NEOEN

THUNDERBOLT
ENERGY HUB

Environmental Impact Assessment

March 2022

umwelt
Environmental & Social Consultants

THUNDERBOLT ENERGY HUB – STAGE 1

Environmental Impact Statement

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Pty Limited

Project Director: John Merrell
Project Manager: Penelope Williams
Report No. 7066/R05
Date: March 2022

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt and Neoen Australia Pty Ltd (Neoen) would like to acknowledge the traditional custodians of the Project Area and pay respect to their cultural heritage, beliefs and continuing relationship with the land.

Umwelt and Neoen would also like to acknowledge the post-contact experiences of Aboriginal people who have attachment to the Project Area and surrounds.

We pay our respect to the Elders – past, present, and future – for they hold the memories, traditions, culture and hopes of Aboriginal people in the area.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final V2	John Merrell	03/03/2022	John Merrell	03/03/2022

Executive Summary

Neoen Australia Pty Ltd (Neoen) proposes to develop the Thunderbolt Energy Hub to generate wind and solar renewable energy to supply the people of New South Wales (NSW). The proposed Thunderbolt Energy Hub is located in the Kentucky Area of New South Wales (NSW), approximately 47 kilometres (km) northeast of Tamworth adjacent to the New England Highway.

The Project is a direct response to the NSW Governments commitment to transition to renewable electricity generation. The Project Area is strategically located within the New England Renewable Energy Zone (REZ), identified in the NSW Government's Electricity Strategy (NSW Government, 2020). The Project Area has ready connection to the existing transmission infrastructure and is in an area with identified high wind renewable energy source potential. The Project will contribute to the implementation of the NSW Electricity Strategy, which seeks to establish a reliable, affordable and sustainable electricity future for NSW.

The Thunderbolt Energy Hub is proposed to include wind and solar electricity generation and is planned to be progressed in two stages. Stage 1 is located to the north of the New England highway and will include wind energy generation capacity only. Stage 1 is the subject of this Environmental Impact Statement (EIS) and is referred to as 'the Project'. Stage 2 will form part of a separate future development assessment and approval process(es) and subject to further design, would include further renewable energy generation capacity (wind and solar) located to the south of the New England Highway.

The approach of separating the Thunderbolt Energy Hub into two stages is a direct response by Neoen to feedback received from the landholders, neighbours, local community groups and local Members of Parliament. This approach allows Neoen to undertake further consultation, planning and design work for Stage 2 whilst allowing Stage 1 (this Project) to progress. Stage 2 is closer to Kentucky village, will result in turbines being located in multiple directions from some non-involved dwellings, and will generally be move visible. The Stage 1 layout has been designed to minimise visual impacts where practicable and the Landscape and Visual Impact Assessment indicates residual visual impacts from all non-associated dwellings can be mitigated to low or negligible. While Neoen intends on progressing with Stage 2 in the future as part of a separate assessment process, Neoen elected to develop Stage 1 first to demonstrate its professionalism, build trust in the community, and demonstrate its contribution both socially and economically.

The Development of Thunderbolt Energy Hub will allow the community to learn about wind farms in their community and the benefits that they can provide economically and socially and build a relationship with Neoen as a long-term owner-operator.

The Project

The Project will have a capacity of approximately 192 megawatts (MW), with the potential to power approximately 118,000 homes. The Project includes construction and operation of 32 Wind Turbine Generators (WTGs) and associated infrastructure including operation and maintenance buildings, internal access roads and proposed intersection to the New England Highway, civil works and electrical infrastructure (including a new substation and switching station) required to connect to the existing electricity transmission network.

The Project will connect to the existing 330kV transmission line which traverses the Project Area. Energy generated by the Project is proposed to be delivered to the existing transmission lines through a proposed substation and switching station without the need for additional high-voltage transmission lines.

The Project Area encompasses two freehold properties and covers approximately 5,918 hectares (ha). These properties are primarily utilised for sheep and cattle grazing activities. The environmental assessments undertaken as part of this EIS have focused on a 'Development Corridor' which includes a buffer around the conceptual layout for the Project. This approach to the assessment represents a worst-case assessment scenario and provides for further refinement of the conceptual Project design as part of the project implementation process allowing for micro-siting of WTGs and other Project infrastructure as part of the detailed design process.

Environmental and Social Assessment

This EIS has been prepared to assess the environmental and social impacts of the Project and will accompany a State Significant Development (SSD) application for the Project, under Part 4 of the EP&A Act.

The Project has been designed through a detailed social, economic, and environmental risk-based approach that aims to maximise renewable energy generation capacity, whilst also seeking to minimise impacts on the environment and surrounding community.

The Project will provide long-term, strategic benefits to the State of NSW, including:

- renewable energy supply to assist with fulfilling the current obligations under state and federal renewable energy targets
- contribute towards achieving the New England REZ target of 8GW of renewable energy generation
- provide cleaner reliable electricity generation and assist with meeting current load demand while reducing greenhouse gas emissions and the impacts of climate change
- provide regional investment in the NSW renewable energy sector.

The Project will also provide direct financial benefits to the regional and local community, including:

- infrastructure investment of approximately $373 million
- creation of 495 full time positions (direct and indirect) during the 18-24 month construction phase and 20 full time positions (direct and indirect) during operations
- indirect benefits to local services through the construction and operation phases
- local community benefits through the implementation of a neighbour benefit sharing program and proposed community benefit fund that will invest in local community projects and initiatives to provide a direct and targeted local benefit.

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 below.

Aspect	Summary
Landscape, Visual and Shadow Flicker	• The broad landscape character surrounding the Project Area is dominated by rural land which consists primarily of modified undulating hills. This predominantly rural landscape, while recognised of value to the local community, has not been identified as significant or rare in a visual context and the scenic quality classes of the landscape character units surrounding the Project Area have been rated as low and moderate. • Key factors which form a part of the existing landscape character include large areas of vegetation, undulating topography, roadside vegetation and riparian vegetation associated with creek lines which will assist in reducing the potential for viewing the Project in its entirety. • The character of areas in the vicinity of the Project Area, which are valued for their high landscape quality (those utilised for recreation and tourism) will remain intact. • It is noted that regardless of how visible the Project actually is, it will become a visual feature of the area. However, existing regionally identified significant landscape features would remain dominant in the landscape and it is unlikely the Project would degrade the scenic value of these landscape features. • Visual impacts from non-associated dwellings can be appropriately mitigated (to low or negligible) through the implementation of vegetation planting and screening. • There is negligible impact associated with the associated infrastructure due to limited views from outside of the Project Area. • Night lighting of WTGs (if required, however, not currently proposed) and lighting of ancillary infrastructure can be appropriately mitigated. • No non-associated dwellings are predicted to experience shadow flicker durations above the applicable limits.
Noise and Vibration	• Noise (without noise mitigation measures applied) and under worst case weather conditions, from the operation of the proposed WTGs, is predicted to achieve the baseline operational noise criteria of 35dB(A) at all non-associated dwellings in the vicinity of the Project Area. • Noise from the proposed substation is predicted to be below the noise criteria of 35 dB(A) at the closest non-associated dwellings. • during standard hours construction will potentially be at noise levels of greater than 45 dB(A) for some activities at six non-associated residences when activity is occurring in the vicinity. However, the predicted noise levels are significantly less than 75 dB(A) (the point where there may be strong community reaction to noise). Additionally these noise impacts relate to road construction which is linear construction work, any potential exceedance will be temporary as construction continues along the length of the road or access track. • Neoen will implement a Construction Environmental Management Plan (CEMP) which will include all feasible and reasonable noise control strategies to manage noise associated with construction activities. Additionally, neighbouring residents will be informed regarding proposed construction work. • Given the significant distance to non-associated dwellings, vibration effects are not predicted at any non-associated dwellings during construction. • Any blasting required for construction activities is predicted to be able to be designed to achieve relevant air-blast overpressure and ground vibration criteria. • Noise associated with additional vehicle movements on public roads associated with the Project is predicated to achieve the relevant road noise criterion.

Aspect	Summary
Biodiversity	• Construction of the Project will result in removal of vegetation and associated fauna habitat. However, the conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise impact to identified biodiversity values. • Impacts are also minimised by the nature of the Project with most of the required infrastructure being narrow linear roads and easements that will still facilitate the movement of fauna within the landscape. • Areas of the critically endangered ecological community (White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland) recorded during survey, have been avoided were practicable with only an area of 8.56ha of moderate to good condition vegetation proposed to be removed and a further 5.66ha of heavily grazed Derived Native Grassland. • Neoen has committed to the design and implementation of a comprehensive biodiversity mitigation strategy to minimise the unavoidable direct and indirect impacts to biodiversity associated with the Project. • Neoen has also committed to the development and implementation of a Bird and Bat Adaptive Management Plan which will include baseline and ongoing monitoring to develop trigger levels and mitigation measures designed to address potential impacts from turbine strikes on significant bird and bat species. • Impacts to the aquatic habitat within the Project Area will be minor and generally restricted to impacts associated with the construction of crossing over the tributaries. Impacts associated with construction and water quality will be controlled through the implementation of proposed erosion and sediment control mitigation measures. • Impacts associated with the removal of native vegetation and the threated Blue Grass (*Dichanthium setosum*) (threatened flora species) and koala habitat will be offset by Neoen in accordance with the NSW Biodiversity Assessment Method.
Traffic and Transport	• The Project Area is accessed directly from the New England Highway (NEH). The Project includes the construction of a new intersection designed in accordance with relevant guidelines to meet the peak hour traffic volumes associated with the Project. • The new intersection has been subject to traffic flow modelling and will operate satisfactorily during the peak construction, operation and decommissioning phases of the Project. • Expected construction, operations and decommission phase traffic volumes from the Project would have minimal impact on the NEH, with all increases in daily traffic volumes forecast to be less than 5% and within the operating capacity of the highway (generally 12,000-15,000 vehicles per day). • Heavy vehicle movements associated with the construction phase of the Project are expected to result in minor (10%) increase in pavement loadings on the relevant section of the NEH. When considered over the duration of the construction period, this will not lead to a significant impact or reduction to the design life of the existing road pavement. • Some lower order local government roads associated with the turbine transport route may require further detailed assessment and active management during construction to cater for increased pavement loading. Neoen has committed to consultation with Newcastle City Council and Muswellbrook Shire Council regarding these potential works during the detailed design phase. • Traffic volumes associated with the operations phase are expected to have negligible impact on the operation (and pavement loadings) of the relevant section of the NEH. • Neoen will development a TMP during the detailed design phase. The transport of turbine components to the Project Area from the Port of Newcastle will require minor works within the road reserve. The TMP will also include proposed measures to reduce the impact of Project traffic on the road network and manage road safety. Movements associated with over size and over mass (OSOM) vehicles will also be managed through the development of the TMP in consultation with Transport for NSW.

Aspect	Summary
Aboriginal Cultural Heritage	• An Aboriginal cultural heritage assessment (ACHA) has been prepared for the Project in collaboration with the Registered Aboriginal Parties (RAPs) to assess the Aboriginal heritage values (cultural and archaeological) of the Project Area and surrounds. • Construction of the proposed infrastructure will result in ground disturbance with potential to impact on Aboriginal sites. However, the conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise impact to identified Aboriginal Archaeological constraints. • During the survey, Aboriginal party representatives identified four possible scarred trees and five potential stone arrangements that they felt may have cultural value even if not necessarily meeting archaeological criteria for recording of sites of this type. • During the combined surveys, seven new Aboriginal archaeological sites (comprising three artefact scatters and four isolated artefacts) were recorded. The artefact scatters (TWF AS1, TWF AS2 and TWF AS3) all contained low densities of artefacts. Of the sites identified, two (TWF AS1 and TWF AS2) were located outside of the Development Corridor. All of the sites were identified in proximity to a water source, being Pine Creek, Spring Creek, or an associated tributary. • The majority of the Development Corridor was assessed as having low archaeological potential as it comprises landforms that do not provide direct access to water resources, have a slope inclination that is not conducive to camping/occupation activities, are extremely rocky with limited topsoil depth (within which subsurface deposits may be located) and/or have been subject to disturbance. • During final design and construction planning, all consideration will be given to minimising impacts to these sites and areas of potential through micro siting, however, for the purposes of the ACHA, it is assumed that partial or complete impact to five of the new Aboriginal sites sites/areas may occur. • Neoen will prepare and implement and Aboriginal cultural heritage management plan (ACHMP) for the Project in consultation with the Registered Aboriginal Parties. The ACHMP will outline the measures required to be implemented through all stages of the Project to manage Aboriginal cultural heritage values, including the protection of Aboriginal archaeological sites where impacts can be avoided and management methodologies for sites where impact cannot be avoided.
Historic Heritage	• There are no listed heritage items within the Project Area and no potential heritage items were identified during the preparation of the Historic Heritage Assessment. • Due to the disturbed nature of the Project Area, the Project is unlikely to impact on historical sub-surface archaeological remains. • Unexpected finds will be managed through appropriate management measures incorporated into the proposed CEMP and OEMP.
Aviation Safety	• The Project: ○ will not impact on the operation of Tamworth and Armidale Airports ○ will not penetrate Procedures for Air Navigation Services - Aircraft Operations PANS-OPS surfaces ○ will not impact any nearby designated air routes ○ will not have an impact on the grid lowest safe altitude (LSALT) ○ will not have an impact on prescribed airspace ○ is wholly contained within un-controlled airspace ○ is outside the clearance zones associated with aviation navigation aids and communication facilities ○ may result in wake turbulence affecting aircraft operations at three nearby private aircraft landing areas on of whom is a host landholder. Neoen has committed to engage with the owners of these landing areas to discuss impacts and potential mitigation measures.

