damaging during lambing periods.	Likely (B)	Minor (4)	12	During construction, landowners could move lambing ewes to paddocks not in proximity to works. Avoid routine operational maintenance (biannual) during lambing period	Unlikely (D)	Minor (4)	5
Erosion and scour impacting downstream (stock and domestic) water quality	Potential of erosion and scour caused by soil disturbance during earthworks	Possible (C)	Moderate (3)	13	Avoid extensive earthworks during expected high rainfall events. Erosion and sedimentation controls put in place (as per Erosion and Sediment Control Plan)	Unlikely (C)	Moderate (3)	9
Biosecurity breach leading to weeds, disease or pest spread	Potential of biosecurity protocols (as outlined in management plan) not being followed	Possible (C)	Major (2)	18	Development of Project-wide and property-specific biosecurity management plans. Protocols that are practical for that property to be agreed with landowner and contractors	Unlikely (D)	Major (2)	14

Note: Pink cells indicate a risk rating of higher than 10

15.8 Environmental management measures

Proposed measures to manage and/or mitigate impacts to land use from the Project are detailed in **Table 15-6**.

Biosecurity measures and consultation with local aerial applicators are also detailed in **Section 9.13** (biodiversity) and **Section 16.1.5** (aviation safety).

Table 15-6 Land use environmental management measures

Impact	Reference	Environmental management measure	Timing
Communication protocols with landowners	LU01	Agreed communication and behaviour protocols will be established to minimise disruption to farm activities. This will include protocols for entry to properties, scheduling of construction or maintenance activities, and for landowner queries or complaints management. Examples of protocols include, but will not be limited to the following: • Biannual maintenance crews will provide a minimum seven-day notice period before coming onto properties • Scheduled maintenance will avoid lambing season (May-July) • All visitors will follow colour coded gateway opening and closing protocol to avoid mixing mobs of sheep.	Prior to construction, construction, operation, decommissioning
Biosecurity risk	LU02	A comprehensive Biosecurity Management Plan will be developed for all Host Landowner properties and all stages of the Project. This would include the requirement for strict biosecurity protocols, such as vehicle and footwear hygiene practices, and to follow colour coded gateway opening and closing protocols to avoid mobs of sheep leaving properties via boundary gates.	Prior to construction, construction, operation, decommissioning
Aerial applicators	LU03	To minimise the risk associated with aerial spraying and in accordance with the Aerial Agricultural Association of Australia policy document on windfarms, the Project design will ensure the following in cropped areas of the Project: • All power lines to be underground, where possible • All meteorological masts are marked in accordance with National Airports Safeguarding Framework (NASF) guidelines and notified to the local aerial applicators	Construction, operation
	LU04	Host and neighbouring landowners, local aerial agricultural operators and aerial firefighting operators will be contacted to inform them of the Project. Details of the Project, including location and height information of WTGs, meteorological masts and overhead power lines will be provided to facilitate the flight planning of aerial application operators.	Prior to construction

Impact	Reference	Environmental management measure	Timing
		An agreed set of protocols with the local aerial applicators will be developed for all relevant operational issues, including notification of applications and action by the wind farm operator to stop blades in a safe position during application operations.	
Access tracks impacts	LU05	Discussions with Host Landowners will be held on the opportunity to utilise existing farm tracks to minimise the additional area lost to track construction	Detail design
Disruption to farm activities	LU06	Discussions will be undertaken with landowners on potential micro-siting WTGs to minimise disruption to farm activities.	Detailed design
Erosion	LU07	Further supplementary laboratory testing will be undertaken on geotechnical soil samples to confirm the potential for soil erosion in the Project. Relevant laboratory tests will include: • Emerson Class Number • Pinhole dispersion testing • Particle Size Distribution • Atterberg Limit • Sodicity and electrical conductivity chemical tests.	Prior to construction

16. Hazards and risks

This section provides the findings in relation to aviation safety, telecommunications, health, bushfire risk, battery storage and blade throw.

16.1 Aviation safety

This section summarises the findings of the Aeronautical impact assessment (**Appendix P**) prepared for the Project in response to the SEARs.

16.1.1 Assessment methodology

The methodology for the assessment involved the following:

- Identification of aerodromes (certified and uncertified) within 30 kilometres of a WTG
- Risk assessment for Lowest Safe Altitude (LSALT) and Grid Lowest Safe Altitude (GRID LSALT), and potential requirements to adjust WTG location or height
- Risk assessment to consider the merits of installing obstacle marking and/or lighting
- Risk assessment of Project permanent meteorological masts
- Consideration if the Project (or any part therefore) would be within the Building Restricted Area of any Airservices or Defence Communication Navigation and Surveillance (CNS) equipment and what notification requirements exist
- Review the location of important Helicopter Landing Sites near the Project area
- Review of wind turbulence and low level activities within 16 rotor-blade diameter distance of WTGs
- Consideration of agricultural aerial spraying
- Review of notification and communication requirements with agencies such as Airservices, the Royal Australian Air Force (RAAF) and the Civil Aviation Safety Authority (CASA).

16.1.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant policy and guidelines:

- National Airports Safeguarding Framework Principles and Guidelines (NASF), including:
  - Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation
  - Guideline F: Managing the Risk of Intrusions into the Protected Airspace of Airports
  - Guideline G: Protecting Aviation Facilities – Communication, Navigation and Surveillance (CNS)
  - Guideline H: Protecting Strategically Important Helicopter Landing Sites.

16.1.2.1 Notification requirement to regulators/agencies

Based on the NASF guidelines, if a wind farm exceed the following criteria agencies and regulators must be notified:

- The proposed WTGs exceed 30 metres in height
- There are proposed WTGs that exceed 150 metres in height
- There are proposed WTGs that exceed 30 metres in height within 30 kilometres of Jerilderie Airport.

As a result, the location of the WTGs would need to be advised to RAAF, Airservices Australia and CASA, along with the Aeronautical Impact Assessment. Virya Energy has notified all agencies in August 2022 and September 2022 (refer to **Table 5-6**).

16.1.3 Existing environment

16.1.3.1 Aerodrome and aircraft landing areas

There are nine aerodromes shown on Aeronautical Charts around the Project area. The distance from the Project area to the aerodrome, their status, and if they are serviced by instrument procedures are listed in **Table 16-1**.

There are also other aircraft landing areas near the Project area that are not published, (refer to **Figure 16-1**). The owners of these airstrips and the pilots that use them are responsible for ensuring that the condition of the airstrip and the surrounding terrain and obstacle environment are suitable for the safe operation of the aircraft.

Table 16-1 Aerodromes near the Project area as identified in the Aeronautical Information Publication (Airservices Australia, 2022)

Aerodrome/landing ground	Distance from Project area (km)	Status	Instrument approach procedures apply?
Narrandera Airport	91	Certified	Yes
Hay Airport	78	Certified	Yes
Deniliquin Airport	67	Certified	Yes
Tocumwal Airport	59	Certified	Yes
Leeton Airport	96.6	Uncertified	No
Finley Airport	43.2	Uncertified	No
Conargo Airport	38.4	Uncertified	No
Coleambally Airport	34	Uncertified	No
Jerilderie Airport	10.9	Uncertified	No

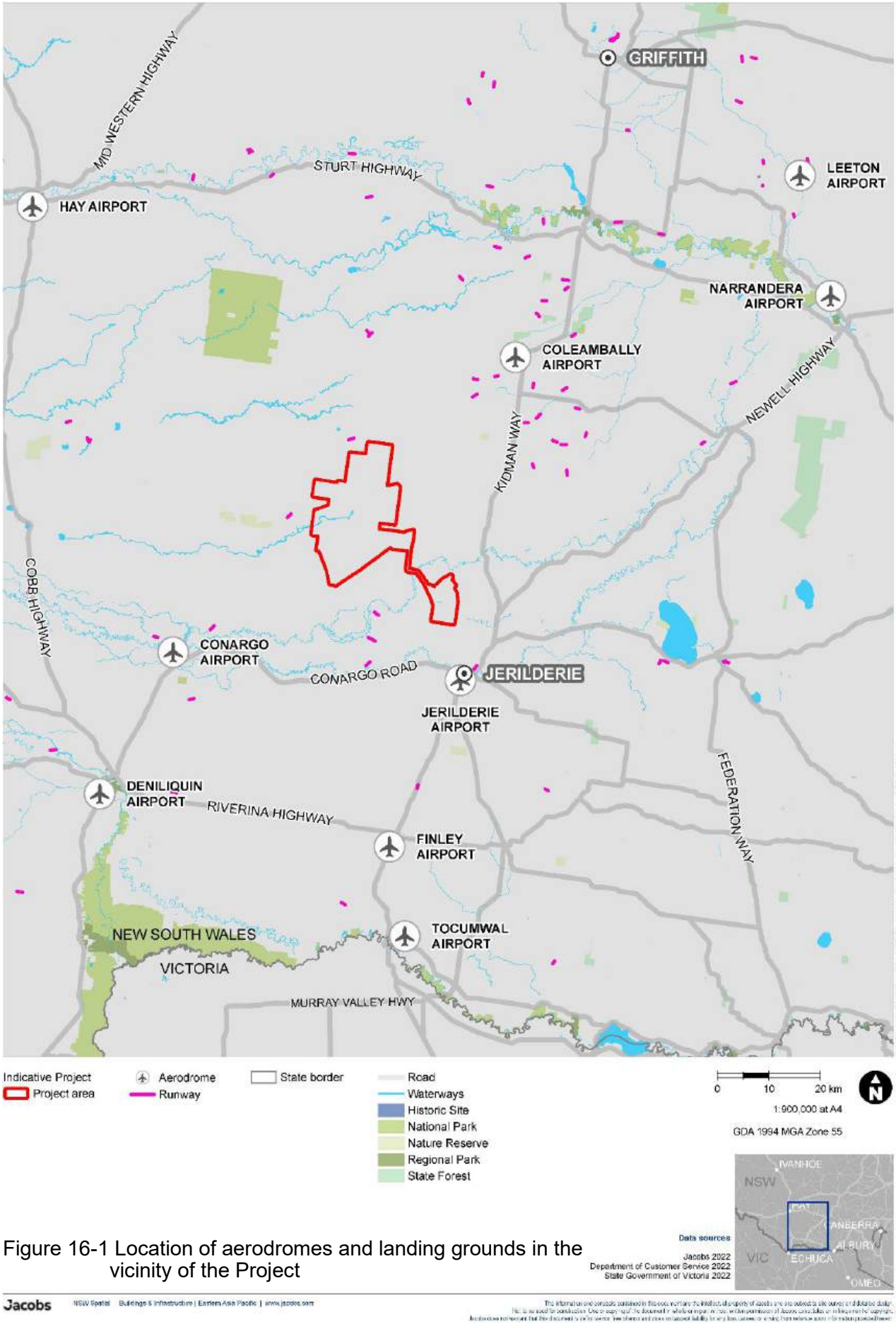


Figure 16-1 Location of aerodromes and landing grounds in the vicinity of the Project

16.1.4 Potential impacts

The maximum WTG tip height would be 270 metres above ground level. The maximum heights of WTGs will therefore vary from 373 metres to 379.3 metres (1224 ft to 1244.3 ft) AHD (refer to **Table 3-5**). The tallest WTG is W-017.

The eight permanent meteorological masts have a maximum height of 294 metres (965 ft).

Given the height of the WTGs and the location of Jerilderie Airport there is a requirement to notify Royal Australian Air Force and AirServices the location of WTGs as per NASF Guideline D. Consultation with agencies has already begun (refer to **Section 5.5.3**).

16.1.4.1 LSALT assessment

Each designated instrument flight rules (IFR) air route has a published LSALT which is the lowest altitude that an IFR aircraft can fly on that route without having visual reference to the ground or water. Grid LSALTs apply over the whole of Australia and are shown in the Aeronautical Information Publication (Airservices Australia, 2022).

Table 16-2 shows the results of a comparison between the Project WTGs heights with the IFR air routes and/or Grid LSALTs in the vicinity of the Project area. All the proposed WTGs would infringe an LSALT. Due to the infringement of the LSALT there is a need to seek a raising of the LSALT by 200 ft from Airservices (refer to **Section 5.5.3**).

Table 16-2 Air routes LSALT impact

Air route & segment / Grid LSALT considered	Height of LSALT (ft AHD)	Infringements of LSALT	Likely LSALT result
W264	3000/2000	No infringement	Pass
W419	2100/1100	All WTGs – maximum WTG Height 1244.3 ft AHD – Infringes by 144.3 ft	Fail
V255	3600 / 2600	No infringement	Pass
W310	2300 / 1300	No infringement	Pass
W612 to Griffith	2900 / 1900	No infringement	Pass
W612 to Mangalore	3700 / 2700	No infringement	Pass
Grid LSALT	2200/1200	All WTGs – maximum WTG Height 1244.3 ft AHD – Infringes by 44.3 ft	Fail

16.1.4.2 OLS assessment

The protection of airspace around any certified aerodrome/airport is safeguarded by declaring an Obstacle Limitation Surface (OLS).

The proposed WTGs do not penetrate the OLS of any of the aerodromes in the vicinity and would not have impacts on the OLS of aerodromes.

16.1.4.3 Certified aerodromes assessment

The nearest aerodrome with flight protection (PANS-OPS) surfaces is 59 kilometres away (refer to **Table 16-1**) from a WTG. The Project, therefore, would not impact on certified aerodromes.

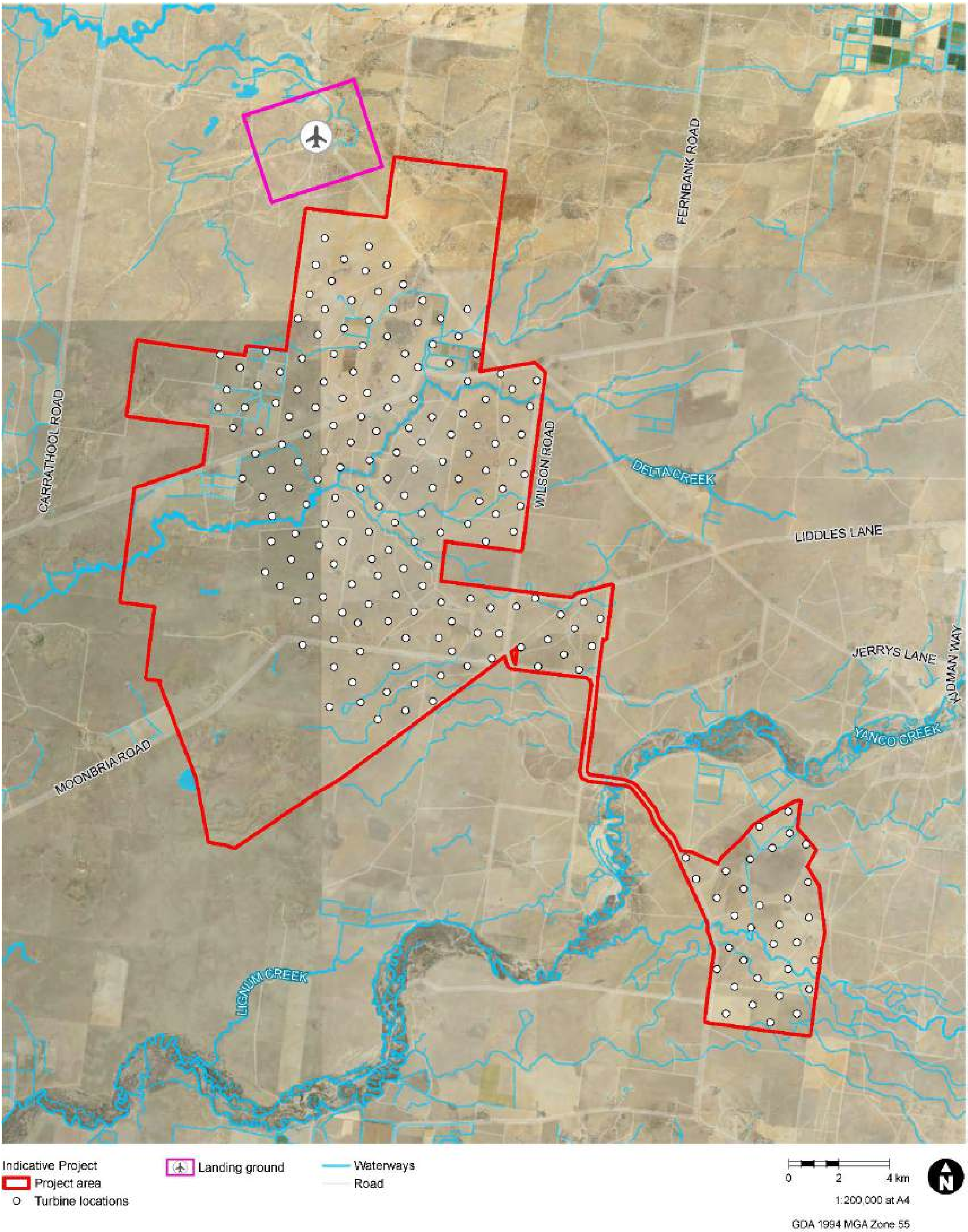
16.1.4.4 Uncertified aerodromes assessment

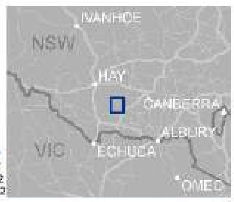
The nearest uncertified aerodrome to a WTG is 3.77 kilometres away, shown as Landing Ground 1 in **Figure 16-2**. The Project would be located outside the Landing Ground 1 aerodrome traffic circuits, therefore there would be no impacts on the nearest Landing Ground 1. The Project would not infringe on the Visual Flight Rules of any uncertified aerodrome/landing ground.

16.1.4.5 Wind turbulence and low level activities assessment

A potential direct physical impact of WTGs on aviation is that of turbulence induced by the turning of the turbine blades. This can potentially be noticeable up to 16 rotor diameters down-wind of the Project. Based on the Project rotor diameter of 220 metres, potential turbulence could be noticeable up to 3.52 kilometres from the outermost WTGs . This is shown as red circles in **Figure 16-3**.

One aerodrome (Landing Ground 1; refer to **Figure 16-3**) is within this radius. As a result, consultation with the aerodrome owner/operator and those that operate from the facility will be undertaken to ensure that they are aware of the potential for unusual turbulence arising from the Project.





Data sources
Jacobs 2022
Department of Customer Service 2022
State Government of Victoria 2022

Figure 16-2 Aerodrome traffic circuit for Landing Ground 1

Jacobs NSW Spatial Buildings & Infrastructure | Eastern Asia Pacific | www.jacobs.com

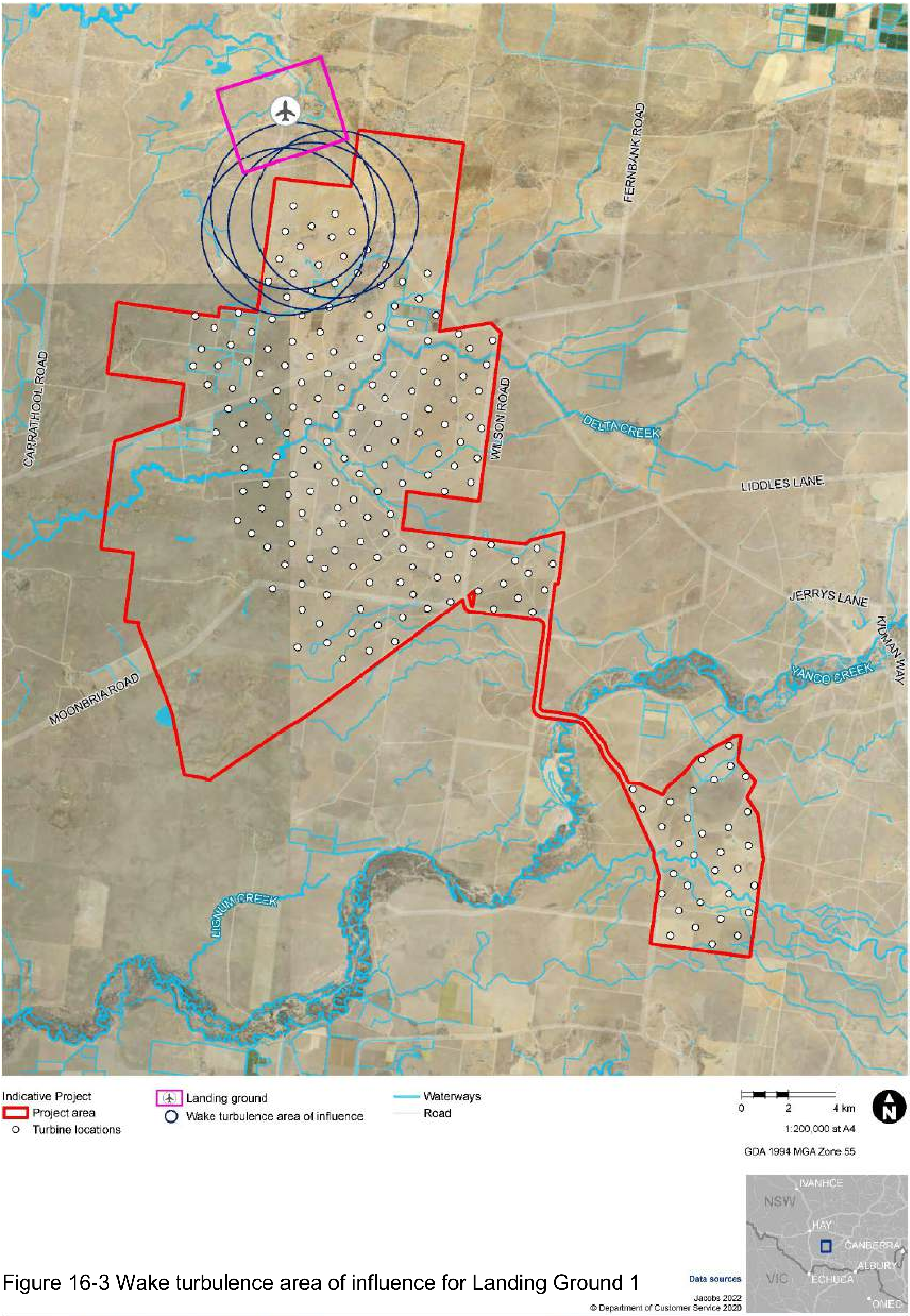


Figure 16-3 Wake turbulence area of influence for Landing Ground 1

16.1.4.6 Aviation marking and lighting

As discussed in **Section 3.6**, WTGs would include lighting and marking in line with best practice and any required marking and lighting of the permanent meteorological monitoring masts.

The assessment has identified the following recommendations as part of best practice:

- Rotor blades, nacelle and the upper two thirds of the supporting mast of WTGs that are 150 metres and over (above ground level) to be painted white to contrast against the natural background
- Night radar lighting is required to manage potential hazards to aviation given the WTGs are greater than 150 metres
- During the detailed design process, any required marking and lighting of the permanent meteorological monitoring masts will be confirmed, according to National Airports Safeguarding Framework (NASF) Guideline D and best practice.

The above recommendations have been incorporated into the environmental management measures (**Section 16.1.5**).

16.1.4.7 Airport and non-airport CNS

For the nine aerodromes on the Aeronautical Charts in the vicinity of the Project, no impacts or issues regarding CNS have been identified. Additionally, there are two CNS facilities near the Project:

- Mt Bobbara Surveillance Radar – 260 kilometres from the Project
- Mt Macedon Surveillance Radar – 250 kilometres from the Project.

The Project would have no impacts or issues regarding the identified CNS facilities.

16.1.4.8 Helicopter Landing Sites

The Project would be located more than 3.5 kilometres away from any relevant Helicopter Landing Sites and, therefore, no impacts have been identified.

16.1.4.9 Agricultural uses

Virya Energy will contact the landowners local aerial agricultural operators and aerial firefighting operators to inform them of the Project. Details of the Project, including location and height information of WTGs, meteorological masts and overhead power lines will be provided to facilitate the flight planning of aerial application operators. Where required, Virya will develop an agreed set of protocols with the local aerial applicators for all relevant operational issues, including notification of applications and action by the wind farm operator to stop blades in a safe position during application operations.

Further information on the impact of the Project on aerial activities associated with agriculture is provided in **Chapter 15** (land).

16.1.5 Environmental management measures

Proposed measures to manage and/or mitigate aeronautical impacts from the Project are detailed in **Table 16-3**.

Table 16-3 Aviation safety environmental management measures

Impact	Reference	Environmental management measure	Timing
Aerial obstacles	AV1	The location of 'as constructed' WTGs and permanent meteorological masts will be advised to RAAF, Airservices Australia and CASA, along with the Aeronautical Impact Assessment (L&B, 2022).	Prior to construction
LSALT infringement	AV2	Ongoing consultation will be undertaken with Airservices Australia and CASA to assess potential impacts of the Project and to address the lowest safe altitude (LSALT) impact of air route W419 and Grid LSALTs near the Project that will need to be raised.	Prior to construction
Low level activities	AV3	Consultation with the aerodrome owner/operator and those that operate from Landing Ground 1 will be undertaken to ensure that they are aware of the potential for unusual turbulence arising from the Project.	Prior to construction
Visibility of WTG	AV4	The rotor blades, nacelle and the supporting tower of the WTGs will be painted white.	Detailed design
Visibility of monitoring masts	AV5	During the detailed design process, any required marking and lighting of the permanent meteorological monitoring masts will be confirmed, according to National Airports Safeguarding Framework (NASF) Guideline D best practice.	Detailed design

16.2 Telecommunications

This section summarises the findings of the Electromagnetic interference assessment technical report (**Appendix Q**) prepared for the Project in response to the SEARs.

16.2.1 Assessment methodology

The Australian Communications and Media Authority Register of Radiocommunication Licences (Australian Communications and Media Authority, 2022), as of April 2022, was downloaded to conduct the electromagnetic interference assessment.

For this assessment, transmitters and receivers within a 100 kilometre radius from a notional centre point of the Project have been assessed. The following study areas were then utilised within the respective sections of the assessment:

- Point to point links – A radius of 100 kilometres from the notional centre point of the Project
- Point to multi point links – A radius of 100 kilometres from the notional centre point of the Project
- Point to area telecommunication – A radius of 20 kilometres from each WTG
- Aviation and meteorological radar operations – A radius of 100 kilometres from each WTG.

16.2.2 Statutory context and guidelines

The electromagnetic interference assessment has been carried out in accordance with the following relevant policy and guidelines:

- NSW Wind Energy Guidelines (DPE, 2016)
- Clean Energy Council Best Practice Guidelines (Clean Energy Council, 2018)
- Environment Protection and Heritage Council Draft Guidelines (EPHC, 2010).

16.2.3 Existing environment

Telecommunications within the study area are provided in **Table 16-4.**

Further details of the link paths are provided in the Electromagnetic interference assessment technical report (**Appendix Q**).

16.2.4 Potential impacts

A summary of the assessment results is provided in **Table 16-4**.

Table 16-4 Telecommunications assessment results summary

Service type	Existing environment	Potential impact	Actions
Point to point links[1]	Six point to point links cross the Project area and would intersect the proposed WTGs, based on a 2D analysis.	Seven of the proposed WTG locations have potential to impact upon two Licensees; NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service.	Further stakeholder consultation before and during detailed design will be undertaken with each of the Licensees. Antennae heights are required to inform a 3D assessment. Further detail on required clearances and identification of suitable options to avoid disturbances will also be carried out as part of consultation. Possible rectification options to avoid any point to point link interferences include: • Relocation of WTGs out of 2nd Fresnel Zone • Rerouting of transmission path around the Project.
Point to multi point links[2]	49 point to multi point telecommunication towers have been identified within 100 km of the Project. These towers are owned by 15 different Licensees including: • Murray Irrigation Ltd • Coleambally Irrigation Cooperative Ltd • Murrumbidgee Irrigation Limited • Water NSW • Goulburn Valley Region Water Corporation • Telstra Corporation Limited • Narrandera Shire Council • Berrigan Shire Council • Essential Energy • Goulburn-Murray Rural Water Corporation • Hay Shire Council • Deniliquin Council • Federation Council • Orica Australia Pty Ltd • Edward River Council.	• The level of risk for each of these point to multi point links is predicted to be low • The distance from each of the telecommunication towers to the Project would be greater than 10 km • It is anticipated that each of these point to multi point telecommunication towers is used for communication with local receivers.	Stakeholder communication pre and during detailed design will be undertaken for all towers identified within 100 km of the Project, and particularly for Murray Irrigation Ltd, Coleambally Irrigation Co-operative Ltd, Water NSW, and Telstra Corporation Limited, as the distances to the closest WTGs would be less than 30 km.

Service type	Existing environment	Potential impact	Actions
Point to area telecommunication			
Internet coverage	Two internet coverage towers are identified within 20 km of the closest WTG.	The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small.	Stakeholder consultation pre and during detailed design will undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Rerouting of transmission paths around the Project • Improving existing infrastructure, such as increasing antennae gain • Relocation and/or removal of WTGs to not disrupt any telecommunications.
Mobile phone coverage	Four mobile phone coverage towers are identified within 20 km of the closest WTG.	The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small.	Stakeholder consultation pre and during detailed design will be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Rerouting of transmission paths around the Project • Improving existing infrastructure, such as increasing antennae gain • Relocation and/or removal of WTGs to not disrupt any telecommunications.
Government telecommunication	Two government telecommunication towers are identified within 20 km of the closest WTG	The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small.	Stakeholder consultation pre and during detailed design will be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Rerouting of transmission paths around the Project

Service type	Existing environment	Potential impact	Actions
			• Improving existing infrastructure, such as increasing antennae gain • Relocation and/or removal of WTGs to not disrupt any telecommunications.
Emergency services	Three emergency services telecommunication towers are identified within 20 km of the closest WTG. The Licensees for these are: • NSW Police Force • NSW Rural Fire Service • Ambulance Service of NSW	The level of risk with regards the Emergency Services towers needs to be established by communication with these owners directly during detailed design when the final design and location of WTGs are confirmed.	Stakeholder consultation pre and during detailed design will be undertaken for all these towers to establish level of risk for the Project. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Rerouting of transmission paths around the Project • Improving existing infrastructure, such as increasing antennae gain • Relocation and/or removal of WTGs to not disrupt any telecommunications.
Broadcasting	Seven broadcasting towers are identified within 20 km of the closest WTG.	The level of risk associated with these telecommunication towers is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small.	Stakeholder consultation pre and during detailed design will be undertaken for all these towers. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Rerouting of transmission paths around the Project • Improving existing infrastructure, such as increasing antennae gain • Relocation and/or removal of WTGs to not disrupt any telecommunications.

Service type	Existing environment	Potential impact	Actions
Aviation radar operations	15 aeronautical towers, across six locations, are identified within 100 km of the nearest WTG.	The potential impact needs to be established by communication with these owners directly during detailed design when the final design and location of WTGs are confirmed.	The owners of these towers will be consulted pre and during detailed design to determine any potential impact to their telecommunications from the Project.
Meteorological radar operations	Two meteorological stations are identified within 100 km of the nearest WTG.	The potential impact needs to be established by communication with these owners directly during detailed design when the final design and location of WTGs are confirmed.	The Bureau of Meteorology will be consulted pre and during detailed design to determine any potential impact to their telecommunications from the Project.
Miscellaneous	One miscellaneous coverage tower is identified within 20 km of the closest WTG.	• The level of risk associated with this telecommunication tower is predicted to be low, as the number of sensitive receivers sitting on the far side the Project in relation to the telecommunication towers is relatively small. • The potential impact to any communications cannot be established without an understanding of the stakeholder's usage.	Stakeholder consultation pre and during detailed design will be undertaken for this tower. Should a potential impact be raised during this stakeholder communication, then possible mitigation options can be discussed and established including: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Rerouting of transmission paths around the Project • Improving existing infrastructure, such as increasing antennae gain • Relocation and/or removal of WTGs to not disturb any telecommunications.

[1] Point to point links use line of sight communication for transmission of data. WTGs risk interference of point to point telecommunication through potential obstruction, reflection, or refraction of the electromagnetic waves along the transmission path

[2] Point to multi point licence allows communication between one or more fixed locations, whereas a point to point link allows communication between only two fixed locations

16.2.5 Environmental management measures

Proposed measures to manage and/or mitigate impacts on telecommunications from the Project are detailed in **Table 16-5**.

Table 16-5 Telecommunication environmental management measures

Impact	Reference	Environmental management measure	Timing
Point to point impacts	EMI1	Consultation will be carried out with NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service, to determine their antennae heights, and regarding potential interference due to the seven WTGs identified potentially in their communication paths. A detailed 3D analysis will be undertaken when further information is available.	Detailed design
Point to multi point links	EMI2	Consultation will be carried out with the 15 different Licensees of the 49 point to multi point telecommunication towers identified within 100 km of the Project. This consultation will determine the potential interference due to the Project.	Detailed design
Point to point and point to multi point links	EMI3	Should consultation with point to point, or point to multipoint, link Licensees determine that interference is a risk, then options to relocate/remove WTGs and/or rerouting of transmission paths around the Project will be considered.	Detailed design
Point to area telecommunications	EMI4	Consultation will be carried out with all point to area telecommunication tower owners within 100 km of the Project. This consultation will determine the potential interference due to the Project.	Detailed design
Point to area telecommunications	EMI5	Should consultation with point to area communication tower owners determine that interference is a risk, options for mitigation will be considered in the following order: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Improving existing infrastructure, such as increasing antennae gain • Rerouting of transmission paths around the Project • Relocation and/or removal of WTGs to not disrupt any telecommunications.	Detailed design, construction, operation
Aviation and meteorological radar operations	EMI6	Consultation will be carried out with the owners of the 15 aeronautical towers, and the Bureau of Meteorology, to determine any potential impact to their telecommunications from the Project.	Detailed design

16.3 Health and electromagnetic fields

This section summarises the findings of the Electric and magnetic fields technical report (**Appendix R**) prepared for the Project in response to the SEARs.

16.3.1 Assessment methodology

EMF are invisible, physical fields that surround electrical charges and exert forces on all charged particles in the field. All electrical and electronic equipment and appliances that are powered by electrical charges produce EMF. Most generated fields fluctuate between minimum and maximum peaks at a fixed rate per second, known as the frequency of emission. The EMF generated by a given source is characterised by the magnitude and frequency of the fields.

In wind farms, extremely low frequency (ELF) EMF is produced by transmission lines, electrical transformers, underground networks cabling, any overhead cabling and equipment within the turbines.

The assessment for EMF values has been carried out using the HIFREQ module of CDEGS software, and SESEnviroPlus software.

16.3.1.1 Human health

Extremely low frequency electric and magnetic fields induce internal electric fields and current within the human body. The World Health Organisation (WHO) states that exposure to high magnetic field levels (well above 100 μT) can cause nerve and muscle stimulation and changes in nerve cell excitability in the central nervous system. Established biological effects caused by acute exposure to high field strengths include:

- Magneto-phosphene effect – The sensation of flashes of light caused by induced electric currents stimulating the retina
- Micro-shocks – a sensation caused by a small electric spark discharge or arc when a person touches a metallic object that is electrically earthed.

Extensive scientific research has broadly found that the exposure normally encountered in the environment, including in the vicinity of power lines, does not pose long term effects and risk to human health (ARPANSA, 2022).

For active implantable medical devices (AIMDs), the more recently developed devices in accordance with standards such as EN 45502 for AIMDs and EN50527 series for pacemakers, implantable cardioverter-defibrillators, and spinal cord stimulators have been designed to be immune to EMF. There have been no known instances of adverse effects on users with correctly fitted pacemakers near power lines.

16.3.2 Statutory context and guidelines

The WHO recognises two international ELF EMF exposure guidelines:

- The Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz to 100 kHz) (International Commission on Non-Ionising Radiation Protection (ICNIRP), 2010)
- IEEE Standard C95.1- Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz (Institute of Electrical and Electronics Engineers, 2019).

These guidelines apply to the general public in all areas (i.e. not just under or adjacent to transmission lines) and no distinction is made in the guidelines as to the duration of exposure for the general public.

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is the national Commonwealth government of Australia's regulatory agency tasked with protecting Australians from both ionising and non-ionising radiation. ARPANSA's Radiation Health Committee recognised that the ICNIRP 2010 Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields (1 Hz – 100 kHz) are consistent with ARPANSA's understanding of the scientific basis for the protection of people from exposure to ELF EMF.

16.3.2.1 ICNIRP reference levels and limits

The ICNIRP guidelines define general public exposure as the exposure of individuals of all ages and of varying health statuses to electric and magnetic fields. These guidelines specify basic restrictions for ELF EMF which are limits set for electric fields internal to the human body, and in different body tissues.

ICNIRP has also defined reference levels, which equates external, measurable field levels with internal field levels within body tissues that are below the basic restrictions. However, the ICNIRP reference levels are defined only for generic EMF sources and not the field distributions that are specific to high voltage (HV) equipment such as underground cables and overhead transmission lines. They also include conservative safety factors that account for statistical variability in the general population and uncertainty in the calculation method.

The reference levels specified in the ICNIRP guidelines are defined as the spatial average of the area occupied by a person's body. As such, the reference levels are compared to measured levels at one metre above the normal standing surface of a person under or near the line. **Table 16-6** shows the ICNIRP guideline reference levels.

Table 16-6 ICNIRP EMF reference levels and AIMD limits

Exposure Scenario	Electric Field Strength (kV/m)	Magnetic Field Strength (μT)
General Public – all areas	5	200
Active Implantable Medical Devices	5	100

16.3.3 Potential impacts

EMF would only occur during Project operation (i.e. when electricity is being generated).

16.3.3.1 Wind turbine generators

The main sources of EMF from the WTG would be from the electrical reticulation and the power transformer. The EMF measurements that have been reported in and around 3 MW (Israel et al, 2011) and 1.8 MW WTGs (McCallum et al, 2014) are summarised in **Table 16-7**. The Project WTGs would have 8 MW capacity. As such, the EMF levels associated with the Project WTGs may be up to 4.5 times the magnitude of the reported measurements. Based on this, the worst-case EMF levels for the Project would be much lower than the ICNIRP reference levels.

Table 16-7 EMF wind farm field measurements based on other studies

Study	Measured Electric Field Strength (kV/m)	Measured Magnetic Flux Density (μT)
Vesta V90 50 Hz 3 MW (Israel et al, 2011)	1.44×10^{-3}	0.133 – 0.225
Vesta 60 Hz 1.8 MW (McCallum et al, 2014)	-	0.3 – 0.9

16.3.3.2 Underground cables

The HV collector network for the Project would comprise underground 33 kV or 66 kV cables. The worst-case EMF levels at one metre above ground level above 33 kV cables were calculated in the HIFREQ module of CDEGS for the specified WTG number and size, as summarised in **Table 16-8**. The detailed calculation plots are provided in Appendix A of the Electric and magnetic fields technical report (**Appendix R**).

The 33 kV cables would produce the worst-case magnetic field density at one metre above ground level compared to the 66 kV cable option. Both the calculated electric field strength and magnetic field density levels generated by the underground 33 kV cables are much lower than the ICNIRP reference levels.

Table 16-8 Calculated EMF levels above the underground 33 kV collector cables

HV Equipment	Calculated Maximum Electric Field Strength (kV/m)	Calculated Maximum Magnetic Flux Density (μT)
33 kV Underground Cable	2.4×10^{-6}	8

16.3.3.3 Overhead power lines

Overhead power lines are proposed to connect the collector substations to the central primary substation. These are proposed to be either 66 kV or 132 kV. The 132 kV option is considered to be the worst-case option from an electric field perspective and the 66 kV option is the worst-case from a magnetic field perspective; therefore, both options have been modelled in SESEnviroPlus.