Aspect	Summary
	• Relevant operational requirements associated with aerial fire-fighting will be addressed in the proposed Bushfire Emergency Management Plan to be prepared during the detailed design phase in consultation with the Rural Fire Service (RFS). • The RFS has advised that in relation to aerial firefighting, wind farms are treated like any other potential hazard to aircraft operations. Aerial firefighting strategies and tactics in relation to the area will continue to be selected based on the fire location, what the fire is threatening and hazard in the area. • All relevant authorities have been consulted in relation to the Aviation Safety Assessment.
Telecommunications	• Mobile phone services may be susceptible to interference in areas that are currently receiving a weak signal to the north and west of the Project Area. Network operators have indicated, however, that they do not expect wind farm developments to interfere with their services. If interference to these services is experienced during operation of the Project, Neoen has committed to investigating the issue and developing appropriate mitigation in consultation with the relevant service provider and the landowner. • There is potential for the proposed WTGs to interfere with point-to-area style services (such as terrestrial television broadcasting), particularly in areas where there is already poor or marginal signal coverage. However, relevant dwellings may be able to receive an alternative signal, which could mitigate any potential interference that may occur. Neoen has committed to investigating any potential interference and providing mitigation in consultation with the service provider and landowner if required. • WTGs are not expected to interfere with any satellite television or internet services intended for Australian audiences. Interference is possible for international satellite television and internet signals (which do not provide services designed for Australian residents) and are therefore unlikely to be in used by nearby residents. • Interference to fixed point-to-point communication links passing over the Project Area (such as those used by mobile phone providers and television broadcasting towers) is considered unlikely as there are no WTGs located within the calculated exclusion zones for those links. • Potential impacts on other services including radio broadcasting, weather radar, trigonometrical stations and CB radio, are not expected, or are considered to be minor. • Consultation is ongoing with the operators of point-to-multipoint links, emergency services, wireless internet services, and meteorological radar in the vicinity of the Project Area to confirm any potential for the Project to cause interference to these services. Impact to these services is unlikely or generally expected to be low. However, Neoen has committed to developing appropriate mitigation in consultation with the relevant operators in the event that interference is experienced as a result of the Project.
EMF and Health	• The Electromagnetic Field (EMF) levels to be produced by the Project are predicted to be within the recommended exposure limits at all publicly accessible locations in and around the Project Area. • The EMF assessment concludes that the risks to human health from EMF associated with the Project are low.
Bushfire	• The Project Area is identified as Bushfire Prone Land. All relevant bushfire protection measures will be implemented by Neoen during construction and operation of the Project. • A bushfire management plan will be developed and implemented in consultation with the RFS including operational management measures in relation to aerial fire-fighting.
Blade Throw	• The risk of injury or property damage associated with blade throw associated with the proposed WTGs is considered very low at all non-associated dwellings and roads in the vicinity of the Project Area.

Aspect	Summary
	• Blade throw risk may be above the limit considered acceptable at one vacant host landholder dwelling. Should the dwelling remain uninhabited throughout the operating life of the Project, the risk limit will be applicable to that dwelling. If the dwelling is to be inhabited during the life of the Project, detailed site-specific blade throw modelling will be undertaken during the detailed design phase to establish the expected blade throw risks and whether refinement to the to the Project layout or operation of the WTG is required to mitigate the risks.
Preliminary Hazard Screening	• A storage quantity and transport screening of hazardous materials has been undertaken which indicates a Preliminary Hazard Analysis (PHA) is not required for the Project.
Water and Soils	• Spring Creek and Pine Creek and other minor tributaries, traverse the Project Area, impacts to these watercourses will be limited to creek crossings associated with the internal access tracks. • Parts of the Project Area is prone to erosion particularly along water courses and erosion and sedimentation are considered the primary risk to soil and surface water resources for the Project during the construction phase. This risk can be readily managed through the implementation of appropriate erosion and sediment controls. • The extent of disturbance is minor compared to the overall size of the Project Area which limits the overall potential for erosion and not all areas of the Project Area have a high erosion hazard (i.e. areas with lower gradients). • Detailed erosion and sediment control measures will be developed during the detailed design phase and implemented through the CEMP and OEMP.
Waste Management	• Neoen will develop a Waste Management Plan which will outline the measures and strategies to be implemented during construction and operation to manage, reuse, recycle and safely dispose of waste. • Neoen will develop a decommissioning and rehabilitation plan prior to closure which will include a detailed review of the associated waste streams and recycling/disposal options available at the time.
Air Quality	• The Project will contribute to positive air quality outcomes through reductions in greenhouse gas emissions in comparison to other electricity generating sources including traditional coal fired power stations. • Air emissions from the Project Area would be predominately associated with the proposed construction activities which are temporary (18 – 24 months). The construction activities that may generate dust will be localised and small at any one time in the context of the overall scale of the Project Area. • The CEMP and OEMP will include relevant air quality management measure to avoid dust impacts outside of the Project Area. • The lowest blade edge point of the proposed WTGs will be 70 m above the ground. While turbine rotation does cause some downstream wake effects (a type of turbulence) for a distance beyond the wind turbine, the effect is very high above ground, such that it is not noticeable at ground level, and does not draw up air to spread dust and seeds.
Economic Impact	• The Project will have the capacity to supply sufficient clean energy to power the equivalent of approximately 118,000 homes per annum, which represents approximately 2.7 times of the total annual residential requirements of the Region (Armidale, Tamworth, Uralla and Walcha LGAs - 43,300 dwellings). • Overall, the Project will involve approximately $373 million in investment. • The Project will generate employment in the region, creating a total of 495 full time equivalent (FTE) positions (direct and indirect) over the 18–24-month construction phase. Once operational, a total of 20 FTE jobs (direct and indirect) will be created by the Project. Employment generated by the Project within the region surrounding the Project Area (direct and indirect) is estimated at approximately 210 FTE jobs during the construction phase and approximately 9 FTE jobs during the operational phase.

Aspect	Summary
	• The Project will provide significant participation opportunities for businesses and workers (subject to skills and available resources). Additionally, the Project will support increased/new revenues for accommodation providers and private homeowners over the construction phase, particularly in off-peak seasons and there is sufficient capacity in the region to support the Project. The 55 FTE construction workers expected to relocate to the region are expected to inject approximately $2.7 million in new spending into the economy over the construction phase, supporting approximately 18 FTE jobs in the service sector across the region. • Ongoing economic stimulus (operation phase) of approximately $99.0 million is expected over 30 years, (2021 dollars, Consumer Price Index (CPI) adjusted). This will be generated from host landowner lease payments, Neighbour Benefit Sharing Program payments, operational wage stimulus, Community Benefit Fund payments and increased Council land tax returns from the Project Area. It is considered this economic stimulus will also assist with supporting the ongoing agricultural land use within the region.

Social Impact	• Engagement with the community and key stakeholders regarding the Thunderbolt Energy Hub has been undertaken by Neoen since 2018 and has been ongoing since this time. Outcomes from community consultation activities undertaken by Neoen have been reviewed and consolidated to inform the SIA and understand the range of community views, concerns, interests and feedback provided on the Project to date.
	• This Neoen engagement has been complimented by a targeted consultation program for the SIA specifically, undertaken between September and October 2021 by Umwelt in collaboration with Neoen. Engagement utilised in the SIA (undertaken by Neoen and Umwelt) has involved consultation with landholders and near neighbours, members of the wider community, community and special interest groups, local businesses and service providers, Aboriginal Stakeholders and government agencies
	• Stakeholder engagement with the community, businesses, interest groups and other interested stakeholders has indicated that there is both support for the Project and those not supportive or with concerns. This situation is common for large State significant project such as wind farms where they elicit a diversity of views and stakeholder responses. An online survey (conducted by Neoen from July 2020 to October 2021) found that on average participants rated their support for the Thunderbolt Energy Hub Project as 7.3 out of 10 (where 0 reflected limited support / opposition and 10 indicated a high degree of support). Of the responses received, the majority (59%) indicated that they live in Kentucky or Kentucky South. The average level of support of respondents from Kentucky and Kentucky South was 7.2/10, indicating the majority of nearby residents are supportive of the Project.
	• To minimise potential negative impacts and enhance social benefits for the community, there have been a number of Project design changes and a range of management measures, these include:
	  ○ Separating the Thunderbolt Energy Hub into two stages and only progressing with Stage 1 as part of this current development application
	  ○ Designing the Project to seek to avoid and minimize impacts on environmental values and the surrounding community where practicable. Multiple design changes have been made to reduce impacts including through consideration of the findings of preliminary environmental studies and stakeholder feedback.
	  ○ Neoen has sought to enter into agreements with the most affected near neighbours to the Project including commitments to appropriate mitigation and management measures. Agreements are in place with the most affected nearby landowners. These agreements are in addition to the agreements in place with the host landholders and collectively ensure the effective mitigation and management of the impacts of the Project on the most effected nearest neighbours (see also the Neighbours Benefit Program below)
	  ○ A range of environmental mitigation and management activities as outlined in the EIS

Aspect	Summary
	○ Continued update and implementation of the Community Relations Plan (CRP) to include all community engagement measures to manage and enhance social impacts ○ A Community Benefit Sharing Program, including a Neighbours Benefit program under which near neighbours receive a direct annual payment from the Project and a Community Benefits Fund to provide benefits to the broader local community ○ A Local Participation Plan which includes an Accommodation, Employment, and Procurement Strategy. • Collectively these measures provide a robust social impact management and mitigation plan for the Project that aims to enhance the positive social impacts and mitigate the potential negative impacts.
Cumulative Impact	• The REZ proposes a range of renewable energy infrastructure in one location to deliver affordable, reliable and clean energy to homes and businesses that need it. While there are clear benefits to this approach, the cumulative effect of the potential volume of electricity generation proposed within the region, particularly during the construction phase, requires consideration in project planning and assessment. • Due to the separation distance between the Project Area and relevant Projects requiring cumulative assessment, impacts associated with the operations phase will be limited with majority of the potential impacts associated with the construction phase (particularly traffic and social/economic impacts). • Given the distance to the closest neighbouring windfarm (27 km) cumulative visual impacts associated with the Project and other projects in the Region are not considered to be relevant. There is some potential for cumulative visual impact when a number of wind farms are viewed in succession as a traveller moves through the landscape (eg. Motorist travel routes or walking tracks). However, there are limited opportunities to view the Project sequentially along the New England Highway and it is unlikely the perception of the region's broad landscape character will be altered as a result of the Project. • An assessment of the cumulative traffic impacts found that the Project intersection will operate satisfactorily and there is sufficient capacity along the section of the New England Highway relevant to the Project. • In regard to OSOM vehicle movements for the delivery of turbine components associated with the other identified projects, it is expected that all movements will originate from the Port of Newcastle and follow a similar route to that identified for the Project, via the New England Highway. All OSOM movements will be required to be undertaken under permit, and restrictions and management measures will be implemented so that movements from one site only will occur at any time, to minimise the impacts. • In relation to the economic capacity (workforce, accommodation, services) of the region the potential cumulative impacts associated with the Project will be manageable through Neoen's commitment to the development and implementation of workforce, procurement and accommodation strategies. These strategies will be developed in the lead up to the construction phase of the Project to reflect and respond to actual regional demand conditions at that time, especially in relation to concurrent projects principally being serviced out of Tamworth and Armidale.

Neoen has applied an iterative approach through the development of this EIS responding to both environmental constraints and community concern through refinement of the layout and the overall project approach. This can be seen most strongly by Neoen's decision, based on feedback from the community, to proceed with Stage 1 of the Thunderbolt Energy Hub only at this stage.

Through the implementation of best practice management, the potential environmental impacts associated with the Project can be appropriately managed, which will also address the community concerns and associated social impacts identified during the stakeholder engagement process. Given the net benefit and commitment from Neoen, as Australia's largest renewable energy company, to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to the region and broader NSW community.

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Appendices

1.0 Introduction

Neoen Australia Pty Ltd (Neoen) proposes to develop the Thunderbolt Energy Hub to generate wind and solar renewable energy to supply energy to the people of New South Wales (NSW). This Environmental Impact Statement (EIS) relates to Stage 1 of the Thunderbolt Energy Hub.

The proposed Thunderbolt Energy Hub is located in the Kentucky Area of New South Wales (NSW), approximately 47 kilometres (km) north east of Tamworth adjacent to the New England Highway (refer to **Figure 1.1**). The Project area is located within both the Tamworth Regional Local Government Area (LGA) and the Uralla LGA.

The Thunderbolt Energy Hub is proposed to include wind and solar electricity generation and battery storage, with the Project to be progressed in two stages. Stage 1 will include up to 32 wind turbine generators (WTGs) located to the north of the New England highway only (the subject to this EIS, referred to as 'the Project'). Stage 2 will form part of a separate future development assessment and approval process(es) and subject to further design would include further renewable energy generation capacity (wind and solar) located to the south of the New England Highway.

The approach to separating the Thunderbolt Wind Farm into two stages is a direct response by Neoen to feedback received from the neighbouring property owners, local landholders, local community groups and local community leaders.

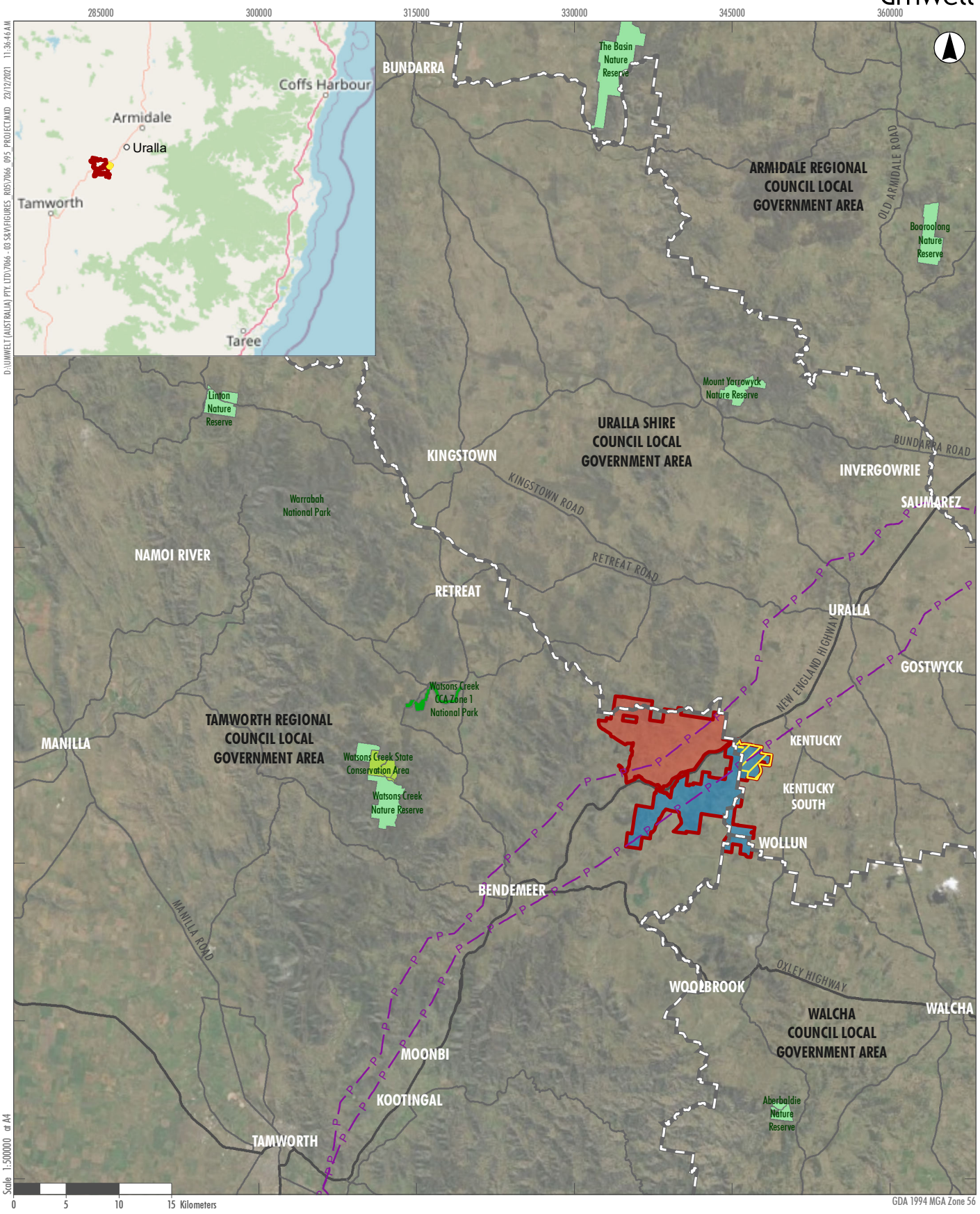
The Project Area is located within the New England Renewable Energy Zone (NE-REZ) identified in the NSW Government's Electricity Strategy (NSW Government, 2020) (refer to **Section 2.1.3**). The REZ is expected to play a vital role in delivering affordable energy to the community across NSW (NSW Energy, 2019). The Project is therefore strategically located in an area identified as suitable for renewable energy projects.

The Kentucky region has been identified as having high wind renewable energy resource potential. Wind monitoring undertaken on site by Neoen has guided the development of the conceptual WTG layout for the Project.

The Project will have a capacity of approximately 192 megawatts (MW), with the potential to power approximately 118,000 homes. The Project includes construction and operation of 32 WTGs, the Project includes associated infrastructure including operation and maintenance buildings, internal access roads and proposed intersection to the New England Highway, civil works and electrical infrastructure (including one new substation and one switching station) required to connect to the existing electricity transmission network.

One new substation is proposed, with two possible locations currently included in the conceptual layout. Both locations are adjacent to the existing 330kV transmission lines which traverse the Project Area. Energy generated by the Project is proposed to be delivered to the existing transmission lines through the proposed substation and switching station.

The Project Area encompasses two freehold properties and covers approximately 5,918 hectares (ha). These properties are primarily utilised for sheep and cattle grazing activities. The environmental assessments undertaken as part of this EIS have focused on a 'Development Corridor' which includes a buffer to the conceptual layout for the Project (refer to **Section 3.0**). This approach to the assessment represents a worst case scenario and provides for further refinement of the conceptual project design as part of the project implementation process and allows for micro-siting of WTGs and other project infrastructure as part of the detailed design process.



Legend

- Thunderbolt Energy Hub
- Stage 1 Project Area
- Stage 2 Project Area - Subject to separate Approval Process
- Thunderbolt Solar Farm - Subject to separate Approval Process
- Local Government Areas
- Existing 330kV Power Lines
- National Park
- Nature Reserve
- State Conservation Area

FIGURE 1.1

Thunderbolt Energy Hub

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)

1.1 The Proponent

The proponent for the development application for the Project is Neoen Australia Pty Ltd (ABN 57 160 905 706; Suite 1, Level 10, 227 Elizabeth Street, Sydney NSW 2000). Neoen was founded in 2008 and is a leading independent producer of renewable energy. Neoen has been operating in Australia since 2012 and is the owner and operator of DeGrussa solar farm in WA, the Hornsdale Wind Farm and Hornsdale Power Reserve in SA; Parkes Solar Farm, Dubbo Solar Hub, Griffith Solar Farm and Coleambally Solar Farm in NSW; and the Bulgana Green Power Hub, Numurkah Solar Farm and Victorian Big Battery in Victoria. The business therefore has an established presence in both NSW and more broadly in Australia as a producer of renewable energy.

Neoen currently has more than 2 gigawatts (GW) of renewable projects either operating, or under construction in Australia with offices in Sydney, Canberra, Adelaide and Perth and is a key provider of renewable energy to both the people of NSW and across Australia, refer to **Figure 1.2**. Neoen is the largest renewable energy company in Australia and intends on reaching 5 GW of operating or under construction assets in its portfolio in Australia by 2025.

Neoen in Australia

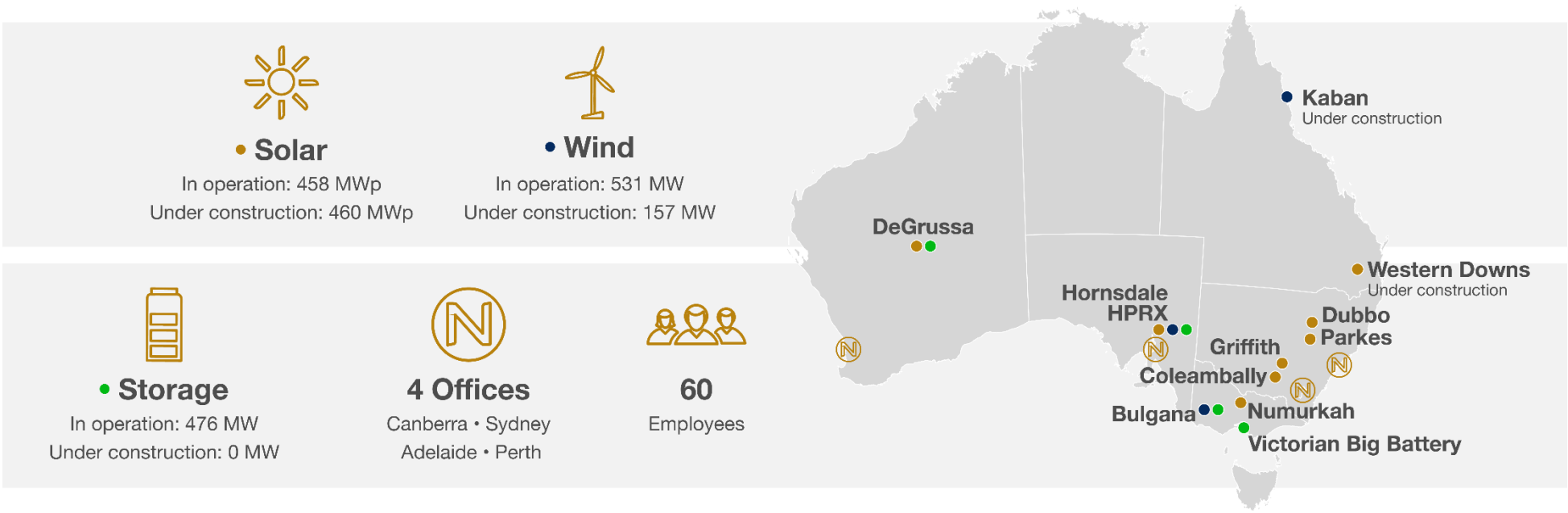


Figure 1.2 Neoen in Australia

2.0 Strategic Context

2.1 Renewables Context

2.1.1 Electricity Generation Market

NSW is currently in a transition to increased renewable electricity generation with the NSW Government committed to ensuring a transition to a reliable, affordable and modern energy future for NSW households and businesses (Energy NSW, 2021).

It is estimated that that three-quarters of Australia's coal-fired power stations are operating beyond their original design life, with some receiving extensive 'life extension' re-fits (Department of Industry and Science, 2015) to continue operation. In NSW, all five of the coal-fired power stations are scheduled to retire between 2022 and 2043 (AEMO, 2019) beginning with the Liddell Power Station (Hunter Valley) in 2023, increasing the current demand for renewable energy. In Australia, the share of wind and solar energy generation tripled in the five years to 2019, with the share of renewable electricity generation expected to increase to 57% by 2030 and 84% by 2050 (Energy Networks Australia, 2019).