The transmission line connecting the central primary substation to the Dinawan Terminal Station is proposed to be operated at 330 kV or 500 kV. The derived electric field limit derived by detailed calculation of the transmission line EMF was 7.8 kV/m for a 330 kV transmission line and 9.1 kV/m for a 500 kV transmission line, defined at one metre above ground level.

Generic 330 kV and 500 kV tower geometries for an assumed single circuit transmission line have been considered for this EMF assessment. All EMF calculations were done for 1.1 pu (per unit) voltage and maximum windfarm capacity. The calculated EMF levels at one metre above ground level are summarised in **Table 16-9**. The detailed calculation plots are provided in the Electric and magnetic fields technical report (**Appendix R**).

Table 16-9 Calculated maximum EMF levels from overhead power lines and transmission line

Voltage Level (kV)	Calculated Maximum Electric Field Strength (kV/m)	Calculated Maximum Magnetic Flux Density (μT)
66	0.84	41
132	2.32	33
330	7.06	69
500	9.10	36

The calculated magnetic field levels are below the ICNIRP reference levels for all transmission line options.

The calculated electric field strength under the 330 kV and 500 kV transmission line options is above the ICNIRP reference level but below the limit derived by detailed dosimetric calculations, as reported by Transgrid in the Project EnergyConnect EIS. However, the electric field strength for both 330 kV and 500 kV option is below the 5 kV/m ICNIRP reference level at 17 metres and 21 metres, respectively, from the centre of the line. The electric field strength levels would therefore be below the ICNIRP reference levels within a typical transmission line easement width.

In addition, the closest sensitive receiver to the proposed transmission line is a dwelling 2.6 kilometres from the transmission line easement. At this distance, the measured electric field strength would be much lower than the ICNIRP reference levels.

16.3.3.4 Substations

A central primary substation (two options are presently under consideration) and eight collector substations are proposed within the Project area.

The Australian Standard AS 2067 for HV installations requires that the detailed substation design complies with the ICNIRP reference levels both inside and outside the substation. The Project would require compliance with the requirements of AS 2067. The EMF requirements specified in AS 2067 would also apply to any future installations for the Project.

The closest sensitive receiver would be located more than two kilometres from the nearest proposed substation. At this distance from the substation(s), the electric and magnetic fields from any of the proposed operating voltages would be much lower than the ICNIRP reference levels.

16.3.4 Environmental management measures

The EMF assessment has determined that the expected EMF levels from the Project would comply with the relevant Australian and international standards and guidelines. As such, mitigation measures are not required.

However, the concept of prudent avoidance is recommended by Energy Networks Australia for the design and operation of electricity generation, transmission and distribution systems. Prudent avoidance is part of a precautionary approach built on the understanding that whilst adverse health effects from EMF have not been established, based on findings of science reviews conducted by credible authorities, the possibility of a cause-effect relationship cannot be ruled out. The following prudent avoidance measures listed in **Table 16-10** would be considered in the detailed design of the Project.

Table 16-10 Prudent avoidance measures applicable to the Project

Impact	Reference	Environmental management measure	Timing
Human health	EMF1	The phase spacing of overhead conductors (including transmission line and substation bus equipment) will be reduced where practicable to increase the degree of magnetic cancellation and reduce associated EMF levels. The design will also ensure that the reduction in phase spacing does not result in unacceptable levels of audible noise and radio frequency interference from the transmission line and substations where practicable.	Detailed design
	EMF2	The phase-to-ground separation associated with the Project transmission line will be increased where practicable to reduce the electric field strength and magnetic flux density at 1 m above ground level.	Detailed design
	EMF3	Underground cables will be arranged in close trefoil or multicore cable arrangement where practicable. This will maximise the magnetic field cancellation and minimises the magnetic flux density level at 1 m above ground level.	Detailed design
	EMF4	Consideration will be given to the location of substation equipment with respect to the perimeter fence. For example, equipment that generates significant magnetic fields, such as air-core reactors associated with harmonic filters, will not be placed close to publicly accessible areas where practicable.	Detailed design

16.4 Bush fire risk

This section summarises the findings of the Bush fire risk technical report (**Appendix S**) prepared for the Project in response to the SEARs.

16.4.1 Assessment methodology

A desktop assessment was carried out for the consideration of bush fire risks within and around the Project area, drawing on the following data:

- Vegetation type
- Topography
- Climate
- Available bush fire prone land mapping
- Fire history from National Parks and Wildlife Service
- Climate data sourced from the Bureau of Meteorology (BoM) for Deniliquin (Station ID: 74129) (data for 1970-1997, up to 3 hourly) and Deniliquin Airport (Station ID: 74258) (data for 1997-2022, up to hourly)
- Temperature, wind speed, humidity and rainfall data, which were used to calculate the Grass Fire Danger Index (GFDI) from 1970 to 2021 to describe historic bush fire conditions
- Climate change projections for climate variations sourced from SimCLIM (CLIMsystems, 2022) to describe potential bush fire conditions by 2055 and 2090. Median results from the SimCLIM model that describes the high-emissions scenario (Representative Concentration Pathway (RCP) 8.5) were used from the Intergovernmental Panel on Climate Change (IPCC) *Fifth Assessment Report* (IPCC, 2013).

The bush fire assessment and protection measures was sent to the NSW Rural Fire Service be subject to review and input from NSW RFS on the 9 August 2022 (refer to **Section 5.5.2**).

16.4.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant legislation, policy and guidelines:

- EP&A Act
- *Work Health and Safety Act 2011*
- *Rural Fires Act 1997*
- Planning for Bush Fire Protection (PBP) (NSW RFS, 2019a)
- Guide For Bush Fire Prone Land Mapping (NSW RFS, 2019b).

16.4.3 Existing environment

16.4.3.1 Regional context

The Project area is in the Southern Riverina Fire Area for the purposes of fire danger ratings, and falls within the region covered by the Mid Murray Zone Bush Fire Management Committee (MMZ BFMC).

16.4.3.2 Historical bush fire weather

The Project area experiences a warm and persistently dry climate. Annual rainfall has ranged between 141 millimetres and 804 millimetres, with an average of 407 millimetres in the region. Although winter and spring tend to be wetter than summer and autumn, rainfall is relatively evenly distributed throughout the year, with 55% of annual rain falling between May and October.

Average daily temperature maximums range between 32.5°C in January and 14.4°C in July. Temperatures exceeding 40°C have occurred in all months between October and April. The

highest temperature on record is 49.6°C, occurring in January 1878. The highest temperature in recent decades (i.e. since 1970) is 47.6°C, which has occurred in January 1990 and 2019.

The average monthly fire danger ratings (FDR) are in the low to moderate range between March and December (GFDI <12), and are high in January and February (GFDI 12-<25). Days of very high FDR or greater (GFDI ≥25) have occurred in all months between November and April. Days with catastrophic fire danger (GFDI >150) have been recorded in January and March.

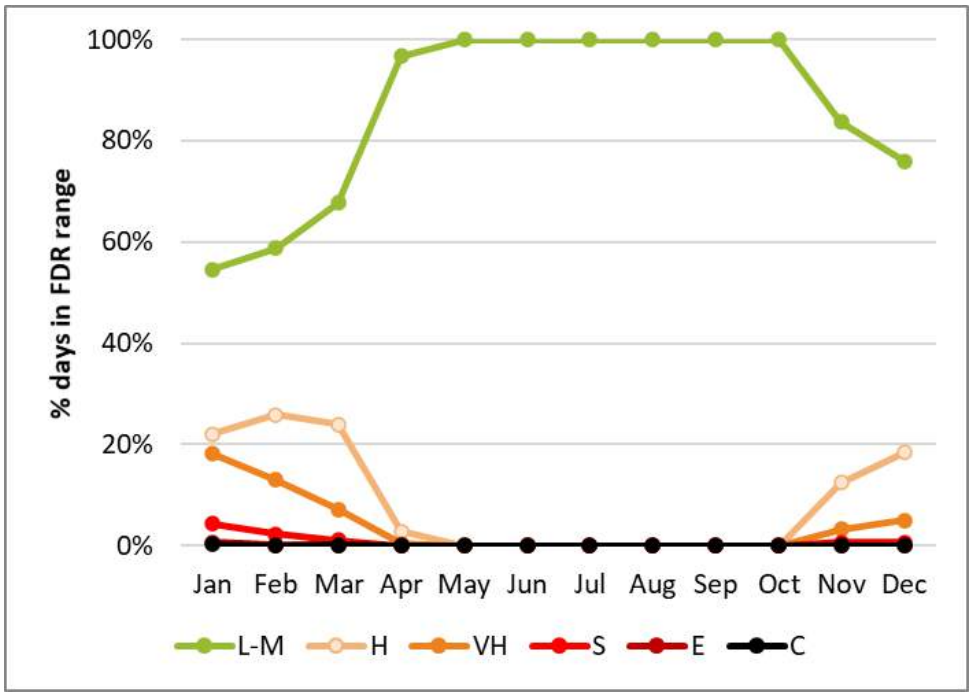


Figure 16-4 Percentage of days with maximum daily GFDI in each fire danger rating scale

Low-moderate: L-M; high: H; very high: VH; severe: S; extreme: E; catastrophic: C. Data compiled from BoM stations 74128 Deniliquin and 74258 Deniliquin Airport, data for 1975-2021.

Total fire bans (TOBANs) are declared by the NSW RFS. During TOBANs, potential human sources of ignition are prohibited or restricted to reduce the risk of bush fires igniting during or (rarely) immediately preceding a period of dangerous fire weather. FDR on total fire ban days is typically very high or greater.

Days with elevated FDR usually coincide with winds from a westerly direction, but this ranged from south-easterly through to north-easterly over the period of record.

The bush fire season generally runs between October/November and March/April, varying with local conditions (MMZ BFMC, 2009). Days with westerly to northerly winds, high daytime temperatures and low humidity are most commonly associated with dangerous fire weather conditions in this region. Two days in the period of record, however, have experienced relatively mild temperatures and relative humidity, but strong (92.5 kilometres per hour) north-easterly to south-easterly winds that drove the FDR to catastrophic and extreme respectively. These were in March 1979 and in January 1983. In addition, dry storms can occur during the bush fire season, and are known to start fires (MMZ BFMC, 2009).

16.4.3.3 Climate change projections for bush fire weather

The Project WTGs would have a design life of 30 years, so would therefore be resilient to fire danger and other climate conditions in the 2050s. At the end of design life, the Project area may be closed or refurbished for continued operation.

Climate projections for 2055 (end of WTG design life) and 2090 (longer term horizon for ongoing operation) were generated for the Project area. Combined, these projections indicate that bush fire weather will become harsher. However, the effects on overall GFDI and FDR is only projected to be marginal, considering the incidence of dangerous fire weather already experienced in the region. The projected FDR with a description of fire behaviour and the average number of days per year occurrence are outlined in **Table 16-11**.

Table 16-11 Fire danger index, indicative fire behaviour and average occurrence at the Project area for the baseline period (1976-2015), and projected for 2055 and 2090 under RCP8.5

FDR	Fire behaviour guidance	Average # days per year		
		Baseline	2055	2090
Low-moderate GFDI<12	There is some potential for fires and those that occur will normally stop (meteorological conditions allowing) at roads, tracks and watercourses. Fires that occur can generally be extinguished by the use of hand operated water sprays and fire beaters.	320 (88%)	318 (87%)	315 (86%)
High GFDI 12-<25	Fires are capable of spreading rapidly, particularly in the absence of preventative measures and may require additional work effort to be extinguished.	30 (8%)	31 (9%)	32 (9%)
Very high GFDI 25-<50	Fires are capable of spreading rapidly, with or without preventative measures. Fire containment may require significant effort and the use of earthmoving equipment and/or backburning.	12 (3%)	13 (4%)	15 (4%)
Severe GFDI 50-<100	Fires are capable of being uncontrollable, unpredictable and extremely fast moving. They will NOT be contained without extensive effort on established fire lines with adequate personnel and equipment (this may include water bombing aircraft).	2 (0.6%)	2 (0.7%)	3 (0.7%)
Extreme GFDI 100-150		0.3 (0.1%)	0.3 (0.1%)	0.3 (0.1%)
Catastrophic GFDI>150	Fires are capable of being uncontrollable, unpredictable, and extremely fast moving, and will NOT be contained without extensive effort on very large established fire trails with extensive personnel and equipment (this will include water bombing aircraft).	0.1 (0.02%)	0.1 (0.02%)	0.1 (0.02%)

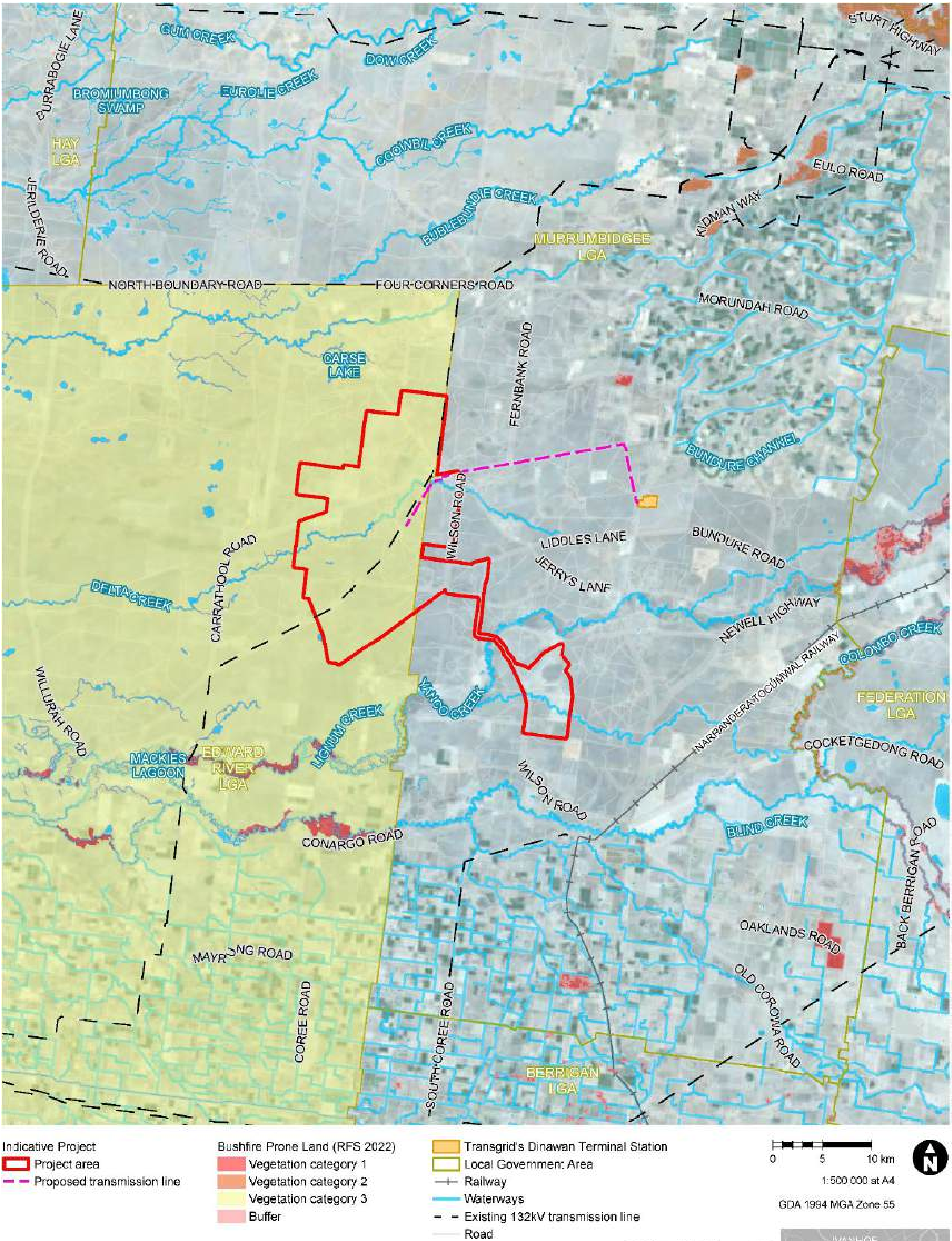
16.4.3.4 Topography and vegetation

The Project area is largely flat with altitudes varying between 100 metres and 114 metres AHD. Average slope in the Project area is approximately 1%, with maximum slopes approaching 4% over short distances. It is a highly modified rural landscape with isolated patches of remnant woody vegetation, and a strip of riparian vegetation along the Yanco Creek.

Much of the region is used for grazing native vegetation (Category 3 vegetation under the PBP classification), with some patches of grazing modified vegetation (Category 3 vegetation) or irrigated cropping (not considered bush fire prone land unless within 30 metres of the Category 3 vegetation or 100 metres of Category 1 vegetation). The mapped bush fire prone land around the

Project area is shown in **Figure 16-5**. Publicly available bush fire prone land mapping in the Murrumbidgee Council has not yet been updated to the most recent version of the BPL mapping guide, which recognises grazed grassland as Category 3 vegetation. In addition, adjoining Councils have flagged the riparian vegetation associated with Yanco Creek as Category 1 vegetation.

It should be noted that the Host landowners plough mineral earth firebreaks at their property boundaries prior to the commencement of each fire season.



Publicly available BPL mapping for the Murrumbidgee Council Area is yet to be updated to the most recent version of the BPL guide, which would recognise grazed grasslands as Category 3 vegetation and riparian vegetation along Yanco Creek as Category 1

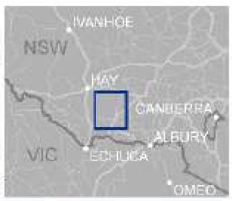


Figure 16-5 Bush fire prone land mapping for the Project area

Data sources
Jacobs 2022
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16.4.3.5 Fire history and ignition sources

Large wildfires have occurred in the landscape in the past, as shown in **Figure 16-6**, including:

- The Project area was partially burnt in the Wanganella wildfire in January 1987
- In 1989 to 1990 the One Oak fire burnt approximately eight kilometres south of the Project area
- The 1990 to 1991 Glencoa fire came within 12 kilometres of the Project area.

The most destructive fires tend to follow winters with high rainfall, causing rapid growth and accumulation of bush fire fuel. Fires in the grasslands of the region tend to move quickly and burn at a high intensity. The major sources of bush fire ignition in the region are:

- Lightning strike
- Escaped hazard reduction/planned burns
- Escaped camp fires
- Power lines
- Machinery and traffic
- Hot work (e.g. cutting and welding).

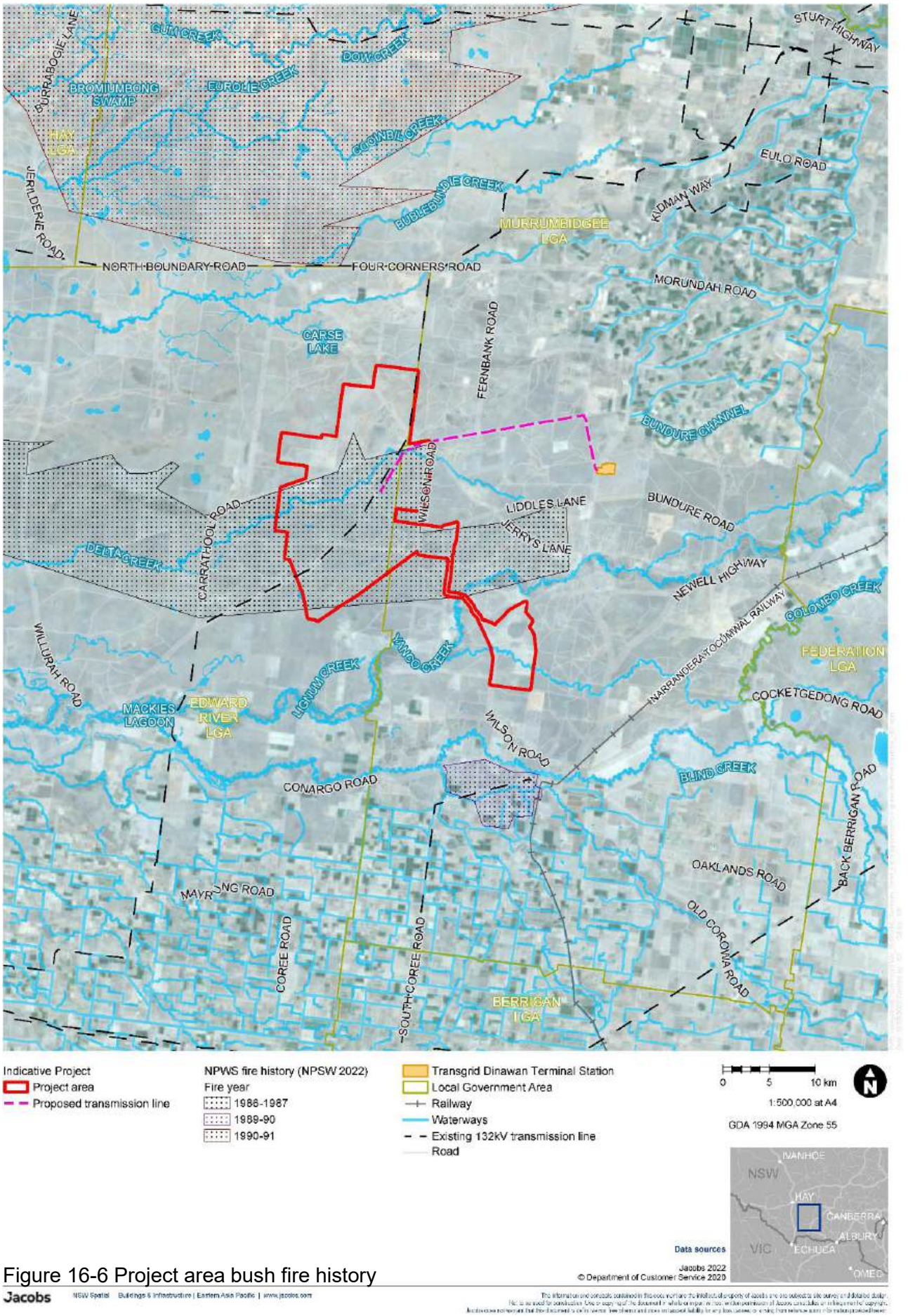

Figure 16-6 Project area bush fire history

16.4.3.6 Places and values at risk from bush fire

Town centres

Bush fires can threaten the life and safety of people living, working and visiting the Project area. Nearby towns include Jerilderie (population 922) located approximately 10 kilometres south of the Project, Deniliquin (population 7,432) located approximately 57 kilometres south-west of the Project, and Coleambally (population 1,152) approximately 32 kilometres north-east of the Project.

National parks

The Jerilderie Nature Reserve is about 10 kilometres from the southern extent of the Project area. Three small nature reserves of South West Woodland are located eight kilometres west, 17 kilometres east, and 23 kilometres south of the Project area. Oolambeyan National Park is located approximately 24 kilometres north-west of the Project area. The Murray Valley National Park is located 33.5 kilometres south-west of the Project area.

Dwellings

There are rural properties scattered throughout the landscape, with most of the land area being native vegetation or agricultural commercial enterprises including cereal cropping, grazing, supported by infrastructure such as silos, fences, outbuildings, farm sheds.

Safer places

Outlined in the *Rural Fires Act 1997*, these are locations where people may find shelter from a bush fire. The Neighbourhood Safer Places in the region are:

- Monash Park (sports ground), corner of Bolton St and Mahonga St, Jerilderie (19 kilometres by road south of the Project)
- Yamma Hall (building), 1334 Gilbert Road, Coleambally (35 kilometres by road east of the Project)
- Conargo Hall Car Park (Conargo Road, Conargo) (55 kilometres by road south west of the Project).

Project infrastructure

Once constructed, the Project infrastructure including WTGs, substations, BESS, operations and maintenance facility, meteorological towers, above-ground electrical cables and poles would also be at risk of bush fire in the landscape.

Heat flux refers to the rate of heat energy transfer through a given surface. The heat flux threshold value is the minimum heat flux required for ignition. Heat flux for electrical substations can be applied to all electrical infrastructure associated with the Project. WTGs incur damage with a heat flux of 30 kW/m^2.

16.4.4 Potential impacts

16.4.4.1 On-site bush fire ignition

There are several potential ways in which construction, operation and/or decommissioning of the Project may cause a fire to ignite including:

- Work that may create a spark or generate hot particles (hot work such as the use of angle grinder, welding)
- Off-road vehicle use or parking leads to contact between bush fire fuels (particularly dry grasses) and hot parts of vehicles

- Lightning strikes a WTG or other elevated structure
- WTG fault causes an elevated fire on the tower structure
- An extreme wind event, structural fault, defect, contact with a vehicle or farm machinery or act of sabotage results in the collapse of a WTG and/or a live transmission power line contacting the ground, vegetation and/or another live power line
- Contact between vegetation or wildlife and power lines or switchgear at a substation
- Explosive failure of a transformer at a substation
- Explosive failure at the BESS.

A fire ignited this way, and which escaped beyond the immediate vicinity of the Project area could lead to injury, loss of life, psychological trauma and/or damage and/or disruption to property, land uses, and the environment in the surrounding landscape. The consequence or impact of an on-site fire would vary, depending on scale to which the fire was able to develop and the speed at which it spread through the landscape.

The implementation of bush fire protection measures in **Section 16.4.5** will minimise the risk of on-site ignition and fire spread, thereby reducing potential impacts on livelihoods and other features of value.

16.4.4.2 Off-site bush fire ignition

There are several ways in which a bush fire burning in the landscape (landscape fire or off-site ignition) may affect Project infrastructure and personnel during construction, operation and/or decommissioning. These include:

- Effects on personnel engaged in construction, operational and/or decommissioning activities
- Damage to transmission infrastructure and/or equipment at construction sites or laydown areas from flames, radiant heat, smoke or embers
- Interruption to power supplies due to damage to transmission line infrastructure or the need to deactivate power supplies due to safety issues associated with fire in the vicinity of electricity transmission infrastructure.

Depending on the severity of the fire, warning time, personnel or equipment present at the time, and the effectiveness of mitigation measures, an off-site ignition could, in the worst case, lead to loss of life and/or psychological impacts for personnel, as well as potential loss and damage to assets.

Direct fire damage to Project infrastructure is unlikely to be severe due to the materials used to construct WTGs and their inherent fire resilience.

A fire burning in the landscapes of the Project area is unlikely to generate its own weather and hence not likely to create winds that would cause a WTG to collapse. While power supplies may be temporarily disrupted during the passage of a fire front across the transmission line, this would most likely be limited to no more than a few hours.

The implementation of bush fire protection measures in **Section 16.4.5** will minimise the risk of off-site ignition impacting on the Project area.

16.4.4.3 Risk to firefighting operations

There are several concerns commonly raised regarding the impact of wind farms on fire suppression efforts for fires in the landscape, including:

- Wind farms acting as direct obstacles to aerial firefighting operations
- Moving blades and wake turbulence creating a major hazard to aircraft, if not marked appropriately (Australian and New Zealand National Council for Fire and Emergency Services

[AFAC], 2018). In clear conditions and with the WTGs turned off, the blades are clearly visible to aircraft and are not likely to constrain aerial operations (Clean Energy Council, 2017). However, transmission infrastructure, meteorological towers and guy ropes can be difficult to see and can therefore limit aerial firefighting operations
- Smoke exacerbating electrocution risks from power lines
- Wind farms may interfere with local and regional radio transmissions (Australian Wind Energy Association, 2004), hampering bush fire response
- Fire crews may be unable to work in the immediate vicinity of the transmission line due to electrical safety concerns associated with electrical induction through flame and smoke, use of water near the power lines and/or structural failure of the infrastructure. If they could not directly attack fires burning in the immediate vicinity of power lines or undertake backburning, the effectiveness of attack or backburning may be diminished.

In order to minimise the potential effects on firefighting operations, the bush fire protection measures in **Section 16.4.5** will be implemented, in consultation with NSW RFS and Fire and Rescue NSW.

16.4.4.4 Fire in the landscape

Wind farms are not expected to worsen fire behaviour in the landscape, nor create a major ignition risk (AFAC, 2018). As such, the consequences of a given fire in the landscape to receptors outside of the Project area are not changed by the construction and operation of the Project.

WTGs may attract lightning strike (one of the major causes of fire in the region). Subject to the final WTG design by the manufacturer, with the inbuilt lightning protection in WTGs, likelihood of fires in the landscape due to lightning strike may decrease.

16.4.5 Environmental management measures

Proposed measures to manage and/or mitigate bush fire risks from and to the Project are detailed in **Table 16-12.**

Table 16-12 Bush fire risk environmental management measures

Impact	Reference	Environmental management measure	Timing
Bush fire	BU01	The Project will implement the following permanent bush fire protections: • Asset Protection Zones (APZs) around each WTG (accomplished by hardstand, no additional vegetation management needed) • APZs around the substations and BESS • An APZ around the operation and maintenance facility, which is to be constructed to a BAL-12.5 standard as the Project refuge of last resort • Perimeter firebreak • Ongoing vegetation management (grazing, clearance around poles and overhead power lines) • Access for emergency response vehicles • A permanent, dedicated firefighting water source • Controls on Project actions to prevent bush fire ignition • Fire suppression systems in WTGs, substations, BESS • Project fire fighting vehicle.	Construction, operation
	BU02	Construction and Operation Bush fire Emergency Management Plans will be developed for the Project in accordance with Planning for Bush Fire Protection (PBP) (NSW Rural Fire Service [RFS], 2019) and in consultation with the NSW RFS (including any requirements in relation to aerial firefighting). These plans will identify all relevant bush fire risks and mitigation measures associated with the construction and operation of the Project, including those listed in BU01 and: • Specific measures to prevent bush fire ignition or spread from Project activities • Work types that will not be conducted during total fire bans • Storage location and safety arrangements for any fuels or other hazardous or flammable materials • Notification protocols to the NSW RFS of any work with the potential to cause a fire in the surrounding vegetation • Instructions and triggers to shut down WTGs with an approaching fire • Any other measures required by the NSW RFS or other authorities to manage risk to aerial firefighting in the region • Notification protocols and contact details for the local NSW RFS Fire Control Centre, local fire brigades, CASA, Air Services Australia, Transgrid, and any other people or organisations who will be notified of an emergency at the Project • Location of firefighting water, any alternative water supplies that may be available during an emergency, and any other fire suppression equipment held on site	Prior to construction, construction, operation

Impact	Reference	Environmental management measure	Timing
		• Bush fire emergency planning, including evacuation triggers, evacuation routes and when and where to take refuge.	
	BU03	Risks to firefighting operations will be managed, including: • Registering all towers (WTGs and meteorological monitoring towers) prior to emplacement on site • WTG shutdown procedures in a Y-position in case of a fire in the area.	Construction, operation

16.5 Battery storage

This section summarises the findings of the Preliminary Hazard Analysis (PHA) relating to the BESS (**Appendix T**) prepared for the Project in response to the SEARs.

16.5.1 Assessment methodology

As the Project is at an early stage of concept design, the PHA involved a qualitative assessment. The methodology for the assessment involved the following:

- Identify possible hazard scenarios during Project construction and operation, including abnormal events and potential consequences
- Application of risk matrix for assessing the hazard scenarios identified (refer to **Section 16.5.1.1**)
- A review of other credible PHAs for similar sized projects, literature and recommendations from battery hazards assessments, as well as review of battery incident investigations, such as the Victoria Big Battery fire
- Recommended safeguards and actions to avoid or minimise potential risks to as low as reasonably practicable.

Detailed methodology for the PHA including the risk screening and criteria are provided in **Appendix T**. A more detailed hazard and risk analysis will also be carried out during Project detailed design.

16.5.1.1 Criteria

This assessment is principally concerned with the Project development and operation related hazards that could result in significant offsite effects, the consequence categories are limited to categories as defined in the **Table 16-13**.

A risk matrix was used to assess the potential hazards using both the consequence detailed in **Table 16-13** and the likelihood criteria presented in **Table 16-14**.

Table 16-13 Consequence category

Consequence category	Health and Safety	Community	Environment
1	First aid treatment	Workforce concern.	• Onsite release, containable with minimal damage • Localised impact on energy usage
2	Medical treatment required	Local community concern	• Onsite release with some damage, no offsite damage • Numerous and/or widespread but small-scale impacts on energy and waste • Remediation in terms of days
3	Serious injury requiring urgent treatment	Regional concern	• Offsite release, no significant environmental damage • Remediation in terms of weeks

Consequence category	Health and Safety	Community	Environment
4	Permanent and serious disablement	Widespread community outcry. Regional concern	• Major offsite release, short to medium term environmental damage • Remediation in terms of months
5	Fatality	Extreme community outcry. National concern.	• Major offsite release, long term environmental damage • Remediation in terms of years

Table 16-14 Risk matrix

Consequence Likelihood	1	2	3	4	5
Remote Once every 50 - 100 years	1	2	3	4	5
Highly unlikely Every 10 - 50 years	2	4	6	8	10
Unlikely Every 3 - 10 years	3	6	9	12	15
Likely Every 1- 3 years	4	8	12	16	20
Highly Likely At least once a year	5	10	15	20	25

16.5.2 Statutory context and guidelines

The assessment has been carried out in accordance with the following relevant legislation, policy and guidelines:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning (Department of Planning (DoP), 2011a)
- Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis (DoP, 2011b)
- Multi-Level Risk Assessment (DoP, 2011c).

16.5.3 Existing environment

There is low population density in the vicinity of the Project area. There are three dwellings within the broader Project area, all owned by Host Landowners, and all a minimum of 4.5 kilometres from either BESS option. The closest town to the Project is Jerilderie, which would be located a minimum of 35 kilometres from the BESS.

16.5.4 Potential impacts

16.5.4.1 Hazardous materials

Based on the State Environmental Planning Policy (Resilience and Hazards) 2021, a risk screening has been carried out in relation to the storage of hazardous materials, transport of hazardous materials and other types of hazards.

The outcomes of the risk screening for the PHA are summarised below:

- The expected storage of hazardous materials associated with the Project would not exceed the relevant risk screening threshold
- The expected transport of hazardous materials associated with the Project would not exceed the relevant risk screening threshold.

Based on the above, the Project would not be considered potentially hazardous. However, as DPE also requires assessment of other types of hazards, the following potential hazards are assessed further:

- Uncontrolled thermal runaway reaction or decomposition within the Li-ion batteries in the BESS potentially leading to propagation to other infrastructure (refer to **Section 16.5.4.2**)
- Environmental impact or health and safety impact from exposure if there is a spill of pollutant from the battery enclosures, transformers or landing gantries, e.g. cooling medium or oil. This risk will be mitigated during detailed design and the environmental management measures outlined in **Section 16.5.5**.

16.5.4.2 Hazard identification and risk analysis

The Project BESS would be a 800 MW/800 MWh lithium-ion battery. Lithium-ion batteries can have a technology failure mode called thermal runaway, which can be caused by battery mechanical damage, defects within the battery unit, or improper operation. As a result, the prevention, detection and control of thermal runaway events is an important technology design consideration for battery manufacturers.

With the advancement of technology, there is an increased likelihood that battery technology will become more reliable and less susceptible to extreme impacts from known failure modes. Further technology evaluation and safety in design controls will be applied to the battery system selected for the Project during detailed design.

A summary of the key hazards and the associated risk levels are outlined in **Table 16-15**. The highest risk level associated with the Project is medium. Medium level risks can be managed with the measures inherent to the BESS and Project design, and the additional measures provided in **Table 16-16**. The risk level for each hazard is considered to be mitigated to so far as reasonably practical.

The assessment concludes that with the standard sizing of BESS enclosures, separation distances and balance of plant, the nominated capacity of the BESS would be able to be accommodated within the designated area within the Project area. Overall, the assessment considers the hazards

and associated risks can be mitigated to so far as reasonably practical through adoption of controls in place with the Project requirements and various recommendations arising from the PHA.

Further, to prepare for emergency response during the operation of the Project, a comprehensive fire safety study will be prepared in consultation with Fire and Rescue NSW, which will include an assessment of the capabilities of the local fire and rescue services to respond to events such as thermal runaway. The fire safety study will be implemented to ensure appropriate emergency response plans and other management measures are in place during the operation of the Project.

Further information on the potential hazards described below is provided in the Preliminary Hazard Analysis (PHA) (**Appendix T**).

Table 16-15 Hazard analysis summary

Potential hazard	Consequence	Likelihood	Risk level
Thermal runaway occurs because of BESS defect	3	Highly unlikely	6 – Medium
Thermal runaway because of improper operation of the BESS	3	Highly unlikely	6 – Medium
Thermal runaway occurs because of mechanical damage	3	Highly unlikely	6 – Medium
Thermal runaway propagation from one battery enclosure to another	3	Highly unlikely	6 – Medium
Thermal runaway escalates to a battery deflagration/explosion event	3	Highly unlikely	6 – Medium
Bush fire triggers thermal runaway or asset damage	1	Highly unlikely	2 – Low
Incident or injury to emergency services personnel responding to an incident	3	Remote	3 – Low
Surface water leaving the site has negative impact on surrounding habitat or wildlife	3	Highly unlikely	6 – Medium
EMF from the transmission connection causes health impacts	1	Highly unlikely	2 – Low
Groundwater contamination during construction and operations	1	Highly unlikely	2 – Low
Fire caused from site operations spreads off-site	1	Remote	1 – Low

16.5.5 Environmental management measures

Proposed measures to manage and/or mitigate hazards and risks related to the Project BESS are detailed in **Table 16-16**.

Table 16-16 BESS environmental management measures

Impact	Reference	Environmental management measure	Timing
Hazards	PHA1	Undertake detailed Hazard and Operability Study and design review of the selected designs with specific attention on the inherent design features that detect, control and prevent thermal runaway	Detailed design
Thermal runaway	PHA2	Specify requirements for suppliers and designers to demonstrate robust designs to prevent, monitor and (where unable to eliminate the possibility) control thermal runaway and undertake specialist safety in design assessments such as a fire risk assessment to inform the design and selection of the battery technology	Detailed design
	PHA3	Implement a design principle that assumes a thermal runaway event within an enclosure would occur during the lifetime of the asset and therefore limits deflagration energy release (and prevents the spread of fire to adjacent enclosure by adopting appropriate design controls such as suitably designed enclosures and separation distances)	Detailed design
	PHA4	Determine credible scenarios from a thermal runaway event once the technology and its size are determined to quantify the amount of potential hazardous byproducts that must be managed and establish the Project design basis accordingly (e.g. amount of combustion and pollution, fire water uses for containment (if applicable), volumes of retention dams etc.)	Detailed design
Quality control	PHA5	Implement a robust quality plan and inspections throughout the supply chain and during installation. This will include factory and site acceptance testing	Detailed design, commissioning
Hazards	PHA6	Develop and implement suitable asset management plans to ensure proper maintenance of the facility in line with manufacturers' recommendations and good industry practice throughout Project operation.	Operation
Fire safety	PHA7	Prepare a fire safety study in consultation with Fire and Rescue NSW (FRNSW) and to the satisfaction of the operational requirements of FRNSW	Detailed design
Emergency response	PHA8	Make provisions for training and education of operations staff and emergency response services to understand the technology to safely manage potential incident responses.	Proponent/ Contractor

16.6 Blade throw

This section summarises the findings of the Blade throw assessment technical report (**Appendix U**) prepared for the Project in response to the SEARs.

16.6.1 Assessment methodology

A blade throw incident is a structural failure of the blade in a WTG, which results in either the full blade or a segment of the blade detaching from the structure and being thrown from the turbine. This can occur due to physical damage caused by erosion or lightning, material defects or fatigue, amongst other failure modes. This blade throw assessment looks at the risk levels given a portion of the blade being thrown from the structure into the surrounding area. With proper controls in place, such as manufacturing quality controls and operational inspections, it is unlikely that such an incident would occur.

The blade throw assessment identified and evaluated the potential impacts of a blade throw incident. The assessment evaluated the risk of the Project in relation to:

- Blades falling from the turbine whilst stationary
- Full blade snapping from the hub and being thrown based on its rotational velocity
- Small fragment of the blade tip being thrown based on its rotational velocity.

The methodology for the assessment involved the following:

- Calculation of the maximum throw of a blade and tip fragment of the WTG based on a projectile equation of motion with no drag or aerodynamic effects. This was calculated for a normal running speed, overspeed and a variety of wind turbine sizes, given the WTGs flexibility at this project stage
- Maximum throw distances were compared to the literature on the maximum throw of a blade and tip fragment. This was to ensure calculations and results were realistic and conservative
- The maximum throw of a full blade and tip fragment was plotted across the Project area based on proposed WTG locations. This allowed for identification of all potentially impacted infrastructure
- From this, the site-specific risk for an individual is then calculated for each of the identified locations
- Acceptable level of risk associated with blade throw incident was determined by the individual risk being compared against the recommended allowable risks at each location. The individual risk was also compared against some other common activities to illustrate the risk level of blade throw on the Project.

16.6.1.1 Risk limit

Table 16-17 outlines the acceptable levels of the risk of death per year for a location or for an individual, dependent on the type of infrastructure, as outlined in the Dutch Guide (Waterstaat, 2019). For example, a risk of 10^{-6} per year equates to a risk of 0.00001 (0.001%) probability of an individual dying in a year.

Table 16-17 Dutch Guide Acceptable Risk Limits

Type of infrastructure	Risk Limit
Dwellings	10^{-6} (one in one million) per year as a risk to the location
Road	10^{-6} (one in one million) per year as a risk to an individual

16.6.2 Statutory context and guidelines

The methodology largely follows the Dutch Wind Turbine Risk Zoning Guide (the Dutch Guide) developed by Waterstaat (2020). The Dutch Guide provides a methodology for conservative site-specific assessment of risk as well as recommended allowable individual risks based on infrastructure type. Additional conservative measures were integrated into the assessment from academic and industry resources, including:

- Analysis of throw distances of detached objects from horizontal axis WTGs (Sorensen, 2015)
- Numerical Modelling of Wind Turbine Blade Throw (Cotton, 2007).

16.6.3 Existing environment

16.6.3.1 Throw risks

Based on the assessment, the following key findings have been identified:

- The maximum distance a full blade can be thrown at a normal operating speed is calculated as 399 metres
- The maximum distance a full blade can be thrown at an overspeed of 1.5 is calculated as 734 metres
- The maximum distance a tip fragment can be thrown at a normal operating speed is calculated as 1191 metres
- The maximum distance a tip fragment can be thrown at an overspeed of 1.5 is calculated as 2471 metres.

Based on a review of literature the above calculations are considered to be conservative.

16.6.3.2 Location-specific risks

The Dutch Guide (Waterstaat, May 2020) sets out the risk of death at specified distances away from the WTGs. These are set out in **Table 16-18**. The radius used for this assessment has adopted an overspeed of 1.5 as a worst-case scenario.

Table 16-18 Location-specific risks around a single WTG

Radius from the WTG	Location-specific risk	Radius from any WTG used within this assessment (m)
Half the rotor diameter	10^{-5} per year	110
Maximum throw distance for a full blade at 1.5 overspeed	10^{-6} per year	734
Maximum throw distance for a tip fragment at 1.5 overspeed	10^{-12} per year	2471

16.6.4 Potential impacts

16.6.4.1 Dwellings

There are two dwellings, R01 and R02, that would be situated within the tip fragment blade throw zone of three separate WTGs. These dwellings are 2,030 metres and 2,063 metres, respectively from the nearest proposed WTG. The specific risk at each dwelling is 3×10^{-12}, which is much lower than the acceptable risk detailed for dwellings of 10^{-6} per year. The risks at dwellings that would be neighbouring the Project are significantly less than that of a being a victim of a lightning strike.

16.6.4.2 Roads

Three routes through the Project area were used to assess blade throw risk. The associated risk for one individual taking this one journey is provided in **Table 16-19**. All routes have been assessed as meeting the acceptable limits of risk.

Table 16-19 Blade throw risk on road network

Road	Location-specific risk	Comparison
Moonbria Road	4.1×10^{-11}	This would allow one person to take this journey 24,400 times a year and remain within the acceptable limits
Mabins Well Road	6.0×10^{-11}	This would allow one person to take this journey 16,770 times a year and remain within the acceptable limits
Goolgumbla Road / Wilson Road	8.9×10^{-11}	This would allow one person to take this journey 11,210 times a year and remain within the acceptable limits

16.6.5 Environmental management measures

Proposed measures to manage and/or mitigate blade throw risks from the Project are detailed in **Table 16-20**.

Table 16-20 Blade throw environmental management measures

Impact	Reference	Environmental management measure	Timing
Blade throw	BT1	Wind turbine components will be manufactured and certified to current best practice Australian and international (IEC 61400-23) safety standards and are equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.	Prior to construction
	BT2	WTGs will be subject to stringent safety and security measures, including regular maintenance and servicing (within an ISO90001 Quality Assurance system).	Prior to construction, construction, operation
	BT3	Contactors certified in the manufacture, delivery, build, inspection, maintenance and repair of turbine components will be employed.	Prior to construction, construction

17. Social impacts

This section summarises the social impacts presented in the Socio-economic impact assessment technical report (**Appendix V**) prepared for the Project in response to the SEARs.

17.1 Assessment methodology

An assessment of the social locality and potential social impacts has been carried out for the Project. The social locality considers communities that may experience changes to daily living conditions or community wellbeing from the Project's location, construction, operation and decommissioning activities. The methodology for the social impact assessment included the following:

- Scoping of likely social impacts and identification of the social locality represented by a primary and secondary study area as described in **Table 17-1** and **Figure 17-1**
- The collection of data for the social baseline included the following:
  - Analysis of population, demographic and employment data for the primary and secondary study areas, including data and information from the Australian Bureau of Statistics (ABS) Census of Population and Housing for 2016 and 2021, related ABS publications and NSW and Australian Government agencies
  - Review of local and State government policies and strategies relevant to the Project and the social environment of the study areas
  - Audit of social infrastructure in towns and centres near the Project, including recreational uses, health and emergency services, education facilities, and community services and facilities
  - Analysis of community values relating to such things as local amenity, character and identify, community cohesion, and community wellbeing and safety, based on the analysis of consultation outcomes, review of existing literature, and findings of other technical studies undertaken for this EIS
  - Targeted engagement with Council officers, police and community organisations, including Jerilderie Police, Jerilderie Country Women's Association and Murrumbidgee Council
- Assessing and evaluating social impacts of Project construction, operation and decommissioning
- Identifying mitigation and enhancement measures to address social impacts.

17.1.1 Study areas

The social locality considers those communities that may experience changes to daily living conditions or community well-being from the siting of the Project or construction, operation and decommissioning activities. The social locality for this socio-economic impact assessment (SEIA) is shown in **Figure 17-1**. It includes those areas within about 50 kilometres of the Project area and towns and centres within commuting distance (i.e. about one hour) of the Project area.

The study area for the assessment represent the social locality and recognises the extent for potential changes to the social environment as a result of the Project (**Table 17-1**).

Table 17-1 Social impact study areas

Study area	Description
Primary study area	Communities within about 50 kilometres of the Project area, including in the towns of Jerilderie and Coleambally within the Murrumbidgee LGA. This includes residents that are likely to experience changes to the visual environment from the presence of the WTGs. People in the primary study area are likely to interact more frequently with construction activities or the Project area (e.g. daily or weekly) due to the proximity of their properties to the Project or as they move around the area for work, education and leisure.
Secondary study area	The secondary study area comprises communities in towns and centres within commuting distance (i.e. about one hour) of the Project area. These are shown in **Figure 17-1** and include: • Darlington Point in the Murrumbidgee LGA • Deniliquin in the Edward River LGA • Finley, Berrigan, Tocumwal and Barooga in the Berrigan LGA • Koonoomoo, Cobram, Yarroweyah and Yarrawonga in the Moira LGA • Oaklands, Urana, Daysdale, and Corowa in the Federation LGA • Leeton, Whitton and Yanco in the Leeton LGA • Carrathool in the Carrathool LGA • Narrandera in the Narrandera LGA. People in the secondary study area are expected to interact with the Project less frequently as they move about the area for work, education and leisure, but may experience temporary impacts during Project construction and decommissioning (both positive and negative) due to such things as an influx of non-local workers and demand for accommodation and services, construction-related employment, and business opportunities.

17.2 Statutory context and guidelines

The social impact assessment has been carried out in accordance with the following relevant legislation, policy and guidelines:

- EP&A Act
- Social Impact Assessment Guideline for State Significant Projects (DPIE, 2021d)
- Riverina Murray Regional Plan 2036 (NSW Government, 2017)
- Edward River Council Community Strategic Plan 2022-2050 (Edward River Council, 2022)
- Edward River Council Economic Development Strategy 2018-2021 (Edward River Council, 2018b)
- Edward River Local Strategic Planning Statement 2020 (Edward River Council, 2020)
- Murrumbidgee Council Community Strategic Plan 2017-2027 (Murrumbidgee Council, 2017)
- Murrumbidgee Council Economic Development Strategy 2019 (Murrumbidgee Council, 2019)
- Murrumbidgee Council Local Strategic Planning Statement 2020 (Murrumbidgee Council, 2020)
- A Guide to Community Benefit Sharing for Renewable Energy Projects (Clean Energy Council, 2019).

Figure 17-1 Social locality and study areas

17.3 Existing environment

17.3.1 Regional and local context

The Project would be located in both the Murrumbidgee and Edward River LGAs, within the Riverina Murray Region of NSW. The Riverina Murray Region is a large agricultural producer and is known for its biodiversity and environmental values such as the Murray River, Murrumbidgee River and Kosciusko National Park. The Riverina Murray Region has three regional centres, including Wagga Wagga, Albury and Griffith. Griffith is located approximately 100 kilometres north east of the Project area and is the closest regional centre to the Project. The nearest towns to the Project area include:

- Townships and smaller towns such as Daysdale, Oaklands, Carrathool, Koonoomoo, Urana, Whitton, Yanco, Darington Point, Berrigan, and Yarroweyah (Victoria)
- Towns such as Barooga, Finley, Tocumwal and Narrandera
- Larger towns and centres such as Corowa, Leeton, Cobram (Victoria) and Yarrawonga (Victoria).

The population of the Murrumbidgee LGA was 3,871 people at the 2021 Census (ABS, 2021a). It was generally unchanged between 2011 and 2021, with the LGA recording a decline in population in more recent years. The Edward River LGA had a population of 9,158 people at the 2021 Census (ABS, 2021b). It grew at about 0.3% annually over the 10 years to 2021, with population growth marginally higher since 2016.

17.3.2 Population and demography

At the 2021 Census, communities in the primary study area generally:

- Have lower proportions of children (aged 14 years or under) compared to the NSW average
- Have higher proportion of people aged 65 years or older compared to the NSW average
- Have higher proportion of working aged people (between 15 and 64 years) compared to the NSW average, however the towns of Jerilderie and Coleambally reported working aged people similar to or lower than the NSW average
- Jerilderie has a higher proportions of Aboriginal and Torres Strait Island people than the NSW average.

The towns within the secondary study area also had generally older populations, with higher median ages, lower proportions of children and higher proportions of older people. All towns, apart from Carrathool, had proportions of older people aged 65 years or over above the State averages. Tocumwal had the highest proportion of older people (at 40.2%), followed by Urana (at 34.3%), and Berrigan (34.2%). In addition, all towns in the secondary study area, apart from Daysdale, Carrathool and Darlington Point had proportions of working aged people aged between 15 years and 64 years below the State averages.

Towns in the secondary study area generally had proportions of Aboriginal and Torres Strait Islander people above the State averages. Darlington Point had the highest proportion (18.4%), followed by Narrandera (14.6%), and Whitton (11.1%).

The primary study area mainly includes communities with moderate levels of relative socio-economic disadvantage, based on the ABS Socio-Economic Indexes for Areas. Localities such as Jerilderie, Bunure, Gala Vale and Argoon east of the Project area, and Mayrung, Hartwood, Lindifferon and Finley south of the Project area displayed lower levels of relative disadvantage.

17.3.3 Housing

There were 1,939 private dwellings in the primary study area at the 2021 Census, of which 1,613 dwellings (about 83%) were occupied. Consistent with other rural and regional areas, single houses are the predominant dwelling type, with separate dwellings representing 96% of all occupied private dwellings. The towns of Jerilderie and Coleambally had 646 dwellings in 2021, of which about 84% were occupied.

In December 2021, there were 917 rental houses in the Murrumbidgee and Edward River LGAs, of which the majority (81%) are within the Edward River LGA. This number has remained stable over recent years, although there has been a decline in the number of new rental houses becoming available in the Edward River LGA in the December quarters of 2020 and 2021.

It is likely that the total number of rental properties in the primary study area is likely to be higher than the recorded bonds information from the Renting & Strata Services Branch, with 195 dwellings (or about 40% of rental dwellings) rented from a family member or other person for which a rental bond is unlikely to be lodged.

Median weekly rents in Edward River and Murrumbidgee LGAs at the December quarter 2021 were $225 and $250 respectively, with these remaining relatively consistent over recent years. Median rents in the LGAs covering the secondary study area ranged from $280 per week in the Berrigan, Leeton and Narrandera LGAs to $375 per week in the Griffith LGA.

17.3.4 Visitor accommodation

Between July 2020 and June 2021, there was a total of 187 accommodation establishments with 10 or more rooms, offering a combined total of 6,071 rooms. This included 117 establishments in The Murray tourism region and 70 establishments in the Riverina region.

The average room occupancy rates in 2020-2021 for the Riverina and Murray tourism regions were 61.6% and 51.3% respectively, which was above the room occupancy rate for NSW. These occupancy rates are likely to be influenced by travel restrictions implemented over the COVID-19 pandemic, with pre pandemic occupancy rates in the order of 67% for the Riverina region and up to 59% in the Murray region, compared to up to 79% in NSW (STR, 2020; STR, 2021a; STR, 2021b). It is expected that the easing of domestic and international travel restrictions related to COVID-19 may see room occupancy rates increase in 2021/2022 and beyond.

There are about 30 visitor accommodation providers within the towns near the Project, and there are about 62 visitor accommodation providers within towns up to about a one-hour drive from the Project area, offering various accommodation options including hotels, motels, motor inns and caravan parks with multiple rooms, B&Bs, and individual holiday houses and apartments. A further 154 accommodation providers are located in towns and centres between about a one hour and a 1.5 hour drive from the Project area. In addition, there are likely to be a range of other smaller accommodation types such as holiday houses and apartments rented through holiday rental sites such as Airbnb.

17.3.5 Social infrastructure

There is no social infrastructure within and surrounding the Project area. Social infrastructure in the primary study area such as schools, recreation facilities, cultural facilities, and health and emergency services are mainly located in towns such as Jerilderie and Coleambally. Social infrastructure in towns within the primary study area are outlined in **Table 17-2**.

Table 17-2. Social infrastructure in the primary study area

Type of facility	Facilities	
Jerilderie		
Education facilities	• Jerilderie Early Learning Centre • Jerilderie Public School	• St Joseph's Primary School
Health and medical services	• Jerilderie Multi-Purpose Service / Jerilderie District Hospital	• Jerilderie Medical Centre
Emergency services	• Fire and Rescue NSW Jerilderie Fire Station	• Jerilderie Police Station
Sport and recreation facilities	• Jerilderie Sports Club • Monash Park (football ground) • Jerilderie Golf Club • Jerilderie Swimming Pool and Sports Complex • Luke Park and Jerilderie Lake	• Brew Park • Elliott Park and Jerilderie Skate Park and Pump Track • Memorial Park • Jerilderie Nature Reserve • Jerilderie Racecourse
Cultural facilities	• Jerilderie Uniting Church • St Stephen's Anglican Church	• Jerilderie Library • Old Printery Museum
Community organisations	• Country Women's Association	• Men's Shed
Coleambally		
Education facilities	• Coleambally Central School Careers • St Peter's Primary School	• Coleambally Central School
Health and medical services	• Coleambally Medical Centre	
Emergency services	• Coleambally Fire Station • Coleambally Rescue Squad – NSW Volunteer Rescue Association	• Coleambally Ambulance Station – NSW Ambulance
Sport and recreation facilities	• Coleambally Sport and Recreation Complex • Coleambally Community Club • Coleambally Skatepark • Coleambally Equestrian Centre • Coleambally Golf Club	• Coleambally Squash Club • Apex Park • Coleambally Lions Park • Curlew Park • Coleambally Pistol Club
Cultural facilities	• Coleambally Community Hall • St Peters Catholic Church	• St Mark the Evangelist Anglican Church
Community support facilities	• Tirkandi Inaburra Cultural and Development Centre	
Conargo		
Education facilities	• Conargo Public School	
Cultural facilities	• Conargo Church	• Conargo Tourist Information Centre

Key community services and facilities in the secondary study area include:

- Secondary and tertiary education facilities (e.g. TAFE) – Including in Deniliquin and Corowa
- Hospital and health care facilities – Including Deniliquin Hospital and Health Services, Berrigan Memorial Hospital, Urana Multi-purpose service, Tocumwal Hospital, Cobram Hospital and Corowa Hospital
- Sport and recreation facilities – Including formal sporting facilities (e.g. sporting ovals, golf courses, swimming pools, racecourses) and informal recreation facilities such as parks, reserves, skateparks, botanic gardens
- Cultural facilities – Including museums and art centres
- Community facilities – Such as RSL clubs in Deniliquin, Oaklands, Tocumwal and Corowa; community halls in Deniliquin, Berrigan, Urana, Yarroweyah, and Corowa.

17.3.6 Community values

The local amenity and character of the primary study area is influenced by the areas of agricultural land uses, rural landscapes and lifestyles, natural features and heritage and history, including history associated with the activities of bushranger Ned Kelly. Jerilderie and Coleambally are the main towns within the primary study area that support agricultural pursuits of the surrounding area and provide a focus for community life.

Feedback from a Project survey identified the importance of the area's agriculture, local history, rural landscape and scenic beauty. The ecological heritage and biodiversity, and recreational opportunities were also identified as important attributes. The area's natural features, rural landscapes, and history and heritage are key attractions for tourists and visitors. They provide economic and employment benefits for residents and business owners. Targeted consultation also identified the openness and vastness of the landscape as being important to the character of the area along with the sense of freedom and safety of the community was also identified.

Local communities in the primary study area display a strong sense of community and pride, with high levels of volunteerism. This includes community events, sporting clubs and community organisations. At the 2021 Census, approximately 29% of people in the study area aged 15 years or over indicated that they undertook voluntary work for an organisation or group, with this increasing to more than one in three people (i.e. above 33%) for numerous rural communities. This is compared to about 13% in NSW.

Feedback from consultation indicated that residents actively participate in a range of community activities. This includes sport, community events, such as the Jerilderie Working Dog Auction and events held at Lake Jerilderie, and fundraising for community projects and the town's history. Feedback from targeted consultation also indicated that people feel a part of something and it was great to be part of the community, and that the community valued that people look after each other, and care about the community and growing it.

Communities in the primary and secondary study areas host a range of community events, including those that celebrate the region's agricultural produce, culture, heritage and history. These events attract visitors from across the wider region and NSW, as well as interstate and international visitors. Examples of some key events include:

- Deni Ute Muster in Deniliquin, held in September/October each year and attracting about 20,000 visitors
- Deni Fest in Deniliquin, which is an arts and cultural event held annually over the Easter weekend
- Griffith Spring Fest, held annually in October
- A Taste of Italy Griffith, held annually in August

- Australian Art Deco Festival in Leeton, held in July
- Taste Coleambally Food and Farm Festival (Taste Coly), held biannually in August
- Weekly or monthly markets, for example Leeton Farmers Market, Yanco Village Markets, Griffith Rotary Markets, and Riverina Producers Market.

17.4 Potential construction impacts

17.4.1 Preliminary scoping

Refinements were made to the Project area and siting of WTGs to avoid proximity to neighbouring dwellings to address social issues identified through the scoping phase and early consultation relating to changes to visual amenity from surrounding dwellings. Further information on Project refinements is provided in **Section 1.5**.

17.4.2 Property

Project construction activities would generally be contained within the Project area, and temporary use of additional property would not be required. During construction, Host Landowner use of and access to areas used for construction activities and temporary construction facilities would be restricted. This may result in temporary disruptions to the use of land within the Host Landowners' wider property for grazing, irrigated cropping or other agricultural activities, and subsequent effects on some agricultural enterprises.

Temporary removal of some farming infrastructure, such as fencing and gates may also be required to allow construction access, possibly requiring temporary changes to existing farming operations (e.g. temporary disruption to the use of some paddocks). Potential disruptions to agricultural operations and rural activities may also occur from the conduct of construction workers in relation to site access (e.g. leaving gates open) and accidental damage to farm infrastructure such as fencing.

Temporary impacts to property will be managed via the management measures outlined in **Section 17.8**, including the implementation of a Community and Stakeholder Engagement Plan and rehabilitation of affected areas.

17.4.3 Population and demography

During construction, potential impacts on population and demography would mainly be associated with the temporary influx of non-local construction workers in nearby towns and centres. As indicated in **Section 3.4**, the Project is anticipated to require a workforce of about 300 people during the 12 month peak construction phase, and about 150 people during the other two years.

Where possible, workers would be sourced from towns and centres up to about a 1.5 hour commute from the Project area (i.e. 'local workers'). However, it is expected that workers would be required outside of the primary and secondary study areas (i.e. 'non-local workers') where specialist skills are not readily available in the local labour force or insufficient unemployment labour is available for lower skilled positions.

Further discussion on positive and negative employment impacts is provided in **Section 17.4.5**.

The assessment considered two scenarios relating to the breakdown of local and non-local workers, being 50% local workforce and 80% local workforce. Assuming between 50% and 80% of workers would be able to be sourced locally, it is anticipated that the influx of non-local workers to towns and centres surrounding the Project area would range from:

- 60 people to 150 people during the peak construction period

- 30 people to 75 people during the non-peak construction periods.

Consistent with many other energy and resource projects elsewhere, it is anticipated that most non-local workers would work on a 'drive-in/ drive-out' basis from major centres rather than relocate to the primary or secondary study areas for the duration of construction. It is also expected that, where possible, the non-local workforce would seek housing and accommodation in towns near the Project area (i.e. Jerilderie, Coleambally, Darlington Point and Deniliquin).

Based on the 2021 estimated resident population, this would result in a temporary population increase during the 12-month peak construction period of between 0.5% and 1.2% across the Murrumbidgee and Edward River LGAs collectively. During the non-peak construction phase, the population increase would be between 0.2% and 0.6%.

Since 2016, the combined population of the Murrumbidgee and Edward River LGAs grew at an average of 0.2% annually, ranging between -0.1% and 0.5%. The temporary population increase from the Project is expected to be similar to or above recent population growth. It is anticipated that the temporary population increase is likely to be skewed towards young males, given the nature of employment opportunities during construction, which may reinforce the existing gender distribution across these LGAs (e.g. 50.3% males to 49.7% females).

While these temporary changes in population and demography may be noticeable in smaller towns such as Jerilderie, Coleambally, and Darlington Point, it is unlikely to impact on population and demography in larger towns such as Deniliquin. Further, towns near the Project currently experience temporary fluctuations in population associated with seasonal tourism and major events such as the Deniliquin Ute Muster. As such, there is likely to be some capacity in local towns to respond to temporary changes in population and demography.

Project employment may provide opportunities for young people to remain in towns and centres near the Project and gain skills in the construction industry and renewable energy sector. It may also attract younger people from regional centres and cities. This is likely to impact positively on population and demography across the primary and secondary study areas, which has an ageing population. The retention and attraction of young people is important for future growth and vitality of towns and centres.

17.4.4 Housing and accommodation

During construction, potential impacts on housing and accommodation would mainly result from increased demand from construction workers. As workers would be sourced from towns and centres up to about a 1.5 hour commute, where possible, this would help to minimise the Project's demand for housing and accommodation in the towns near the Project. However, it is anticipated that construction workers would also come from outside of the study areas, and would need housing and accommodation in towns near the Project.

Based on the assumptions regarding the breakdown of local and non-local workers, it is anticipated that up to 75 workers would require accommodation during non-peak construction periods, with this increasing to about 150 workers over the 12-month peak period. The construction workforce is expected to seek use of a mix of short-term visitor accommodation and private rental accommodation. This would be in towns near the Project area where possible (i.e. Jerilderie, Coleambally, Darlington Point, and Deniliquin in the Murrumbidgee and Edward River LGAs).

While there appears to be some capacity in the availability of rental accommodation in the LGAs covering the primary study area, housing shortages are reported across regional NSW, including the Riverina region (Twyford, 2021), with vacancy rates in the primary and secondary study area at 0.8% in June 2022. Increased demand by construction workers for rental housing has potential to

impact on the availability of rental housing for existing residents. Specifically, increased demand for housing may put pressure on rental prices to increase, possibly reducing the supply of affordable rental housing, and may increase levels of housing stress for vulnerable households.

Feedback from consultation indicated that there was a high proportion of people on fixed incomes in the primary study area, with this partly due to the older population. Reduced housing affordability and increased housing stress may require some households to forego spending on other items in order to cover higher rental prices, or force some households out of the local private housing market in search of more affordable rental housing elsewhere.

Maximising the use of short-term accommodation such as motels, cabins, caravans and other 'guest' accommodation would help to ease demand for rental housing and help to reduce pressure on rental prices. As indicated in **Section 17.3.4**, there are an estimated 30 accommodation providers in towns near the Project (e.g. Jerilderie, Coleambally, Darlington Point, and Deniliquin). In addition to visitor accommodation in towns near the Project, a total of 62 visitor accommodation providers are located in towns up to about a one-hour drive from the Project area, offering various accommodation options including hotels, motels, motor inns and caravan parks with multiple rooms, B&Bs, and individual holiday houses and apartments.

The average room occupancy rates for the Riverina and Murray regions was 67% and 59% respectively in pre-pandemic periods prior to 2020. It is estimated that:

- Between 77 rooms and 95 rooms would be available in Jerilderie, Coleambally, Darlington Point, and Deniliquin
- Between 175 rooms and 217 rooms would be available in towns up to a one-hour commute from the Project area, including those in Jerilderie, Coleambally, Darlington Point, and Deniliquin.

Existing data suggests that there is capacity in short-term accommodation up to about one hour from the Project to accommodate the construction workforce during both the peak and non-peak periods. The use of available, under-utilised tourist accommodation for the construction workforce would have positive impacts for accommodation owners, by providing reliable and consistent business throughout Project construction, particularly during the off-peak tourist periods. This would support increased income for individual accommodation providers, potentially providing opportunities for increased investment in business improvements.

Demand for housing and accommodation would increase during peak tourism periods (e.g. holidays and regional events) and peak agricultural harvest periods where visitors and seasonal workers seek temporary accommodation in the study areas. In accordance with environmental management measures presented in **Section 17.8**, engagement with local accommodation providers, housing support agencies and other relevant stakeholders will be undertaken prior to, and during construction, to assist in managing potential impacts on housing and accommodation. Further, a workforce accommodation strategy will be prepared prior to construction in consultation with Edward River and Murrumbidgee Councils and tourism representatives that outlines strategies to manage demand for accommodation during Project construction.

17.4.5 Employment and training

During construction, the Project would impact positively on employment through the creation of direct employment opportunities. Where possible, the Project would maximise local employment and source workers from existing towns and centres up to about a 1.5-hour commute, subject to the availability of the necessary skills in the local labour force and the level of unemployed labour available for lower skilled positions (e.g. such as traffic management or labourers).

The creation of employment opportunities during construction would support enhanced social outcomes by supporting improved incomes and skills development for individuals. Training opportunities and apprenticeships provided for the Project have potential to deliver benefits for groups such as young people, unemployed, women and Aboriginal people, providing people in these groups to gain the skills in the construction and energy industries.

The development and implementation of a Local Workforce Strategy for construction would help to maximise social outcomes from project-related employment and training. This would outline such things as strategies to maximise employment opportunities for residents in the study areas (e.g. communication of opportunities and worker requirements), strategies relating to training and apprenticeships for Aboriginal people, young people, and women, and engagement with local stakeholders about worker requirements.

17.4.6 Business and industry

During construction, the Project is expected to have positive impacts on businesses in the primary and secondary study areas that supply goods and services to support construction activities. Construction expenditure of the Project would also have positive impacts for industries across the State, including manufacturing, construction, and professional, scientific and technical services.

Increased trade and expenditure associated with purchases by construction workers is also expected to have positive impacts (e.g. increased business income, support opportunities to grow business) for businesses offering goods and services such as accommodation, retail, hospitality, recreation and personal services. These benefits are most likely to occur in towns closest to the Project area, such as Jerilderie, Coleambally, Deniliquin and Darlington Point, although would extend to further towns. This was reflected in feedback from community and stakeholder consultation by Virya Energy and for this socio-economic impact assessment, with potential business opportunities and an increase in the number of people in town with the Project, identified as key benefits of the Project and positives for businesses in the area.

Conversely, increased demand for visitor accommodation by construction workers has the potential to impact on the availability of some accommodation types for travellers and holiday makers. As a result, this would reduce the ability to meet peak tourist demand. Further, demand for Project workers has the potential to increase competition for local workers in the primary and secondary study area. This could result in some workers moving away from their job with existing businesses and industries to work on the Project or for businesses that supply goods and services to the Project. This has potential to negatively impact local business and industry, and affect service provision for communities in the primary and secondary study areas.

Adverse effects on business amenity may also occur for some business during construction due to temporary increases in road traffic noise on roads such as Jerilderie Street, Newell Highway and Kidman Way. Potential noise amenity impacts are discussed in **Chapter 8**.

17.4.7 Social infrastructure

There are no community services or facilities located near the Project area that have potential to be affected by Project construction. During construction, potential impacts on social infrastructure would mainly be associated with an influx of construction workers in towns and centres in the primary and secondary study area resulting in increased demand by construction workers for some community services and facilities.

The temporary influx of working aged people into the study areas during Project construction may have a positive impact on some facilities (e.g. recreation facilities, sporting and community clubs).

These would provide recreation and entertainment options for the construction workforce and would benefit through increased participation and membership of construction workers.

Increased demand by non-local construction workers for essential services such as general health and medical services has the potential to increase the pressure on existing facilities. Increased demand for services by Project construction workers has potential to result in short-term challenges for some residents accessing these services when required, such as increased 'wait times' for services and the need to travel further to access these services elsewhere. In accordance with environmental management measures presented in **Section 17.8**, a workforce health and safety plan would be prepared for the Project that outlines measures for responding to health, medical and safety incidents during Project construction.

17.4.8 Community values

17.4.8.1 Amenity

Potential construction impacts on local amenity and character would mainly be associated with:

- Clearing of vegetation, resulting in changes to landscape, environmental and visual amenity values and impacting on community values relating to the environment
- Changes in local amenity for residential uses closest to the Project, due to noise and dust from construction activities including construction traffic
- Presence of construction infrastructure, resulting in changes to the landscape and visual character for occupants of nearby rural properties.

Adverse changes to residential amenity associated with construction traffic noise for the Project has potential to diminish peoples' enjoyment of their properties. It is recognised that any impacts are likely to be transient due to the nature of construction traffic movements. However, for some people the disruptions caused by construction traffic noise may affect their use of outdoor areas or areas of their dwelling fronting the road. Potential impacts associated with noise and landscape visual amenity are presented in **Chapter 7** (landscape and visual amenity) and **Chapter 8** (noise and vibration).

17.4.8.2 Community cohesion

The temporary influx of non-local workers from outside the study areas may cause some community members to be concerned about possible disparities in levels of community participation between residents and non-local workers; potential for residents' access (either perceived or actual) to services and facilities, including housing to be affected; or increased incidences of anti-social behaviour, possibly affecting their sense of cohesion, trust and community safety amongst community members. Targeted consultation indicated that issues of anti-social behaviour had previously occurred on other projects, due to labourers drinking too much during free time and causing trouble.

It is anticipated that up to 150 people would temporarily relocate to towns in the primary and secondary study area during the peak construction period, with up to 75 people during the non-peak period. The potential for these workers to affect levels of community cohesion would be dependent on where they choose to live. Effects would more likely be experienced in towns with smaller populations (e.g. Jerilderie and Coleambally) rather than larger towns such as Deniliquin.

The implementation of protocols relating to worker conduct in local communities and ongoing engagement with local communities would assist in managing any potential adverse change in community cohesion associated with the Project.

17.4.8.3 Wellbeing and safety

During construction, potential impacts on community wellbeing and safety would mainly result from the use of local and regional roads for construction traffic, and potential road safety risks, either actual or perceived, for road users.

There is potential that some haulage activities (e.g. delivery of WTGs) would need to be carried out outside of standard daytime construction hours due to requirements of NSW Police or other authorities. Noise from night-time construction traffic has potential to disrupt sleeping patterns for occupants of dwellings along some haulage roads. Potential noise impacts associated with sleep disturbance is presented in **Chapter 8** (noise and vibration).

17.4.8.4 Access and connectivity

Increased use of local and regional roads, including by heavy vehicles and for OSOM deliveries, may cause concerns for local communities due to temporary disruptions and possible road safety risks for road users, potentially impacting local communities, tourists and commercial and freight operators. The traffic assessment undertaken for the Project determined that Project construction would not have a significant impact on road safety, refer to **Chapter 12**.

Concerns about increased construction traffic and potential damage to already damaged roads was identified during targeted consultation. Where required, local road upgrades, including culvert upgrades and intersections, would be undertaken prior to construction, which would help to improve the quality of the local road network and maintain or improve road safety on roads used by the Project. Traffic management measures will also be detailed in a Traffic Management Plan to maintain access and road safety and minimise disruptions for road users (refer to **Section 12.7**).

17.5 Potential operational impacts

17.5.1 Property

Potential property impacts during Project operation would mainly be associated with direct property impacts from with the siting of project infrastructure such as WTGs, access tracks and ancillary infrastructure. The Project would be located across eight properties, which are currently used for sheep and cattle grazing, irrigated cropping and groundwater extraction. During operation, land within the Project area, outside of that used for the WTGs, access tracks and associated infrastructure, would continue to be used for agricultural activities such as grazing.

Regular lease payments would be provided to Host Landowners for the use of land. In addition, Associated Landowners would receive an annual financial participation contribution. This would have beneficial impacts by providing an additional income stream over the life of the Project.

In terms of adverse changes, potential impacts would occur for owners and occupants of properties near the Project due to the introduction of the WTGs and individuals' perceptions on local amenity. Potential impacts on visual amenity are discussed in **Chapter 7** (landscape and visual amenity).

17.5.2 Population and demography

Project operation is expected to generate employment for about 20 to 30 people, including both on site staff and remote workers. It is anticipated that many workers for the on-site roles would be sourced from existing residents of communities in the primary and secondary study areas. However, it is expected that some jobs would require specialist skills that are not available locally. The location of where workers and their families would live would be dependent on the circumstances and needs of individual families. It is, however, expected that most would relocate

to towns up to about a one-hour commute from the Project. This would represent a negligible increase in the population of these towns as a whole.

The Project has potential to support the retention of existing residents in the primary study area, by providing local employment opportunities for the Project operation, and regular payments to Host Landowners and neighbouring property owners. Payments provided to Host Landowners and Associated Landowners within eight kilometres of a WTG would also provide an additional non-farm income for these property owners, supporting enhanced financial wellbeing.

17.5.3 Housing and accommodation

As indicated in **Section 17.3.3**, existing data on rental bonds indicates that there were about 900 rental houses in the Edward River and Murrumbidgee LGAs, of which about 80 houses were new rentals. More broadly, there were about 5,000 bonds held for rental properties in LGAs in the secondary study area, of which about 350 bonds were for new rentals. Given the relatively minor demand for houses from the operational workforce (i.e. 10 to 15 houses), it is expected that demand for housing from the Project would be met by current housing supply in the primary and secondary study areas with minimal social impacts.

17.5.4 Employment and business

Local employment provided by the Project would have positive impacts for individuals employed. It would also provide opportunities for enhanced social outcomes over the long-term through ongoing incomes for individuals and skills development.

During operation, the Project would provide opportunities for local contractors, suppliers and businesses in the primary and secondary study areas that support the ongoing operation and maintenance of the Project. This would have positive impacts on these businesses by supporting improved incomes and business development.

Land within the Project area that would not be affected by permanent infrastructure such as WTGs, access tracks and electrical substations could continue to be used for agricultural purposes such as grazing. This would help to minimise potential impacts on agricultural businesses.

Regular lease payments would be provided to Host Landowners with WTGs for the life of the Project. This would help to offset any potential loss of income associated with the reduction in land available for agricultural activities or any changes to farming operations. Regular lease payments would also provide a stable passive income for the landowners. In addition, Associated Landowners would receive an annual financial participation contribution. This would have beneficial impacts for owners of agricultural businesses by allowing landowners to diversify and expand their income streams, and support the ongoing viability of some agricultural businesses.

17.5.5 Social infrastructure

The Project would be located away from social infrastructure, such as recreational or community facilities, and is not expected to impact on the use or operation of facilities during Project operation.

The implementation of the community benefit fund during operation would support local initiatives, including the development of new or upgraded community services and facilities in the study areas. This would have positive impacts for communities and visitors in the primary and secondary study area, supporting improved social outcomes, such as increased community cohesion, health and wellbeing.

17.5.6 Community values

17.5.6.1 Amenity

Changes to agricultural activities due to the introduction of WTGs and associated Project infrastructure may be a concern for some people and cause them to feel a sense of loss relating to the rural landscape and traditional agricultural uses. This was identified through survey undertaken for the Project, with two respondents identifying concerns about effects of the Project on land use. Concerns about the loss of productive land was also raised in stakeholder consultation undertaken by the proponent for the Project. This impact is likely to be exacerbated by loss of agricultural land from other proposed renewable energy projects in the South West REZ.

The introduction of WTGs and ancillary infrastructure may present a significant change to the locality and rural landscape of the Project area and surrounds, resulting in changes to views and visual outlook from some public spaces and residential dwellings. Visual and landscape changes from the Project have potential to impact on amenity for residents and occupants of rural properties, potentially affecting some peoples use and enjoyment of their property, particularly from areas of the property that provide views of the WTGs. It is noted that the extent of this impact would be dependent on individual perceptions, with some near neighbours indicating that they were not concerned about seeing the WTG during consultation undertaken by Virya Energy for the Project. The potential impacts to visual amenity are discussed in **Chapter 7** (landscape and visual amenity).