In Australia in 2020, fossil fuels contributed 76% of the total electricity generation, including coal (54%), gas (20%) and oil (2%). The share of coal in the electricity sector has continued to decline in contrast to the beginning of the century when coal's share of electricity generation exceeded 80%. The contribution of renewable energy to the total national electricity generation increased from 21% in 2019 to 24% in 2021. In NSW in 2021, renewable energy (wind and solar) accounted for 21% of electricity generation (14,312 GWH) (energy.gov.au, 2021).

The Clean Energy Regulator estimates that a record 7 gigawatts (GW) of renewable capacity was installed during 2020, an increase of 11% from 2019. A record 53.6 terawatt hours of electricity was generated in the National Electricity Market, from renewables (including rooftop solar) during 2020, up 16% from 2019 (energy.gov.au, 2021).

NSW has a strong pipeline of renewable energy projects which will contribute to achieving the current transition targets. However, significant investment is required from the private sector to achieve sufficient renewable energy supply that will support NSW's transition to renewable energy and the retirement of the existing fossil fuel generated supply. The Project will fit within the current strategic direction of the NSW and Australian energy generation market and assist in achieving the planned transition to an increased contribution of renewable energy to Australia's energy needs.

2.1.2 Federal and State Renewable Energy Commitments

- Australia is one of the 195 countries from around the world signed to the international climate change agreement (the Paris Agreement). The Paris Agreement aims to:
- hold the increase in the global average temperature to below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels
- increase the ability [of nations] to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production

- make finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilient development.

The Paris Agreement seeks to meet its objectives by developing programs and mechanisms that:

- require participating Parties to prepare and communicate greenhouse gas mitigation contributions. Parties have been expected to set mitigation targets for 2020, and then develop new targets every five years. Each successive target is expected to represent a larger mitigation effort than the previous target
- promote climate change resilience and adaptation
- provide mitigation and adaptation funding to developing countries
- foster mitigation and adaptation technology transfer between Parties
- require participating Parties to report progress towards their mitigation contributions on an annual basis.

Australia signed the Paris Agreement on 22 April 2016. The obligations under the Paris Agreement will drive national greenhouse gas policy between 2020 and 2030. Australia's commitment to the Paris Agreement includes reducing greenhouse gas emissions by 26 - 28% on 2005 levels by 2030 (Commonwealth of Australia, 2015). Australia's Nationally Determined Contribution (NDC) prescribes an unconditional economy-wide target to reduce greenhouse gas emissions, and states that future policies will target emissions generated from energy use, industrial processes, agriculture, land-use, land-use change and forestry and waste.

The NSW Government has developed its NSW Climate Change Policy Framework, which aims to deliver net zero emissions by 2050, and a State that is more resilient and responsive to climate change (OEH 2016).

Under the NSW Climate Change Policy Framework, NSW has committed to both follow the Paris Agreement and to work to complement national action.

The policy framework is being delivered through:

- the Climate Change Fund
- developing an economic appraisal methodology to value greenhouse gas emissions mitigation
- embedding climate change mitigation and adaptation across government operations
- building on NSW's expansion of renewable energy
- developing action plans and strategies.

In 2013 the NSW Government released the Renewable Energy Action Plan (REAP) and the NSW Energy Efficiency Action Plan (EEAP).

The REAP aimed to increase the generation, storage and use of renewable energy in NSW, at least cost to customers and with maximum benefits to NSW. The three core goals of the REAP were to attract renewable energy investment, build community support for renewable energy and attract and grow expertise in renewable energy. Based on the implementation of the REAP, renewable energy is now well-placed to play a leading role in meeting NSW's energy needs into the future.

Current and future electricity development in NSW is supported though the NSW Government's Electricity Strategy (NSW Government, 2020) and the NSW Electricity Infrastructure Roadmap which builds on the framework set out in the Electricity Strategy taking an integrated approach to all demand and supply options, including action by households and small businesses, demand management and investment in large-scale, affordable and reliable generation. The Project is consistent with the objectives of the Electricity Strategy and Infrastructure Road Map, in aiming to provide large-scale renewable electricity generation that is affordable and reliable.

The NSW Electricity Strategy is the NSW Government's plan for a reliable, affordable and sustainable electricity future that supports a growing economy. The Project Area is located within the New England REZ as identified within the NSW Government's Electricity Strategy (NSW Government, 2020), (refer to **Figure 2.1**). A target of 8 GW of renewable energy generation has been assigned to the New England REZ.

2.1.3 Regional and Local Renewables Context

The Project will contribute to the implementation of the NSW Electricity Strategy, and will assist to establish a reliable, affordable and sustainable electricity future for NSW. The Project Area is strategically located within the New England REZ, with ready connection to the existing transmission infrastructure and in an area with identified high wind renewable energy source potential.

Wind energy is known to be one of the cheapest forms of new build large-scale energy generation and NSW has significant wind resources. The east coast and regions along the higher exposed parts of New England, the Great Dividing Range and the Southern Highlands, have all been identified as some of Australia's best locations to support wind energy development with consistently high average wind speeds and are often closer to existing transmission lines.

The Project Area is mapped as an area with high wind renewable energy source potential under the NSW REAP. The Renewable Energy Resource Mapping (DPIE, 2019) is reproduced in **Figure 2.2** which indicates the existing wind resources applicable to the Project Area. This high wind resource makes the location suitable for a productive wind farm.

There are a number of renewable energy projects within and in the vicinity of the REZ, at different stages of the approval process (refer to **Table 2.1**).

Table 2.1 Regional Renewable Energy Projects

Project	Development Type	Development Stage
Sapphire Wind Farm (93km north of Armidale – outside REZ) – 319MW	Wind	Operational
White Rock Wind Farm (115km Northeast of Project Area) – 175MW	Wind	Operational
White Rock Solar Farm (115 km northeast of Project Area) – 20MW	Solar	Operational
White Rock 2 Wind Farm (110 km north of Project Area) – 202MW	Wind	Under Construction
Gunnedah Solar Farm (95 km southwest of Project Area – outside REZ) – 146MWdc	Solar	Under Construction
Metz Solar Farm (58 km northeast of Project Area) – 100MW	Solar	Under Construction

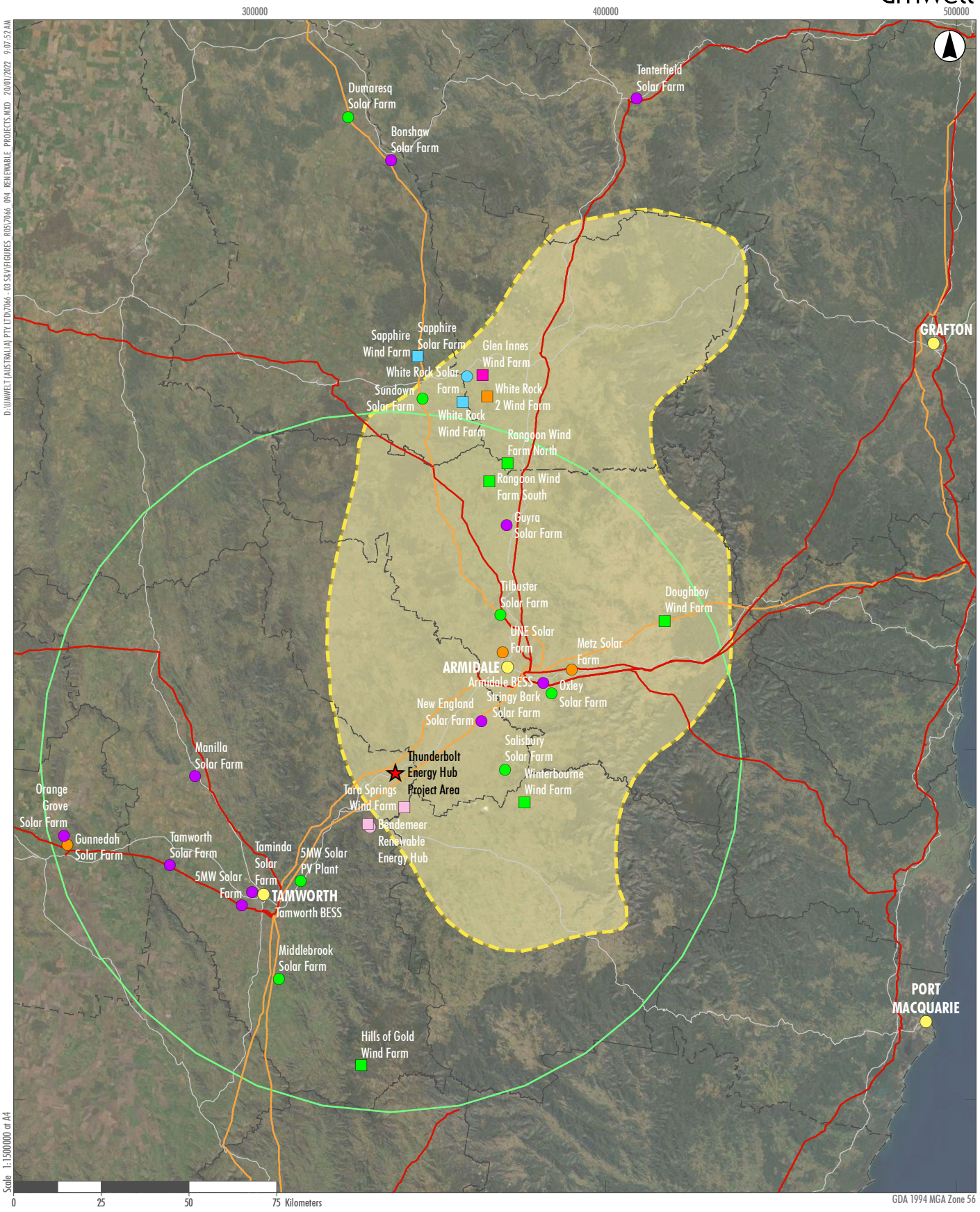
Project	Development Type	Development Stage
UNE Solar Farm (46 km northeast of the Project Area) – 5.2GW	Solar	Under Construction
Glen Innes Wind Farm (115 km north of Project Area) – 3.6MW	Wind	Approved
Bonshaw Solar Farm (175 km north of Project Area – outside of REZ) – 200MW	Solar	Approved
Sapphire Solar Farm (130 km north of Project Area – outside REZ) – 180MW	Solar	Approved – construction expected to commence 2022
Tenterfield Solar Farm (200km north of Project Area – outside REZ) – 25MWac	Solar	Approved – construction expected to commence 2022
Orange Grove Solar Farm (95km southwest of Project Area – outside REZ) – 110MW	Solar	Approved
Stringy Bark Solar Farm (50km northeast of Project Area) – 29.9MW	Solar	Approved
Taminda Solar Farm (50 km southwest of Project Area – outside REZ) – 9MW	Solar	Approved
Tamworth Solar Farm (65 km southwest of Tamworth) – 65MW	Solar	Approved
New England Solar Farm (28 km northeast of Project Area) – 720MW	Solar	Approved
Guyra Solar Farm (76 km northeast of Project Area) – 4.6MW	Solar	Approved
5MW Solar Farm (58 km southwest of Project Area) – 5MW	Solar	Approved
Manilla Solar Farm (40km East of Project Area – outside REZ) - 4.8MW	Solar	Approved
Hills of Gold Wind Farm (95 km southeast of Project Area– outside REZ) – 420MW	Wind	Under Assessment EIS Exhibited
Doughboy Wind Farm (88.5km northeast of Project Area) – 300MW	Wind	Under Assessment Prepare EIS
Rangoon Wind Farm (North and South) (93.9 km North of Project Area) – 130MW	Wind	Under Assessment Prepare EIS
Winterbourne Wind Farm (38km east of Project Area) – 700MW	Wind	Under Assessment Prepare EIS
Oxley Solar Farm (50km northeast of Project Area) – 225MW	Solar	Under Assessment EIS Exhibited
Dumaresq Solar Farm (200 km North of Project Area – outside of REZ) – 190MW	Solar	Under Assessment Prepare EIS
Middlebrook Solar Farm (75 km southwest of Project Area – outside REZ) – 500MW	Solar	Under Assessment Prepare EIS
Salisbury Solar Farm (32 km northeast of Project Area) – 700MW	Solar	Under Assessment Prepare EIS
Sundown Solar Farm (108 km north of Project Area) – 600MW	Solar	Under Assessment Prepare EIS
Tilbuster Solar Farm (55km northeast of the Project Area) – 152MW	Solar	Under Assessment EIS Exhibited

Project	Development Type	Development Stage
Thunderbolt Energy Hub – Solar Farm (adjacent to the Project Area) – 120MW	Solar	Under Assessment Prepare EIS
Tamworth Battery Energy Storage System (55 km southwest of Project Area) – 400MWh	Other	Under Assessment Prepare EIS
Armidale Battery Energy Storage System (45.54km Northeast of Project Area) – 300MWh	Other	Under Assessment Prepare EIS
5MW Solar Plant (40 km southwest of Project Area) – 5MW	Solar	Under Assessment (DA Submitted – local Council)
Thunderbolt Energy Hub – Stage 2 (immediately south of the Project Area) – 180MW	Wind	Pre-scoping
Bendemeer Renewable Energy Hub (30 km southwest of Project Area) – 680MW	Wind and Solar	Pre-scoping
Tara Springs Wind Farm (9.9km south of Project Area) – 400MW	Wind	Pre-scoping

The Electricity Strategy (NSW, 2020) proposed the REZ's to combine renewable energy generation such as wind and solar, storage (batteries) and high-voltage transmission infrastructure in the same location to deliver affordable, reliable and clean energy to homes and businesses that need it. While there are clear benefits to this approach, the cumulative effect of the potential volume of electricity generation proposed within the region, particularly during the construction phase, requires careful assessment and consideration in project planning.