Noise was identified as a key concern by one respondent to the Project survey. Potential noise from the operation of the WTGs, including individuals' perceptions about potential noise impacts, may also impact on the amenity of dwellings and rural properties closest to the Project. This noise has potential to negatively affect residents' use of their dwellings and detract from their enjoyment of their property. Engagement with landowners and/or residents of these properties would be undertaken about potential impacts and proposed management measures. Operation of the substations is not expected to result in noise impacts at sensitive receivers. Further discussion about potential operational noise impacts is provided in **Chapter 8** (noise and vibration).

17.5.6.2 Community cohesion

Potential impacts of the Project's operation on community cohesion would mainly be associated with the unequal distribution of Project impacts and benefits, including the distribution of financial benefits and impacts of infrastructure development (e.g. reduced landscape and visual amenity).

Host Landowners would directly benefit from lease payments received for the life of the Project. Neighbour participation agreements would also allow benefits of the Project to be shared more equitably with property owners surrounding the wind farm who have potential to experience impacts of the Project (e.g. adverse changes to local amenity). The Project would also make annual contributions to a community benefit fund that would support community projects and local initiatives across the Murrumbidgee and Edward River LGAs. This would have positive social impacts and enhance social outcomes for communities, clubs and organisations in the primary study area and ensure that communities that are likely to experience changes from the Project (e.g. on landscape and visual amenity) directly benefit from the Project in their community.

17.5.6.3 Wellbeing and safety

During operation, potential impacts on community wellbeing and safety would mainly be associated with community perceptions about possible effects on the health of individuals from such things as low frequency noise and EMF from associated electrical infrastructure. Operation of the WTGs are not expected to result in any low frequency or tonal noise impacts and the predicted EMF levels

form the operation of the Project would be expected to be below the levels specified in the ICNIRP guidelines at sensitive receptors (refer to **Section 16.3** (EMF and human health)).

Community concerns were also raised during consultation about potential for the Project to impact fire services and the use of water bombers. Wind farms can act as direct obstacles for aerial firefighting operations, due to moving blades and wake turbulence, presence of such things as transmission infrastructure and meteorological towers, and interference with radio transmissions. The Project would include a range of bush fire protection measures to minimise potential risk to firefighting operations (refer to **Chapter 16.4** (bush fire risk)).

17.5.6.4 Access and connectivity

Operational activities that would generate traffic would predominantly come from operational workforce travelling within, to and from the Project area in light vehicles, and carrying out maintenance activities at WTGs. These activities are not expected to have any day-to-day impacts on local property access, including community perceptions of road safety.

New or upgraded access tracks provided by the Project would support all-weather access and improved road conditions for local roads in the Project area, impacting positively on local access for landowners and local road users.

17.6 Potential decommissioning impacts

The life of the Project is anticipated to be in the order of 30 years. Once the design life of the Project comes to an end, there may be opportunities for the Project to be repowered or the site would be decommissioned and the land rehabilitated.

During Project decommissioning, potential socio-economic impacts would be similar to those of construction, and would mainly be associated with:

- Impacts on local employment and business, including opportunities for individuals and businesses to support decommissioning activities
- Influx of workers for decommissioning activities to towns and centres near the Project, potentially resulting in temporary changes to local population and demography, and increasing demand for housing and accommodation, and on local services and facilities
- Impacts on community values due to amenity impacts for nearby properties from decommissioning activities
- Increased traffic and truck movements associated with the removal of project infrastructure and decommissioning activities.

Decommissioning would involve the removal of Project infrastructure and rehabilitation of the affected land. It is assumed that the Project area would be reinstated for rural land uses, consistent with the existing land uses. The removal of Project infrastructure such as WTGs, and the rehabilitation of the affected land would change the landscape and visual environment of the Project area and surrounding area from that during Project operation.

A detailed assessment of potential impacts of decommissioning activities on socio-economic conditions and values in the primary and secondary study area would be undertaken prior to the commencement of decommissioning activities. This would include the identification of strategies to manage potential negative impacts and enhance potential positive impacts.

17.7 Evaluation of significance

Table 17-3 presents a summary of the identified socio-economic impacts of Project construction and operation, along with an evaluation of the likely level of significance. The evaluation of significance is based on the evaluation framework outlined in **Section 17.1**. The level of significance of decommissioning impacts would be similar to those for construction.

Table 17-3 Significance evaluation of potential socio-economic impacts

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Construction impacts									
Property	Temporary disruptions to the use of land within landowners wider property due to restrictions on access to areas used for construction	Negative	Possible	Minor	Medium	• Minimise area of land affected by temporary construction activities • Consider wider property operations in siting of temporary construction facilities	Possible	Minimal	Low
	Temporary changes to existing farming operations due to temporary removal of farm infrastructure	Negative	Possible	Minor	Medium	• Consultation with host landowners prior to removal of farm infrastructure about any temporary arrangements • Reinstate farm infrastructure affected following construction in consultation with the landowner	Possible	Minimal	Low
	Disruptions to agricultural operations and rural activities due to conduct of construction workers (e.g. leaving gates open)	Negative	Likely	Minor	Medium	• Develop and implement land access agreements and protocols for workers • Ongoing engagement with host landowners about timing and duration of construction activities	Unlikely	Minor	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Population and demography	Temporary changes to population and demography due to influx of non-local construction workers	Neutral	Likely	Minimal	Low	• Develop and implement local workforce strategy to maximise number of local construction workers and minimise influx of non-local construction workers	Likely	Minimal	Low
	Retention and attraction of young people due to local employment opportunities	Positive	Possible	Minimal	Low	• Develop and implement local workforce strategy to maximise employment opportunities for residents in the study areas	Possible	Minor	Medium
Housing and accommodation	Reduced availability of affordable housing impacting low or fixed income households (e.g. increased housing stress or movement out of local private housing market)	Negative	Likely	Moderate	High	• Develop and implement workforce accommodation strategy prior to construction • Maximise use of short-term accommodation • Engagement with local accommodation providers, housing support agencies and other relevant stakeholders	Possible	Minor	Medium

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	Increased income for accommodation providers due to use of available, under-utilised tourist accommodation for construction workers	Positive	Likely	Moderate	High	• Maximise use of short-term accommodation	Likely	Moderate	High
	Reduced availability of visitor accommodation for travellers and holiday makers, reducing ability to meet tourism demand during peak periods	Negative	Possible	Moderate	Medium	• Develop and implement workforce accommodation strategy prior to construction • Engagement with local accommodation providers • Consideration of timing of major regional events and peak tourist periods in construction planning	Possible	Minor	Medium
	Potential to deter seasonal workers due to increased housing and accommodation costs	Negative	Possible	Moderate	Medium	• Develop and implement workforce accommodation strategy prior to construction • Engagement with local accommodation providers • Consideration periods of seasonal employment in construction planning	Possible	Minor	Medium

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Employment and training	Improved incomes and skills developments for individuals due to creation of local employment on the Project	Positive	Likely	Moderate	High	• Develop and implement local workforce strategy to maximise employment opportunities for residents in the study areas	Almost certain	Moderate	High
	Skills development relating to training and apprenticeship opportunities on the Project	Positive	Likely	Moderate	High	• Develop and implement local workforce strategy, which includes strategies relating to training and apprenticeships for Aboriginal people, young people, and women • Work with local contractors and relevant stakeholders (e.g. Aboriginal groups, youth and women organisations) to identify and develop training and education opportunities.	Almost certain	Moderate	High
Business and industry	Use of local suppliers and businesses leading to improved business income and livelihoods for business owners and employees, and opportunities for business growth and development	Positive	Likely	Moderate	High	• Maximise local business opportunities in project procurement practices, including encouraging contractors to source local goods and services, where possible • Establish a register of local businesses for upcoming work and communicate to	Almost certain	Moderate	High

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
						local communities prior to and during construction opportunities and requirements for work on Project construction • Engagement with local Councils and business groups about local business requirements and necessary skills to improve preparedness of local business			
	Reduced availability of visitor accommodation for travellers and holiday makers, reducing ability to meet tourism demand during peak periods	Negative	Possible	Moderate	Medium	• Develop and implement workforce accommodation strategy prior to construction • Engagement with local accommodation providers • Consideration of timing of major regional events and peak tourist periods in construction planning	Possible	Minor	Medium
	Increased competition for local workers leading to workers moving away from existing business and industry leading to increased cost of	Negative	Possible	Moderate	Medium	• Develop and implement local workforce strategy, which includes strategies to minimise potential for movement of workers away from existing industries	Unlikely	Moderate	Medium

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	services or ability to provide services					• Implementation of training to increase local skills and availability of labour			
	Reduced business amenity due to increased road traffic noise on regional roads, including during evening and night-time	Negative	Possible	Minor	Medium	• Where possible, restrict haulage activities during night-time hours (noting, WTGs are required to be transported at night) • Communication with businesses in Jerilderie, Coleambally, Finley, and Tocumwal about the timing and duration of major haulage activities • Implement environmental management measures outlined in **Section 8.7** (noise and vibration)	Unlikely	Minor	Low
Social infrastructure	Increased participation in recreation, sporting and community clubs due to influx of construction workers	Positive	Possible	Minor	Medium	• No mitigation measures required	Possible	Minor	Medium
	Impact on residents accessing community services due to increased demand for	Negative	Possible	Minor	Medium	• Implement worker health and safety measures on site • Engagement with managers of community facilities in	Unlikely	Minor	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	social infrastructure from non-local workers					towns closest to the Project about timing of potential influx of non-local workers			
	Increased demand for emergency services affecting ability to respond to incidents elsewhere	Negative	Possible	Minor	Medium	• Engagement with local emergency service providers in the preparation and planning of emergency response procedures	Unlikely	Minimal	Low
Community values	Impact on community values relating to the environment due to clearing of native vegetation	Negative	Possible	Minor	Medium	• Minimise extent of native vegetation clearing, where possible	Unlikely	Minor	Low
	Adverse amenity impacts due to noise and dust from construction activities	Negative	Possible	Minor	Medium	• Implementation of environmental management measures (e.g. noise attenuation, dust suppression) • Early and ongoing communication with local residents closest to construction activities • Restricting work to daylight hours where possible	Unlikely	Minor	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	Temporary amenity impacts for residents at Liddles Lane due to increased traffic noise	Negative	Unlikely	Minimal	Low	• Early and ongoing communication with local residents at Liddles Lane • Where possible, restrict haulage activities during night-time hours (noting, WTGs are required to be transported at night)	Unlikely	Minimal	Low
	Temporary amenity impact for residents along regional roads (e.g. Jerilderie Street, Kidman Way, Newell Highway) due to increased traffic noise	Negative	Possible	Minor	Medium	• Where possible, restrict haulage activities during night-time hours (noting, WTGs are required to be transported at night) • Communication with residents in Jerilderie, Coleambally, Finley, and Tocumwal about the timing and duration of major haulage activities • Implement environmental management measures outlined in **Section 8.7** (noise and vibration)	Unlikely	Minor	Low
	Impacts on community cohesion due to influx of non-local construction workers (e.g., due to disparities	Negative	Possible	Minor	Medium	• Develop and implement protocols relating to worker conduct	Unlikely	Minimal	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	in community participation, impact on residents' access to services, possible anti-social behaviour)					• Early and ongoing engagement and communication about the Project with communities in the primary and secondary study areas • Encourage community ownership of the Project by maximising local employment and business opportunities. • Encourage contractors and workers to participate in community organisations and community life. • Implementation of Community Benefit Fund at commencement of construction that provides support to community groups and facilities			
	Health and wellbeing effects due to sleep disturbances associated with increased road traffic noise	Negative	Possible	Minor	Medium	• Where possible, restrict haulage activities during night-time hours (noting, WTGs are required to be transported at night) • Communication with communities in Jerilderie, Coleambally, Finley, and Tocumwal about the timing	Unlikely	Minor	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
						and duration of major haulage activities • Where possible, minimise the number of continuous nights that night-time haulage activities occur • Implement environmental management measures outlined in **Section 8.7** (noise and vibration)			
Access	Temporary traffic disruptions and road safety risks from use of local and regional roads by construction traffic	Negative	Possible	Minor	Medium	• Implementation of traffic management measures • Early and ongoing engagement and communication with communities and road users in the primary and secondary study areas about potential construction traffic impacts • Implementation of local road and intersection upgrades used for construction access	Unlikely	Minor	Low
Economic impacts	Regional and State GVA and employment impacts due to Project expenditure (refer to **Chapter 18**)	Positive	Almost certain	Major	Very high	• No mitigation measures required	Almost certain	Major	Very high

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Operational impacts									
Property	Economic benefits for host landowners and associated landowners (e.g. additional income stream) due to regular lease payments and annual financial participation contribution	Positive	Almost certain	Moderate	High	• No mitigation measures required	Almost certain	Moderate	High
Population and demography	Population increase due to permanent relocation of non-local workers and their families to towns in the primary study area for the Project	Neutral	Unlikely	Minimal	Low	• No mitigation measures required	Unlikely	Minimal	Low
	Retention of existing residents due to regular payments to host landowners and associated landowners and employment opportunities	Positive	Possible	Minimal	Low	• No mitigation measures required	Possible	Minimal	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Housing and accommodation	Reduced housing affordability and increased housing stress for low and fixed income households due to increased demand for housing by non-local operational workers	Negative	Unlikely	Minor	Low	• Encourage non-local operational workers to look at housing in towns across the study areas to minimise housing demand in one town only	Unlikely	Minimal	Low
Employment and training	Local employment on the Project leading to enhanced incomes and skills development for individuals	Positive	Possible	Minor	Medium	• Develop and implement local workforce strategy to maximise employment opportunities • Work with relevant stakeholders to implement training and education relevant to the Project operation	Possible	Moderate	Medium
Business and industry	Opportunities for participation of local businesses supporting improved incomes and opportunities for business development	Positive	Likely	Moderate	High	• Development and implement local procurement strategy • Establish register of local businesses for upcoming work	Almost certain	Moderate	High

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
						• Engagement with local Councils and business groups about local business requirements and necessary skills to improve preparedness of local businesses			
	Regular payments and contributions to host landowners and associated landowners, allowing them to diversify and expand income streams and support viability of agricultural businesses	Positive	Almost certain	Moderate	High	• No mitigation measures required	Almost certain	Moderate	High
Social infrastructure	Implementation of community benefit fund, supporting local initiatives (e.g. development of new or upgraded facilities)	Positive	Almost certain	Moderate	Very high	• Engagement with local Council, community organisations and other relevant stakeholders to identify community needs to allow targeted investment	Almost certain	Major	Very high

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Community values	Changes to agricultural activities and sense of loss of rural landscape and traditional agriculture due to introduction of WTGs	Negative	Likely	Major	High	• Minimise loss of productive agricultural land in the siting of the WTGs and associated infrastructure	Likely	Moderate	High
	Changes to landscape and visual environment impacting on residential amenity and people's use and enjoyment of their properties	Negative	Possible	Moderate	Medium	• Implementation of environmental management measures outlined in **Section 7.7** (landscape character and visual amenity)	Possible	Minor	Medium
	Changes to landscape and visual environment detracting from the enjoyment or experience of the primary study area for some individuals and deterring them from visiting the area	Negative	Possible	Minor	Medium	• Implementation of environmental management measures outlined in **Section 7.7** (landscape character and visual amenity)	Possible	Minor	Medium
	Potential for shadow flicker for nearby residential uses	Negative	Rare	Minimal	Low	• No mitigation measures required	Rare	Minimal	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	Changes to night-time amenity for motorists using local roads and highways from night-time obstacle lighting.	Negative	Unlikely	Minimal	Low	• No mitigation measures required	Unlikely	Minimal	Low
	Potential disruptions to night-time amenity and use and enjoyment of outdoor areas due to night-time obstacle lighting	Negative	Possible	Minor	Medium	• Implementation of measures outlined in **Section 7.7** (landscape character and visual amenity)	Unlikely	Minor	Low
	Noise from operation of the WTGs (perceived or actual) impacting amenity for occupants of dwellings and rural properties closest to the wind farm	Negative	Possible	Minor	Medium	• Implementation of environmental management measures outlined in **Section 8.7** (noise and vibration)	Possible	Minimal	Low
	Perceptions about unequal distribution of Project impacts and benefits leading to adverse impacts on community cohesion	Negative	Possible	Minor	Medium	• Provide regular conditions to community benefit fund to support community initiatives and activities	Unlikely	Minor	Low

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
	Implementation of community benefit fund supporting social outcomes for communities, clubs and organisations	Positive	Almost certain	Moderate	Very high	• Engagement with local Council, community organisations and other relevant stakeholders to identify community needs to allow targeted investment	Almost certain	Major	Very high
	Community perceptions about possible effects on health of individuals (i.e. from EMF, low frequency noise)	Negative	Possible	Minor	Medium	• Implementation of environmental management measures outlined in **Section 8.7** (noise and vibration) and **Section 16.3.4** (health and EMF)	Unlikely	Minor	Low
	Potential disruption to aerial fire services due to presence of WTGs	Negative	Possible	Minor	Medium	• Implementation of environmental management measures outlined in **Section 16.4.5** (bush fire risk)	Possible	Minimal	Low
Access	Generation of traffic associated with operation and maintenance activities	Negative	Rare	Minimal	Low	• No mitigation measures required	Rare	Minimal	Low
	Improvements in property access due to improved road conditions form new or upgraded access tracks	Positive	Likely	Moderate	High	• No mitigation measures required	Likely	Moderate	High

Impact		Nature	Without mitigation			Mitigation measure	With mitigation		
			Likelihood	Magnitude	Significance		Likelihood	Magnitude	Significance
Economic impacts	Regional and State GVA and employment impacts due to Project expenditure (refer to **Chapter 18**)	Positive	Almost certain	Major	Very high	• No mitigation measures required	Almost certain	Major	Very high

17.8 Environmental management measures

Proposed measures to manage and/or mitigate social impacts from the Project are detailed in **Table 17-4**.

Measures relating to land access agreements and economic impacts are detailed in **Section 15.8** (land) and **Section 18.6** (economic impacts).

Table 17-4 Social environmental management measures

Impact	Reference	Environmental management measure	Timing
General social impacts	S1	A Community and Stakeholder Engagement Plan (CSEP) will be prepared and implemented to help provide timely and accurate information to the community during construction. The plan will include but not be limited to: • Mechanisms to provide details and timing of proposed activities, potential impacts and mitigation measures to nearby residents and communities, visitors and motorists (e.g. haulage activities, high noise generating activities, etc) • Processes for engaging with affected residents and stakeholders about potential impacts and proposed management measures • Process for receiving and responding to queries and complaints regarding Project construction.	Prior to construction
Property	S2	To minimise potential impacts to property, the Project will: • Minimise area of land affected by temporary construction activities and consider wider property operations in the siting of temporary construction facilities • Consult with Host Landowners prior to removal of farm infrastructure, about any temporary arrangements, and reinstate affected farm infrastructure following construction in consultation with the landowners • Ongoing engagement with Host Landowners, in accordance with the CSEP about timing and duration of construction activities.	Prior to construction, construction, operation
Housing and accommodation	S3	A Workforce Accommodation Strategy will be prepared for the Project, in consultation with relevant stakeholders, to manage demand for housing and accommodation from the construction workforce during construction, which includes but will not be limited to: • Strategies to maximise the use of short-term accommodation, while also managing potential effects on tourists and holiday makers during peak tourist periods and major regional events, and seasonal workers	Prior to construction, construction, operation

Impact	Reference	Environmental management measure	Timing
		• Processes for engaging with local accommodation providers, housing support agencies and other relevant stakeholders about anticipated demand for housing and accommodation by the construction workforce • Mechanisms to encourage non-local operational workers to look at housing in towns across the study areas to minimise housing demand in one town only.	
Social infrastructure	S4	To minimise potential impacts to social infrastructure, the Project will: • Implement worker health and safety measures on site, including preparation and implementation of Workforce Health and Safety Plan that includes measures for responding to health, medical and safety incidents during construction • Engagement with local emergency service providers in the preparation and planning of emergency response procedures • Engage with managers of community facilities in towns closest to the Project in accordance with the CSEP about timing and duration of a potential influx of non-local workers.	Prior to construction, construction
Community values	S5	To minimise potential impacts to community values, the Project will: • Carry out early and ongoing communication with local residents closest to construction activities and along Liddles Lane about the timing, duration and potential impacts on construction and haulage activities • Communicate with communities in Jerilderie, Coleambally, Finley and Tocumwal about the timing and duration of major haulage activities • Where possible, restrict haulage activities during night-time hours (noting that WTGs are required to be transported at night) • Where possible, minimise the number of continuous nights that night-time haulage activities occur • Develop and implement protocols relating to worker conduct • Encourage contractors and workers to participate in community organisations and community life • Carry out early and ongoing engagement and communication about the Project with communities in the primary and secondary study areas • Implement Community Benefit Fund at commencement of construction that provides support to community groups and facilities • Continue engagement with local Council, community organisations and other relevant stakeholders to identify community needs to allow targeted investment.	Prior to construction, construction

Impact	Reference	Environmental management measure	Timing
Access	S6	Early and ongoing engagement and communication will be carried out with communities and road users in the primary and secondary study areas about potential construction traffic impacts.	Prior to construction, construction
Decommissioning	S7	A detailed assessment will be undertaken of potential impacts of decommissioning activities on socio-economic conditions and values in the primary and secondary study area prior to the commencement of decommissioning activities, including identification strategies to manage potential negative impacts and enhance potential positive impacts.	Prior to decommissioning

18. Economic impacts

This section summarises the economic impacts presented in the Socio-economic impact assessment technical report (**Appendix V**) prepared for the Project in response to the SEARs.

18.1 Assessment methodology

The methodology for the assessment involved the following:

- Describing the economic baseline and existing regional economy
- Assessing and evaluating economic impacts of Project construction, operation and decommissioning
- Using the input-output (I-O) analysis to quantitatively assess contributions to gross value added (GVA) and employment (refer to **Section 18.1.1**)
- Identifying mitigation and enhancement measures to address economic impacts.

The study areas for the economic assessment are the same as those described in **Table 17-1**.

18.1.1 Input-output analysis

The following provides an overview of the I-O methodology used to quantitatively assess contributions to gross value added (GVA) and employment.

The total economic impact of a project comprises direct and indirect economic impacts. The project expenditure also creates larger economic activity as it moves through the economic system. The following provides an overview of each of these impacts:

- Direct impacts are those that relate to the initial or immediate activity (e.g. employment generated during construction and operation and expenditure on the construction materials)
- Indirect impacts (or production-induced impacts) are those resulting from the linkages between different parts of the economy (e.g. increases in output and employment from businesses supporting the direct suppliers to the Project)
- Induced impacts (or consumption-induced impacts) are those resulting from increased income to the employees and owners of the businesses directly supplying the Project. When this income is spent in the economy for personal consumption, it generates induced effects in the economy
- Total economic impacts are the sum of direct, indirect and induced impacts.

The I-O analysis provides an estimate of the total economic impact of project expenditure, based on I-O tables that describe relationships between suppliers and buyers across industries and sectors within the economy. The types of economic impacts that have been analysed in this assessment using I-O modelling are GVA and employment (refer to **Table 18-1**).

The assessment is based on the development and construction cost estimates provided by Muller Partnership – Capital Investment Value Report (Muller Partnership, 2022).

Table 18-1 Impact types in the I-O model

Impact type	Description
GVA	GVA is equal to economic output, less the costs of goods and services used by these industries in the production process (intermediate consumption) but before deducting consumption of fixed capital (depreciation). To avoid double counting, only the value added at each stage of production is included in GVA and not the total expenditure. This is the standard measure in Australia to represent the size of an economy.
Employment	A measure of employment levels (full time equivalents) required to service the demand for economic output per annum.

Further details on the I-O analysis including multipliers and distribution of expenditure is provided in Socio-economic impact assessment technical report (**Appendix V**).

18.2 Statutory context and guidelines

The economic assessment has been carried out in accordance with the following relevant guidelines:

- NSW Treasury Employment Calculator - Input-Output Methodology (NSW Treasury, 2020)
- Wind farm investment, employment and carbon abatement in Australia (Clean Energy Council, 2012).

18.3 Existing environment

The Riverina Murray Region is one of Australia's most productive and diverse agricultural regions. Primary production in the region includes beef and sheep grazing, broad-acre cropping, and irrigated cropping, including cotton, rice and horticulture. The Murrumbidgee River delivers water to major food producing areas of the Murrumbidgee Irrigation Area and Coleambally Irrigation Area. Combined, these irrigation areas provide over a quarter of fruit and vegetable production in NSW and are also one of Australia's largest export sources of bulk wines (Regional Development Australia, 2022).

Renewable energy generation is one of eight priority growth sectors identified for the Riverina Murray Region. Others in the Murrumbidgee and Edward River LGAs being agribusiness, tourism, and transport and logistics (NSW Government, 2017).

18.3.1 Business, industry and tourism

There was a total of 1,645 businesses in the Edward River and Murrumbidgee LGAs at 30 June 2020, with a further 7,317 businesses in the LGAs covering the secondary study area (ABS, 2022).

The main industries of business in the study areas reflect the importance of agriculture and tourism to local and regional communities. Agriculture, forestry and fishing related businesses comprised the largest proportion of businesses in each of the LGAs covering the primary and secondary study area, with other key business industries being:

- Rental, hiring and real estate services
- Construction
- Accommodation and food services
- Retail trade
- Transport, postal and warehousing (ABS, 2022).

The majority of businesses in the LGAs covering the primary and secondary study area comprise small businesses employing up to four people. These include 'non-employing' business such as sole traders or partnerships with no employees in addition to the business owners. Apart from the Carrathool LGA, non-employing businesses comprised between about 62% and 66% of businesses in each LGA, with businesses employing between one and four people comprising about a quarter of businesses in each LGA.

Larger businesses employing 20 or more people accounted for between 1% and 2.9% of businesses in the study areas LGAs. The LGAs with the highest proportions of larger businesses included Leeton (2.9%), Griffith (2.8%) and Edward River (2.8%) (ABS, 2022).

Tourism data for the primary and secondary study area is presented at a tourism region level. The study areas fall into two tourism regions, being:

- Riverina, which includes the major towns of Griffith, Gundagai, Hay, Leeton, Temora, and Wagga Wagga
- The Murray, which includes the main centres of Albury, Corowa, Deniliquin, Moama, Balranald and Wentworth.

Over the 12 months ending December 2021, there were 1.87 million domestic overnight and daytrip visitors to the Riverina region and 1.95M visitors to The Murray region. These numbers are likely to reflect domestic and international travel restrictions associated with the COVID-19 pandemic, with pre pandemic visitor numbers in the order of 2.6 million to 2.8 million annually for each region. The majority of visitors to the tourism regions are domestic daytrip visitors, most of which come from other areas of NSW.

The primary purposes of travel for domestic overnight visitors in 2021 was visiting friends and relatives, and holidays. The Riverina region also attracted a high number of business travellers, with this group making up about 29% of domestic overnight visitors for the 12 months to December 2021.

18.3.2 Income and employment

At the 2021 Census, communities in the primary study area generally had higher personal incomes and lower household incomes compared to NSW. Median household incomes for the SA1s in the primary study area ranged from $766 to $2,333 per week, with the average being $1,559, compared to $1,829 in NSW. Median personal incomes for the SA1s ranged from $550 per week to $1,187 per week, with the average of the SA1s being $820. This is compared to a median personal income of $813 in NSW.

There was a total of 2,395 people in the primary study area who were working or looking for work at the 2016 Census, representing a labour force participation rate of 61.8%. Labour force participation rates across the primary study area were generally above the NSW average. There were 69 people in the primary study area who were unemployed at the 2016 Census, representing an unemployment rate of 2.9%.

Agriculture, forestry and fishing was the main industry of employment in the primary study area at the 2016 Census, with this industry employing nearly 50% of workers aged 15 years or over. This reflects the agricultural land uses in the primary study area with key activities including sheep and cattle grazing and irrigated cropping. There were 117 people in the primary study area who were working in the construction industry at the 2016 Census, representing about 5.0% of working people. About 3.1% of workers were employed in the transport, postal and warehousing industry, and 0.6% in electricity, gas, water and waste services.

The towns of Jerilderie and Coleambally reported labour force participation rates below the NSW average, which may in part reflect the older population of these communities. Levels of unemployment for communities in these towns were generally below the NSW average.

18.4 Potential construction impacts

18.4.1 Economic impacts

The total construction costs for the Project are estimated to be $3.45 billion. This total fee includes an escalation percentage of 5% per annum from 2024 totalling $332M, however this is not included in the estimated construction costs below as this fee does not create added value or generate employment in itself, and thus cannot economic benefits cannot be attributed to it.

Table 18-2 presents a breakdown of the estimate construction costs.

Table 18-2 Estimated development and construction spend

Category	Percentage	Estimated cost
Civil works	6%	$183,089,721
Electrical works	18%	$554,053,962
External grid connection works	3%	$107,150,820
Turbine supply & installation	73%	$2,274,635,999
Total	**100%**	**$3,118,930,502**

Table 18-3 presents outcomes of the I-O analysis for Project construction. Assigning the categories of construction costs to relevant ABS industries, the Project is expected to generate a total GVA increase of $1.095.53 billion to NSW during the construction period. This is primarily attributed to the manufacturing, construction, and professional, scientific and technical services industries

Table 18-3. Total NSW GVA (construction) ($M)

ABS industry	Direct effect	Indirect effect	Induced effect	Total
Manufacturing	228.81	252.11	146.62	627.54
Construction	120.09	170.90	86.41	377.39
Professional, scientific and technical services	40.47	28.49	21.64	90.59
Total	**389.37**	**451.49**	**254.67**	**1,095.53**

Table 18-4 presents an overview of the distribution of the total GVA between the region and rest of the State based on the Clean Energy Council (2012) estimate of distribution of expenditure. Project construction is expected to generate a GVA increase of $391.26M for the Project region and $704.27M for the rest of the State.

Table 18-4 GVA (construction) – region and rest of the State ($M)

ABS Industry	Direct effect	Indirect effect	Induced effect	Total
Region				
Manufacturing	81.72	90.04	52.36	224.12
Construction	42.89	61.03	30.86	134.78
Professional, scientific and technical services	14.45	10.17	7.73	32.35
Total (Region)	**139.06**	**161.25**	**90.95**	**391.26**
Rest of the State				
Manufacturing	147.09	162.07	94.26	403.42
Construction	77.20	109.86	55.55	242.61
Professional, Scientific and Technical Services	26.02	18.31	13.91	58.24
Total (Rest of State)	**250.31**	**290.25**	**163.72**	**704.27**

In addition, the GVA generated through project expenditure will create jobs as it circulates through the economy, in the form of supply chain impacts. **Table 18-5** shows that the expected total impact on employment from Project expenditure is estimated to reach up to 22,892 full time equivalent (FTE) person years of employment during Project construction.

Table 18-5 Total State employment (FTE person-years) from Project expenditure (construction)

ABS Industry	Direct effect	Indirect effect	Induced effect	Total
Manufacturing	6,548	4,985	1,602	13,135
Construction	4,945	3,086	944	8,975
Professional, scientific and technical services	274	272	236	782
Total	**11,767**	**8,343**	**2,782**	**22,892**

Table 18-6 provides an overview of the distribution of employment creation between the region and rest of the State based on the Clean Energy Council (2012) estimate of distribution of expenditure. Of the 22,892 FTE person-years of employment during construction, 8,176 FTE person-years are expected to be created regionally, with 14,716 created in the rest of the State.

Table 18-6 Employment (FTE person-years) from Project investment (construction) – region and rest of State

ABS Industry	Direct effect	Indirect effect	Induced effect	Total
Region				
Manufacturing	2,338	1,780	572	4,691
Construction	1,766	1,102	337	3,205
Professional, scientific and technical services	98	97	84	279
Total (Region)	**4,202**	**2,980**	**994**	**8,176**

ABS Industry	Direct effect	Indirect effect	Induced effect	Total
Rest of the State				
Manufacturing	4,209	3,205	1,030	8,444
Construction	3,179	1,984	607	5,770
Professional, scientific and technical services	176	175	152	503
Total (Rest of State)	**7,564**	**5,363**	**1,789**	**14,716**

18.5 Potential operational impacts

18.5.1 Economic impacts

The total operating costs over the 30-year life of the Project are estimated to be $936M. **Table 18-7** provides outcomes of the I-O analysis for Project operation. The project is expected to generate a total GVA increase of $467.16M to NSW over the 30-year operating period (i.e. $15.57M per annum). This is primarily attributed to the electricity, gas, water and waste, construction, and other services industries.

Table 18-7 Total State GVA per annum (operations) ($M)

ABS industry	Direct effect	Indirect effect	Induced effect	Total
Other services	7.70	1.68	3.51	12.89
Construction	0.67	0.95	0.48	2.09
Electricity, gas, water and waste	0.27	0.20	0.12	0.59
Total	**8.64**	**2.83**	**4.10**	**15.57**

Table 18-8 provides an overview of the distribution of the total GVA between the region and rest of the State based on the Clean Energy Council estimate of distribution of expenditure. Operation of the Project is expected to generate a GVA increase of $10.38M per annum for the region and $5.19M per annum for the rest of the State.

Table 18-8 Distribution of GVA per annum (operations) – region and rest of State ($M)

ABS industry	Direct effect	Indirect effect	Induced effect	Total
Region				
Other services	5.13	1.12	2.34	8.59
Construction	0.44	0.63	0.32	1.39
Electricity, gas, water and waste	0.18	0.13	0.08	0.40
Total (Region)	**5.76**	**1.89**	**2.74**	**10.38**
Rest of the State				
Other services	2.57	0.56	1.17	4.30
Construction	0.22	0.32	0.16	0.70

ABS industry	Direct effect	Indirect effect	Induced effect	Total
Electricity, gas, water and waste	0.09	0.07	0.04	0.20
Total (Rest of State)	**2.88**	**0.94**	**1.37**	**5.19**

The operation and maintenance of the Project would support direct employment for 20 to 30 staff. In addition, the GVA generated through Project expenditure will create jobs as it circulates through the economy, in the form of supply chain impacts. As indicated in **Table 18-9**, the expected total impact of Project expenditure on employment is estimated to reach up to 500 FTE person years of employment per annum during Project operation.

Table 18-9 State employment (FTE person years of employment per annum) from Project expenditure (operations)

ABS industry	Direct effect	Indirect effect	Induced effect	Total
Other services	388	19	38	445
Construction	27	17	5	50
Electricity, gas, water and waste	2	2	1	6
Total	**417**	**38**	**45**	**500**

Table 18-10 provides an overview of the distribution of employment creation between the region and rest of the State based on the Clean Energy Council (2012) estimate of distribution of expenditure. Of the 500 FTE person-years of employment per annum, 333 FTE person-years are expected to be created regionally, with 167 created in the rest of the State.

Table 18-10 Distribution of employment (FTE person years of employment per annum) from Project investment (operations) – region and rest of State

ABS Industry	Direct effect	Indirect effect	Induced effect	Total
Region				
Other services	258	12	26	296
Construction	18	11	3	33
Electricity, gas, water and waste	2	1	1	4
Total (Region)	**278**	**25**	**30**	**333**
Rest of the State				
Other services	129	6	13	148
Construction	9	6	2	17
Electricity, gas, water and waste	1	1	0	2
Total (Rest of State)	**139**	**13**	**15**	**167**

18.6 Environmental management measures

Proposed measures to manage and/or mitigate economic impacts from the Project are detailed in **Table 18-11**.

Measures relating to social impacts are detailed in **Section 17.8** (social impacts)

Table 18-11 Economic environmental management measures

Impact	Reference	Environmental management measure	Timing
Employment and training	E1	A Local Workforce Strategy will be prepared for the Project, in consultation with local Councils and relevant stakeholders, that includes but is not limited to: • Strategies to maximise employment opportunities for residents in the study areas, including strategies to communicate to local communities (prior to and during construction) opportunities and requirements for work on the Project • Strategies relating to training and apprenticeships for Aboriginal people, young people, and women, including consultation with local contractors and relevant stakeholders (e.g. Aboriginal groups, youth and women organisations) to identify and develop training and education opportunities • Engagement with local Councils in the primary and secondary study areas in accordance with the CSEP about construction and operational workforce numbers and timing • Strategies to minimise potential for movement of workers away from existing industries.	Prior to construction, construction, operation
Business and industry	E2	To minimise potential impacts to business and industry, the Project will: • Commit to considering local business opportunities in Project procurement practices, including encouraging contractors to source local goods and services, where possible • Establish a register of local businesses for upcoming work and communicate to local communities prior to and during construction opportunities and requirements for work on Project construction • Engage with Edward River and Murrumbidgee Councils and business groups in accordance with the CSEP about local business requirements and necessary skills to improve preparedness of local business • Implement training to increase local skills and availability of labour	Prior to construction, construction, operation

19. Waste

19.1 Assessment methodology

Assessment of waste management and potential impacts was carried out using a desktop assessment. A detailed analysis of waste types, classification and management methods, estimated quantities of waste associated with Project construction, operation and decommissioning would not be available until Project detailed design, during which the WTG manufacturer specifications and construction contractor will be determined.

An indicative waste type classification is provided below in **Section 19.2**.

19.2 Statutory context and guidelines

The assessment has been carried out with consideration with the following relevant legislation, policy and guidelines:

- POEO Act
- Protection of the Environment Operations (Waste) Regulation 2014
- *Waste Avoidance and Resource Recovery Act 2001* (WARR Act)
- NSW Waste Avoidance and Resource Recovery Strategy 2014-2021 (NSW EPA, 2014a)
- The Waste Classification Guidelines (NSW EPA, 2014b) which includes the resource management hierarchy objectives underpinning the WARR Act, from most to least preferable:

  1. Avoid and reduce waste
  2. Reuse waste
  3. Recycle waste
  4. Recover energy
  5. Treat waste
  6. Disposal of waste.

In addition, Schedule 1 of the POEO Act lists six classifications of waste as follows:

- General solid waste (non-putrescible)
- General solid waste (putrescible)
- Hazardous waste
- Liquid waste
- Restricted solid waste
- Special waste.

The classification of waste streams associated with the Project is outlined in **Table 19-1**.

19.3 Existing environment

There are several licensed waste management facilities in the area near the Project. The Murrumbidgee Council operates the following waste depots (Murrumbidgee Council, 2022):

- Coleambally Waste Depot (Martin Bell Road, Coleambally NSW 2707)
- Darlington Point Waste Depot

Similarly, Edward River Council operates the following waste depots (RAMJO Murray Waste Group, 2022):

- Deniliquin Landfill Depot (Tip Road, Deniliquin NSW 2710), operating under Licence No. 6188
- Blighty Waste Disposal Depot (Riverina Highway, Blighty NSW 2713)
- Conargo Landfill (McKenzie Street, Conargo NSW 2710)

- Pretty Pine Landfill (Gibbs Road, Pretty Pine NSW 2710)
- Wanganella Landfill (Cobbs Highway, Wanganella NSW 2710)
- Booroorban Landfill (Cobbs Highway, Booroorban NSW 2710).

Metal recycling facilities are available at Blighty Waste Disposal Depot, Deniliquin Landfill Depot and Pretty Pine Landfill Depot. The Deniliquin Landfill Depot, and the Coleambally, Darlington Point, Jerilderie Waste Depots also supports the national drumMuster program, which accepts triple rinsed plastic and steel drums. Oil drums are not accepted.

The landfill sites that accept used motor oil are located at Blighty, Conargo, Pretty Pine, Wanganella and Booroorban landfills.

Sewage treatment plants are located at the Deniliquin Sewage Treatment Plant at Calimo Street, Deniliquin (Licence No. 1694), Jerilderie Sewage Treatment Plant at Wilson Road, Jerilderie (Licence No. 1692), and Murrumbidgee Council Sewage Plant at Boyd Street, Darlington Point (Licence. No. 6260).

Consultation has been carried out with Edward River Council regarding the use of Deniliquin Landfill Depot for general waste generated by the Project. Further consultation will be carried out with local Council regarding sewage and waste disposal options for the Project prior to construction.

19.4 Impact assessment

19.4.1 Waste management

Waste generated by the Project would predominantly be during Project construction and decommissioning. Waste generated during the operation would be minimal as it would only involve maintenance or monitoring activities with a small operational workforce.

The anticipated likely waste types during construction, operation and decommissioning are included in **Table 19-1**. The estimated quantity of waste streams are based on the quantities provided in **Table 20-3**.

Table 19-1 Anticipated waste generation and management strategies

Waste type	Description/source	Classification	Project phase	Quantity (tonnes)	Management
Paper and cardboard	General office wastes, packaging materials	General solid waste (non-putrescible)	• Construction • Operation • Decommissioning	328	Separated for recycling
Wood	Pallets and cable drums, timber offcuts	General solid waste (non-putrescible)	• Construction • Decommissioning	1	Separated for reuse or recycling
Plastic	Packing materials, ties, straps and excess building materials such as safety fencing and barriers	General solid waste (non-putrescible)	• Construction • Decommissioning	0.4	Recyclable and non-recyclable waste will be separated. Materials unable to be recycled or reused on site will be classified for lawful disposal.
Green waste	Cleared vegetation	General solid waste (non-putrescible)	• Construction	To be determined during detailed design	Beneficial on-site or off-site reuse where feasible. Weeds will be separated, sprayed and bagged and non-weedy vegetation will be mulched for reuse. Any excess green waste will be disposed appropriately.
Soil	Surplus spoil from excavations and earthworks	General solid waste (non-putrescible)	• Construction	To be determined during detailed design	On-site or off-site reuse where feasible, or disposal at a licenced facility Any contaminated soils (if encountered) will be tested and treated on-site and disposed at a suitably licensed facility.
Hydrocarbons	Spills from construction plant and refuelling Used lubricants, oils and fuels, contaminated water from equipment washing.	Liquid waste	• Construction • Decommissioning	3.4	Any spills will be cleaned up, with the clean-up material placed in dedicated covered skip bin for collection and off-site disposal at a suitably licensed facility. Refuelling will only occur in controlled areas.

Waste type	Description/source	Classification	Project phase	Quantity (tonnes)	Management
					Used liquids will be collected in tanks and transported to suitably licensed facility.
Sewage	Biological wastes from on-site septic systems, portable ablutions facilities pump-out	Liquid waste	• Construction • Operation • Decommissioning	1,313	Waste will be collected by a contractor and disposed off-site at a suitably licensed facility or through existing sewage treatment system.
General domestic	Food scraps, aluminium cans, glass bottles, plastic and paper containers	General solid waste (putrescible and non-putrescible)	• Construction • Operation • Decommissioning	26	Waste will be collected by a contractor and disposed off-site at a suitably licensed facility.
Commercial waste	Empty fuel/lubricant, filters and oily rag drums and storage containers (non-volatile), herbicide and pesticide storage containers	General solid waste (non-putrescible)	• Construction • Operation • Decommissioning	656	When in use, storage containers will be stored in appropriately bunded hardstand areas. Empty containers will be collected by a contractor and disposed off-site at a suitably licensed facility.
Wind turbines	Resin, fibreglass, metals and electrical components	General solid waste (non-putrescible)	• Decommissioning	To be determined during detailed design	Consistent with current Industry practice, blades will be disposed of by being cut to a size to facilitate handling and transportation and disposed of to landfill (in consultation with Council). Alternative disposal methods for recycling and reuse will be investigated with the manufacturer (Siemens Gamesa) which is creating solutions to produce fully recyclable WTGs by 2040. Metal structures and electrical components will be separated where possible and sent to a suitably licensed facility for recycling.

Waste type	Description/source	Classification	Project phase	Quantity (tonnes)	Management
Foundations	Reinforced concrete	General solid waste (non-putrescible)	• Decommissioning	66	Foundations will remain in situ where it is determined to be more environmentally disruptive to remove the foundation.
Transmission and reticulation line poles	Electrical components and metal structures	General solid waste (non-putrescible)	• Decommissioning	328	Metal components will be disassembled and sold as scrap metal where possible or disposed of to a suitably licensed facility.
Chemical/ dangerous goods	Lithium-ion cell and BESS components	Hazardous waste	• Decommissioning	To be determined during detailed design	Transportation, disposal and/or recycling of lithium-ion batteries and BESS components will be carried out in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).

19.4.2 Resource use and availability

The quantity of materials required for the Project are unlikely to impact on the availability of local or regional resources.

19.5 Environmental management measures

Proposed measures to manage and/or mitigate waste from the Project are detailed in **Table 19-2**.

Table 19-2 Waste environmental management measures

Impact	Reference	Environmental management measure	Timing
Waste	W01	A Waste Management Plan (WMP) will be prepared which will include a detailed breakdown of waste types and quantities in accordance with relevant legislation and guidelines. It will outline the strategies to reuse, recycle and dispose of waste and will also refine the indicative waste quantities for each waste type. Specific measures in the WMP will include: • Removal of packaging waste • Separation of recyclable and non-recyclable materials where possible • Waste receptacles will be collected on a regular basis by licensed contractors or Council collection service and transported for off-site disposal at a suitably licensed landfill or recycling facility • All waste disposal will be in accordance with the POEO Act and Waste Classification Guidelines (NSW EPA, 2014) • Waste tracking will occur for any types and quantities of waste that trigger the requirement for tracking • An objective to ensure that any use of local waste management facilities does not exhaust available capacity nor disadvantage the local community.	Prior to construction

20. Greenhouse gas

20.1 Assessment methodology

The overall objective of the greenhouse gas (GHG) impact assessment is to provide an assessment of GHG emissions associated with the construction and operation of the Project.

The assessment methodology follows the principles set out in the Greenhouse Gas Protocol (GHG Protocol) (World Business Council for Sustainable Development and the World Resources Institute (WRI), 2003). According to the GHG Protocol, GHG emissions are split into three categories listed below:

- **Scope 1** – Direct emissions of GHGs from sources that are owned or operated by a reporting organisation (examples – combustion of diesel in company owned vehicles or used in on-site generators)
- **Scope 2** – Indirect emissions associated with the import of energy from another source (examples – import of electricity from the grid, or heat)
- **Scope 3** – Other indirect emissions – other than energy imports (above) which are a direct result of the operations of the organisation, but from sources not owned or operated by them (examples include offsite third-party haulage of wastes and manufacture of construction materials).

For the purposes of this GHG impact assessment for the Project, Scope 1, Scope 2 and material Scope 3 emissions have been determined for construction and operation. The GHG inventory (refer to **Table 20-1**) includes an assessment of all material GHG/energy sources (Scopes 1, 2 and 3 emissions) associated with construction activities within the Project area, and at potential ancillary sites/activities (where known and significant).

All emission factors used for the calculation of emissions were derived from the Infrastructure Sustainability Council's emissions calculator tool v2.0.08 (ISC, 2021).

Table 20-1 Construction GHG inventory

Source of GHG emission (construction)	Activity	Included in inventory?	Direct	Indirect	
			Scope 1	Scope 2	Scope 3
Stationary fuel	Fuel consumed by generators for operation of site offices	✓	•		•
Transport fuel	Fuel consumed for use in site management vehicles (utility vehicles)	✓	•		•
Stationary fuel	Fuel consumed by construction plant / equipment	✓	•		•
Transport fuel	Fuel consumed for construction materials delivery and spoil/rock removal	✓			•
Purchased electricity	Electricity consumed in project offices	×		•	•
Purchased electricity	Electricity consumed in construction plant / equipment	×		•	•
Carbon sinks	Land clearing / soil disturbance	✓	•		

Source of GHG emission (construction)	Activity	Included in inventory?	Direct	Indirect	
			Scope 1	Scope 2	Scope 3
Construction materials	Embodied emissions of materials used in construction	✓			•
Transport fuel	Change in road traffic use (fuel consumption) due to traffic impacts around construction zones	×			•
Transport fuel	Employee / business air travel	×			•
Landfill	Construction waste degradation disposed at landfill	✓			•
Transport fuel	Employee commute (vehicles)	×			•

20.2 Statutory context and guidelines

The assessment has been carried out with consideration with the following relevant legislation, policy and guidelines:

- *Electricity Infrastructure Investment Act 2020*
- The Paris agreement (United Nations, 2015)
- NSW Net Zero Plan Stage 1: 2020-2030 (NSW Government, 2020a)
- NSW Electricity Infrastructure Roadmap 2020 (DPIE, 2020a).

20.3 Existing environment

The Australian Department of Industry, Science, Energy and Resources publishes reports and databases that estimate and account for Australian GHG emissions from 1990 onward. NSW GHG emissions have gradually dropped over the seven years of latest available data (2014-2020), with emissions reductions from the energy sector a key contributor to this reduction, as presented in **Figure 20-1**. While total emissions have also gradually reduced in Australia over the same period, emissions from the energy sector increased, before starting a gradual decline in 2019.

Project construction would be expected to add a relatively negligible quantity of emissions to the total State and national emissions. There would be very little direct emissions from the operation of the Project expected during its life, and the electricity generated from the Project would offset carbon emissions from fossil fuel-based generation.

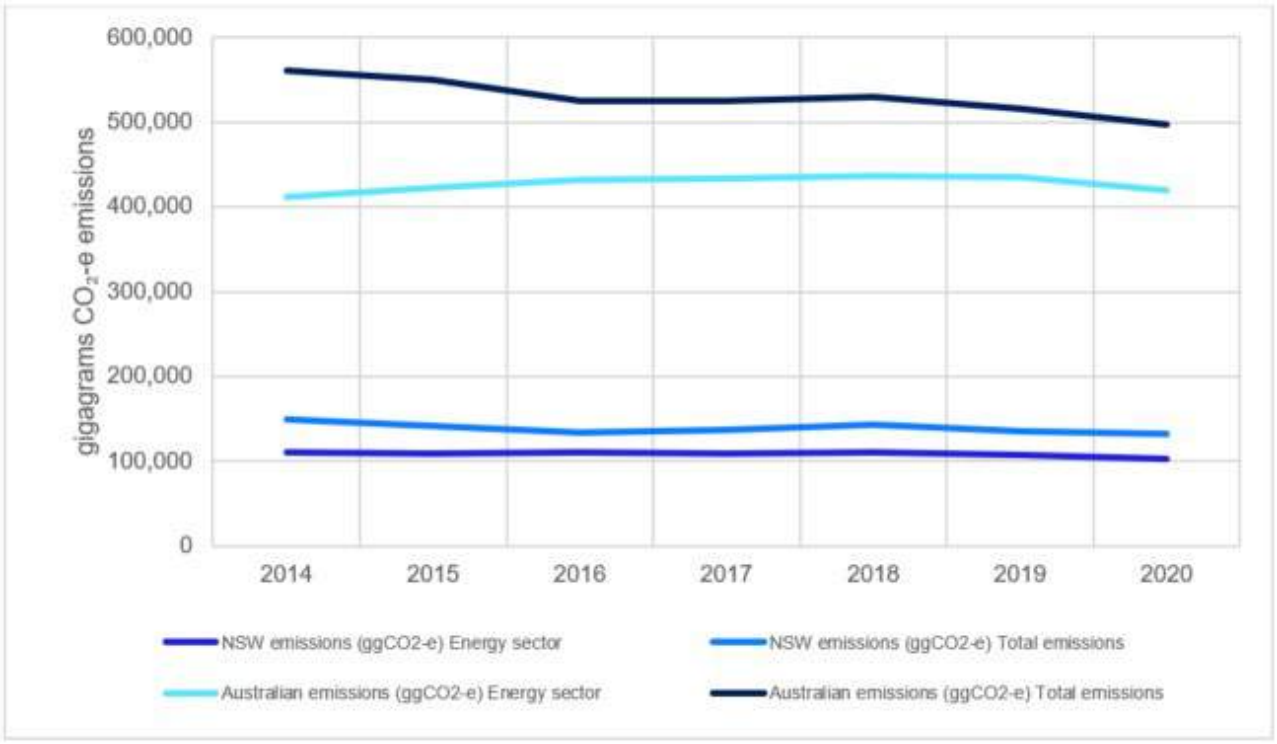

Figure 20-1 Greenhouse gas emission trends, 2014-2020

Note: 1 gigagram = 1,000 tonnes

20.4 Potential construction impacts

20.4.1 Construction materials

The largest contributor of emissions was found to be embodied Scope 3 emissions from Project materials. The total embodied Scope 3 emissions from materials are approximately 3.04 megatons of carbon dioxide equivalent ($MtCO_2$-e). The breakdown of material quantities is presented in **Table 20-2** alongside the predicted Scope 3 emissions. Of this total, 89% of the emissions would be from the WTGs, as shown in **Figure 20-2**.

All WTG components have been assumed to be shipped from the Port of Shanghai to GeelongPort (approximately 9,500 kilometres), from where the components are transported by truck to the Project area (approximately 500 kilometres).

The material Scope 3 emissions have also been assessed for the BESS, substations and transmission line.

Table 20-2 Scope 3 emissions form materials

Emission Source	Source	Quantity	Scope 3 Emission Factor tCO2-e	Scope 3 Emissions tCO2-e
Materials – Embodied (WTGs)	Hub (steel)	44,100 t	2.65	116,865
	Nacelle (steel)	47,775 t	2.65	126,604
	Tower (steel)	398,370 t	2.65	1,055,681
	Blades x 3 (composite fibreglass)	47,775 t	9.23	440,764
	Concrete footing (assumed 50 MPa)	1,058,400 t	0.97	1,030,587
	Steel reinforcement bars	44,100 t	1.98	87,318
	Crane Hardstand Area (aggregates)	173,250 m^3	0.01	872
Materials – Embodied (BESS)	Battery modules	970,000 kWh	0.1	100,210
	Battery racks	1,300 t	3.26	4,237
	Inverters	1,800 t	4.08	7,344
	Transformers – large	240 t	5.44	1,306
	Transformers – small	6 t	5.44	30
	Battery container	3,000 t	3.26	9,777
	Reinforcement steel	100 t	1.80	180
	Concrete	4,800 m^3	0.39	1,851
	Cables	40 t	2.88	114
Materials – Embodied (Substations)	Collector Substation (x8) Concrete	12,000 m^3	0.97	11,685
	Collector Substation (x8) Reinforcing Steel	1,600 t	1.98	3,168
	Collector Substation (x8) Structural Steel	2,400 t	3.72	8,928
	Primary Substation (x1) Concrete	3,000 m^3	0.97	2,921
	Primary Substation (x1) Reinforcing Steel	100 t	1.98	198
	Primary Substation (x1) Structural Steel	700 t	3.72	2,604
Materials – Embodied (Transmission & Cabling)	Transmission Line (32 km)	67t	10.02	674
	Overhead power line (58 km)	130 t	10.02	1,302
	Transmission Lines Steel	5,000 t	3.72	18,600
	Transmission Lines Concrete	8,000 m^3	0.97	7,790
	Underground Cabling	200 t	0.98	196
Total				**3,041,806**

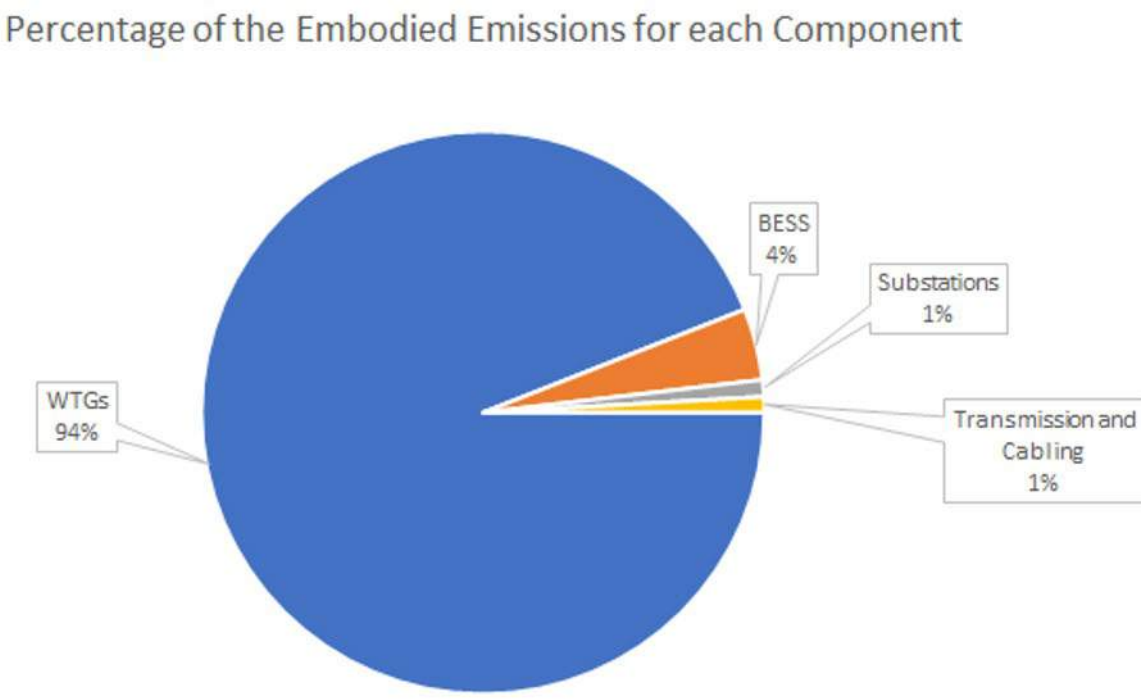

Figure 20-2 Percentage of total material embodied emissions for each component of the Project

20.4.2 Construction summary

Table 20-3 presents the quantities of each emission source and the total projected GHG emissions. The total emissions projected from Project construction would be approximately 3.4 $MtCO_2$-e, with the embodied emissions of the materials being the predominant source. This is evident in **Figure 20-3** as 96% of emissions are embodied in the materials with 2% of the emissions from the transportation of these materials. The emissions from the transport and degradation of waste can be considered negligible.

Table 20-3 Summary of emissions from construction

Emissions Source	Source	Quantity	Scope 1 Emissions tCO_2-e	Scope 2 Emissions tCO_2-e	Scope 3 Emissions tCO_2-e	Total Emissions tCO_2-e
Fuel Consumption	Stationary plant/ equipment[1]	6,383 kL	17,295	-	887	18,182
Vegetation Clearance	Grasslands	100 ha	11,000	-	-	11,000
	Acacia Open Woodland	30 ha	6,270	-	-	6,270
	Eucalypt Open Woodland	1 ha	209	-	-	209
	Callitris Woodland	1 ha	217	-	-	217
Materials – Embodied	WTGs	(refer to **Table 20-2**)	-	-	2,858,691	2,858,691
	BESS	(refer to **Table 20-2**)	-	-	125,050	125,050
	Substations	(refer to **Table 20-2**)	-	-	26,531	26,531
	Transmission & Cabling	(refer to **Table 20-2**)	-	-	27,260	27,260
Transport of Materials	Transport of materials to site	5,502,424,551 t.km	-	-	73,605	73,605
Emissions from waste – landfill degradation	Concrete	66 t	-	-	0	0
	Plastic packaging	0.1 t	-	-	0	0
	Plastics (PET)	0.3 t	-	-	0	0
	Cardboard packaging/ paper waste	328 t	-	-	1,083	1,083
	Glass	1 t	-	-	0	0
	Recyclable domestic waste	0 t	-	-	0	0
	Personal Protective Equipment	2 t	-	-	4	4
	Metals (ferrous and non-ferrous)	328 t	-	-	66	66
	Empty chemical drums	656 t	-	-	131	131

Emissions Source	Source	Quantity	Scope 1 Emissions tCO_2-e	Scope 2 Emissions tCO_2-e	Scope 3 Emissions tCO_2-e	Total Emissions tCO_2-e
	Timber	1 t	-	-	0.4	0.4
	Electronics and electrical infrastructure	0.5 t	-	-	0.2	0.2
	Paint	0.1 t	-	-	0.2	0.2
	Oil spill clean-up material	0.4 t	-	-	0.2	0.2
	Waste oils, lubricants and liquids	3 t	-	-	1	1
	Septic tank waste	1,313 t	-	-	525	525
	Domestic Waste	26 t	-	-	42	42
Transport of Waste[2]	Transport of waste from site to landfill	6,054,664 t.km	-	-	437	437
Total			**34,991**		**3,117,304**	**3,3,152,294**

Note:
[1] assumed to be operating using diesel for 100% of each phase duration operating for 8 hours a day and 4 hours a night (6 days a week)
[2] The distance to landfill has been assumed to be 100 kilometres from the Project area and was used for calculating the emissions from transporting the waste to landfill.

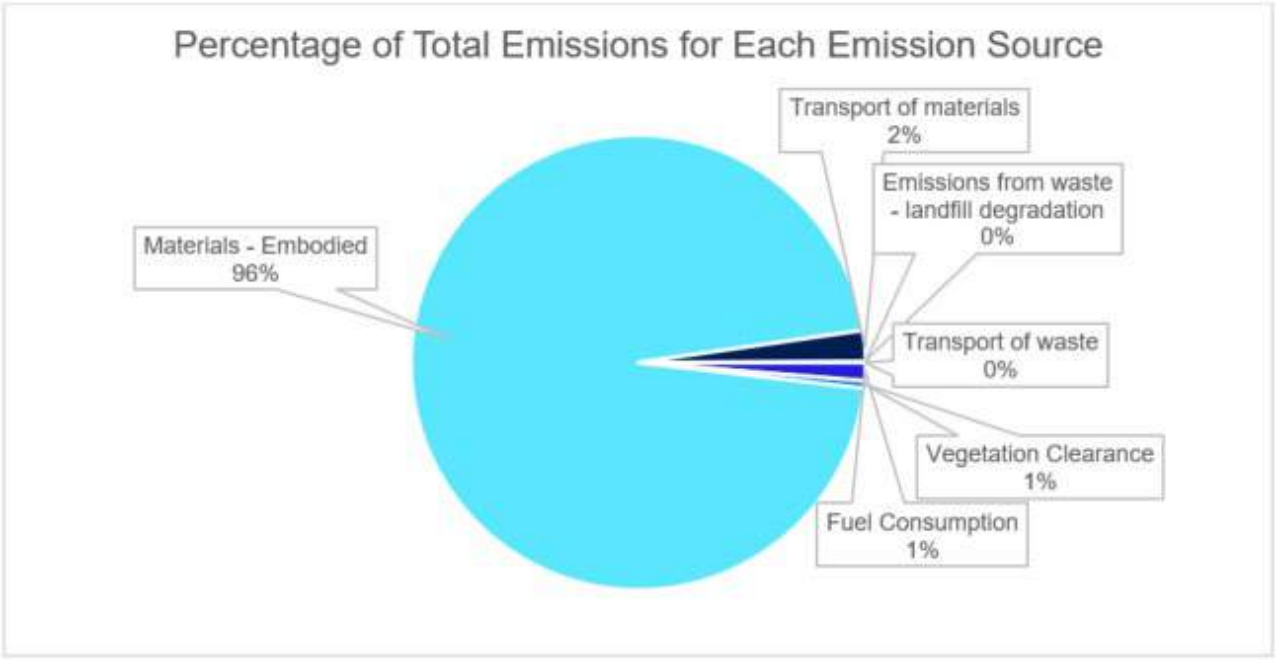

Figure 20-3 Percentage of total emissions for each emissions source

20.5 Potential operational impacts

Operational emissions produced by the Project during operation and maintenance are expected to be minimal.

20.5.1 Operational carbon offset

The generating capacity of the wind farm would be about 1,500 MW, with an assumed maximum output capacity of approximately 1,664 MW/h (8.0 MW x 208 WTGs). This would give a potential power output of 14,587 GWh/year, assuming all WTGs are operating 24 hours a day, 365.25 days a year at full capacity. As this is not realistic, the capacity factor is applied, which considers downtime, expected wind conditions and other factors. The capacity factor stated for this Project is 38%, which gives the potential an energy output of 5,543 GWh/year.

As different fuel sources for power generation have varying emissions, using the emissions intensity is a useful method of comparing the emissions of each fuel source. **Figure 20-4** shows the emissions intensity for common fuel sources.

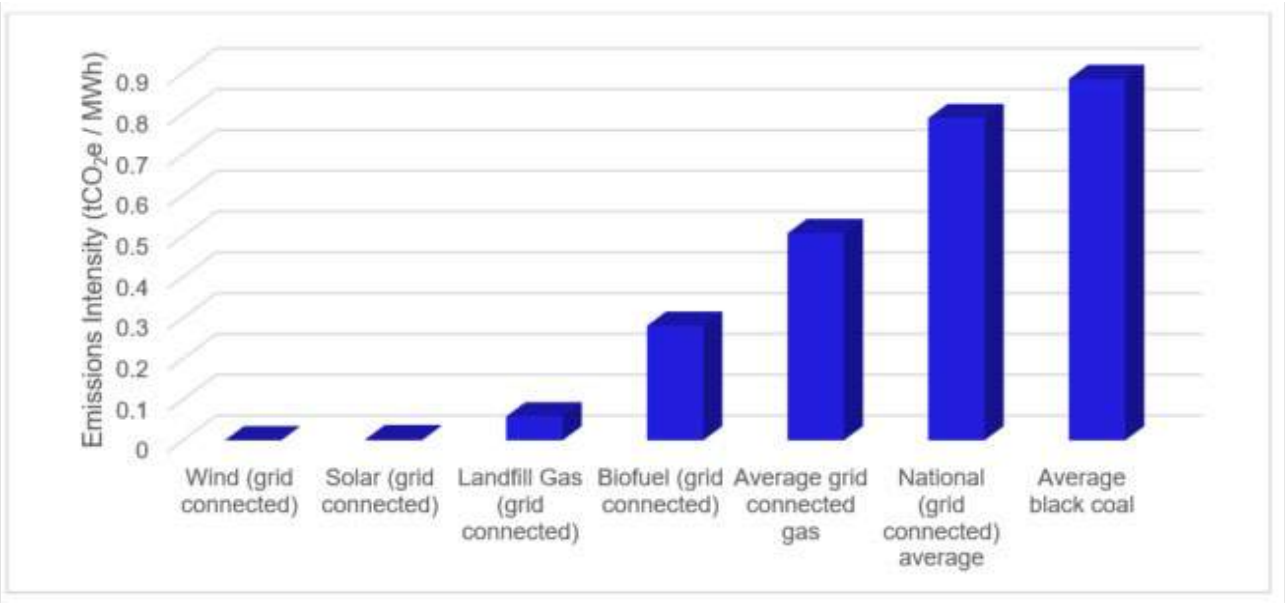

Figure 20-4 Emissions intensity comparison for common fuel sources

To calculate the yearly carbon offset, the emissions intensity is multiplied by the yearly output of the Project (5,543 GWh). As provided in **Table 20-4**, if all wind power generated replaces the power from black coal, the carbon offset is nearly 5 million tonnes of CO_2-e per year. Similarly, if all wind power generated replaces power from gas, approximately 2.8 million tonnes of CO_2-e is offset per year.

The carbon payback period is the time taken for the Project to offset the emissions due to construction. For black coal this payback period is approximately 0.64 years, whereas if gas power is being offset the payback is just over a year at 1.12 years.

Table 20-4 Yearly carbon offset and carbon payback periods for different power generation methods

Power Generation Method	Emissions Intensity tCO_2-e / MWh	Carbon Offset tCO_2-e per year	Carbon Payback Period (years)
Average black coal	0.89	4,933,196	0.64
National grid average	0.79	4,378,905	0.72
Average grid connected gas	0.51	2,826,888	1.12
Renewable energy	0.00	0	N/A

20.6 Potential decommissioning impacts

Individual WTGs have an operational lifespan of approximately 30 years, after which they will either be refurbished or decommissioned. If refurbished, some or all the major components would be replaced with the WTG towers being reused where possible. As this process would be similar to Project construction described in this report the emissions would be similar, assuming manufacturing and construction methods have not been improved.

In the case of decommissioning the Project, all materials will be disposed of correctly. Steel and concrete both make up the majority of the materials of the Project. It is assumed that these materials will be reused and recycled where possible which will aid in decreasing the embodied emissions of future wind farm projects.

20.7 Environmental management measures

Proposed measures to manage and/or mitigate GHG emissions from the Project are detailed in **Table 20-5**.

Table 20-5 GHG environmental management measures

Impact	Reference	Environmental management measure	Timing
Greenhouse gas emissions	GHG1	Equipment and vehicles will be regularly serviced and maintained to optimise efficiency.	Construction, operation, decommissioning
	GHG2	Where possible, fuel and energy efficient equipment and vehicles will be selected.	Prior to construction
	GHG3	Opportunities will be reviewed to use alternative materials in construction to concrete, such as fly ash as a supplementary cementitious material and reclaimed aggregate.	Prior to construction
	GHG4	High recycled content in steel use will be specified where technically possible and cost effective.	Prior to construction

21. Cumulative impacts

21.1 Assessment methodology

Cumulative impacts have the potential to occur when impacts from a project interact or overlap with impacts from other projects and can potentially result in a larger overall effect (positive or negative) on the environment, businesses or local communities.

The methodology for the assessment involved the following:

- Identification of relevant future and existing projects (which have publicly available information) that could have cumulative impacts
- Application of a screening criteria to determine which projects should be taken forward to the cumulative impact assessment (refer to **Table 21-1**)
- Assessment of cumulative impacts for each relevant environmental matter
- If necessary, recommendation of environmental management measures to mitigate potential risks of cumulative impact or minimise identified during Project construction, operation and decommissioning.

Table 21-1 Screening criteria for cumulative impact assessment

Screening criteria	
Location	• Direct overlap – Construction footprints of a project intersect with this Project • Construction footprints are in close proximity to the Project (~ up to 130 km)
Timeframe	• Concurrent or consecutive construction program with the Project
Status	• Changes to existing projects (expansions, modifications, closure) • Approved projects (approved but construction has not commenced) • Projects under assessment (application of the project has been exhibited and is currently under assessment) • Related development (development that is required for the project but subject to separate development)
Scale	• A project was considered relevant where it is a large-scale major development or infrastructure project that could cause cumulative impacts with the proposal

21.2 Statutory context and guidelines

The assessment has been carried out with consideration with the following relevant policy and guidelines:

- Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2021b).

21.3 Existing environment

There are a total of three wind energy project and eight other projects within 130 kilometres of the Project, refer to **Table 21-2**.

Most of the projects are also part of the South West REZ, and are considered relevant to the cumulative impact assessment due to their proximity, and potential benefits and adverse effects for the local and regional area. As described in **Section 2.1**, the location of the South West REZ has been strategically selected for establishing new renewable generation capacity and the diversification of energy resources in the State.

The location of the relevant projects are provided in **Figure 21-1**.

Table 21-2 Projects for cumulative impact assessment

Project	Brief project description	Location	Status
Wind energy			
Bullawah Wind Farm	Construction, operation and maintenance of a wind farm with up to 170 WTGs (up to 300 metres tip height), BESS and associated infrastructure. The project will have a capacity of 1000 MW.	16 km north-west of the Project Located within the South West REZ	Announced, pre-scoping phase
Baldon Wind Farm	Construction, operation and maintenance of a wind farm with up to 162 WTGs, BESS and associated infrastructure.	117 km west of the Project Located within the South West REZ	In planning – SEARs issued
Keri Keri Wind Farm	Construction, operation and maintenance of a wind farm with up to 176 WTGs, BESS (up to 200 MW/800 MWh) and associated infrastructure.	128 km west of the Project Located within the South West REZ	In planning – SEARs issued
Other nearby projects			
Victoria to NSW Interconnector West (VNI West)	A new interconnector between Victoria and NSW including a series of high voltage transmission lines and terminal stations that links the regions of Murray River, Western Victoria, South-West NSW. The VNI West transmission route is indicated to link the Dinawan substation to Kerang, Bendigo and Ballarat, where the Western Victoria Transmission Network Project would be constructed. The transmission route is not yet finalised.	Transmission route may intersect the Project near Mabins Well Road, Moonbria Road and Wilson Road Located within the South West REZ	Announced, pre-scoping phase

Project	Brief project description	Location	Status
Dinawan Energy Hub	Construction and operation of a hybrid wind, solar and battery storage project, with capacity up to 2.5 GW, to be located between Coleambally and Jerilderie, west of the Kidman Way. The energy hub would connect to Project EnergyConnect.	Adjacent to the Project northern boundary Located within the South West REZ	Announced, pre-scoping phase
Project EnergyConnect (Eastern)	Construction and operation of a high voltage interconnector between NSW and SA. The transmission project's eastern section includes new transmission lines between Wagga Wagga and Buronga, with a new Dinawan Terminal Station to be located next to Kidman Way about 55 km south of Darlington Point.	11 km east of the Project and would connect to Dinawan Terminal Station (the same connection point as the Project) Located partially within the South West REZ	Approved
Coleambally BESS	Construction and operation of a 100 MW/200-400 MWh BESS including ancillary infrastructure in Coleambally, NSW. The BESS footprint would be about four hectares and is located near Kidman Way with proposed transmission connection to the Transgrid Coleambally substation.	42 km north-east of the Project	In planning – SEARs issued
Micro Solar Farm	Construction and operation of a 5 MW micro solar farm and associated infrastructure, located within the Coleambally Irrigation Area.	54 km north-east of the Project	Approved
Woodland BESS	Construction and operation of a 200 MW/800 MWh BESS located about 10 km south of Darlington Point. This project is located next to the Darlington Point Solar Farm.	55 km north-east of the Project	In planning – SEARs issued
Riverina and Darlington Point BESS	Construction and operation of a combined 150 MW/300 MWh three independent but co-located BESS projects.	55 km north-east of the Project	Approved
Keri Keri Solar Farm	Solar farm with a maximum installed capacity of 500 MW_p (MW-peak) and an alternating current capacity of up to 400 MW_n (MW-nominal). The project will also include ancillary infrastructure.	128 km west of the Project Located within the South West REZ	In planning – SEARs issued

In addition, there are three other projects proposed within the South West REZ that are not being assessed in this EIS as they are over 130 kilometres from the Project, including:

- Burrawong Wind Farm – proposed 750MW wind farm that may include BESS infrastructure, located approximately 15 kilometres south of Balranald, in the Murray River Council LGA. The project would be located in the South West REZ and is currently at the EIS preparation stage. The project is expected to have project construction after 2023, with construction period taking 24 to 36 months to complete, and an expected operational life of 30 to 35 years.
- Limondale Solar Farm MOD 2 BESS – proposed 200MW / 400MWh BESS to support the existing 250MW solar farm. The project is locate approximately 14 kilometres south of Balranald, in the Balranald Shire LGA. The BESS project construction would commence after the end of the solar farm construction schedule, and would require 15 months to complete. The project would be located in the South West REZ and is currently at the assessment stage.
- Mallee Wind Farm – proposed wind farm project with BESS located in the Wentworth Shire LGA, approximately 16 kilometres north east of Buronga and adjacent to the western boundary of the Mallee Cliffs National Park. The wind farm would have generation capacity of up to 1 GW and would be located in the South West REZ. The project is currently at the scoping stage, and is anticipated to have project construction commence after 2024.

At the time of exhibition, there are ten proposed or approved projects within the South West REZ.

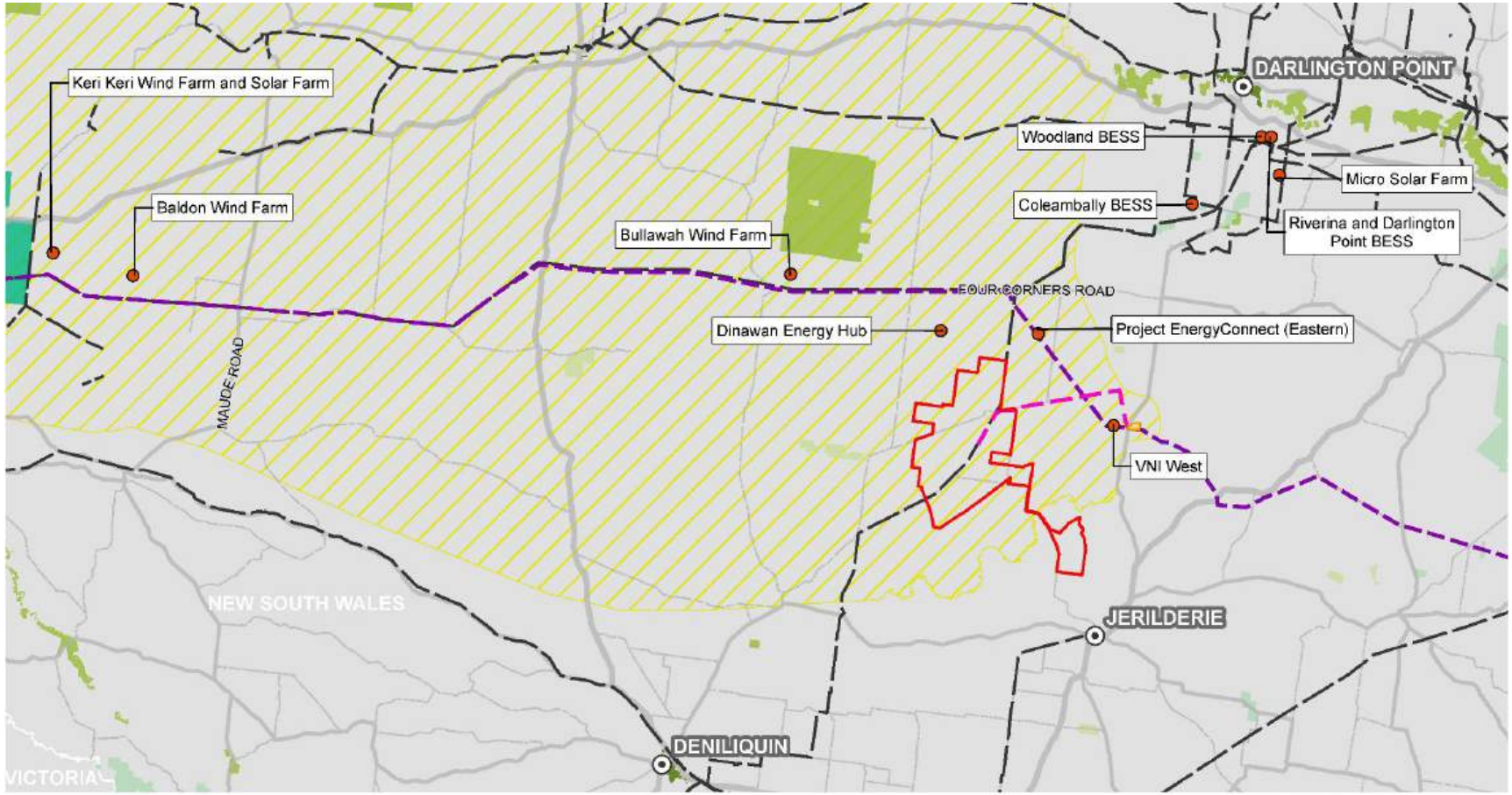

Figure 21-1 Planned and existing projects considered for cumulative impacts

21.4 Impact assessment

Potential cumulative impacts associated with the Project have been addressed in the relevant technical reports (**Appendix E** to **Appendix V**). Potential cumulative impacts associated with the Project are expected to be limited to the following:

- Cumulative impacts on biodiversity
- Construction traffic volumes and movements
- Construction and operational noise
- Changes to the landscape and visual amenity
- Social and economic impacts, including construction workforce accommodation and availability
- Regional changes to land use.