Based on available information at the time of writing this EIS, there are a total of 34 renewable energy projects within or in the vicinity of the REZ (20 within and 14 outside of the REZ) and two Battery Energy Storage System (BESS) projects. Of the 34 renewable energy projects, 3 are operational, 4 are under construction and 12 are approved (but not yet commenced). Twelve projects are at various stages of the assessment process and 3 projects are pre-scoping (scoping report yet to be submitted). Of the 12 Projects currently under assessment, 4 are wind farm developments and 8 are solar farm developments.

The cumulative impacts associated with the Project and the REZ are discussed further in **Section 2.4**.



Legend

- New England Renewable Energy Zone
- 100km Radius from Thnderbolt Energy Hub
- Local Government Area (LGA)
- Roads

Operating System Voltage (kV)

- 132kV
- 330kV

Solar Developments

- Pre-Scoping
- Under Assessment
- Approved
- Under Construction
- Operational

Wind Developments

- Pre-scoping
- Under Assessment
- Approved
- Under Construction
- Operational

FIGURE 2.1

Regional and New England REZ Development

Image Source: ESRI Basemap, Data source: DFSI (2020), NSW Government (2020)

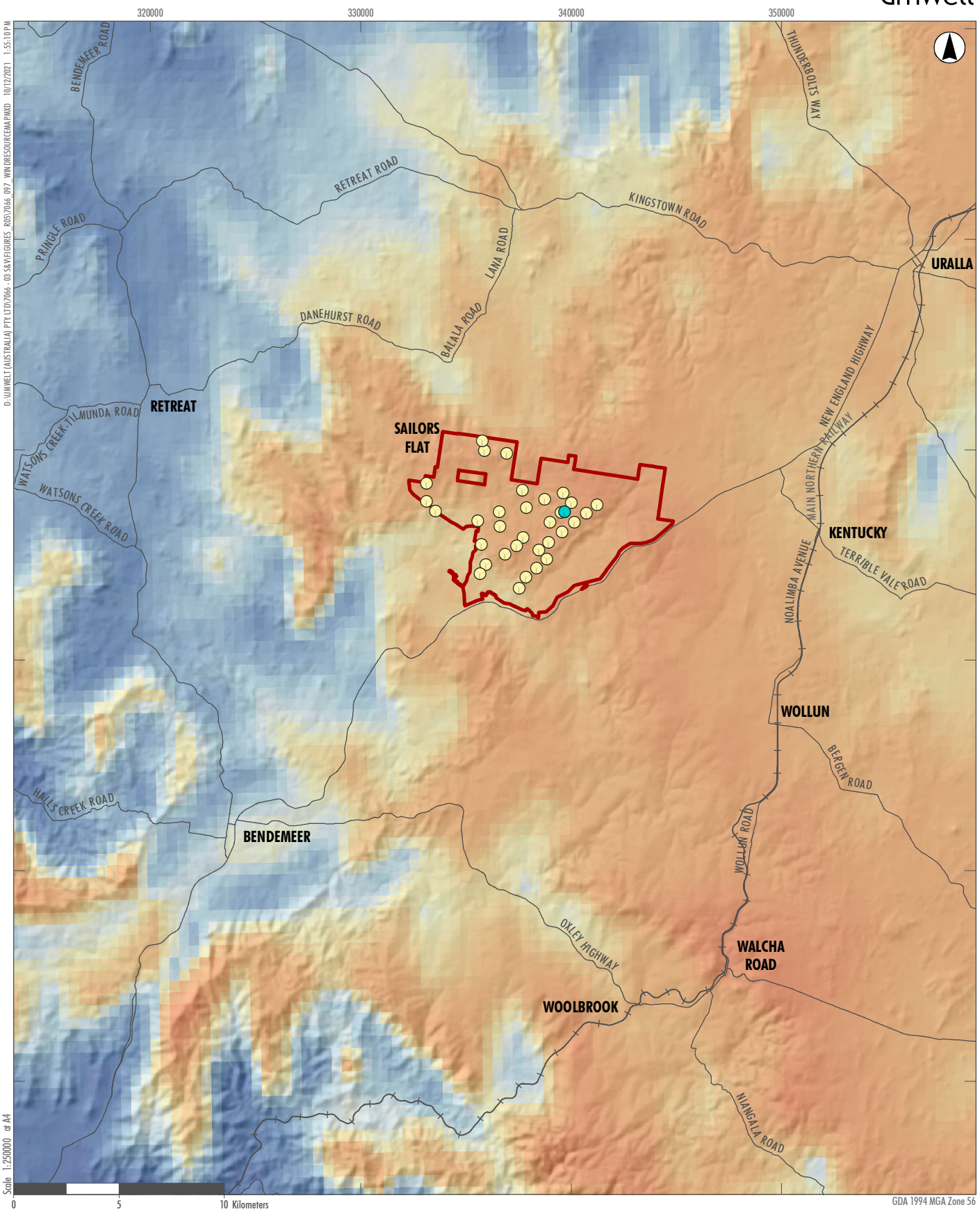


FIGURE 2.2

Wind Resource Mapping

Note: Wind Speed – 100m Above Ground Level (AGL)

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)

2.1.4 Regional Strategies and Plans

2.1.4.1 New England North West Strategic Regional Land Use Plan

The Project Area falls within the New England North West region, as defined in the New England North West Strategic Regional Land Use Plan (SRLUP) (DPIE, 2021). The SRLUP is the NSW Government's framework to support growth, protect the environment and respond to competing land uses, while preserving key regional values over the next 20 years.

The purpose of the SRLUP is to facilitate balanced land use policy decisions for NSW and to provide initiatives to address land use conflict in regional areas. The Project is considered to be generally consistent with the SLRUP, as it is proposing a compatible land use that provides for the continued agricultural use of the Project Area. The Project also provides a secondary income for host landholders and near neighbours via the landholder agreements and neighbour benefit program which will assist in providing an additional income stream through drought or other periods that impact agricultural productivity and income. The Project also provides benefits for the community surrounding the Project Area through the Community Benefits Fund, proposed to be $100,000 per annum (subject to final capacity of the Project) during the operations phase of the Project.

Additionally, the Project will provide a number of benefits related to cleaner and reliable electricity generation, contribute to regional investment including infrastructure, benefit sharing and generate employment during construction and operations (refer to **Section 2.6**).

2.1.4.2 Tamworth Regional Blueprint 100

Adopted by Tamworth Regional Council on 26 May 2020, Tamworth Blueprint 100 is a series of plans that provides Council with an integrated and robust strategic direction and action plan in order to better deliver on Community Strategic Plan outcomes (Tamworth Regional Council, 2020). The Blueprint guides and promotes the development of the Tamworth Region to 2041. It examines 'business as usual' scenarios (a population of 80,000 at 2041) as well as the potential to stimulate the growth of the region to a population of 100,000. The Blueprint also addresses land use planning and includes Council's land use vision, priorities, actions and how Council will monitor success.

The Project is consistent with a number of key themes and planning priorities that make up the Blueprint, including economic contributions required to create a prosperous region, economic diversification through the establishment of a renewable energy industry and creating resilient communities. The Project's contribution to these outcomes is provided through community benefit sharing program, neighbour benefit sharing program and employment (including diversification of local employment opportunities) and training opportunities for local workers (associated with both the construction and operation of the Project) and direct and indirect income associated with the Project.

2.1.4.3 Uralla Shire Local Strategic Planning Statement

Uralla Shire Council adopted the amended Uralla Shire Local Strategic Planning Statement on 29 June 2021 (Uralla Shire Council, 2021). The Statement plans for the Uralla Shire community's economic, social and environmental land use needs over the next 20 years to 2040.

The Statement indicates that the community of the Uralla Shire *values the area as it is but also wants to create more opportunities for the future*, highlighting growth in agriculture, tourism and industries. A high value industry that is highlighted in the statement is renewable energy.

The Project is consistent with several directions and planning priorities within the Statement, in particular it contributes to the creation of a new renewable energy generation industry, and helps to adapt to a changing climate by deploying renewable energy technologies.

2.2 Environmental Context

The Project Area is located within a rural setting and covers approximately 5,918 ha of agricultural land. The Project area is located within both the Tamworth Regional Local Government Area (LGA) and the Uralla LGA (refer to **Figure 2.3**).

Watsons Creek National Park is the closest national park, located approximately 13 km west of the Project Area. Watsons Creek State Conservation Area is the closest State Conservation Area, located approximately 20 km west of the Project Area (refer to **Figure 2.3**).

The locality surrounding the Project Area consists predominately of agricultural land and some smaller rural holdings. The Project Area is located near to the villages of Bendemeer, Wollun, Kentucky and Kentucky South which have populations of 492, 67, 158 and 125 respectively (Australian Bureau of Statistics, 2016).

The New England Highway extends along the southeast boundary of the Project Area providing direct access to the site from Tamworth to the south and Armidale to the north (regional service centres) and the Port of Newcastle. The Project Area can also be accessed from a number of small local roads including Green Valley Road and Glenburnie Road (refer to **Figure 2.3**).

2.2.1 Climate

The Project Area is located in the southern portion of the NSW New England Tableland Bioregion. This bioregion is characterised by warm summers, with uniform rainfall generally occurring in summer. The mean annual temperature for the New England Tableland Bioregion is 9°C to 17°C and the mean annual rainfall is between 653 mm and 1,765 mm (NSW National Parks and Wildlife Service, 2003). The mean maximum and minimum temperatures and mean rainfall at the closest meteorological monitoring station (Woolbrook Road), approximately 18km southeast of the Project Area are presented in **Table 2.2**. The data indicates the region has relatively mild temperatures during the summer months and higher rainfall.

Table 2.2 Woolbrook Road Meteorological Monitoring Data 1970 - 2021

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Mean Max Temp	27.8	26.8	24.8	21.3	17.0	13.5	12.8	14.4	17.98	21.3	23.7	26.4
Mean Min Temp	12.8	12.7	10.1	5.7	2.0	0.3	-1.0	-.08	2.0	5.3	8.4	10.9
Mean Rainfall	97.5	76.1	54.1	40.7	45.5	45.9	51.3	52.0	54.0	72.4	83.5	100.7

The Renewable Energy Resource Mapping (DPIE, 2019) is reproduced in **Figure 2.2** which indicates the existing wind resources applicable to the Project Area. The wind resources available in the Project Area are identified as greater than 6.3 metres/second (m/s) on average by the Renewable Energy Resource Mapping, which is considered to be appropriate for the development of a wind farm. On-site monitoring undertaken by Neoen indicates wind resources available in the Project Area are 7.6 metres/second (m/s) on average at a hub height of 170m.

2.2.2 Topography

Landforms within the Project Area are consistent with landforms found in the New England Tableland Bioregion, which consist of hills and broad valleys featuring rugged granite outcrops with tors (NSW National Parks and Wildlife Service, 2003). The Project Area generally comprises hills and ridgelines with intervening valleys and some areas of steep slopes particularly in the northern portion of the Project Area. Flatter areas are predominately within the southern and western portion of the Project Area in proximity to drainage lines. The Project Area has an elevation ranging from 870 m AHD to 1142 m AHD (refer to **Figure 2.4**).