A summary of the anticipated cumulative impacts are discussed in the following sections.

21.4.1 Impacts to biodiversity

The potential biodiversity impacts of the Project must be considered as a consequence during construction and operation within the existing environment. The Project would not act alone in causing direct and indirect impacts to biodiversity, including prescribed impacts of wind farm bird and bat blade strikes. The incremental effects of multiple sources of impact (past, present and future) are referred to as cumulative impacts and provide an opportunity to consider the Project within a strategic context.

Known biodiversity impacts of approved or proposed projects with scoping reports are listed in **Table 21-3**. The level of vegetation and habitat clearing for other projects is unknown as many are still in planning approval stage.

Based on available information, the cumulative impacts to biodiversity in the region were further assessed by identifying the expected loss of vegetation and TECs associated with the EnergyConnect (Eastern) project (refer to **Table 21-3**). Both projects are located within a regional landscape that is dominated by native vegetation and the trend of vegetation and habitat removal is likely to continue in the short and long term at this location with approved, proposed and future projects. The removal of vegetation for this Project would contribute to the cumulative loss of vegetation in the surrounding landscape. The Project would involve removal of around 173.39 hectares of native vegetation, of which 129.7 hectares are TECs. In addition to this there is an estimated 1555 hectares of native vegetation of which 133 are TECs that are similar to the Project and are also proposed for removal associated with the EnergyConnect (Eastern) project. Given that the TEC's and threatened species across both projects are similar, it is likely that there will be a cumulative impact associated with the loss of similar native vegetation and threatened species habitat in the region.

Table 21-3 Cumulative biodiversity impacts

Project	Potential cumulative biodiversity impacts
Approved projects	
Project EnergyConnect (Eastern)	Direct impacts on 1,554.88 hectares of native vegetation. Impacts on threatened biodiversity for this project are shown below. TECs: • 101.21 hectares of Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions listed as endangered under the BC Act • 31.99 hectares of Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions listed as endangered under the BC Act. Threatened flora: • 71.17 hectares of habitat for *Brachyscome papillosa* (Mossgiel Daisy) – listed as vulnerable under the BC Act and EPBC Act (18.69 hectares of area of occupancy and 52.48 hectares of assumed habitat) • 50.31 hectares of assumed habitat for *Cullen parvum* (Small Scurf-pea) – listed as endangered under the BC Act. (50.31 hectares of assumed habitat) • 7 hectares of habitat for *Lepidium monoplocoides* (Winged Peppercress) – listed as endangered under the BC and EPBC Act (0.20 hectares of area of occupancy and 6.8 hectares of assumed habitat) • 15.32 hectares of habitat for *Leptorhynchos orientalis* (Lanky Buttons) – listed as endangered under the BC Act (0.63 hectares of area of occupancy and 14.69 of assumed habitat) — 109.68 hectares of habitat for Maireana cheelii (Chariot Wheels) – listed as vulnerable under the BC Act and EPBC Act (7.01 hectares of area of occupancy and 102.67 of assumed habitat) • 8.62 hectares of habitat for *Pilularia novae-hollandiae* (Austral Pillwort) – listed as endangered under the BC Act (0.32 hectares of area of occupancy and 8.62 hectares of assumed habitat) • 232.35 hectares of habitat for *Swainsona murrayana* (Slender Darling Pea) – listed as vulnerable under the BC Act and EPBC Act (80.67 hectares of area of occupancy and 80.67 hectares of assumed habitat) • 109.17 hectares of habitat for *Swainsona sericea* (Silky Swainson-pea) – Vulnerable (10.32 hectares of area of occupancy and 98.85 hectares of assumed habitat). Threatened fauna: • 0.41 hectares of habitat for Pedionomus torquatus (Plains-wanderer) – listed as endangered under the BC Act and EPBC Act • 4.77 hectares of habitat for Myotis macropus (Southern Myotis) – listed as vulnerable under the BC Act.
Micro Solar Farm	No impacts on biodiversity
Riverina and Darlington Point BESS	Direct impact to Plains Grassland on Alluvial mainly clay soils in the Riverina Bioregion of NSW South Western Slopes (PCT 45) moderate to good moderate Direct impact to Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (PCT 16) moderate to good - moderate

Project	Potential cumulative biodiversity impacts
In planning – Scoping report available	
Baldon Wind Farm	TECs considered to likely or potentially occur: • Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions • Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions Threatened species considered to likely or potentially occur: • Brachyscome papillosa • Maireana cheelii • Southern Bell Frog • Spotted Harrier • White-fronted Chat • White-bellied Sea-Eagle • Major Mitchell's Cockatoo • Plains-wanderer • Painted Honeyeater.
Keri Keri Wind Farm	Threatened biodiversity considered to likely or potentially occur: • Brachyscome papillosa • Maireana cheelii • Lepidium monoplocoides • Plains-wanderer • Southern Bell Frog • Natural Grasslands of the Murray Valley Plains TEC.
Coleambally BESS	Biodiversity considered to likely or potentially occur: • Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (BC Act) • Weeping Myall Woodland (EPBC Act) • Plains Grassland on Alluvial mainly clay soils in the Riverina Bioregion of NSW South Western Slopes (PCT 45).
Woodland BESS	Threatened biodiversity considered to likely or potentially occur: • 5 TECs • 17 Threatened species and 9 migratory species.
Keri Keri Solar Farm	Threatened biodiversity considered to likely or potentially occur: • Brachyscome papillosa • Maireana cheelii • Lepidium monoplocoides • Plains-wanderer • Southern Bell Frog • Natural Grasslands of the Murray Valley Plains TEC.

21.4.2 Construction traffic volumes and movements

The Project has the potential to contribute to cumulative impacts on traffic and transport with other proposed and approved projects that may use similar transport routes over concurrent construction timeframes. In particular, the Project would have one or more haulage routes overlap with Project EnergyConnect, Coleambally BESS, Woodland BESS, Keri Keri Wind Farm and Solar Farm, Baldon Wind Farm and Bullawah Wind Farm. Details on potential cumulative construction impacts are provided in **Table 21-5**. Potential cumulative impacts would be dependent on the final timing and duration of construction activities associated with nearby proposed projects.

Based on publicly available information, a mid-block capacity assessment (refer to **Table 21-5**) was carried out to assess cumulative construction traffic impacts on road capacity and performance. For many of the in planning and announced projects, no information on vehicle movements is publicly available, and a conservative estimate for construction and operational vehicles have been applied based on estimates from other similar sized wind projects in NSW, to provide a worst-case scenario for the cumulative traffic assessment.

The assessment found that, with the Project and nearby concurrent developments, all roads would operate satisfactorily at a LoS A in the road network, apart from one section of Liddles Lane and Jerilderie Street within the township of Jerilderie. Minor cumulative impacts are identified in these sections of local roads which would experience a change from LoS A to LoS B at Liddles Lane, and change from LoS A to LoS C at Jerilderie Street during the morning and evening peak hours. The flow of traffic would remain stable and the road network would be sufficient capacity to accommodate cumulative traffic demand and potential minor impacts.

The Project also has the potential to contribute to cumulative impacts on traffic and transport with other proposed and approved projects that may use similar local road networks during operation. Due to the small number of light vehicles proposed for the Project and expected for other projects' operation, no cumulative impacts are expected to operational traffic and transport. Details on potential cumulative construction impacts are provided in **Table 21-5**. Potential cumulative impacts would be dependent on the final details of operational activities associated with nearby proposed projects.

Table 21-4 Nearby projects and potential cumulative traffic interactions

Project name	Potential cumulative traffic interactions with the Project	Considered in mid-block capacity
Approved projects		
Riverina and Darlington Point BESS (Approved)	Limited information is available on the traffic generated by the proposed BESS development. However construction for this project is expected to be completed in 2023, and operational traffic volumes are anticipated to be in line with other renewable energy projects in the area, with up to five light vehicle movements during peak hours. Therefore, cumulative traffic impacts are not anticipated to occur with this project.	X
Micro Solar Farm (Approved)	The Micro Solar Farm construction period is expected to be completed within 2022. During operation the facility is expected to be accessed via Kidman Way (B87) and Sturt Highway (A20), and two light vehicles are expected to attend the site every six months. Therefore, cumulative traffic impacts are not anticipated to occur with this project.	X

Project name	Potential cumulative traffic interactions with the Project	Considered in mid-block capacity
Project EnergyConnect (Approved)	Traffic generated by the construction and generation of Project EnergyConnect has the potential to result in cumulative traffic impacts to common access roads with the Project, such as Liddles Lane, Kidman Way (B87), Newell Highway (A39) and Sturt Highway (A20). Kidman Way (B87) would be a key site access for the Dinawan Terminal Station and accommodation site construction as part of Project EnergyConnect. Based on the indicative number of peak vehicle movements identified in the Project EnergyConnect – Eastern EIS, the worst case scenario has been assumed, where there would be concurrent construction periods between the Project, and Project EnergyConnect.	✓
Projects in planning		
Woodland BESS (In planning)	The Scoping Report for the Woodland BESS indicates common access roads with the Project would include Kidman Way (B87) and Sturt Highway (A20). No information on vehicle movements and project timing is publicly available, and a conservative estimate for construction and operation vehicles have been applied based on estimates from other similar sized BESS projects in NSW. The Woodland BESS construction period is therefore assumed to overlap with Project construction period and similarly during operational and decommissioning periods to provide a worst-case scenario assessment.	✓
Baldon Wind Farm (In planning)	The Baldon Wind Farm construction period is planned to begin in 2024 and conclude by 2027. Primary access to this project would be via the Sturt Highway (A20). As a result, concurrent construction or operation with the Project could generate cumulative traffic impacts to Sturt Highway (A20). No information on vehicle movements is publicly available, and a conservative estimate for construction and operational vehicles have been applied based on estimates from other similar sized wind projects in NSW, to provide a worst-case scenario for the cumulative traffic assessment.	✓
Keri Keri Wind Farm and Solar Farm (In planning)	The Keri Keri Wind Farm and Solar Farm construction period is expected to commence in 2024 with operation beginning in 2026 or 2027. Primary access to this project would be via the Sturt Highway (A20). As a result, concurrent construction or operation with the Project could generate cumulative traffic impacts to Sturt Highway (A20). No information on vehicle movements is publicly available, and a conservative estimate for construction and operational vehicles have been applied based on estimates from other similar sized wind and solar projects in NSW, to provide a worst-case scenario for the cumulative traffic assessment.	✓

Project name	Potential cumulative traffic interactions with the Project	Considered in mid-block capacity
Coleambally BESS (In planning)	The Scoping Report for the Coleambally BESS indicates access during construction and operation would be via Kidman Way (B87). The project is anticipated to have a maximum of 60 light vehicle movements, 20 heavy vehicle movements and ten OSOM daily vehicle movements during the construction of the BESS. No information on project timing is publicly available as the project is in the EIS preparation phase, and a worst-case cumulative scenario of concurrent construction periods has been assumed, where the Coleambally BESS construction period would overlap with Project construction period and similarly during operational and decommissioning periods.	✓
Announced projects		
Dinawan Energy Hub (Announced)	Based on published information, it is anticipated that construction of the first stage of the Dinawan Energy Hub would begin in 2024 with the first operations to commence in 2025. The number of vehicle movements generated by construction and operation of the Dinawan Energy Hub has not been made available at the time of writing.	X
VNI West (Announced)	VNI West is at the pre-scoping stage and no information about the project. The number of vehicle movements generated by construction and operation of the project is not available at the time of writing.	X
Bullawah Wind Farm (Announced)	Based on published information, it is likely that access to the project would be via major roads including the Cobb Highway (B75) and Sturt Highway (A20). As a result, concurrent construction or operation with the Project could generate cumulative traffic impacts to Sturt Highway (A20). No information on vehicle movements is publicly available, and a conservative estimate for construction and operational vehicles have been applied based on estimates from other similar sized wind projects in NSW, to provide a worst-case scenario for the cumulative traffic assessment.	✓

Table 21-5 Comparison of mid-block assessment results for cumulative construction traffic impacts

Road	Road Type	Peak period	Direction of travel	Level of Service (LoS)	
				Without Project and nearby concurrent developments	With Project and nearby concurrent developments
Liddles Lane	Local (unsealed, no posted speed limit)	AM	Eastbound	A	A
			Westbound	A	B
		PM	Eastbound	A	B
			Westbound	A	A
Jerrys Lane	Local (unsealed, no	AM	Eastbound	A	A
			Westbound	A	A

Road	Road Type	Peak period	Direction of travel	Level of Service (LoS)	
				Without Project and nearby concurrent developments	With Project and nearby concurrent developments
	posted speed limit)	PM	Eastbound	A	A
			Westbound	A	A
Kidman Way (B87)	Highway (sealed, 100 km/h)	AM	Northbound	A	A
			Southbound	A	A
		PM	Northbound	A	A
			Southbound	A	A
Newell Highway (A39)	Highway (sealed, 110 km/h)	AM	Northbound	A	A
			Southbound	A	A
		PM	Northbound	A	A
			Southbound	A	A
Jerilderie Street (A39)	Town (sealed, 50 km/h)	AM	Northbound	A	C
			Southbound	A	A
		PM	Northbound	A	A
			Southbound	A	C
Sturt Highway (A20)	Highway (sealed, 110 km/h)	AM	Eastbound	A	A
			Westbound	A	A
		PM	Eastbound	A	A
			Westbound	A	A

21.4.3 Construction and operational noise

The Project has the potential to contribute to cumulative noise impacts with other proposed and approved projects that may have concurrent construction timeframes and similar sensitive receivers. In particular, the Project may have noise interactions with Project EnergyConnect and Dinawan Energy Hub, as detailed in **Table 21-6**. For all other considered projects, cumulative noise impacts are not anticipated to occur due to the distance between the proposed developments and the receivers assessed for this Project.

Due to the Dinawan Energy Hub being in the early stages of design, it is not possible at this stage to predict cumulative noise impacts with these projects.

Based on publically available information for Project EnergyConnect and estimated noise levels, cumulative construction noise and operational noise are deemed unlikely at receivers. Given the distance between the substation to this Project's receivers, cumulative construction noise impacts have been deemed unlikely.

Table 21-6 Nearby projects and potential cumulative noise interactions

Project name	Potential cumulative noise interactions with the Project
Approved projects	
Project EnergyConnect (Approved)	Construction and operational noise impacts from Project EnergyConnect, as detailed in EnergyConnect (NSW – Eastern Section) Technical Paper 10 – Noise and Vibration Impact Assessment (WSP, 2021) have been compared to this project's predicted noise. During the construction of the Project EnergyConnect transmission line, 823 Fernbank Road, Argoon (approximately 11 km from the nearest WTG of this project) would become impacted by noise up to 60 dB(A). During the construction of this Project, noise levels at this receiver have not been predicted to exceed 30 dB(A) under any construction phase. As such it has been deemed unlikely to result in a cumulative construction noise impact at these receivers. The assessment also found that no receivers would be impacted by noise greater than the NMLs during the construction of Dinawan Terminal Station. Given the distance between the substation to this project's receivers, cumulative construction noise impacts have been deemed unlikely. Operational noise at Dinawan Terminal Station was assessed from 211 Liddles Lane and 137 Cadell Road, Jerilderie (both approximately 13 km from the nearest WTG). Operational noise levels were determined to be less than 20 dB(A) at both of these receivers. Likewise, it was identified that the transmission lines involved in Project EnergyConnect may produce a 'crackling', tonal noise under certain conditions, which may result in one residence, 823 Fernbank Road, Argoon (approximately 11 km from the nearest WTG) being impacted by noise of up to 38 dB(A). The above receivers sit well outside of both the 30 dB(A) noise contour of the wind farm under the highest noise conditions as well as ancillary facility noise, and as such it is unlikely that a cumulative noise impact would occur.
Announced projects	
Dinawan Energy Hub (Announced)	As the layout of the Dinawan Energy Hub has not been finalised the potential cumulative noise impacts cannot be determined. An in-depth environmental impact assessment has yet to be performed for the Dinawan Energy Hub, however the proposed site boundary indicates that the Dinawan Energy Hub may border the Project to the north and east, and would also extend further east of the Project. As the layout of the Dinawan Energy Hub is not yet determined, it is not possible to determine the overall cumulative construction and operational noise impact posed by Dinawan Energy Hub and the Project. Depending on the final design cumulative and/or operational noise impacts may occur.
VNI West (Announced)	While the transmission route is not yet finalised, it is understood that the transmission line would run south of the Dinawan Terminal Station, east of the Project. The extent of noise impacts can be predicted to be similar to construction and operation of the transmission lines of Project EnergyConnect (i.e. about 250 metres to each side of the transmission line alignment). Depending on the final alignment selection cumulative and/or operational noise impacts may occur.

21.4.4 Changes to the landscape and visual amenity

Most of approved and proposed renewable energy and electrical infrastructure projects within the broader Riverina region and specifically those located beyond 30 kilometres of the Project, would be unlikely to have any direct visual connection with the Project.

Whilst other wind farm projects are at various stages of development within proximity to the Project, there is limited publicly available information, and no detailed data that would be required

to prepare a multiple wind turbine tool analysis against other wind farm projects, or to make considered judgements on potential cumulative visual effects.

The assessment has not identified any other approved or operating wind farm projects within eight kilometres of the Project or within the broader regional area.

The proposed Bullawah Wind Farm and Dinawan Energy Hub projects may include views toward WTGs within eight kilometres of the Project WTGs however not enough information is available to carry out an assessment.

21.4.5 Social and economic impacts

Cumulative social or economic impacts can result in actions that, individually may be minor, but collectively could result in considerable changes to the social environment, or that individually may have a positive social impact, but collectively could result in negative social impacts.

The identified list of projects in **Table 21-2** could have cumulative social or economic interactions with the Project. The greatest cumulative impacts are expected to occur in Project construction and minimal impacts are anticipated during operation. Potential construction cumulative impacts would be associated with the following:

- Demand for accommodation by construction workforces of multiple projects, potentially resulting in additional positive impacts to accommodation providers, reduced availability of some visitor accommodation types and housing for seasonal workers, and increased demand for rental housing
- Use of local and regional roads that could result in increased road safety risks and diminished amenity for residents when construction periods of projects overlap (this is expected to occur with Project EnergyConnect, Coleambally and Woodland BESSs, Keri Keri Wind and Solar Farms, Baldon and Bullawah Wind Farms, at a worst-case scenario)
- Demand for local construction workers from communities in the townships near the Project. This could result in reduced availability of local workers across different projects, and possible shortage of workers for local businesses and industries
- Increased number of non-local workers temporarily moving to townships near the Project, potentially disturbing social cohesion in small towns and increasing demand for social infrastructure locally.
- Where construction timeframes of projects occur sequentially, there is potential for social impacts to occur over an extended period, possibly resulting in construction fatigue for some community members.

During operation, potential cumulative impacts of the Project with other projects and developments would mainly be associated with changes to landscape and visual amenity values and potential for the use rural land and agricultural properties to further diminish the rural character and amenity valued by residents and visitors located near the Project.

Potential cumulative social or economic impacts would be managed through the implementation of environmental management measures in **Chapter 17** (social impacts) and **Section 21.5**.

21.4.6 Regional changes to land use

As the impact of the Project on agricultural production is negligible (<0.01% of regional production), it will not make a notable contribution to regional cumulative agricultural impacts from infrastructure projects.

21.5 Environmental management measures

Proposed measures to manage and/or mitigate cumulative impacts from the Project are detailed in **Table 21-7**.

Table 21-7 Cumulative impacts environmental management measures

Impact	Reference	Environmental management measure	Timing
Cumulative traffic impacts	CU1	Ongoing consultation will be undertaken with local Councils and road authorities to manage construction traffic and coordinate delivery of Project elements. Any changes to manage cumulative traffic impacts will be included in the CTMP.	Prior to construction
	CU2	Discussions with proponents of adjacent and nearby wind farms or other Projects to coordinate road upgrades.	Prior to construction

22. Management and monitoring summary

A summary of the proposed measures to manage and/or mitigate environmental and social impacts associated with the Project are provided in **Table 22-1**. In the event of an inconsistency, this table supersedes the measures presented elsewhere in this EIS.

Table 22-1 Summary of environmental management measures

Impact	Reference	Environmental management measure	Timing
General			
Minimising impacts	GEN1	An Environmental Management System (EMS) will be developed which outlines practices and procedures to be followed during construction and operation of the development.	Prior to construction, construction, operation
Construction	GEN2	A Construction Environmental Management Plan (CEMP) will be prepared for the Project. The CEMP will detail how the performance outcomes, commitments, and environmental management measures for the Project will be implemented and achieved during construction. The CEMP will also provide the roles and responsibilities of key construction personnel and describe how environmental risks associated with the Project will be managed.	Prior to construction
Operation	GEN3	An Operational Environmental Management Plan (OEMP) will be prepared to mitigate and manage environmental impacts during operation of the Project. The OEMP will include a program for monitoring and reviewing the performance of environmental controls, and where agreed corrective actions are implemented if necessary.	Prior to operation
Decommissioning	GEN4	A Decommissioning and Rehabilitation Plan will be prepared in consultation with Host Landowners prior to the cessation of operations. This Plan will identify the infrastructure that will be retained for the benefit of external stakeholders.	Prior to decommissioning
Landscape and visual amenity			
Visual impact to dwellings	LV1	Vegetation screening will be offered to Non-associated landowners within the blue and black line in accordance with the Visual Bulletin. Tree and shrub planting mixes will be selected in agreement with landowners.	Prior to construction, construction, operation
Visual impacts during operation	LV2	Where appropriate, provide long term maintenance of vegetation within the Project to maintain visual filtering or screening.	Construction

Impact	Reference	Environmental management measure	Timing
	LV3	The materials and colour finished used for Project elements will be chosen to minimise visual impacts, including the use of non-reflective finishes.	Detailed design
	LV4	All Project elements will be maintained and repaired where required with any damaged or missing elements replaced in a timely manner.	Operation
Lighting	LV5	Where temporary lighting is required, temporary light spill beyond the construction site will be avoided.	Construction
	LV6	Design of security lighting throughout the wind farm, collector substations and the BESS and central primary substation will be minimised to decrease the contrast between the Project and the surrounding night time environment. Where reasonable and feasible, motion detectors will be used to activate the lighting	Detailed design
	LV7	Night lighting of ancillary infrastructure will be limited to low-level lighting for security, night time maintenance and emergency purposes.	Operation
Noise and vibration			
Construction noise	NV1	A Construction Noise Management Plan to address noise where it is likely to be greater than the applicable NMLs.	Prior to construction
General construction and operational noise and vibration	NV2	A complaints line will be established for nearby residents to contact regarding noise from the construction and operation of the Project.	Prior to construction
General construction noise and vibration	NV3	Where reasonable and feasible, standard noise mitigation measures from the Construction Noise and Vibration Guidelines (RMS, 2016) will be adopted, including: • Limit work to standard hours of construction • Select low-noise plant and equipment • Ensure equipment mufflers operate in a proper and efficient manner • Where possible, use quieter and less vibration emitting construction methods • Only have necessary equipment on-site and turn off when not in use • Concentrate noisy activities at one location and move to another as quickly as possible • Vehicle movements, including deliveries outside standard hours, would be minimised and avoided where possible • All plant and equipment is to be well maintained and, where possible, fitted with silencing devices • Use only the necessary size and powered equipment for tasks • Implement training to induct staff on noise sensitivities	Prior to construction, construction, operation, decommissioning

Impact	Reference	Environmental management measure	Timing
		• Where possible, consider the application of less intrusive alternatives to reverse beepers such as 'squawker' or 'broadband' alarms • Consider the installation of temporary construction noise barriers or earth mounds for concentrated, noise-intensive activities • Where practicable, install enclosures around noisy mobile and stationary equipment as necessary • Where possible, avoid simultaneous operation of two or more noisy plant close to receivers • The offset distance between noisy plant and sensitive receivers would be maximised • Plan traffic flow, parking and loading/unloading areas to minimise reversing movements • Complete routine monitoring to evaluate construction noise levels and evaluate whether the mitigation measures in place are adequate or require revision	
General construction vibration	NV4	Where reasonable and feasible, standard vibration mitigation measures will be adopted from the Assessing Vibration: a technical guideline, (DECC, 2006), including: • Choosing alternative, lower-impact equipment or methods wherever possible • Scheduling the use of vibration-causing equipment at the least sensitive times of the day (wherever possible) • Locating high vibration sources as far away from sensitive receiver areas as possible • Sequencing operations so that vibration-causing activities do not occur simultaneously • Keeping equipment well maintained • Do not conduct vibration intensive work within the recommended safe setback distances • Informing nearby receivers about the nature of construction phases and the vibration-generating activities.	Prior to construction, construction, operation, decommissioning
Construction traffic noise	NV5	To minimise construction traffic noise, the following will be implemented where required: • Revising vehicle routes and scheduling to reduce heavy vehicle traffic along roads predicted to experience construction traffic noise impacts • Avoiding the use of compression brakes • Ensuring vehicles are adequately silenced before leaving or accessing the Project.	Prior to construction, construction, operation, decommissioning
Operational noise	NV6	Once the wind turbine, BESS and substation layouts are finalised and the final WTG, BESS and substation components and technology is selected, noise modelling will be revised and predicted noise levels will be updated to ensure it will comply with the criteria.	Detailed design
	NV7	In the event that turbine emissions are found to exceed the contracted values from the turbine supplier, the supplier will be required to implement measures to reduce the noise to the contracted value. This can include measures to rectify manufacturing defects or appropriate control settings. The determination of the	Detailed design

Impact	Reference	Environmental management measure	Timing
		control settings should be performed through a noise assessment, considering the potential controls required at each turbine to address noise non-compliances most effectively. It is noted that the turbines selected feature 'Low Noise Operations' modes, which could be utilised to manage the settings and noise levels of the turbines where it has been identified as necessary.	
	NV8	An Operational Noise Management Plan will be developed and will include: • Demonstration of compliance with noise criteria • Noise testing procedures • Reporting details and timeframes.	Prior to operation
	NV9	Noise monitoring will be undertaken in accordance with the NSW Noise Assessment Bulletin to ensure compliance with criteria.	Operation
Cumulative noise impacts	NV10	Work schedules and timings will be discussed with the proponents of other nearby developments to gain an understanding of when noisy work may take place concurrently. Should respectively project schedules and work priorities change, proponents will seek to commit to regular meetings to ensure all proponents are aware of the changes.	Prior to construction, construction
	NV11	Where reasonable and feasible, work will be scheduled to occur at different times of the day to prevent multiple noisy activities from taking place at the same time.	Construction
	NV12	Where reasonable and feasible, schedule work to take place at different locations within the Project to prevent noisy activities from taking place in close proximity to one another which will limit the amplification of the noise.	Construction
Biodiversity			
Avoid and minimise biodiversity impacts	BIO1	Where reasonable and feasible, the Project design will be refined to: • Avoid and minimise the loss of vegetation and habitat – Threatened species habitat buffers and nest tree buffers show locations of known or potential threatened species habitat that will be avoided and minimised during detailed design • Minimise impacts to fauna movements across the landscape • Minimise the impact of predation on displaced fauna. Access track and cabling corridors will be established with consideration to terrain (e.g. utilisation of the existing tracks and flat areas on slightly higher elevations) to minimise newly created tracks, tracks through depressions and additional vegetation clearing.	Detailed design, prior to construction

Impact	Reference	Environmental management measure	Timing
Avoid and minimise biodiversity impacts	BIO2	Habitat buffer maps (refer to Section 6.4 of the BDAR) will inform the induction of construction and maintenance teams as required for the CEMP and OEMP.	Prior to construction, prior to operation
Avoid impacts to aquatic biodiversity	BIO3	Final design for access tracks across waterway crossings (including creeks and drainage lines) will implement a design option to ensure stream flow is unaffected.	Detailed design
Removal of native vegetation, TECs and habitat	BIO4	A Biodiversity Management Plan (BMP) will be prepared and approved prior to construction. The BMP will: • Be prepared by a qualified ecologist in consultation with and endorsed by NSW Biodiversity, Conservation and Sciences (BCS) • Include a plan for implementing, evaluating and reporting on the effectiveness of all mitigation measures outlined in the Project BDAR, but not be limited to these measures • Involve an overarching framework that will be based on SMART principals (Specific, Measurable, Achievable, Realistic, Timebound) • Focus on monitoring the performance of proposed measures and informing an adaptive management approach based on performance triggers for remedial action or additional offsets where further impacts are identified • Detail required mitigation actions for the Project for all biodiversity, including indirect, prescribed and uncertain impacts • Include a program to monitor, evaluate and publicly report on the outcomes of a biodiversity monitoring program • Stipulate objectives for monitoring, and how baseline data will be captured and represented.	Pre-clearing, construction
	BIO5	An Operational Biodiversity Management Plan will be prepared. The Plan will: • Be prepared by a qualified ecologist in consultation with and endorsed by BCS • Include a plan for implementing, evaluating and reporting on the effectiveness of all mitigation measures outlined in the Project BDAR, but not be limited to these measures • Focus on monitoring the performance of proposed measures and informing an adaptive management approach based on performance triggers for remedial action or additional offsets where further impacts are identified • Detail required mitigation actions for the Project for all biodiversity, including indirect, prescribed and uncertain impacts • Include a program to monitor, evaluate and publicly report on the outcomes of a biodiversity monitoring program • Stipulate objectives for monitoring, and how baseline data will be captured and represented.	Operation

Impact	Reference	Environmental management measure	Timing
	BIO6	A Rehabilitation Plan will be prepared and approved prior to clearing, in consultation with BCS. The Rehabilitation Plan will inform the implementation of rehabilitation within the Project. Such areas will be identified in the final detailed design and will also include areas disturbed during construction that are not required to be maintained or cleared for the operation of the Project, such as trenches for cabling and transmission lines. The plan will include: • Implementation of soil erosion prevention, re-establishment of local expression of the original/adjacent plant community type, use local native plant species and habitat and outline the details of rehabilitation objectives and how their outcomes for success will be measured, locations, target landforms and plant community types • Restoration of riparian vegetation (i.e. weed control) will be implemented to protect and improve key habitat areas, where relevant • A program for adaptive monitoring of specific success measures and reporting and include a Trigger Action Response Plan (TARP); including notification to BCS that remedial actions have been triggered and agreement about the response • Landscaping of pervious surfaces using native indigenous species only • Soil loss will be prevented by immediate stabilisation of exposed surfaces (e.g. use of Jute mesh and/or soil binder) • Ongoing maintenance of the rehabilitation work will be required, including management of weeds and pathogens • Topsoil and subsoil generated during construction will be stockpiled separately on-site to be used for rehabilitation. Stockpiles will be managed according to best management practices (Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004).).	Prior to construction, construction, operation
	BIO7	Pre-clearing Process – the BMP will provide detail of necessary mitigation measures for harm to live animals and threatened hollow dependent fauna during/all pre-clearing survey and translocation activities. The pre-clearing process will include two stages: • Stage 1: – Will include survey and translocation of any fauna from the disturbance footprint into areas of retained vegetation prior to construction – May include detailed markup of threatened species locations and their translocation such as *Swainsona murrayana* – All work will be carried out by qualified ecologists	Pre-clearing

Impact	Reference	Environmental management measure	Timing
		• Stage 2: – Will include final inspections of the disturbance footprint immediately before the construction activity commences to check and physically mark any important habitat features that need to be considered when identifying exclusion zones – Document, mark and record the location of large stick nests, habitat/hollow-bearing trees, and threatened flora. The outcomes of the pre-clearing inspections will be reported to BCS prior to the commencement of vegetation clearing. The report will include any fauna relocated or euthanised, including name of qualified/licensed handler, species, location notes, and release location and method.	
	BIO8	Exclusion Zones – The boundary of the clearing limits for the disturbance footprint will be clearly marked on site by a surveyor before vegetation clearing commences. Specific exclusion zones (habitat buffers) will include known areas of threatened flora populations (*Swainsona murrayana* and *Swainsona sericea*) and the edge of the clearing boundary will be marked with high visibility fencing and signage.	Pre-clearing, construction, operation
	BIO9	Staged Habitat Removal – The staged habitat removal process will minimise direct impacts on fauna by providing them with an opportunity to vacate hollows and relocate naturally. The first stage will involve clearing of non-habitat first (e.g. shrubs, regrowth, ground cover and non-habitat trees) and allowing at least 24 hours to allow fauna to vacate habitat before the second stage of removing habitat trees. The process will include: • Avoiding clearing during times when hollow-dependent fauna are breeding • Contacting vets and wildlife carers before works commence • Ensuring that licensed wildlife carers and/or ecologists are on site during habitat removal • Ensuring wildlife carers and/or ecologists are present during removal of habitat trees • Ensuring that habitat trees are felled carefully, using equipment that allows habitat trees to be lowered to the ground with minimal impact • A procedure for the ethical handling of injured or displaced fauna is to be documented in the BMP • Recording the effort and outcomes of the habitat removal process • Saving and reusing cleared material for rehabilitation and habitat • Preparing an 'Unexpected threatened species finds procedure' to be implemented during construction and operation that will apply to all activities that have potential to impact upon threatened flora and fauna species which have not already been assessed and approved. Any threatened entities found in a location previously unknown during construction or operation must be immediately notified to BCS	Construction

Impact	Reference	Environmental management measure	Timing
		• Preparing a Fauna handling and rescue procedure to be implemented during construction and operation.	
	BIO10	Clearance of native vegetation and habitat prior to start of daily construction to ensure there is no wildlife present. This will involve: • An on-foot pre-clearing survey by a suitably qualified ecologist • A regular drive through sweep of areas planned for construction by the contractor's environmental representatives. If an animal is located within the construction area during work, the Delivery Manager and Project Management Site Representative are to be notified immediately. All work must immediately cease within the immediate area of the find and a local wildlife rescue or an ecologist will be required for assistance where necessary.	Construction
Increase in weeds and disease pathogens in adjacent vegetation	BIO11	Weed monitoring and control programs will be prepared in consultation with BCS and documented in the BMP. Any deviation from measures approved by DPE are to be raised and approved. Additional monitoring and control measures for introduced plant introduction and spread will be implemented at and around locations used for sediment control structures. Monitoring of exotic plants with waterborne propagules and a Trigger Action Response Plan for control must be undertaken along drainage lines outside the Project in locations where runoff drains from the Project, and from locations where sediment control has failed. The program will include adaptive management strategies for priority weed species during construction, and early operational phase. The details of the monitoring program will be determined during the preparation of the BMP and follow the principles outlined in Section 12.2 of the BDAR.	Prior to construction, construction, operation
	BIO12	All weeds will be identified, mapped, and removed before clearing for construction, and location of weed and sprayed area will be recorded for use in ongoing weed monitoring and management programs, particularly for *Lycium ferocissimum*.	
	BIO13	A vehicle and machinery hygiene strategy will be prepared and implemented during construction and operation. The strategy will include specific locations, timing and methods for removing soil and plant matter from vehicles and machinery. Ensure vehicle and machinery hygiene measures in the strategy are applied during construction and operation.	
	BIO14	During the clearing works, weeds will be disposed and managed appropriately to stop the spread of weed species.	

Impact	Reference	Environmental management measure	Timing
	BIO15	Wash down stations will be constructed at suitable locations to wash down vehicles and employee shoes to stop the spread of weeds, pathogens (including agricultural weeds, amphibian chytrid fungus, *Phytophthora cinnamomi* and exotic rust fungi) and the introduction of new species.	
Increase in predatory and pest species	BIO16	Personal waste / refuse generated during construction or operation will be stored appropriately in inaccessible bins and disposed in an appropriate waste facility.	Construction, operation
	BIO17	A feral animal monitoring program will be developed and implemented as described in Section 12.2 of the BDAR based on performance triggers for adaptive management. It will be important to share data with landholders. Increased predator activity will trigger the need for predator control based on performance measures to be outlined in the BMP. Control will be done in consultation with Host Landowners.	
Impacts of wind farm strikes on protected animals Increase in risk of electrocution and EMF exposure	BIO18	A Bird and Bat Adaptive Management Plan (BBAMP) will be prepared to measure any impacts on bird and bats species. The plan is a key mitigation measure to address the prescribed impacts associated with blade strike impacts and will develop trigger levels designed to manage impacts during Project operation . The plan will provide guidance for developing a framework for monitoring impacts, including baseline and ongoing monitoring. The BBAMP will utilise the bird survey data for this Project to identify specific bird and bat species that are at risk of collision with overhead cabling and power lines or the transmission line and electrocution. For higher risk species, a strategy will be developed in consultation with BCS focused on identifying key sections of overhead cabling and power lines or the transmission line where mitigation is required and will include deploying bird divertors, with day/night reflectors within approved buffer distance. This will be appropriate for diurnal and nocturnal birds. The plan will include the following in consultation with BCS: • Regular monitoring in overhead cabling and power lines or the transmission line easements for evidence of bird / bat collision (intervals to be determined in consultation with BCS) • Monitoring of taller structures for evidence of raptor nest building • Developing target trigger for number of high risk species incidents • Deploying species specific bird / bat divertors / flappers / reflectors in areas where a defined number of incidents have occurred. • Identifying locations for specific measures and the monitoring method for testing effectiveness.	Construction, operation

Impact	Reference	Environmental management measure	Timing
Fragmentation resulting in reduced connectivity	BIO19	The barbed wire / razor wire fencing installed around the central primary substation and collector substation switchyards will have improved visibility measures installed, such as adding visible objects to the fence, for example metal tags, tapping or cloth material on the existing barbed wire to increase visibility and act as a deterrence technique for in flight fauna.	Construction
Wildlife impacts from vehicle strike	BIO20	Vehicle movements on newly formed access tracks will be limited to 40 km/h speed limit to reduce the risk of vehicle strike to fauna.	Construction, operation
Aboriginal heritage			
Impacts on Aboriginal sites	AH01	A Cultural Heritage Management Plan (CHMP) will be developed to provide guidance on the procedure for the identification of unexpected Aboriginal objects, the long-term management of Aboriginal objects retrieved from surface collection of artefacts and any preliminary excavations that may need to occur	Prior to construction
Impacts on Aboriginal sites	AH02	Where harm to Yanco Delta AS Hearth 01, Yanco Delta AS Hearth 02, Yanco Delta AS 01, Yanco Delta Hearth 01, PEC-E-G2, and PEC-E-43 is unavoidable salvage will be completed under the authorisation of the Minster's Conditions of Approval	Prior to construction
Human remains	AH03	If suspected human remains are located during any stage of the Project, work will stop immediately, and the NSW police and Coroner's Office will be notified. NSW Heritage will be notified if the remains are found to be Aboriginal	Construction, operation, decommissioning
Impacts on unknown Aboriginal sites	AH04	If changes are made to the Project to include impacts outside the disturbance area as delineated in the ACHAR, further archaeological investigation will be conducted.	Prior to construction, construction
Potential impacts associated with road upgrades	AH05	Prior to the submission of the 'response to submission report' for the Project, an assessment of each proposed road upgrade location will occur. This assessment will include a visual inspection and may require sub-surface testing, if appropriate. The assessment will be undertaken in conjunction with the RAPs identified for this Project.	Prior to response to submission report
Historical heritage			
General historical heritage impacts	HH1	A Historical Heritage Management Plan (HHMP) will be prepared prior to construction in consultation with Heritage NSW. As a minimum, the HHMP will include the following: • A list, plan and maps with GIS layers showing the location of identified heritage items both within, and near, the disturbance footprint • Procedures to be implemented during construction to avoid or minimise impacts on items of heritage significance including protective fencing	Prior to construction

Impact	Reference	Environmental management measure	Timing
		• A procedure for the unexpected discovery of human skeletal remains as per the Skeletal remains: guidelines for the management of human skeletal remains (NSW Heritage Office 1998).	
	HH2	Historical heritage awareness training will be provided for contractors prior to start of construction work to ensure understanding of potential heritage items that may be impacted by the Project, and the procedure required to be carried out in the event of discovery of historical heritage materials, features or deposits; or the discovery of human remains.	Construction
	HH3	The location of each heritage item will be considered when finalising the design and siting of the WTGs, transmission line, access tracks and other associated ancillary and operational infrastructure.	Detailed design
Impacts to Item 6 and Item 7	HH4	The following items will be avoided and will be demarcated within a 50-metre buffer around the item extent: • Item 6: Potential remains of historic camp • Item 7: Potential site of old Cobb & Co horse exchange.	Prior to construction, construction
Impacts to heritage items	HH5	Should design of the Project not avoid impacts to heritage associated with Item 6 and Item 7, archaeological investigations will be completed prior to any work that have the potential to impact upon the potential archaeology of heritage items. Test Excavations will be completed in accordance with the relevant sections (139(4)) of the Heritage Act, the guideline 'Relics of local heritage significance: a guide for archaeological test excavation' published by Heritage NSW and the Archaeological Assessments: Archaeological Assessment Guidelines (NSW Heritage Office, 1996).	Detailed design, prior to construction
Visual impact to heritage items (Item 1, 2, 3 and 8)	HH6	Screening vegetation will be considered at each heritage item to minimise views of Project infrastructure from the heritage item. Consideration of materials and finishes of components of the Project will also be considered to minimise visual impacts.	Detailed design
Traffic and transport			
Impacts to the local road network	TT1	A Construction Traffic Management Plan (CTMP) will be prepared and will include: • Confirmation of haulage routes • Access to the Project, including entry and exit locations • Preferred times of transport to and from the Project to minimise impacts on the road network • Measures to minimise the number of workers using private vehicles • Management of oversize overmass (OSOM) vehicles • The maximum parameters of the materials to be transported to and from the Project • Site-specific traffic control measures (including signage) to manage and regulate traffic movement • Relevant traffic safety measures, including driver induction, training, safety measures and protocols	Prior to construction

Impact	Reference	Environmental management measure	Timing
		• Requirements for, and placement of, traffic barriers • Requirements and methods to consult and inform the local community of impacts on the local road network due to the development-related activities • Consultation with Transport for NSW, Victoria Department of Transport, National Heavy Vehicle Regular (NHVR) and local Council • Consultation with the emergency services to ensure that procedures are in place to maintain safe, priority access for emergency vehicles • A response plan for any construction-related traffic incident • Monitoring, review and amendment mechanisms • Individual traffic management requirements at each phase of construction.	
	TT2	Group transport, such as buses for workstreams of more than 20 persons as well as ride sharing systems, will be implemented, where practical, to reduce the number of traffic movements on the local road network.	Construction, decommissioning
	TT3	Dedicated and demarcated parking areas for light and heavy vehicles will be provided. Vehicles associated with the Project will not be permitted to park on the surrounding public road network.	Prior to construction
	TT4	Heavy vehicle movements to and from the Project will be scheduled to minimise traffic disruption to the surrounding road network. This may include, but is not limited to: • Scheduling the movement of construction material, equipment and waste to occur outside of peak periods where practical • Scheduling heavy vehicle deliveries to be evenly dispersed as far as practical to minimise convoying or platoons and queuing outside the Project or on the road network.	Prior to construction, construction, operation, decommissioning
OSOM vehicles	TT5	A separate OSOM Transport Management Plan will be prepared and will include: • Identification of the final OSOM route • Measures to provide an escort for the loads • Times of transporting to minimise impacts on the road network • Location of rest areas and require rest stops along the route • The maximum parameters of the materials to be transported to and from the Project • Communication strategy and liaising with emergency services and police • Any minor temporary civil infrastructure work which may be required to accommodate OSOM movements.	Prior to construction

Impact	Reference	Environmental management measure	Timing
	TT6	An oversized vehicle permit will be sought for all OSOM vehicle movements where required. The OSOM movements will be in accordance with the permit requirements and be outside of peak traffic periods where reasonable and feasible.	Prior to construction
	TT7	The OSOM route will be finalised in consultation with relevant road authorities prior to official NHVR application and will consider potential impacts to pavement and culverts at intersections along the route. The OSOM route assessment this will be assessed once the vehicle and load dimensions have been confirmed prior to transportation.	Prior to construction
	TT8	A dilapidation report will be submitted with the proposed design in reference to Austroads Design guidelines.	Prior to construction
	TT9	Where required, a NHVR exemption permit will be obtained for any parts of the final OSOM route which requires access through roads which are restricted or conditionally approved for OSOM vehicles.	Prior to construction
	TT10	Detailed 3D swept path assessments will be undertaken for intersections and proposed road upgrades in consultation with relevant road authorities. The design will be developed to the standard and satisfaction of the Victoria Department of Transport and NSW road authorities, including Murrumbidgee Council, Edward River Council and Transport for NSW, as appropriate under Section 138 of the NSW *Roads Act 1993*.	Prior to construction
Road safety	TT11	A Driver Code of Conduct will be prepared and be used to outline the rules and behaviours which drivers associated with the Project will be required to adhere to. The Driver Code of Conduct will outline arrangements for light and heavy vehicle drivers, including: • General requirements, including site induction requirements • Travelling speeds and safe driving practices, particularly through residential areas and school zones • Fatigue management • Adherence to designated haulage routes and heavy vehicle noise • Public complaint resolution and penalties and disciplinary action.	Prior to construction, construction, operation, decommissioning
	TT12	Public roads and Crown roads will not be obstructed by any materials, vehicles, skip bins or the like, under any circumstances.	Construction, operation, decommissioning
	TT13	'Trucks Turning' warning signs will be installed on both approaches to the intersection of Kidman Way / Liddles Lane and Kidman Way / Jerrys Lane to advise existing road users of the increased heavy vehicle volumes. The signs will be removed upon the completion of construction work.	Construction, decommissioning

Impact	Reference	Environmental management measure	Timing
	TT14	All vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or dirt particles depositing onto the roadway during travel to and from the Project.	Construction, decommissioning
	TT15	Speed reductions, use of fog lights during periods of low visibility, cessation of work and site shutdowns will be implemented as required during periods of adverse weather.	Construction, operation, decommissioning
Access	TT16	Affected parties including emergency services will be notified in advance of any disruptions to traffic and restriction of access impacted by Project activities.	Prior to construction, construction, operation, decommissioning
Water and soils			
Erosion and sedimentation	SW1	A Construction Soil and Water Management Plan (CSWMP) will be prepared. The CSWMP will include but not be limited to: • Measures to minimise/manage erosion and sediment transport both within the Project and offsite (including work on erodible soil types), including the requirements for the preparation of Erosion and Sediment Control Plan (ESCP) for construction • Measures to manage accidental spills, including the requirement to maintain materials such as spill kits • Measures to manage any potential acid sulfate soils (ASS) if found in excavated fill material in accordance with the NSW Acid Sulfate Soil Guidelines (Acid Sulfate Soils Management Advisory Committee, 1998) • Measures to manage potential tannin leachate • Measures to manage stockpiles • Details of surface water quality monitoring to be undertaken prior to, throughout and following construction (refer to SW4 for further information). Measures to ensure that all waterway crossings will be constructed in accordance with the Guidelines for Controlled Activities on Waterfront Land – riparian corridors (Natural Resources Access Regulator, 2018), Guidelines for watercourse crossings on waterfront land (DPI, 2012), Guidelines for riparian corridors on waterfront land (DPI, 2012) and Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).	Prior to construction, construction, decommissioning
Erosion and sedimentation	SW2	A construction ESCP will be prepared and will detail the specific erosion and sediment control measures to be implemented within the Project, in accordance with the principles and requirements of Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004).	Prior to construction, construction

Impact	Reference	Environmental management measure	Timing
		Scour protection and control measures will be identified in the CSWMP to reduce erosion and water quality impacts from increased sediment loads from ancillary sites and access tracks.	
Disturbance	SW3	To avoid any impacts on water quality and threatened species, the following measures will be implemented: • Minimise the total area of bare earth exposed at any time • Employ interim rehabilitation strategies to minimise dust generation, soil erosion and weed incursion on parts of the Project that cannot yet be permanently rehabilitated • Where required, rehabilitate all areas of the Project that are not proposed for future disturbance as soon as is practicable following construction and decommissioning.	Construction, decommissioning
Water quality - monitoring	SW4	A surface water monitoring program will be implemented prior to, during and following construction and decommissioning. The monitoring program will include but not be limited to: • Visual assessment and routine monitoring of physico-chemical parameters and contaminants of concern at downstream SREs to ensure compliance with applicable guidelines during construction and decommissioning • Visual assessment of surface water quality control structures at least once a week and also following any heavy rain during construction and decommissioning, to ensure controls are operating effectively for their designed purpose.	Prior to construction, construction, decommissioning
Construction – Spills and litter	SW5	Project specific controls and procedures will be developed and implemented to reduce the risk of litter, spills and leaks entering downstream waterways and/or leaching into the soil and groundwater table. The CSWMP will include, but not be limited to, the following measures: • All fuels, chemicals and liquids will be stored on level ground away from waterways and will be stored in sealed bunded area within the construction compound • Refuelling and minor maintenance activities will be limited to designated areas with established spill capture and management controls • An emergency spill response procedure will be prepared • Regular visual water quality checks (for hydrocarbon spills/slicks, turbid plumes and other water quality issues) will be carried out at waterways in proximity to work • Installing and maintaining control measures such as silt fencing and gross pollutant traps.	Construction, decommissioning
Impacts of stockpiles	SW6	Stockpiles will be managed to minimise the potential for mobilisation and transport of dust, sediment and leachate in runoff. This will include: • Minimising the number of stockpiles, area used for stockpiles, and time that they are left exposed	Construction

Impact	Reference	Environmental management measure	Timing
		• Locating stockpiles away from drainage lines, waterways and area where they may be susceptible to wind erosion • Stabilising stockpiles, establishing appropriate sediment controls and suppressing dust as required.	
Concrete works	SW7	Batch plants will be located on a concrete slab adjacent to the construction compound. To avoid ingress of concrete waste material into downstream waterways, the CEMP will outline procedures to capture, contain and appropriately dispose of any concrete waste from concrete work, including designated lined, bunded and controlled concrete washout areas.	Prior to construction, construction
Operation – stormwater runoff	SW8	Increased stormwater runoff during Project operation will be managed through: • The design of permanent drainage and water management, demonstrating the ability to meet Project performance outcomes of no pollution of water • Scour protection, control measures and maintenance of access tracks to reduce erosion and water quality impacts • Monitoring of receiving drainage channels and waterways downstream of discharge location to identify any evidence of channel erosion and scour.	Operation
Operation – Spills and emergency management	SW9	Project specific controls and procedures will be developed to reduce the risk of the release of potentially harmful chemicals from spills entering downstream watercourses such as: • Appropriate storage of equipment and hazardous substances during operation • Operational procedures for emergency response to spills and leaks from equipment or maintenance activities.	Operation
Water demand	SW10	Any water licences for the Project will be obtained in accordance with the *Water Management Act 2000*.	Prior to construction, construction
Impacts to High Priority GDEs	SW11	If, during detailed design, Project excavation is designed to exceed the current proposed maximum depth of 3 mbgl, potential impacts to GDEs will be re-assessed by a suitably qualified hydrogeologist.	Detailed design, construction
Acid sulfate soils	SW12	For excavation work that is required as part of construction and/or operation within or adjacent to areas of high ASS potential as detailed in **Figure 13-7** of the EIS, investigations will be undertaken to assess the presence of ASS or potential ASS (PASS). If ASS or PASS are identified during investigations, an appropriate ASS management plan will be developed and implemented prior to any excavation work to facilitate construction and/or operation are undertaken.	Prior to construction

Impact	Reference	Environmental management measure	Timing
Unexpected contamination	SW13	The CEMP will include an unexpected finds procedure in the event of unexpected contamination.	Prior to construction
Unexpected contamination	SW14	A visual inspection of the disturbance footprint will be completed prior to construction to confirm the findings of the Soils and contamination technical report. Inspection can be completed by any person with knowledge of the unexpected finds protocol to ensure no obvious signs of contamination are present where work will occur (i.e. staining, fly-tipped waste, odours etc.). Should indicators of contamination be observed during construction, the unexpected finds procedure will be followed: • Indicators of contamination must be documented, and an appropriate sampling program designed • Sampling program will be implemented, and a report on the existing contamination prepared • If contamination is present, further investigation, management and/or remediation will be required.	Prior to construction
Unexpected contamination	SW15	Should areas within the Project be upgraded to a moderate to very high contamination impact potential, as a result of an unexpected find/s and subsequent investigation/s, additional measures will be implemented in accordance with relevant guidelines as recommended by a qualified contamination consultant. These additional mitigation and management measures will be dependent on the outcomes from the subsequent investigations, which may include: • Remedial Action Plans • Involvement of an accredited Site Auditor, and issue of a Site Audit Statement and Site Audit Report • ASS Management Plan.	Prior to construction, construction
Impacts on mainstream and overland flooding	SW16	During detailed design, the Project will be further refined with the following considerations to minimise impacts to flooding where reasonable and feasible, including: • Minimising filling of WTGs, BESS and substations sites • Minimising encroachment of Project infrastructure into the 1% AEP flood extent • Design to manage flood impacts and flow conveyance at watercourse crossings • Power poles for the proposed transmission line will be located away from flow paths where possible.	Detailed design
	SW17	If upgrade of Wilson Road bridge crossing of Yanco Creek is required, design considerations to minimise hydraulic impacts including increases in flood levels will be made during detailed design.	Detailed design
Geomorphic impacts and scouring during	SW18	During detailed design, the Project will be further refined with considerations to minimise erosion, scouring and geomorphic impacts where reasonable and feasible, including:	Detailed design

Impact	Reference	Environmental management measure	Timing
flood and storm events		• Permanent operational infrastructure and landforms will be designed and implemented/formed to minimise any potential scour and erosion risks associated with surface water runoff • Appropriate scour protection will be provided at flow discharge areas, hydraulic structures and other identified at-risk locations.	
Impacts on the Project resulting from flooding	SW19	The Project design will provide filling for any necessary infrastructure to above the PMF level for the central primary substation/BESS and collector substations.	Detailed design
Farm dams and surface water resources	SW20	During detailed design, the Project will be further refined with the following considerations to minimise impacts to surface water resources where reasonable and feasible: • Minimising changes to runoff and natural flow regime by minimising infrastructure in flow paths. • Constructing Project facilities, hardstand areas and access tracks in such a manner to reduction of inflows to farm dams and surface water resources • Provision of culverts/bridges at road crossings to maintain conveyance of low flows.	Detailed design, construction
	SW21	Potential impacts to flow paths associated with Project infrastructure in proximity to existing farm dams will be discussed and management measures (such as diversions) will be confirmed in consultation with landowners to avoid impacts to farm dams inflows. During detailed design, the Project will be further refined to relocate several access tracks and cabling routes where reasonable and feasible to avoid clashes with existing farm dams.	Detailed design
Flood and surface water quantity impacts from temporary construction work and facilities	SW22	Material stockpiles and construction facilities will be located outside the 1% AEP flood extent.	Construction
	SW23	Temporary access tracks will be constructed in such a manner to maintain existing drainage conditions and flow paths.	Construction
	SW24	Drainage swales and channels will be installed to convey runoff and flows around construction areas and gravel pits.	Construction
Air quality			
Dust	AQ01	Air quality management measures will be included in the CEMP for the Project, and would include but not be limited to: • Clearly marking haul routes • Watering and maintenance of haul routes	Prior to construction

Impact	Reference	Environmental management measure	Timing
		• Vehicle speed restrictions • Prompt clean-up of any material spillage.	
	AQ02	Weather will be monitored to minimise activities during adverse dust conditions e.g., during hot and windy conditions	Construction, decommissioning
Land			
Communication protocols with landowners	LU01	Agreed communication and behaviour protocols will be established to minimise disruption to farm activities. This will include protocols for entry to properties, scheduling of construction or maintenance activities, and for landowner queries or complaints management. Examples of protocols include, but will not be limited to the following: • Biannual maintenance crews will provide a minimum seven-day notice period before coming onto properties • Scheduled maintenance will avoid lambing season (May-July) • All visitors will follow colour coded gateway opening and closing protocol to avoid mixing mobs of sheep.	Prior to construction, construction, operation, decommissioning
Biosecurity risk	LU02	A comprehensive Biosecurity Management Plan will be developed for all Host Landowner properties and all stages of the Project. This would include the requirement for strict biosecurity protocols, such as vehicle and footwear hygiene practices, and to follow colour coded gateway opening and closing protocols to avoid mobs of sheep leaving properties via boundary gates.	Prior to construction, construction, operation, decommissioning
Aerial applicators	LU03	To minimise the risk associated with aerial spraying and in accordance with the Aerial Agricultural Association of Australia policy document on windfarms, the Project design will ensure the following in cropped areas of the Project: • All power lines to be underground, where reasonable and feasible • All meteorological masts are marked in accordance with National Airports Safeguarding Framework (NASF) guidelines and notified to the local aerial applicators	Construction, operation
	LU04	Host and neighbouring landowners, local aerial agricultural operators and aerial firefighting operators will be contacted to inform them of the Project. Details of the Project, including location and height information of WTGs, meteorological masts and overhead power lines will be provided to facilitate the flight planning of aerial application operators.	Prior to construction

Impact	Reference	Environmental management measure	Timing
		An agreed set of protocols with the local aerial applicators will be developed for all relevant operational issues, including notification of applications and action by the wind farm operator to stop blades in a safe position during application operations.	
Access tracks impacts	LU05	Discussions with Host Landowners will be held on the opportunity to utilise existing farm tracks to minimise the additional area lost to track construction	Detail design
Disruption to farm activities	LU06	Discussions will be undertaken with landowners on potential micro-siting WTGs to minimise disruption to farm activities.	Detailed design
Erosion	LU07	Further supplementary laboratory testing will be undertaken on geotechnical soil samples to confirm the potential for soil erosion in the Project. Relevant laboratory tests will include: • Emerson Class Number • Pinhole dispersion testing • Particle Size Distribution • Atterberg Limit • Sodicity and electrical conductivity chemical tests.	Prior to construction
Aviation safety			
Aerial obstacles	AV1	The location of 'as constructed' WTGs and permanent meteorological masts will be advised to RAAF, Airservices Australia and CASA, along with the Aeronautical Impact Assessment (L&B, 2022).	Prior to construction
LSALT infringement	AV2	Ongoing consultation will be undertaken with Airservices Australia and CASA to assess potential impacts of the Project and to address the lowest safe altitude (LSALT) impact of air route W419 and Grid LSALTs near the Project that will need to be raised.	Prior to construction
Low level activities	AV3	Consultation with the aerodrome owner/operator and those that operate from Landing Ground 1 will be undertaken to ensure that they are aware of the potential for unusual turbulence arising from the Project.	Prior to construction
Visibility of WTG	AV4	The rotor blades, nacelle and the supporting tower of the WTGs will be painted white.	Detailed design
Visibility of monitoring masts	AV5	During the detailed design process, any required marking and lighting of the permanent meteorological monitoring masts will be confirmed, according to National Airports Safeguarding Framework (NASF) Guideline D best practice.	Detailed design

Impact	Reference	Environmental management measure	Timing
Telecommunication			
Point to point impacts	EMI1	Consultation will be carried out with NSW Electricity Networks Operations Pty Limited and NSW Rural Fire Service, to determine their antennae heights, and regarding potential interference due to the seven WTGs identified potentially in their communication paths. A detailed 3D analysis will be undertaken when further information is available.	Detailed design
Point to multi point links	EMI2	Consultation will be carried out with the 15 different Licensees of the 49 point to multi point telecommunication towers identified within 100 km of the Project. This consultation will determine the potential interference due to the Project.	Detailed design
Point to point and point to multi point links	EMI3	Should consultation with point to point, or point to multipoint, link Licensees determine that interference is a risk, then options to relocate/remove WTGs and/or rerouting of transmission paths around the Project will be considered.	Detailed design
Point to area telecommunications	EMI4	Consultation will be carried out with all point to area telecommunication tower owners within 100 km of the Project. This consultation will determine the potential interference due to the Project.	Detailed design
Point to area telecommunications	EMI5	Should consultation with point to area communication tower owners determine that interference is a risk, options for mitigation will be considered in the following order: • Monitoring telecommunications during construction and operation to determine any impact of the Project • Improving existing infrastructure, such as increasing antennae gain • Rerouting of transmission paths around the Project • Relocation and/or removal of WTGs to not disrupt any telecommunications.	Detailed design, construction, operation
Aviation and meteorological radar operations	EMI6	Consultation will be carried out with the owners of the 15 aeronautical towers, and the Bureau of Meteorology, to determine any potential impact to their telecommunications from the Project.	Detailed design
Health and EMF			
Human health	EMF1	The phase spacing of overhead conductors (including transmission line and substation bus equipment) will be reduced where practicable to increase the degree of magnetic cancellation and reduce associated EMF levels. The design will also ensure that the reduction in phase spacing does not result in unacceptable levels of audible noise and radio frequency interference from the transmission line and substations where practicable.	Detailed design
	EMF2	The phase-to-ground separation associated with the Project transmission line will be increased where practicable to reduce the electric field strength and magnetic flux density at 1 m above ground level.	Detailed design

Impact	Reference	Environmental management measure	Timing
	EMF3	Underground cables will be arranged in close trefoil or multicore cable arrangement where practicable. This will maximise the magnetic field cancellation and minimises the magnetic flux density level at 1 m above ground level.	Detailed design
	EMF4	Consideration will be given to the location of substation equipment with respect to the perimeter fence. For example, equipment that generates significant magnetic fields, such as air-core reactors associated with harmonic filters, will not be placed close to publicly accessible areas where practicable.	Detailed design
Bush fire risk			
Bush fire	BU01	The Project will implement the following permanent bush fire protections: • Asset Protection Zones (APZs) around each WTG (accomplished by hardstand, no additional vegetation management needed) • APZs around the substations and BESS • An APZ around the operation and maintenance facility, which is to be constructed to a BAL-12.5 standard as the Project refuge of last resort • Perimeter firebreak • Ongoing vegetation management (grazing, clearance around poles and overhead power lines) • Access for emergency response vehicles • A permanent, dedicated firefighting water source • Controls on Project actions to prevent bush fire ignition • Fire suppression systems in WTGs, substations, BESS • Project fire fighting vehicle.	Construction, operation
	BU02	Construction and Operation Bush fire Emergency Management Plans will be developed for the Project in accordance with Planning for Bush Fire Protection (PBP) (NSW Rural Fire Service [RFS], 2019) and in consultation with the NSW RFS (including any requirements in relation to aerial firefighting). These plans will identify all relevant bush fire risks and mitigation measures associated with the construction and operation of the Project, including those listed in BU01 and: • Specific measures to prevent bush fire ignition or spread from Project activities • Work types that will not be conducted during total fire bans • Storage location and safety arrangements for any fuels or other hazardous or flammable materials • Notification protocols to the NSW RFS of any work with the potential to cause a fire in the surrounding vegetation • Instructions and triggers to shut down WTGs with an approaching fire	Prior to construction, construction, operation

Impact	Reference	Environmental management measure	Timing
		• Any other measures required by the NSW RFS or other authorities to manage risk to aerial firefighting in the region • Notification protocols and contact details for the local NSW RFS Fire Control Centre, local fire brigades, CASA, Air Services Australia, Transgrid, and any other people or organisations who will be notified of an emergency at the Project • Location of firefighting water, any alternative water supplies that may be available during an emergency, and any other fire suppression equipment held on site • Bush fire emergency planning, including evacuation triggers, evacuation routes and when and where to take refuge.	
	BU03	Risks to firefighting operations will be managed, including: • Registering all towers (WTGs and meteorological monitoring towers) prior to emplacement on site • WTG shutdown procedures in a Y-position in case of a fire in the area.	Construction, operation
BESS			
Hazards	PHA1	A detailed Hazard and Operability Study and design review of the selected designs will be carried out with specific attention on the inherent design features that detect, control and prevent thermal runaway.	Detailed design
Thermal runaway	PHA2	Requirements for suppliers and designers will be specified to demonstrate robust designs to prevent, monitor and (where unable to eliminate the possibility) control thermal runaway and undertake specialist safety in design assessments such as a fire risk assessment to inform the design and selection of the battery technology.	Detailed design
	PHA3	A design principle will be implemented that assumes a thermal runaway event within an enclosure would occur during the lifetime of the asset and therefore limits deflagration energy release (and prevents the spread of fire to adjacent enclosure by adopting appropriate design controls such as suitably designed enclosures and separation distances).	Detailed design
	PHA4	Credible scenarios will be determined from a thermal runaway event once the technology and its size are determined to quantify the amount of potential hazardous byproducts that must be managed and establish the Project design basis accordingly (e.g. amount of combustion and pollution, fire water uses for containment (if applicable), volumes of retention dams etc.).	Detailed design
Quality control	PHA5	A robust quality plan will be implemented and inspections will be carried out throughout the supply chain and during installation, including factory and site acceptance testing.	Detailed design, commissioning

Impact	Reference	Environmental management measure	Timing
Hazards	PHA6	Suitable asset management plans will be developed and implemented to ensure proper maintenance of the facility in line with manufacturers' recommendations and good industry practice throughout Project operation.	Prior to operation
Fire safety	PHA7	A fire safety study will be prepared in consultation with Fire and Rescue NSW and to the satisfaction of their operational requirements.	Detailed design
Emergency response	PHA8	Provisions will be made for training and education of operations staff and emergency response services to understand the technology to safely manage potential incident responses.	Prior to operation
Blade throw			
Blade throw	BT1	Wind turbine components will be manufactured and certified to current best practice Australian and international (IEC 61400-23) safety standards and are equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.	Prior to construction
	BT2	WTGs will be subject to stringent safety and security measures, including regular maintenance and servicing (within an ISO90001 Quality Assurance system).	Prior to construction, construction, operation
	BT3	Contactors certified in the manufacture, delivery, build, inspection, maintenance and repair of turbine components will be employed.	Prior to construction, construction
Social impacts			
General social impacts	S1	A Community and Stakeholder Engagement Plan (CSEP) will be prepared and implemented to help provide timely and accurate information to the community during construction. The plan will include but not be limited to: • Mechanisms to provide details and timing of proposed activities, potential impacts and mitigation measures to nearby residents and communities, visitors and motorists (e.g. haulage activities, high noise generating activities, etc) • Processes for engaging with affected residents and stakeholders about potential impacts and proposed management measures • Process for receiving and responding to queries and complaints regarding Project construction.	Prior to construction

Impact	Reference	Environmental management measure	Timing
Property	S2	To minimise potential impacts to property, the Project will: • Minimise area of land affected by temporary construction activities and consider wider property operations in the siting of temporary construction facilities • Consult with Host Landowners prior to removal of farm infrastructure, about any temporary arrangements, and reinstate affected farm infrastructure following construction in consultation with the landowners • Ongoing engagement with Host Landowners, in accordance with the CSEP about timing and duration of construction activities.	Prior to construction, construction, operation
Housing and accommodation	S3	A Workforce Accommodation Strategy will be prepared for the Project, in consultation with relevant stakeholders, to manage demand for housing and accommodation from the construction workforce during construction, which includes but will not be limited to: • Strategies to maximise the use of short-term accommodation, while also managing potential effects on tourists and holiday makers during peak tourist periods and major regional events, and seasonal workers • Processes for engaging with local accommodation providers, housing support agencies and other relevant stakeholders about anticipated demand for housing and accommodation by the construction workforce • Mechanisms to encourage non-local operational workers to look at housing in towns across the study areas to minimise housing demand in one town only.	Prior to construction, construction, operation
Social infrastructure	S4	To minimise potential impacts to social infrastructure, the Project will: • Implement worker health and safety measures on site, including preparation and implementation of Workforce Health and Safety Plan that includes measures for responding to health, medical and safety incidents during construction • Engagement with local emergency service providers in the preparation and planning of emergency response procedures • Engage with managers of community facilities in towns closest to the Project in accordance with the CSEP about timing and duration of a potential influx of non-local workers.	Prior to construction, construction

Impact	Reference	Environmental management measure	Timing
Community values	S5	To minimise potential impacts to community values, the Project will: • Carry out early and ongoing communication with local residents closest to construction activities and along Liddles Lane about the timing, duration and potential impacts on construction and haulage activities • Communicate with communities in Jerilderie, Coleambally, Finley and Tocumwal about the timing and duration of major haulage activities • Where reasonable and feasible, restrict haulage activities during night-time hours (noting that WTGs are required to be transported at night) • Where reasonable and feasible, minimise the number of continuous nights that night-time haulage activities occur • Develop and implement protocols relating to worker conduct • Encourage contractors and workers to participate in community organisations and community life • Carry out early and ongoing engagement and communication about the Project with communities in the primary and secondary study areas • Implement Community Benefit Fund at commencement of construction that provides support to community groups and facilities • Continue engagement with local Council, community organisations and other relevant stakeholders to identify community needs to allow targeted investment.	Prior to construction, construction
Access	S6	Early and ongoing engagement and communication will be carried out with communities and road users in the primary and secondary study areas about potential construction traffic impacts.	Prior to construction, construction
Decommissioning	S7	A detailed assessment will be undertaken of potential impacts of decommissioning activities on socio-economic conditions and values in the primary and secondary study area prior to the commencement of decommissioning activities, including identification strategies to manage potential negative impacts and enhance potential positive impacts.	Prior to decommissioning

Impact	Reference	Environmental management measure	Timing
Economic			
Employment and training	E1	A Local Workforce Strategy will be prepared for the Project, in consultation with local Councils and relevant stakeholders, that includes but is not limited to: • Strategies to maximise employment opportunities for residents in the study areas, including strategies to communicate to local communities (prior to and during construction) opportunities and requirements for work on the Project • Strategies relating to training and apprenticeships for Aboriginal people, young people, and women, including consultation with local contractors and relevant stakeholders (e.g. Aboriginal groups, youth and women organisations) to identify and develop training and education opportunities • Engagement with local Councils in the primary and secondary study areas in accordance with the CSEP about construction and operational workforce numbers and timing • Strategies to minimise potential for movement of workers away from existing industries.	Prior to construction, construction, operation
Business and industry	E2	To minimise potential impacts to business and industry, the Project will: • Commit to considering local business opportunities in Project procurement practices, including encouraging contractors to source local goods and services, where reasonable and feasible • Establish a register of local businesses for upcoming work and communicate to local communities prior to and during construction opportunities and requirements for work on Project construction • Engage with Edward River and Murrumbidgee Councils and business groups in accordance with the CSEP about local business requirements and necessary skills to improve preparedness of local business • Implement training to increase local skills and availability of labour	Prior to construction, construction, operation
Waste			
Waste	W01	A Waste Management Plan (WMP) will be prepared which will include a detailed breakdown of waste types and quantities in accordance with relevant legislation and guidelines. It will outline the strategies to reuse, recycle and dispose of waste and will also refine the indicative waste quantities for each waste type. Specific measures in the WMP will include: • Removal of packaging waste • Separation of recyclable and non-recyclable materials where reasonable and feasible • Waste receptacles will be collected on a regular basis by licensed contractors or Council collection service and transported for off-site disposal at a suitably licensed landfill or recycling facility • All waste disposal will be in accordance with the POEO Act and Waste Classification Guidelines (NSW EPA, 2014)	Prior to construction

Impact	Reference	Environmental management measure	Timing
		• Waste tracking will occur for any types and quantities of waste that trigger the requirement for tracking • An objective to ensure that any use of local waste management facilities does not exhaust available capacity nor disadvantage the local community.	
GHG			
Greenhouse gas emissions	GHG1	Equipment and vehicles will be regularly serviced and maintained to optimise efficiency.	Construction, operation, decommissioning
	GHG2	Where reasonable and feasible, fuel and energy efficient equipment and vehicles will be selected.	Prior to construction
	GHG3	Opportunities will be reviewed to use alternative materials in construction to concrete, such as fly ash as a supplementary cementitious material and reclaimed aggregate.	Prior to construction
	GHG4	High recycled content in steel use will be specified where technically reasonable and feasible and cost effective.	Prior to construction
Cumulative			
Cumulative traffic impacts	CU1	Ongoing consultation will be undertaken with local Councils and road authorities to manage construction traffic and coordinate delivery of Project elements. Any changes to manage cumulative traffic impacts will be included in the CTMP.	Prior to construction
	CU2	Discussions with proponents of adjacent and nearby wind farms or other Projects to coordinate road upgrades.	Prior to construction

23. Justification of the Project

This section provides a discussion of the justification for the Project, taking into consideration the associated environmental and social impacts and the suitability of the site, to assist the consent authority to determine whether or not the Project is in the public interest.

23.1 Justification for the Project

The Project has been assessed in line with the requirements of Section 4.15 of the EP&A Act to determine the environmental, economic and social costs and benefits. The Project would result in the following key benefits:

- Direct response to Commonwealth and State climate change commitments such as the Paris Agreement (United Nations, 2015), the 2022 ISP (AEMO, 2022), NSW Climate Change Policy Framework (NSW Government, 2016), the NSW Net Zero Plan Stage 1: 2020-2030 (NSW Government, 2020a), the Electricity Infrastructure Roadmap (DPIE, 2020a)
- Supplying over 1.5 GW to the NEM and contributing towards the targeted 2.5 GW for the South West REZ
- Enhancing energy reliability and security in the NEM
- Contributing to capacity gaps in the electricity market following the planned closure of major coal-fired generation
- The Project would generate zero-emissions energy for most of its duration given that the Project would offset its construction emissions in less than one year of operation. By operating with near zero emissions, the energy generated by the Project would support the transition from non-renewable source. Further, if all wind power generated replaces the power from black coal, the carbon offset is nearly 5 million tonnes of CO2-e per year. Similarly, if all wind power generated replaces power from gas, approximately 2.8 million tonnes of CO2-e is offset per year
- Regular payments and contributions to Host and Associated Landowners, allowing them to diversify and expand income streams and support viability of agricultural businesses
- Providing opportunities for local and regional investment, opportunities for local contractors, suppliers and businesses, increased employment opportunities and contributions to a community benefit fund
- Improving incomes and skills developments for individuals due to creation of local employment on the Project
- Using local suppliers and businesses leading to improved business income and livelihoods for business owners and employees, and opportunities for business growth and development
- Increased participation in recreation, sporting and community clubs due to influx of construction workers
- Retaining and attracting young people to the area due to local employment opportunities
- Improvements in Host Landowner property access due to new and upgraded access tracks.

The Project would generate significant employment in the region, generating an expected total impact on employment from Project expenditure up to 22,892 FTE person years of employment (direct, indirect and induced) during Project construction and 500 FTE person years of employment (direct, indirect and induced) per annum during Project operation.

Overall, the Project would involve approximately $3.45 billion in investment and have the capacity to supply sufficient clean energy to power the equivalent of approximately 700,000 homes per annum.

23.1.1 Suitability of the Project

The site selection, layout and size of the Project have been developed in consideration of several alternatives to ensure the Project would result in maximum benefits for the locality and region in the long term, whilst minimising impacts to the environment. The location of the Project is suitable for the following reasons:

- It would be located within the South West REZ
- It has consistent wind speeds, ideal for large-scale wind energy generation
- It would be close to Dinawan Terminal Station, providing a connection to dispatch electricity to the National Energy Market (NEM)
- It largely comprises areas that have been previously disturbed and/or historically cleared, associated with the agricultural land use
- The Project would provide for a compatible land use and support the ongoing agricultural use of the Project
- There are minimal nearby dwellings and the Project provides for sufficient separation distances to Non-associated dwellings (minimum of 3.6 kilometres) to minimise noise, hazard and air quality impacts associated with the construction and operation of the Project
- The conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise potential impacts to identified biodiversity and Aboriginal cultural heritage values. Environmental management measures will be implemented to mitigate residual environmental and social impacts associated with the Project.

With the exception of one trigonometric station (TS 5327) which is listed as being destroyed in 2015, no other trigonometric station is located within the Project. There are no current minerals, coal or petroleum and gas titles within the Project.

The capacity of the existing transmission network is insufficient to accommodate the Project. However, the Project would eventually connect to Transgrid's Dinawan Terminal Station which would provide sufficient new capacity for transmission. The Dinawan Terminal Station will be located about 16.5 kilometres east of the Project.

23.2 Ecologically Sustainable Development

Ecologically sustainable development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In NSW, the principals of ESD have been incorporated into legislation including the EP&A Act and the EP&A Regulation, which consist of the following:

- The precautionary principle
- Inter-generational equity
- Conservation of biological diversity
- Valuation and pricing of resources.

Table 23-1 outlines how the Project and the environmental impact assessment process have considered each ESD principle.

Table 23-1 ESD principles

Principle	Considerations
Precautionary principle	
a) The precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and ii) an assessment of the risk-weighted consequences of various options.	The precautionary principle has been adopted in the assessment of environmental and social impacts in this EIS (**Chapter 7** to **Chapter 21**). The EIS has been undertaken on the basis of the best available scientific information and best practice industry guidelines relevant to the Project, and has been informed by site inspection and surveys, monitoring, modelling and desktop analysis. As described in **Section 1.5** and **Section 3.10**, Virya has considered a range of options, alternatives and strategies to avoid or minimise impacts. Due to the nature of the Project, specific project details will be subject to detailed design and will be influenced by the technology applicable at the time. However, any uncertainty in the data used for the assessment has been appropriately identified, an appropriate assumption has been applied to represent a conservative worst-case analysis. Potential environmental and social impacts have been assessed which considered the conservate worst-case scenarios, and the implementation of management and mitigation measures are also proposed to prevent and minimise environmental risks where possible. These environmental management measures are provided in **Chapter 22**.
Inter-generational equity principle	
b) Inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.	The Project would contribute the NSW shift away from coal fired power generation and supporting local communities in this transition towards clean and renewable sources of energy. The Project would also provide a source of affordable, reliable energy generation to the NEM. The Project would also provide for a compatible land use and support the ongoing agricultural use of the Project. When decommissioned, disturbed areas would be rehabilitated to meet the intended final land use and be comparable with pre-construction conditions in consultation with landowners. As the Project approaches the end of its operational lifespan, it may be upgraded and maintained to continue operating viably, or the land within the Project can be rehabilitated to its current use if required thereby allowing for either continuation of renewable energy generation or a return to agricultural use. Both options would provide benefits for future generations.