2.2.3 Hydrology and Soils

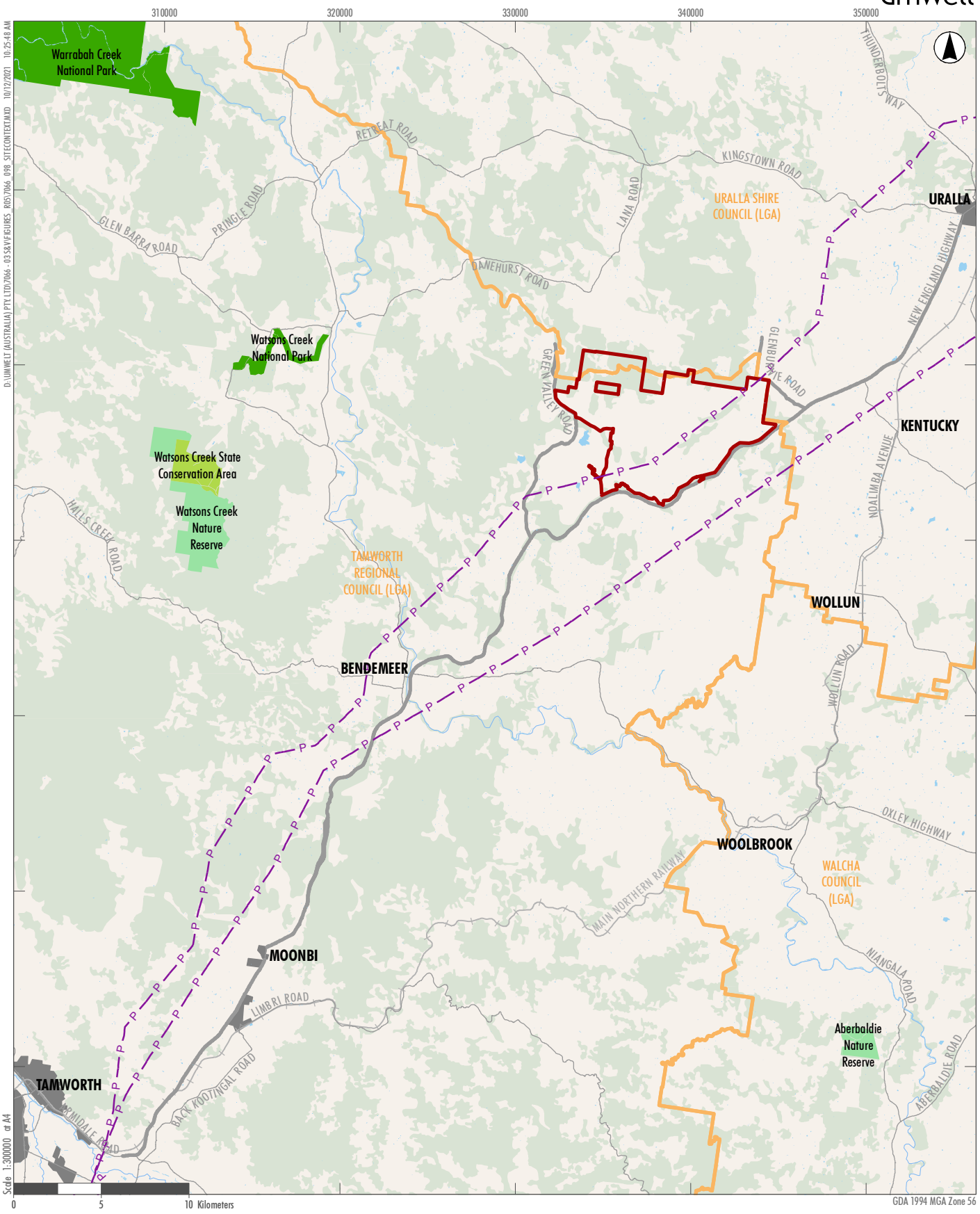
The Project Area falls within the Namoi and Gwydir catchments. Spring Creek (4th order stream) and Pine Creek (5th order stream) and other minor tributaries, traverse the Project Area and flow into Carlisles Gully (7th order stream) to the south of the Project Area (refer to **Figure 2.4**). The Project Area is not prone to flooding.

As part of the New England Tableland Bioregion, the geology of the Project Area is composed of Permian sedimentary rocks, intrusive granites and extensive Tertiary basalts (NSW National Parks and Wildlife Service, 2003).

The majority of the soils within the Project Area are identified as erodible rudosols and tenosols (refer to **Figure 2.5**). Erodible rudosols and tenosols are gravelly soils, particularly shallow and stony on steep slopes with rocky outcrops and generally have limited water holding capacity due to shallowness of the soil. Due to the soil type, vegetation clearing and agricultural land use the Project Area is subject to varying degrees of erosion, particularly on slopes and along creek lines.

The land within the Project Area is Class 4, 5, 6 and 7 under the Land and Soil Capability Assessment Scheme (LSC) which is described as moderate to extremely severe agricultural land use limitations (refer to **Figure 2.6**). The moderate to severely limited land and soil capability of the Project Area reflects the low mapped soil quality.

The Project Area is not identified as containing any areas of Biophysical Strategic Agricultural Land.



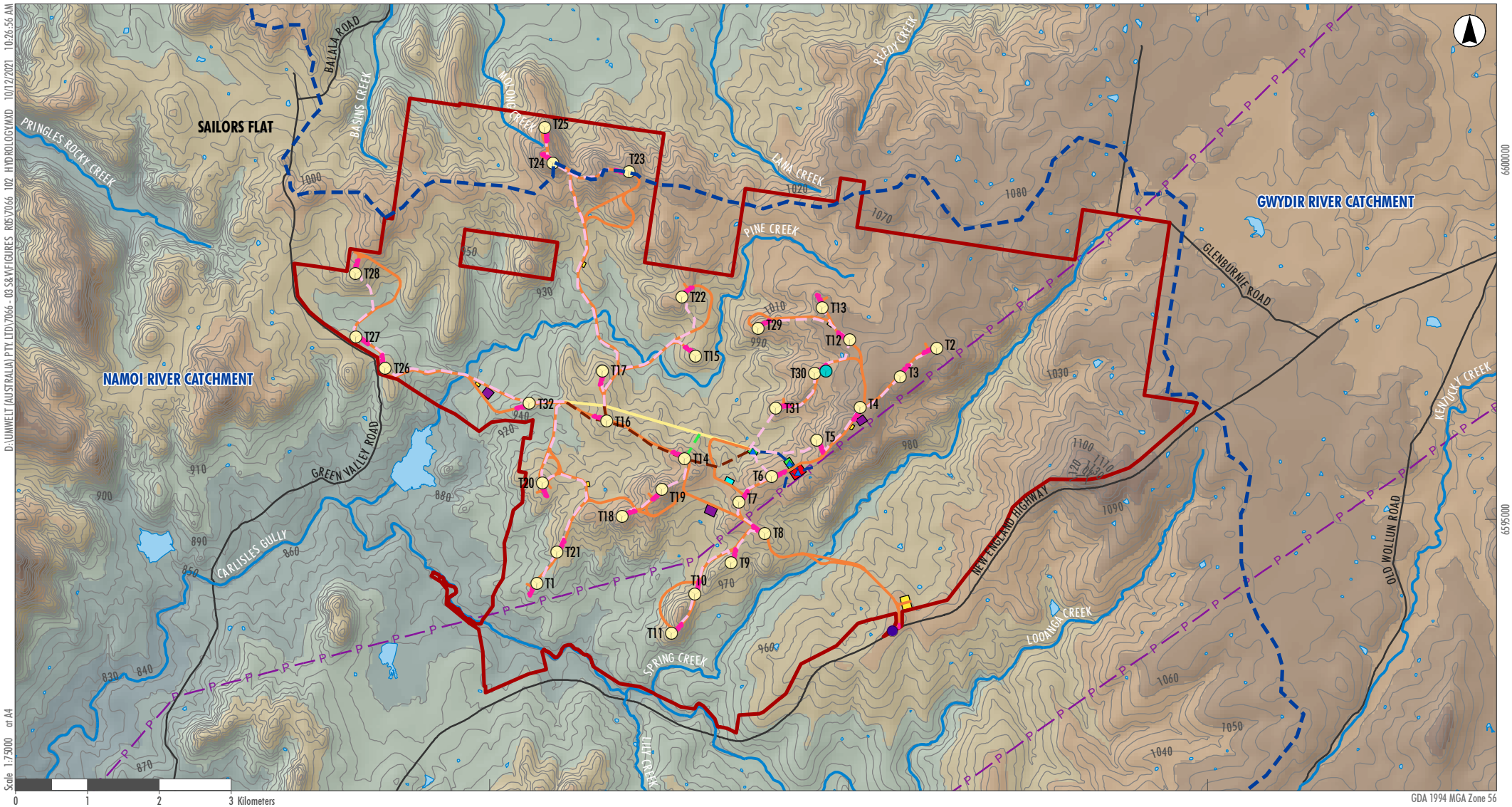
Legend

- Project Area
- Existing 330kV Power Lines
- Local Government Boundary
- Railway
- Road
- National Park
- Nature Reserve
- State Conservation Area

FIGURE 2.3

Site Context

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Proposed Access Point
- Conceptual Access Tracks
- Hardstand Area
- Batching Plants
- Laydown-Compounds
- Operation and Maintenance Compound
- Substation
- Switching Station
- P Existing 330kV Power Lines
- Underground 33kv Cables
- Option 1 - Underground Trench to Overhead Line
- Option 1 - MV Overhead Line Route
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants
- Creek/River
- Catchment Boundary
- Water Bodies

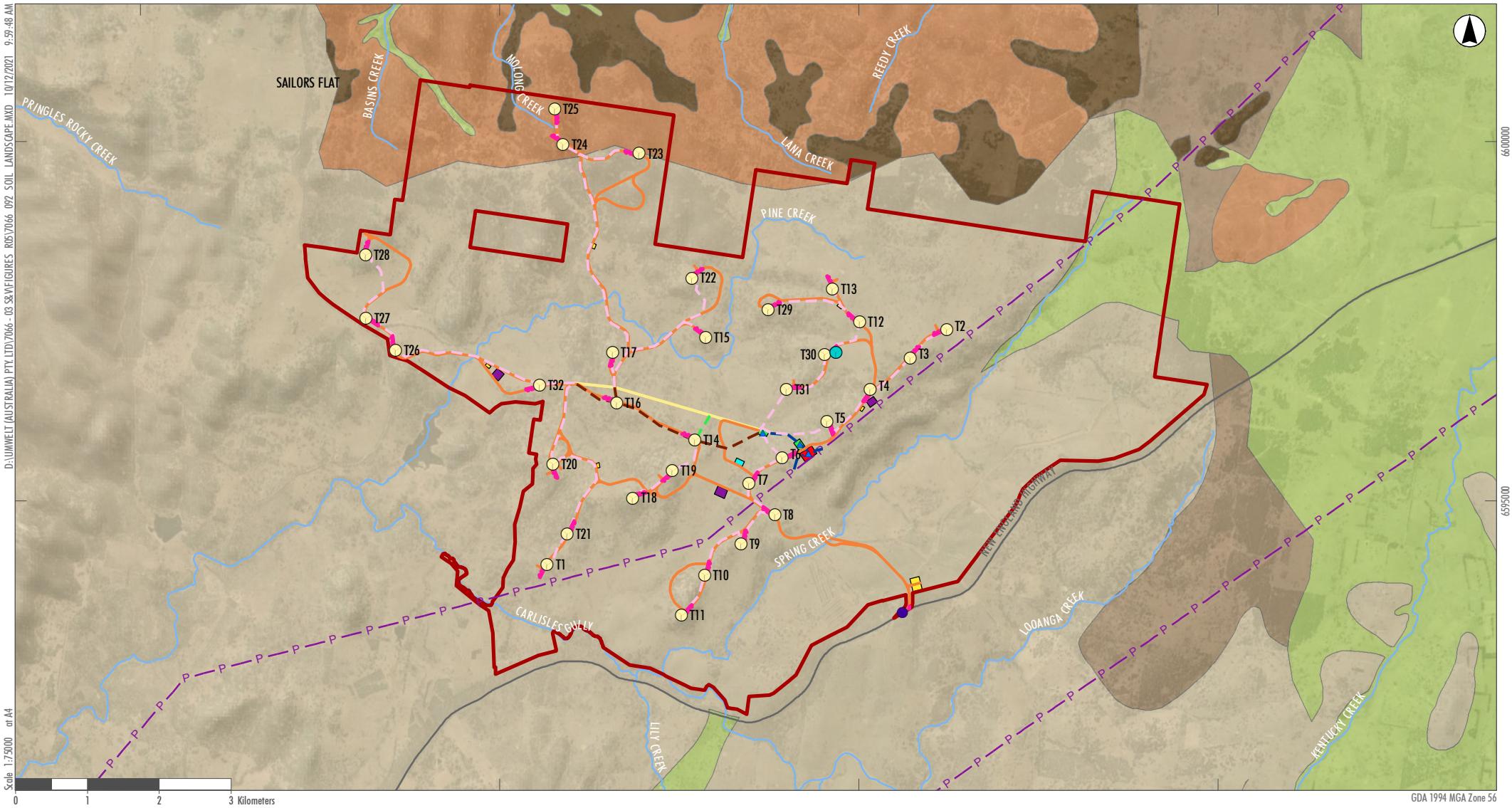
Elevation m(AHD)

- 800 - 850
- 850 - 900
- 900 - 950
- 950 - 1,000
- 1,000 - 1,050
- 1,050 - 1,100
- 1,100 - 1,150

FIGURE 2.4

Hydrology and Topography

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)



Legend

- Project Area
- Conceptual Turbine Layout
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- Conceptual Access Tracks
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- Option 1 - Underground Trench to Overhead Line
- Option 1 - MV Overhead Line Route
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants

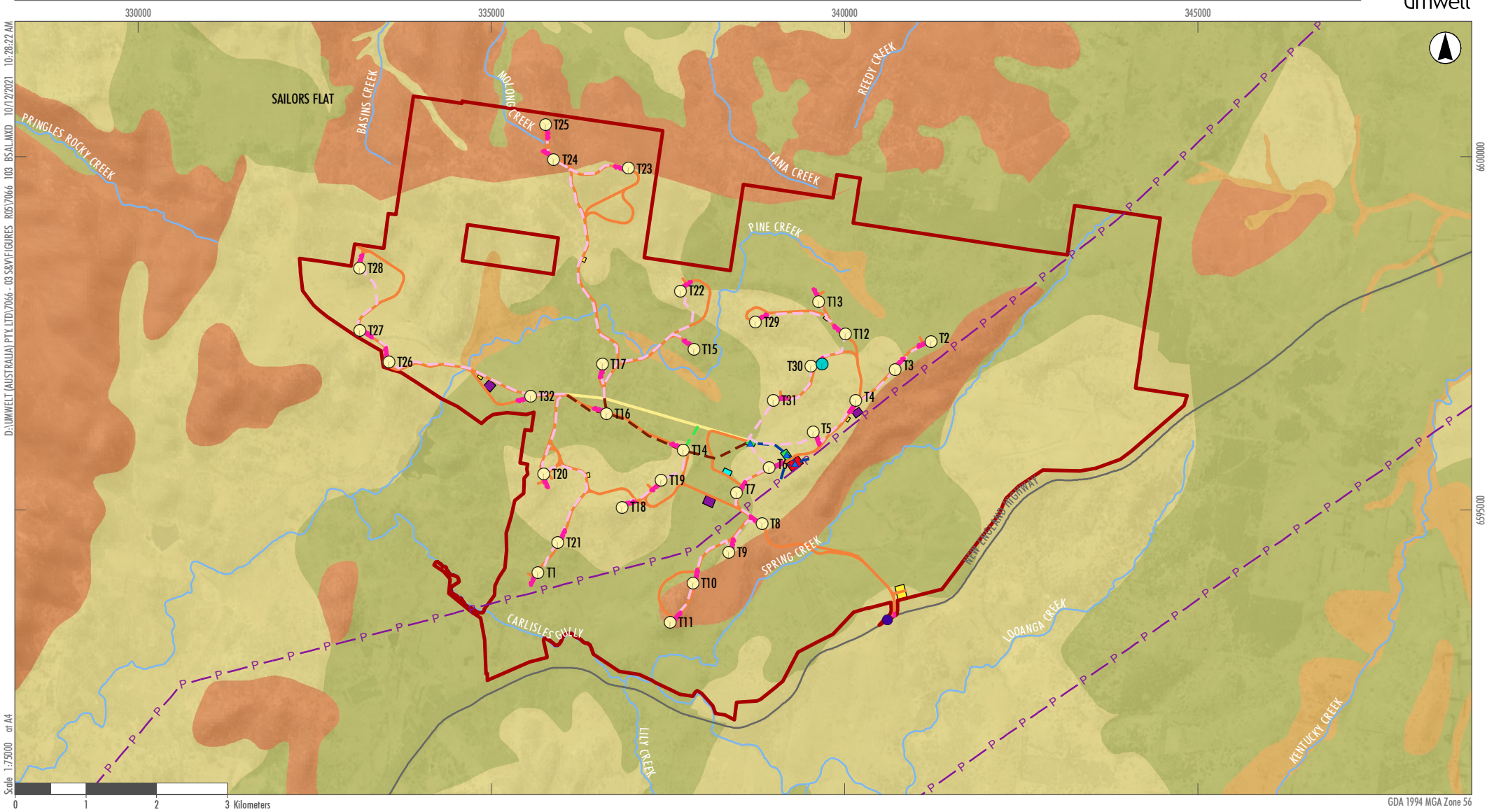
Australian Soil Classification Order

- Ferrosols
- Kandosols
- Kurosols
- Kurosols, Natric
- Rudosols
- Rudosols and Tenosols

Image Source: ESRI Basemap, Data source: Office of Environment and Heritage (2013), DFSI (2020), Neoen (2020)

FIGURE 2.5

Mapped Soil Landscapes



Legend

- Project Area
- Conceptual Turbine Layout
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- Proposed Access Point
- Conceptual Access Tracks
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- Operation and Maintenance Compound
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- Option 1 - Underground Trench to Overhead Line
- Option 1 - MV Overhead Line Route
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants

Land Soil Capability

- 4 - Moderate to severe limitations
- 5 - Severe limitations
- 6 - Very severe limitations
- 7 - Extremely severe limitations

FIGURE 2.6

Land and Soil Capability

Image Source: ESRI Basemap, Data source: Office of Environment and Heritage (2013), DFSI (2020), Neoen (2020)

2.2.4 Biodiversity

The Project Area largely comprises areas that have previously been disturbed and/or historically cleared associated with the agricultural land use. All grasslands within the Project Area are considered to be derived via clearing of previously occurring woodland and forests. The grasslands vary in condition depending on the intensity of the historical and current agricultural land use. Those grasslands occurring in areas of higher agricultural intensity are identified as exotic grasslands with very few native flora species remaining. Derived native grasslands persist in parcels of land where the agricultural land use has been of lower intensity.

Woodlands and forests persist, in some form of degradation, on the protected and steep slopes, gullies and ridgelines, which often align with the presence of rocky outcrops. This includes small, isolated or fragmented patches, through to larger patches of woodlands and forests with degraded understories. The exception to this is the northern boundary of the Project Area which supports a large patch of forest of reasonable quality. This patch occurs on a separate landholding to the remainder of the Project Area and as such has not been exposed to the same degree of agricultural land use.

Despite the previous disturbance and historical clearing across the Project Area, a range of suitable fauna habitat still occurs provided by remnant vegetation and rocky outcrops. Surveys have recorded substantial areas of rocky habitat across the Project Area, including large slabs of imbedded rock as well as large and exposed boulder outcrops. Surveys across the Project Area have not detected high densities of large hollow bearing trees and no cave systems have been recorded.

Further detail regarding the flora and fauna present within the Project Area is provided in **Section 6.4**.

2.2.5 Zoning

The Project Area is primarily zoned as RU1 Primary Production under the Tamworth Local Environmental Plan 2010 (Tamworth LEP), with a small area in the northern extent of the Project Area zoned RU2 Rural Landscape under the Uralla Local Environmental Plan 2012 (Uralla LEP) and (refer to **Figure 2.7**). The Project Area is not currently subject to any mineral titles, exploration leases or licences.

The zonings and applicability of the provisions of the Uralla LEP and Tamworth LEP to the Project are discussed further in **Section 4.2.2.1**.

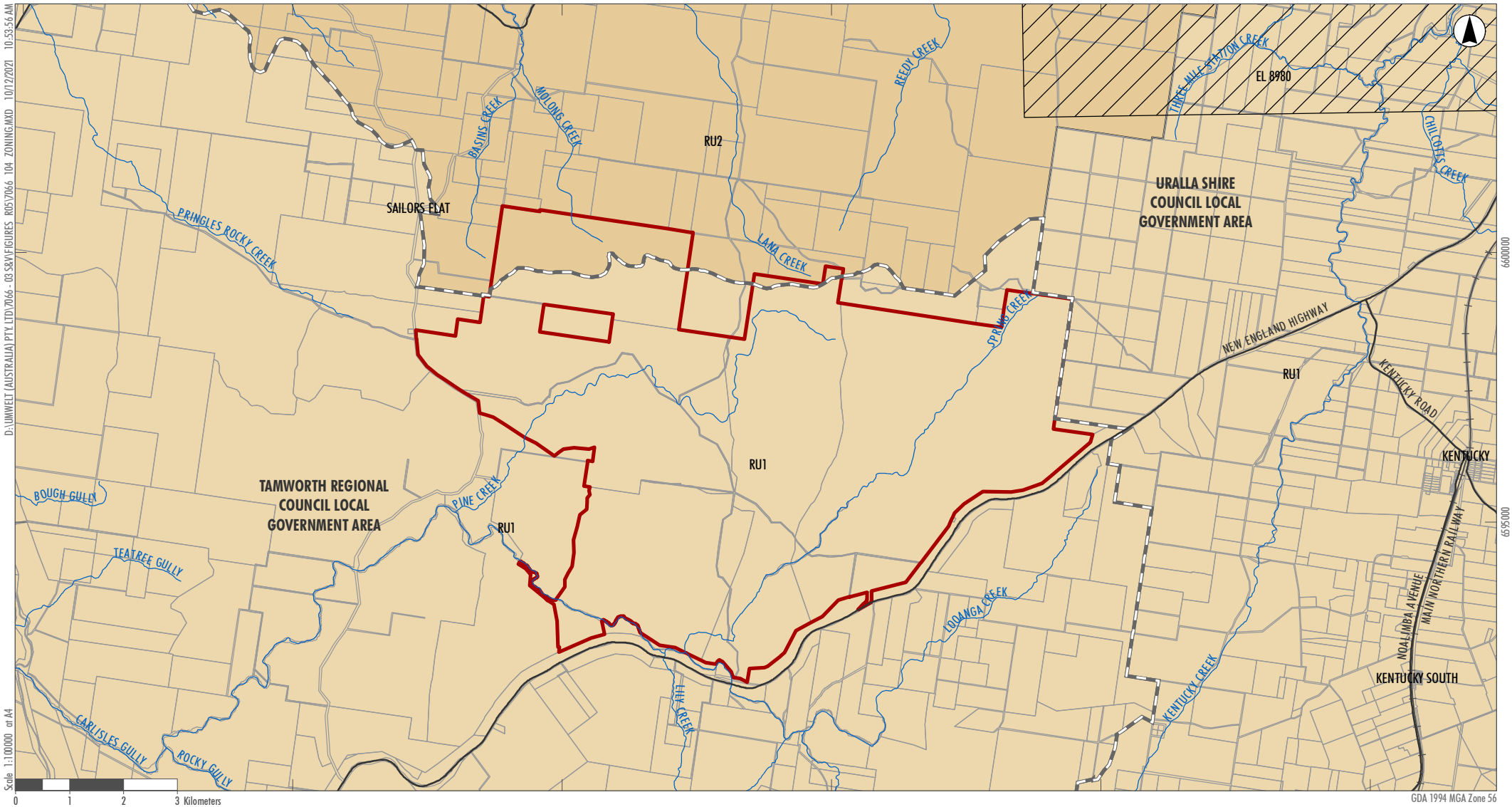


Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)

FIGURE 2.7

Zoning

2.3 Social Context

The Project Area is partially within Tamworth Regional LGA and partially within the Uralla Shire LGA and within the broader New England North Western Region. The Project Area is located to the west of the localities of Kentucky and Kentucky South (refer to **Figure 2.3**).