Principle	Considerations
Biodiversity principle	
c) Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	The impact of the Project on biodiversity values are discussed in **Chapter 9** (biodiversity). The Project design has been further refined since the Scoping Report was exhibited to avoid biodiversity values including impacts to Plains-wanderer important area mapping, threatened flora populations, Eucalypt woodland with hollow bearing trees, paddock trees with large stick nests, creeks/riparian areas, and low lying areas with Lignum/Nitre Goosefoot swamps and proximity to known biodiversity conservation sites. This included the removal of a number of WTGs and their associated electrical infrastructure. Environmental management measures to mitigate residual biodiversity impacts are outlined in **Chapter 22**.
Valuation principle	
d) Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as: i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	The Project would provide cleaner electricity generation which will reduce greenhouse gas emissions when compared to coal-fired generation and other types of fossil fuel use. As a result, the Project and the renewable energy generation industry will contribute towards the reduction of climate change risks. The strategies to minimise waste are outlined in **Chapter 19** and the Project would align with the Waste Classification Guidelines (NSW EPA, 2014b) and the WARR Act. There are no Non-associated dwellings within 3.6 km of a WTG. Management measures are proposed to minimise light spill and where appropriate apply vegetation screening to maintain visual filtering or screening between the Project and Non-associated receivers. The Project would seek to minimise air quality, noise, visual, waste impacts through the implementation of environmental management measures in **Chapter 22.** Further the construction and operation of the Project will be subject to an EPL which will include conditions that relate to pollution prevention and monitoring, and the implementation of best practice. The Project would seek to maximise benefit for the local and regional communities near the Project through establishing a community benefit fund and providing direct investment into landowners' properties.

23.3 Conclusion

The Project would provide long-term, strategic benefits to the State, as well as provide direct local and regional environmental, social and economic benefits. The Project would have the key benefits:

- Strategic:
  - Supplying over 1.5 GW to the NEM and contributing towards the targeted 2.5 GW for the South West REZ
  - Enhancing energy reliability and security in the NEM
  - Contributing to capacity gaps in the electricity market following the planned closure of major coal-fired generation
- Social/economic:
  - Regular payments and contributions to Host and Associated Landowners, allowing them to diversify and expand income streams and support viability of agricultural businesses
  - Provide opportunities for local and regional investment, opportunities for local contractors, suppliers and businesses, increased employment opportunities and contributions to a community benefit fund
  - Improved incomes and skills developments for individuals due to creation of local employment on the Project
  - Use of local suppliers and businesses leading to improved business income and livelihoods for business owners and employees, and opportunities for business growth and development
  - Increased participation in recreation, sporting and community clubs due to influx of construction workers
  - Retention and attraction of young people due to local employment opportunities
  - Improvements in property access due to improved road conditions from new or upgraded access tracks
  - During construction, generating up to 22,892 FTE person years of employment (direct, indirect and induced)
  - During operation, generating up to 500 FTE person years of employment (direct, indirect and induced) per annum.
- Environmental:
  - Suitability of the site, in particular, compatible land use and support the ongoing agricultural use of the Project
  - Minimal nearby dwellings and provides for sufficient separation distances to Non-associated Landowners to minimise noise, hazard and air quality impacts associated with the construction and operation of the Project
  - Avoid and minimise impact to identified biodiversity and Aboriginal heritage values. Further **Chapter 22** (management and mitigation summary) outlines the proposed environmental management measures to mitigate any residual environmental and social impacts associated with the Project.

Overall, the Project is consistent with the principles of ESD, and the objectives of legislation including the EP&A Act.

In the absence of the Project, the needs of NSW for generation capacity or the Commonwealth and State climate change commitments to transition to renewable energy generation and greenhouse gas emission reductions would not be supported. Further, the future security and reliability of

electricity supply in NSW would be weakened as a result of planned closures of coal power stations by 2030. In addition, not proceeding with the Project would result in the loss of significant financial benefit to the region (approximately $3.45 billion), and sufficient clean energy to power the equivalent of approximately 700,000 homes would not be realised.

Based on the above, and the Project's ability to contribute the meeting national and State commitments to transition to renewable energy generation and greenhouse gas emission reductions, the Project should be approved under the EP&A Act.

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Appendix A. Schedule of Land to which this EIS applies

Property	Project – freehold lots	
	Plan Number	Lot Number
Wells-Yanko	252520	7, 8
	576960	2
	581776	4, 5
	585343	1
	756425	30, 31, 32, 84, 85, 86, 87, 88, 89, 131, 143
	756454	2,4, 5, 6, 7, 13, 14, 15, 16, 36, 37, 38, 39, 92, 93, 95, 97, 99
Woodside North	756304	63, 64, 85, 86, 87, 97, 98, 99, 100, 101, 103, 104, 113, 114
West Park	229367	1
Bowmanville	756304	1, 2,4, 16, 17, 20, 71, 72, 73
	756455	39, 88, 89, 90, 91, 92, 93, 94
Dunraven	756455	47, 120
	756455	10, 11, 12, 13, 42, 43
East park	1127723	1
	229367	2
Moonbria	111772	1, 7
	116085	1, 2
	455037	82
	455038	1, 2, 8
	756304	7, 8, 9, 18, 19, 75, 76, 77, 78, 79, 80, 81, 116
	756455	38, 40, 41, 86, 87, 185
	1026614	7001
Waringah	48568	1
	756291	12, 13, 19, 20, 21, 24, 25
	756311	1, 2, 3, 4, 5, 6, 10, 11, 12, 13
Oakville	23356	A, B
	377237	1
	378053	1, 2
	756304	15, 21, 22, 23, 88, 89, 90, 92, 93, 94, 96, 102, 105, 106, 107, 108, 109, 110, 111, 112
	1115053	1,2
	1180553	1
Delta	541494	2
	756334	5, 6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 18 ,19, 20, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 68, 69, 70, 71, 72, 73, 74, 75,

Property	Project – freehold lots	
	Plan Number	Lot Number
	756418	50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60 ,61, 62, 63, 64, 65, 66, 67, 98, 99, 251, 252
Wood Park	134583	1
	252520	2
	581776	3
	756454	17, 58
	756455	6, 83, 85, 123
	1096136	1
	Project – Crown land	
	Plan Number	Lot Number
Crown Land	541494	1
	1026614	7001
	1026617	7001
	1052588	7004
	1142010	7300
	Transmission line	
Transgrid	593483	4
	Proposed road upgrades	
Murrumbidgee Council	839749	141

Appendix B. SEARs table

SEARs	Where addressed
General requirements	
The environmental impact statement (EIS) must meet the minimum form and content requirements as prescribed by Part 8, Division 5 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) and must have regard to the State Significant Development Guidelines. In particular, the EIS must include:	
• a stand-alone executive summary;	**Executive summary**
• a full description of the development, including:	**Chapter 3** (Project description)
– details of construction, operation and decommissioning, including any proposed staging of the development or refurbishing of turbines over time;	**Section 3.3** (Project summary) to **Section 3.9** (Decommissioning) Note that no staging is proposed.
– all infrastructure and facilities, such as substations, transmission lines, battery energy storage system, construction compounds, concrete batching plants, internal access roads, and road upgrades (including any infrastructure that would be required for the development, but the subject of a separate approvals process);	**Section 3.6** (Project elements) Note that no required Project infrastructure is subject to a separate approval process.
– plans for any buildings	N/A
– high-quality site plans and maps at an adequate scale with dimensions showing:	
▪ the location and dimensions of all project components including coordinates in latitude / longitude and maximum AHD heights of the turbines;	Location shown on **Figure 3-1** Dimensions described in **Section 3.6**
▪ existing infrastructure, land use, and environmental features in the vicinity of the development, including nearby residences and approved residential developments or subdivisions within 5 km of a proposed turbine, and any other existing, approved or proposed wind farms in the region;	**Section 2.2** (Key features of the Project and surrounds) Existing environment features are further described in the existing environment section of **Chapters 7 to 20**.
▪ the development corridor that has been assessed, including any allowance for micro-siting of turbines and identification of the key environmental constraints that have been considered in the design of the development;	The area that has been assessed is discussed in **Section 3.2** (Project disturbance) and micro-siting of WTGs is detailed in **Section 3.6.1.2** (Micro-siting) Key environmental constraints considered in the design development are detailed in **Section 1.5** (Strategies to avoid or minimise impacts)
▪ consolidated list and GIS data of coordinates of wind turbines, project infrastructure and relevant receivers and distances to potentially impacted receivers; and	Submitted to DPE separately

SEARs	Where addressed
▪ details of the progressive rehabilitation of the site;	**Section 3.7** (Progressive rehabilitation)
• a list of any approvals that must be obtained before the development may commence;	**Section 4.3** (Summary of licences and approvals)
• the terms of any proposed voluntary planning agreement with the relevant local council;	**Section 2.3** (Other agreements)
• an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including:	**Chapter 7** (Landscape and visual amenity) to **Chapter 21** (Cumulative impacts)
– a description of the existing environment likely to be affected by the development using sufficient baseline data;	Existing environment sections in **Chapter 7** (Landscape and visual amenity) to **Chapter 21** (Cumulative impacts)
– an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), including any cumulative impacts of the site and existing or proposed developments in the region, in accordance with the Cumulative Impact Assessment Guideline (DPIE, 2021), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice and including the NSW Wind Energy Guidelines for State Significant Wind Energy Development (2016);	**Chapter 7** (Landscape and visual amenity) to **Chapter 21** (Cumulative impacts)
– a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development, including details of consultation with any affected non-associated landowners in relation to the development of mitigation measures and any negotiated agreements with these landowners), and draft management plans for specific issues as identified below; and	Described in Environmental management measures sections in **Chapter 7** (Landscape and visual amenity) to **Chapter 21** (Cumulative impacts) and summarised in **Chapter 22** (Management and monitoring summary)
– a description of the measures that would be implemented to monitor and report on the environmental performance of the development, including adaptive management strategies and contingency measures to address residual impact;	Described in Environmental management measures sections in **Chapter 7** (Landscape and visual amenity) to **Chapter 21** (Cumulative impacts) and summarised in **Chapter 22** (Management and monitoring summary)
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and	**Chapter 22** (Management and monitoring summary)
• a detailed evaluation of the merits of the project as a whole having regard to:	**Chapter 23** (Justification of the Project)

SEARs	Where addressed
– the requirements in Section 4.15 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development;	The requirements in Section 4.15 of the EP&A Act are detailed in **Section 4.2.2** (Power to grant consent) and **Appendix D** - Statutory compliance table The principles of ecologically sustainable development are discussed in **Section 23.2** (Ecologically sustainable development)
– the environmental, economic and social costs and benefits of the development, having regard to the predicted electricity demand in NSW and the National Electricity Market, NSW's Net Zero Plan Stage 1: 2020 - 2030 and the greenhouse gas savings of the development;	**Chapter 2** (Strategic context), **Chapter 20** (Greenhouse gas)
– feasible alternatives to the development (and its key components), including the consequences of not carrying out the development; and	**Section 3.7** (Progressive rehabilitation)
– the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses, including rural villages, rural dwellings, subdivisions, land of high scenic value, conservation areas (including National Parks, State Parks and Reserves), state forests, mineral and coal resources, triangulation stations, tourism facilities, existing or proposed wind farms, and the capacity of the existing electricity transmission network to accommodate the development;	**Section 2.2** (Key features of the Project and surrounds), **Section 15.7** (Land use conflict) and summarised in **Section 23.1.1** (Suitability of the Project)
• a detailed consideration of the capability of the project to the security and reliability of the electricity system in the National Electricity Market, having regard to local system conditions and the Department's guidance on the matter; and	**Chapter 2** (Strategic context)
• a signed statement from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.	**EIS Declaration page**
The EIS must also be accompanied by a report from a suitably qualified person providing:	
• a detailed calculation of the capital investment value (CIV) (as defined in the Dictionary of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived;	Submitted separately
• an estimate of jobs that will be created during the construction and operational phases of the proposed infrastructure; and	**Section 2.2.1** (Land ownership), **Chapter 18** (Economic impacts)
• certification that the information provided is accurate at the date of preparation.	**EIS Declaration page**

SEARs	Where addressed
The development application must be accompanied by the consent of the owner/s of the land (as required in Section 23(1) of the Regulation).	To be submitted separately
Key issues	
The EIS must address the following specific issues for the wind farm and associated infrastructure:	
Landscape and Visual – including a detailed assessment of the visual impacts of all components of the project (including turbines, transmission lines, substations, battery energy storage system, and any other ancillary infrastructure) in accordance with the NSW Wind Energy: Visual Assessment Bulletin (DPE, 2016), including detailed consideration of potential visual impacts on local residences (including approved developments, lodged development applications and **dwelling entitlements**), scenic or significant vistas and road corridors in the public domain.	**Chapter 7** and **Appendix E**
Noise and Vibration – including:	
• an assessment of the wind turbine noise in accordance with the NSW Wind Energy: Noise Assessment Bulletin (EPA/DPE, 2016);	**Section 8.5.1** (Wind turbine noise) and **Appendix F**
• an assessment of the noise generated by ancillary infrastructure in accordance with the NSW Noise Policy for Industry (EPA, 2017);	**Section 8.5.2** (Ancillary infrastructure noise) and **Appendix F**
• assessment of the construction noise under the Interim Construction Noise Guideline (DECC, 2009) and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria);	**Chapter 8.4** and **Appendix F** Draft noise management plan in Appendix A of **Appendix F**
• assessment of the traffic noise under the NSW Road Noise Policy (DECCW, 2011);	**Section 8.4.3** (Construction traffic noise) and **Appendix F**
• an assessment of vibration under the Assessing Vibration: A Technical Guideline (DECC, 2006); and	**Section 8.4.4** (Construction vibration) and **Appendix F**
• assessment of the cumulative noise impacts (considering other developments in the area).	**Chapter 21** (Cumulative impacts)
Biodiversity – including:	
• an assessment of the biodiversity values and the likely biodiversity impacts of the project, including impacts associated with transport route road upgrades in accordance the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR), including a detailed description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the BC Act;	**Chapter 9** and **Appendix G**

SEARs	Where addressed
• an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the Fisheries Management Act 1994, and a description of the measures to minimise and rehabilitate impacts, including impacts to Delta Creek, Yanco Creek and Turn Back Jimmy Creek;	**Chapter 9** and **Appendix G**
• an assessment of the impacts of the development on birds and bats, including blade strike, low air pressure zones at the blade tips (barotrauma), alteration to movement patterns, and cumulative impacts of other wind farms in the vicinity; and	**Chapter 9** and **Appendix G**
• if an offset is required, include details of the measures proposed to address the offset obligation.	**Chapter 9.14** and **Appendix G**
Heritage – including:	
• an assessment of the impact to Aboriginal cultural heritage items (archaeological and cultural) in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) and the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010), including results of archaeological test excavations (if required);	**Chapter 10** (Aboriginal heritage) and **Appendix H** Note that archaeological test excavations were not required.
• provide evidence of consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures), having regard to the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010); and	Consultation undertaken and its outcomes are discussed in **Chapter 10** (Aboriginal heritage) and **Appendix H**. Evidence of consultation is appended to **Appendix H.** Note that evidence of consultation is only provided in non-redacted versions supplied to DPE and due to confidentiality is not provided for public exhibition.
• an assessment of the impacts to historic heritage having regard to the NSW Heritage Manual.	**Chapter 11** (Historic heritage) and **Appendix I**
Transport – including:	
• an assessment of the construction, operational and decommissioning traffic impacts of the development on the local and State road network;	**Section 12.4** (Potential construction impacts) to **Section 12.6** (Potential decommissioning impacts) and **Appendix J**
• provide details of the peak and average traffic volumes (including light, heavy and over-mass / over-dimensional vehicles) and transport and haulage routes during construction, operation and decommissioning, including traffic associated with sourcing raw materials (water, sand and gravel);	**Section 12.4** (Potential construction impacts) to **Section 12.6** (Potential decommissioning impacts) and **Appendix J**

SEARs	Where addressed
• an assessment of the potential traffic impacts of the project on road network function including intersection performance, site access arrangements, site access and haulage routes, and road safety, including school bus routes and school zones;	**Section 12.4** (Potential construction impacts) to **Section 12.6** (Potential decommissioning impacts) and **Appendix J**
• an assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project (including over-mass / over-dimensional traffic haulage routes from port) during construction, operation and decommissioning;	**Section 12.4** (Potential construction impacts) to **Section 12.6** (Potential decommissioning impacts) and **Appendix J**
• an assessment of the likely transport impacts to the site access and haulage routes, site access point, any rail safety issues, any Crown Land (including existing Travelling Stock Route network) particularly in relation to the capacity and conditions of the roads and use of rail level crossings (and rail safety assessment if required), and impacts to rail underbridges and overbridges;	**Section 12.4** (Potential construction impacts) to **Section 12.6** (Potential decommissioning impacts) and **Appendix J**
• a cumulative impact assessment of traffic from nearby developments; and	**Chapter 21** (Cumulative impacts)
• provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road and / or rail authority.	**Section 3.6.7** (Access and road network upgrades)**, Section 12.7** (Environmental management measures) and **Appendix J**
Water and Soils – including:	
• quantify water demand, identify water sources (surface and groundwater), including any licensing requirements, and determine whether an adequate and secure water supply is available for the development;	**Section 3.5** (Water demand and supply)
• an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources traversing the site and surrounding watercourses (including their Strahler Stream Order), drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils, related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;	**Chapter 13** (Water and soils), **Appendix K, Appendix L** and **Appendix L**
• where the project involves works within 40 metres of the high bank of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and (if necessary) Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI 2003); and Policy & Guidelines for Fish Habitat Conservation & Management (DPI, 2013);	**Section 13.4.1** (Surface water) and **Appendix L**

SEARs	Where addressed
• a description of the measures to minimise surface and groundwater impacts, including how works on erodible soil types would be managed and any contingency requirements to address residual impacts in accordance with the Managing Urban Stormwater: Soils and Construction series of guidelines;	**Chapter 13** (Water and soils), **Appendix K, Appendix L** and **Appendix L**
• an assessment of risks of dust generation and propose mitigation measures designed in accordance with the Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005).	**Chapter 14** (Air quality) and **Appendix N**
Land – including:	
• a detailed justification of the suitability of the site and that the site can accommodate the proposed development having regard to its potential environmental impacts, permissibility, strategic context and existing site constraints;	**Section 23.1.1**
• an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:	
– consideration of agricultural land, flood prone land, Crown lands, mining, quarries, mineral or petroleum rights;	**Chapter 15, Chapter 12, Section 2.2.1**
– a soil survey to determine the soil characteristics and consider the potential for erosion to occur; and	**Section 15.3.2**
– a cumulative impact assessment of nearby developments;	**Section 21.4.6**
• an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:	**Chapter 15**
– consideration of the zoning provisions applying to the land, including subdivision (if required);	**Section 15.4**
– completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide; and	**Section 15.7**
– assessment of impact on agricultural resources and agricultural production on the site and region.	**Chapter 15**
Hazards and Risks – including:	
• Aviation Safety:	
– assess the impact of the development under the National Airports Safeguarding Framework Guideline D: Managing Wind Turbine Risk to Aircraft;	**Section 16.1** (Aviation safety) and **Appendix P**
– provide associated height and co-ordinates for each turbine assessed;	**Table 3-5** and **Appendix P**

SEARs	Where addressed
– assess potential impacts on aviation safety, including cumulative effects of wind farms in the vicinity, potential wake / turbulence issues, the need for aviation hazard lighting and marking, including of wind monitoring masts, considering, defined air traffic routes, aircraft operating heights, approach / departure procedures, radar interference, communication systems, navigation aids; use of emergency helicopter access, and aerial baiting and culling;	**Section 16.1.4** (Potential impacts) and **Appendix P**
– identify aerodromes within 30 km of the turbines and consider the impact to nearby aerodromes and aircraft landing areas;	**Section 16.1.3** (Existing environment) and **Appendix P**
– address impacts on obstacle limitation surfaces; and	**Section 16.1.4** (Potential impacts) and **Appendix P**
– assess the impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines and transmission line;	**Section 16.1.4** (Potential impacts) and **Appendix P** **Section 15.3.7**
• Telecommunications – identify possible effects on telecommunications systems, assess impacts and mitigation measures including undertaking a detailed assessment to examine the potential impacts as well as analysis and agreement on the implementation of suitable options to avoid potential disruptions to radio communication services, which may include the installation and maintenance of alternative sites;	**Section 16.2** (Telecommunications) and **Appendix Q**
• Health – consider and document 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 electric and magnetic fields (EMF) and demonstrate the application of the principles of prudent avoidance, including an assessment against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields;	**Section 16.3** (Health and electromagnetic fields) and **Appendix R**
• Bushfire – identify potential hazards and risks associated with bushfires / use of bushfire prone land, including the risks that a wind farm would cause bush fire and any potential impacts on the aerial fighting of bushfires and demonstrate compliance with Planning for Bush Fire Protection 2019; and	**Chapter 16.4** (Bush fire risk) and **Appendix S**
• Battery Storage:	
– a preliminary risk screening completed in accordance with the State Environmental Planning Policy (Resilience and Hazards) 2021;	**Section 16.5.4** (Potential impacts) and **Appendix T**
– a Preliminary Hazard Analysis (PHA), prepared in accordance with the Hazardous Industry Planning Advisory Paper No. 6, 'Hazard Analysis' and Multi-level Risk Assessment (DoP, 2011). The PHA must consider all recent standards and codes and verify separation distances to on-site and off-site receptors to prevent fire propagation and compliance with Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning (DoP, 2011);	**Section 16.5.4** (Potential impacts) and **Appendix T**

SEARs	Where addressed
• Blade Throw – assess blade throw risks.	**Section 16.6** (Blade throw) and **Appendix U**
Social Impact – including an assessment of the social impacts in accordance with the Social Impact Assessment Guideline (DPIE, November 2021) and consideration of construction workforce accommodation.	**Chapter 17** (Social impacts) and **Appendix V**
Economic – including any benefits of the economic impacts or benefits of the project for the region and the State as a whole, including consideration of any increase in demand for community infrastructure services, and details of how the construction workforce will be managed to minimise local impacts, including a consideration of the construction workforce accommodation.	**Chapter 17** (Social impacts), **Chapter 18** (Economic impacts) and **Appendix V**
Waste – identify, quantify and classify the likely waste streams to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste	**Chapter 19** (Waste management)
Plans and documents	
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Part 3 of the Regulation. Provide these as part of the EIS rather than as separate documents.	N/A
In addition, the EIS must include high quality files of maps and figures of the subject site, proposal, and proposed road upgrades	Included throughout the EIS and Appendices
Legislation, policies and guidelines	
The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, a list of some of the legislation, policies and guidelines that may be relevant to the assessment of the project can be found at: https://www.planning.nsw.gov.au/Policy-and-Legislation/Planning-reform s/Rapid-Assessment-Framework/Improving-assessment-guidance https://www.planningportal.nsw.gov.au/major-projects/assessment/polici es-and-guidelines; and http://www.environment.gov.au/epbc/publications#assessments	**Chapter 4** (Statutory context), and throughout the EIS and Appendices
Engagement	
During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.	**Chapter 5** (Engagement)
The EIS must:	
• detail how engagement undertaken was consistent with the Undertaking Engagement Guide: Guidance for State Significant Projects (DPIE, July 2021); and	**Chapter 5** (Engagement)

SEARs	Where addressed
• describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	**Chapter 5** (Engagement)
In particular you must consult with:	
• the relevant local, State or Commonwealth Government authorities, service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders; and	**Chapter 5** (Engagement) Note that there are no exploration licence holders, quarry operators or mineral title holders.
• Carry out detailed consultation with the following: – Murrumbidgee Council – Edward River Council – NSW Aboriginal Land Council – DPE's Biodiversity, Conservation and Science Directorate – Murray-Riverina Biodiversity Conservation Trust – NSW National Parks and Wildlife Service – Heritage NSW – DPE Water Group – Environment Protection Authority – Crown Lands – Regional NSW – Mining, Exploration & Geoscience – Department of Primary Industries – Agriculture and Fisheries divisions – Transport for New South Wales – Transgrid – Department of Finance, Services and Innovation – Telco Authority – Fire & Rescue NSW – NSW Rural Fire Service – Commonwealth Department of Defence – Civil Aviation Safety Authority – Airservices Australia.	**Chapter 5** (Engagement)
If you do not lodge a Development Application and EIS for the development within 2 years of the issue date of these SEARs, your SEARs will expire. If an extension to these SEARs will be required, please consult with the Planning Secretary 3 months prior to the expiry date.	Development Application was lodged within 2 years of the issue date of the SEARs.

Appendix C. Commonwealth requirements

Commonwealth DCCEEW Environmental Assessment Requirements	Where addressed
1. On 28 June 2022, a delegate of the Federal Minister for the Department of Climate Change, Energy, the Environment and Water (formerly Department of Agriculture, Water and the Environment) determined Yanco Delta Wind Farm was a controlled action under section 75 of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The EPBC Act controlling provisions for the proposed actions are: i. listed threatened species and communities (sections 18 and 18A)	**Chapter 9** and **Appendix G**
2. The proposed action will be assessed in accordance with the bilateral assessment agreement Amending Agreement No. 1, and as such, is required to be assessed in the manner specified in Schedule 1 to that Agreement, including, addressing the matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations).	**Chapter 9** and **Appendix G**
3. The proponent must undertake an assessment of all protected matters that may be impacted by the development under the controlling provision identified in paragraph 1. The Commonwealth Federal Minister for the Department of Climate Change, Energy, the Environment and Water considers that the proposed action is likely to have a significant impact on threatened species and communities and migratory species listed in Appendix A including: • Natural Grasslands of the Murray Valley Plains (NGM) – Critically Endangered • Plains-wanderer (Pedionomus torquatus) – Critically Endangered • Weeping Myall Woodlands (WMW) – Endangered • Superb Parrot (Polytelis swainsonii) – Vulnerable • Slender Darling Pea (Swainsona murrayana) – Vulnerable Additionally, there is some risk that there may be significant impacts on the following matters and further assessment to determine if the communities and species listed below are present in the proposed action area and, if so, the extent to which they may be impacted by the proposed action, is required: • Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains – Critically Endangered • Swift Parrot (Lathamus discolor) – Critically Endangered • Flathead Galaxias (Galaxias rostratus) – Critically Endangered • Australasian Bittern (Botaurus poiciloptilus) – Endangered • Australian Painted Snipe (Rostratula australis) – Endangered • Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)) – Endangered • Trout Cod (Maccullochella macquariensis) – Endangered • Turnip Copperburr (Sclerolaena napiformis) – Endangered • Austrostipa wakoolica – Endangered • Winged Pepper-cress (Lepidium monoplocoides) – Endangered • Murray Cod (Maccullochella peelii) – Vulnerable • Grey Falcon (Falco hypoleucos) – Vulnerable • Malleefowl (Leipoa ocellata) – Vulnerable • Painted Honeyeater (Grantiella picta) – Vulnerable • Corben's Long-eared Bat (Nyctophilus corbeni) – Vulnerable • Growling Grass Frog (Litoria raniformis) – Vulnerable • Red Darling-pea, Red Swainson-pea (Swainsona plagiotropis) – Vulnerable • Mueller Daisy (Brachyscome muelleroides) – Vulnerable • Mossgiel Daisy (Brachyscome papillosa) – Vulnerable Further analysis of the impacts of the fires on those species and communities identified above should be undertaken during the assessment.	**Chapter 9** and **Appendix G**

Commonwealth DCCEEW Environmental Assessment Requirements	Where addressed
Note: uncertainty around the extent and number of protected matters that may be impacted will need to be resolved through the assessment process once final alignment and construction plans have been completed. Note: this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under these controlling provisions are assessed for the Commonwealth decision-maker's consideration.	
4. The proponent must consider each of the protected matters under the triggered controlling provisions that may be impacted by the action. Note that this may not be a complete list and it is the responsibility of the proponent to undertake an analysis of the relevant impacts and ensure all protected matters that are likely to be impacted are assessed for the Commonwealth Minister's consideration.	**Chapter 9** and **Appendix G**
Relevant regulations	
5. The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the EPBC Regulations and all matters outlined below in relation to the controlling provisions.	**Appendix D**
Project description	
6. The title of the action, background to the action and current status.	**Chapter 9** and **Appendix G**
7. The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on Matters of National Environmental Significance (MNES).	**Chapter 3, Chapter 9** and **Appendix G**
8. How the action relates to any other actions that have been, or are being taken in the region affected by the action.	**Chapter 9** and **Appendix G**
9. How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	**Chapter 9** and **Appendix G**
Impacts	
10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts; ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; iii. analysis of the significance of the relevant impacts; and iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	**Chapter 9** and **Appendix G**
Avoidance, mitigation and offsetting	
11. For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures, ii. any statutory policy basis for the mitigation measures; iii. the cost of the mitigation measures;	**Chapter 9** and **Appendix G**

Commonwealth DCCEEW Environmental Assessment Requirements	Where addressed
iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing; v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	
12. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	**Chapter 9** and **Appendix G**
13. For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any: i. conservation advice or recovery plan for the species or community; ii. relevant threat abatement plan for the species or community; iii. wildlife conservation plan for the species; and iv. any strategic assessment. Note: the relevant guidelines and policy statements for each species and community are available from the Department of Climate Change, Energy, the Environment and Water Species Profiles and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl	**Chapter 9** and **Appendix G**
14. In addition to the general requirements described above, specific information is required with respect to each of the determined controlling provisions. These requirements are outlined in paragraphs 15-18.	**Chapter 9** and **Appendix G**
Key Issues **Biodiversity (threatened species and communities and migratory species)**	
Assessment requirements	
15. The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	**Chapter 9** and **Appendix G**
16. Further analysis of the impacts of the 2019-2020 bushfires on EPBC Act listed threatened species and communities should be undertaken during the assessment. Further assessment will determine whether the remaining habitat within the proposed action area is of substantially greater importance to the survival of the listed threatened species following the fires and/or whether the population of the species in the area is considered an important population. This information, once obtained, can be considered when determining avoidance, mitigation and offset measures for these species.	**Chapter 9** and **Appendix G**
17. For each of the EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action the EIS must provide a separate: i. description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	**Chapter 9** and **Appendix G**

Commonwealth DCCEEW Environmental Assessment Requirements	Where addressed
ii. details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements; iii. description of the relevant impacts of the action having regard to the full national extent of the species or community's range; and iv. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action; v. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account; vi. a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established; vii. details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and viii. details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites. Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action and deliver an overall conservation outcome that improves or maintains the viability of the MNES i.e. 'like for like'. In applying the BAM, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.	
18. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy. https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-environmental-offsets-policy.	**Chapter 9** and **Appendix G**
Other approvals and conditions	
19. Information in relation to any other approvals or conditions required must include the information prescribed in Schedule 4 Clause 5 (a) (b) (c) and (d) of the EPBC Regulations.	**Chapter 9** and **Appendix G**
Environmental Record of person proposing to take the action	
20. Information in relation to the environmental record of a person proposing to take the action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations.	There have been no proceedings for the protection of the environment or the conservation and sustainable use of natural resources against Virya Energy

Commonwealth DCCEEW Environmental Assessment Requirements	Where addressed
Information Sources	
21. For information given in an EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information.	Throughout EIS and technical appendices (**Appendix E** to **Appendix V**).

Appendix D. Statutory compliance table

Section 4.15 of the EP&A Act

Matters for consideration	Where this is addressed
(a) the provisions of:	
(i) any environmental planning instrument that apply to the land to which the development application relates	**Section 4.2.4**
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved) that apply to the land to which the development application relates	**Section 4.2.4**
(iii) any development control plan that apply to the land to which the development application relates	Not applicable under section 2.10 of the Planning Systems SEPP, which excludes the application of development control plans to SSD projects
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4 that apply to the land to which the development application relates	**Section 2.3**
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates	The following table.
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	**Chapter 7** to **Chapter 21**
(c) the suitability of the site for the development that apply to the land to which the development application relates	**Section 2.2** and **Section 23.1.1**
(d) any submissions made in accordance with this Act or the regulations	To be addressed following public exhibition
(e) the public interest.	**Chapter 5** and **Chapter 17**

Division 5 Environmental Planning and Assessment Regulation 2021

Section 190 of Division 5 (Form of environmental impact statement)

Requirement	Where addressed in the EIS
1. An environmental impact statement must contain the following information:	
(a) the name, address and professional qualifications of the person who prepared the statement	**EIS Certification page**
(b) the name and address of the responsible person	**EIS Certification page**
(c) the address of the land – (i) to which the development application relates, or (ii) on which the activity or infrastructure to which the statement relates will be carried out	**Appendix A**
(d) a description of the development, activity or infrastructure	**Chapter 3**
(e) an assessment by the person who prepared the statement of the environmental impact of the development, activity or infrastructure, dealing with the matters referred to in this Division	**EIS Certification page**
2. The person preparing the statement must have regard to – (a) for State significant development—the State Significant Development Guidelines	**EIS Certification page**
3. An environmental impact statement must also contain a declaration by a relevant person that – (a) the statement has been prepared in accordance with this Regulation, and (b) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure, and (c) the information contained in the statement is not false or misleading, and (d) the information contained in the statement is not false or misleading, and (e) for State significant development or State significant infrastructure—the statement contains the information required under the Registered Environmental Assessment Practitioner Guidelines.	**EIS Certification page**

Section 192 of Division 5 (Content of environmental impact statement)

Requirement	Where addressed in the EIS
1. An environmental impact statement must contain the following	
(a) a summary of the environmental impact statement	**Executive summary**
(b) a statement of the objectives of the development, activity or infrastructure	**Section 1.2**
(c) an analysis of feasible alternatives to the carrying out of the development, activity or infrastructure, considering its objectives, including the consequences of not carrying out the development, activity or infrastructure	**Section 3.10**
(d) an analysis of the development, activity or infrastructure, including – (i) a full description of the development, activity or infrastructure, and	**Chapter 3**
(ii) a general description of the environment likely to be affected by the development, activity or infrastructure and a detailed description of the aspects of the environment that are likely to be significantly affected, and	**Section 2.2** **Chapter 7** to **Chapter 19**
(iii) the likely impact on the environment of the development, activity or infrastructure, and	**Chapter 7** to **Chapter 21**
(iv) a full description of the measures to mitigate adverse effects of the development, activity or infrastructure on the environment, and	**Chapter 7** to **Chapter 21**, **Chapter 22**
(v) a list of the approvals that must be obtained under another Act or law before the development, activity or infrastructure may lawfully be carried out	**Section 4.3**
(e) compilation (in a single section of the environmental impact statement) of the measures referred to in paragraph (d)(iv)	**Chapter 22**
(f) the reasons justifying the carrying out of the development, activity or infrastructure, considering biophysical, economic and social factors, including the principles of ecologically sustainable development set out in section 193	**Chapter 23**

Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000

Requirement	Where addressed in the EIS
1. General information	
1.01 The background of the action including:	
(a) the title of the action	Yanco Delta Wind Farm
(b) the full name and postal address of the designated proponent;	**Section 1.4**
(c) a clear outline of the objective of the action;	**Section 1.2**
(d) the location of the action;	**Section 1.1**, **Figure 1-2**
(e) the background to the development of the action;	**Section 1.3**
(f) how the action relates to any other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;	**Chapter 21** **Chapter 9** and **Appendix G** has considered impacts to threatened species and ecological communities having regard to habitat within 10 km of the Project and in accordance with the BAM.
(g) the current status of the action;	Virya Energy is currently seeking approval for the Project under Part 4, Division 4.7 of the EP&A Act
(h) the consequences of not proceeding with the action.	**Section 3.10**
2. Description	
2.01 A description of the action, including:	
(a) all the components of the action	**Chapter 3**
(b) the precise location of any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;	**Chapter 3** **Appendix A**
(c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;	**Chapter 3**
(d) relevant impacts of the action;	**Chapter 9**, **Chapter 21** and **Appendix F**
(e) proposed safeguards and mitigation measures to deal with relevant impacts of the action;	**Chapter 22**
(f) any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action;	**Section 4.3**
(g) to the extent reasonably practicable, any feasible alternatives to the action, including: i. if relevant, the alternative of taking no action;	**Section 3.10**
ii. a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action;	**Section 3.10**
iii. sufficient detail to make clear why any alternative is preferred to another;	**Section 3.10**

Requirement	Where addressed in the EIS
(h) any consultation about the action, including: i. any consultation that has already taken place;	**Chapter 5**
ii. proposed consultation about relevant impacts of the action;	**Chapter 5**
iii. if there has been consultation about the proposed action—any documented response to, or result of, the consultation;	**Chapter 5**
iv. identification of affected parties, including a statement mentioning any communities that may be affected and describing their views	**Chapter 5**
3. Relevant impacts	
3.01 Information given under paragraph 2.01(d) must include:	
(a) a description of the relevant impacts of the action;	**Chapter 9**, **Chapter 21** and **Appendix G**
(b) a detailed assessment of the nature and extent of the likely short term and long term relevant impacts;	**Chapter 9**, **Chapter 21** and **Appendix G**
(c) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;	**Chapter 9**, **Chapter 21** and **Appendix G**
(d) analysis of the significance of the relevant impacts;	**Chapter 9**, **Chapter 21** and **Appendix G**
(e) any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	**Chapter 9**, **Chapter 21** and **Appendix G**
4. Proposed safeguards and mitigation measures	
4.01 Information given under paragraph 2.01(e) must include:	
(a) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures;	**Appendix E**
(b) any statutory or policy basis for the mitigation measures;	Mitigation measures have been prepared in accordance with the NSW Biodiversity Assessment Method and Biodiversity Offset System requirements.
(c) the cost of the mitigation measures;	The cost of mitigation measures has not yet been calculated. The retirement of biodiversity credits would constitute the vast majority of costs and would be subject to finalisation of offset strategy and extent of clearing ultimately required. Biodiversity offsets are discussed in **Section 9.14** (biodiversity) and **Appendix G**
(d) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;	**Chapter 22**

Requirement	Where addressed in the EIS
(e) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;	DPE is responsible for the establishment of compliance requirements for the Project including assigning obligations to consult with other relevant agencies.
(f) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the proponent.	**Chapter 22**
5. Other approvals and conditions	
5.01 Information given under paragraph 2.01(f) must include:	
(a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:	**Chapter 2**, **Section 7.2**
i. what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy;	**Section 7.2** and **Appendix F**
ii. how the scheme provides for the prevention, minimisation and management of any relevant impacts;	**Appendix F**
(b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the Act), including any conditions that apply to the action;	No approval has been obtained for the action to date.
(c) a statement identifying any additional approval that is required;	**Section 3.10**
(d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.	**Chapter 22**
6. Environmental record of person proposing to take the action	
6.01 Details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:	
(a) the person proposing to take the action; and	Nil
(b) for an action for which a person has applied for a permit, the person making the application.	Nil
6.02 If the person proposing to take the action is a corporation—details of the corporation's environmental policy and planning framework.	Nil
7. Information sources	
7.01 For information given in a draft public environment report or environmental impact statement, the draft must state:	
(a) the source of the information; and	**Chapter 9** and **Appendix G**
(b) how recent the information is; and	**Chapter 9** and **Appendix G**

Requirement	Where addressed in the EIS
(c) how the reliability of the information was tested; and	The information presented in the EIS is the most recent available. The information has been prepared by specialist consultants with many years' of experience. Qualifications are provided in **Appendix G**
(d) what uncertainties (if any) are in the information.	**Chapter 9** and **Appendix G**