Large and regionally strategic population centres within the social locality include Armidale and Tamworth. Armidale and Tamworth are the administrative and service centres of the respective regions; each have their own airports, are located on the New England Highway, and are positioned on the North West railway line and freight corridor.

Other smaller population centres identified within the broader social locality include Uralla, Bendemeer, Woolun, Walcha, Woolbrook, Invergowrie, Saumarez, Moonbi, Kootingal and Manilla, refer to **Figure 1.1**.

2.3.1 Land Use and Ownership

The Project Area encompasses two privately-owned properties, both of which are primarily utilised for sheep and cattle grazing, refer to **Figure 2.8**.

Land surrounding the Project Area is also predominately utilised for agricultural purposes and rural residential land use. The dwellings assessed by the relevant specialist assessments undertaken as part of this EIS have identified the dwellings as follows:

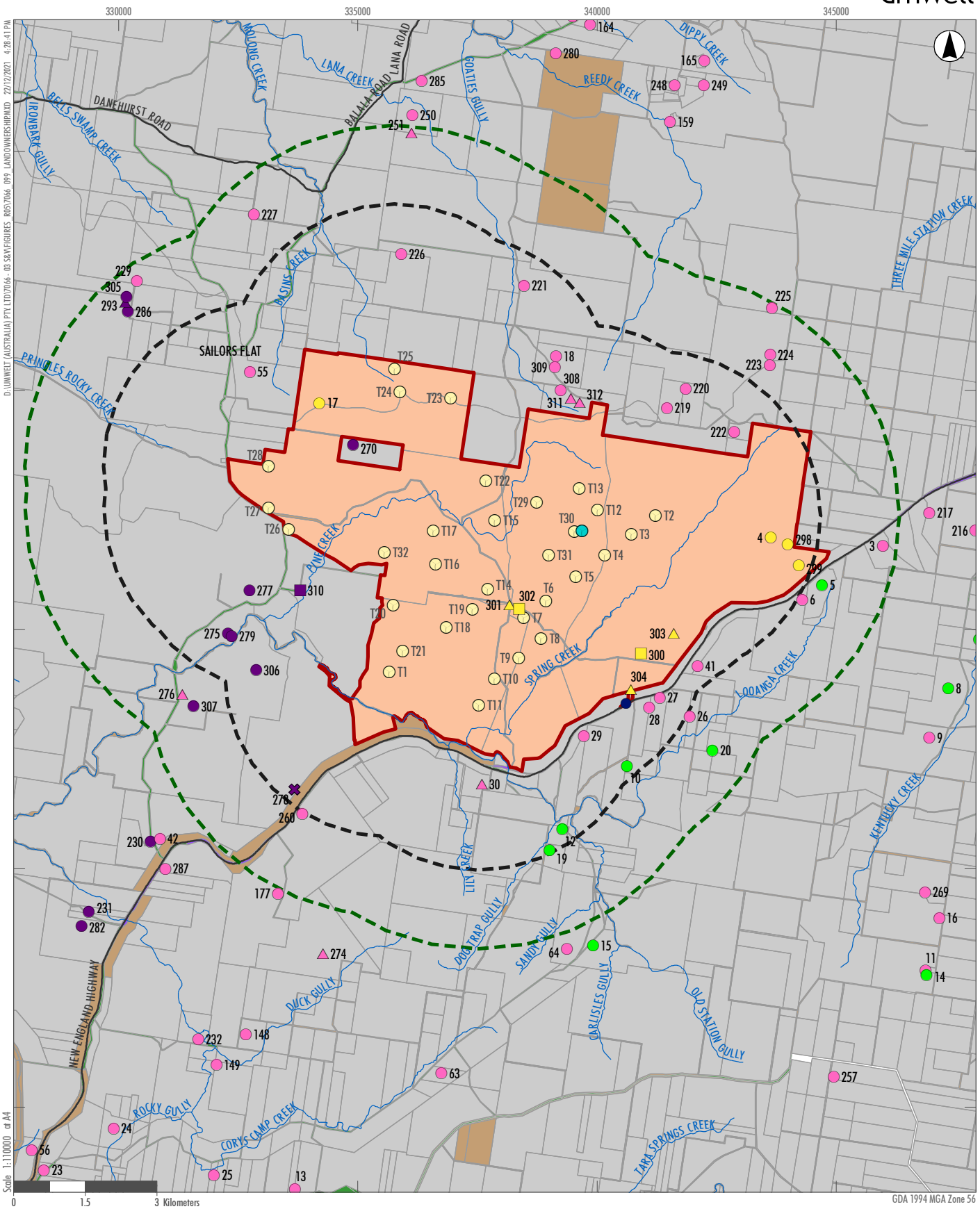
Host Dwellings – those dwellings located within the Project Area and located on land hosting the infrastructure associated with the Project. The host landholders have agreements in place with Neoen.

Associated Dwellings – dwellings not located on land within the Project Area or hosting infrastructure, however, the Proponent has a negotiated agreement in place with the landowner regarding Project impacts and are therefore associated with the Project.

Non-associated Dwellings – dwellings located outside of the Project Area and not associated with the Project.

There are 6 host dwellings located within the Project Area (refer to **Figure 2.8**). Dwelling ID 4, 17, 298 and 299 are currently in use and ID 300 and 302 are vacant.

There are seven associated dwellings and 16 non-associated dwellings within 3,450m and a further 11 non-associated and 3 associated dwellings within 5,100m of the proposed WTGs, refer to **Figure 2.8**.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Proposed Access Point
- 3450m Turbine Buffer
- 5100m Turbine Buffer
- Host Landholder - Dwelling
- Host Landholder - Shed
- Host Landholder - Vacant Dwelling
- Associated Landholder - Dwelling
- Associated Landholder - Shed
- Associated Landholder - Vacant Dwelling
- Associated Landholder - Derelict Dwelling
- Non-Associated Landholder - Stage 2 Dwelling
- Non-Associated Landholder - Dwelling
- Non-Associated Landholder - Shed
- Non-Associated Landholder - Vacant Dwelling

Land Ownership

- Private - Involved Landholder
- Crown land
- Private
- Local Government Authority
- Shared Crown/Council

FIGURE 2.8

Land Ownership

Image Source: Data source:

2.4 Cumulative Impacts

As discussed in **Section 2.1.3**, there are a total of 35 renewable energy projects within or in the vicinity of the REZ (extending up to approximately 165 km from the Project Area) and two BESS projects. Of the 35 renewable energy projects 3 are operational, 4 are under construction and 13 are approved. Twelve projects are at various stages of the assessment process and 3 projects are pre-scoping (scoping report yet to be submitted). Of the 12 projects currently under assessment, 4 are wind farm developments and 8 solar farm developments.

The *Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects* (DPIE, 2021) requires consideration of a project together with the impacts of other relevant future and existing projects in order to determine the potential cumulative impact. The CIA indicates the following future projects should be considered in the cumulative impact assessment:

- changes to existing projects (expansion, modification, closure)
- approved projects (approved but construction has not commenced)
- projects under assessment (application for the project has been exhibited and is currently under assessment)
- related development (development that is required for the project but subject to separate assessment).

As noted above there are 3 projects which are currently pre-scoping (a scoping report has not been submitted). In relation to the Tara Springs Wind Farm and the Bendemeer Energy Hub, project details are limited and detailed analysis of the layout in relation to visual and noise impacts is not possible. However, given the distance from the Project Area (>8km) significant impacts associated with the operation of the Project are unlikely. Additionally, given the current status of these projects the construction timeframes are unlikely to overlap should these projects proceed.

Additionally, consideration has been given to the cumulative impact associated with the planned Thunderbolt Energy Hub Stage 2 project and the planned Thunderbolt Energy Hub Solar Farm. However, the extent of Stage 2 and the solar farm is yet to be determined and the construction of the stage of this Project and the remainder of the Thunderbolt Energy Hub are unlikely to overlap. A full assessment of the cumulative impacts associated with Stage 2 will be included in the EIS for Stage 2 wind farm and the Stage 2 solar farm respectively.

It is noted there are currently 12 approved projects (as outlined in **Table 2.3**) within the REZ and region (11 solar and one wind) that are yet to be constructed. Given the distance between the Project Area and these approved projects (ranging from 50 to 150 km) cumulative impacts associated with the operation of the Project are unlikely to be an issue. The timing of construction of these projects is unknown, however given the timing associated with the assessment of the Project, there is sufficient time for the approved projects to be constructed without overlap with the construction timeframe associated with the Project. With the exception of the New England Solar Farm, which proposes a staged 36-month construction phase and therefore there is potential for overlap with the construction phase of the Project. This approved project has been considered further in the cumulative impact assessment.

The cumulative impact assessment prepared for the Project has predominately focused on the relevant existing and proposed projects currently under assessment as outlined in **Table 2.3**.

Table 2.3 Projects Currently Under Assessment

Project	Location	Status
Wind Projects		
Hills of Gold Wind Farm	75 km south of the Project Area - outside REZ	EIS Exhibited
Doughboy Wind Farm	88.5km northeast of Project Area	SEARs issued
Rangoon Wind Farm (North and South)	93.9 km North of Project Area	SEARs issued
Winterbourne Wind Farm	38 km east of Project Area	SEARs issued
Solar Projects		
New England Solar Farm	28 km North East of the Project Area Currently approved however construction timeframe is staged over 36 months – potential to overlap with the Project	Approved
Oxley Solar Farm	50 km northeast of Project Area	EIS Exhibited
Dumaresq Solar Farm	75 km southwest of Project Area – outside REZ	SEARs Issued
Middlebrook Solar Farm	75 km southwest of Project Area – outside REZ	SEARs Issued
Salisbury Solar Farm	32km northeast of Project Area	SEARs Issued
Sundown Solar Farm	108km north of Project Area	SEARs Issued
Tilbuster Solar Farm	55 km northeast of the Project Area	SEARs Issued
5MW Solar Plant	40 km southwest of Project Area	DA Submitted – Tamworth Council
Other		
Tamworth Battery Energy Storage System	55 km southwest of Project Area	SEARs Issued
Armidale Battery Energy Storage System	45.54 km Northeast of Project Area	SEARs Issued

The EIS for the Hills of Gold Wind Farm has been exhibited and is at the 'response to submissions' phase of the assessment process, with the Doughboy, Rangoon and Winterbourne Wind Farms at the 'prepare EIS phase'. Additionally, the EIS for the Oxley Solar Farm has been exhibited and is currently at the 'response to submissions phase' with the other 7 solar farm projects at the 'prepare EIS phase' of the process. It is possible the construction timeframe associated with the Project will align with these projects, however given the varying timelines associated with the assessment and pre-construction process it is likely the timing of the construction phases will be staggered, however overlap is possible.

In presenting a worst-case scenario the cumulative impact associated with the alignment of the construction phases of these projects located within 100 km of the Project Area has been included in the relevant assessments particularly the demand for services in the region and workforce. Consideration has also been given to the service centres proposed for the Project, being Tamworth and Armidale and the reliance of the other projects in the region on these centres. The cumulative impact assessment indicates potential cumulative impacts associated with these aspects can be appropriately managed (refer to **Section 6.0** and specifically **Section 6.13**).

Given the distance between the relevant Project Areas cumulative impacts associated with the operation of the Project (visual, noise etc) are unlikely to be an issue (closest proposed wind farm is 38km away and closest solar farm is 25km away). The cumulative assessment of the Project is discussed further in the relevant subsections in **Section 6.0** and more specifically in **Section 6.13**.

2.5 Project Related Agreements

Through the development of the Project design and the stakeholder engagement process Neoen has developed and implemented a number of project related agreements and benefit sharing programs.

Host Landholder Agreements

Host Landowners will receive annual lease payments to host wind farm infrastructure. These payments are confidential between Neoen and host landowners and address the Project related impacts on these land holdings and residences. Host landowners will continue to undertake agricultural activities on their land unaffected by the Project (excluding the areas hosting infrastructure). The impacts of the Project on these residences whilst noted in the technical assessments as relevant, are addressed by the agreements in place.

Neighbour Benefit Sharing Program

Neoen publicly announced its neighbour benefits program in September 2021. Neoen is committed to an equitable, transparent and easy-to-understand neighbour benefits program. The program applies to neighbours who own a residential dwelling within 3.5km of a proposed wind turbine with direct payments being offered to these landholders. Payments are to be made on a sliding-scale based on the distance of their dwelling to wind turbines, and the number of turbines nearby. The payments are annual and are proposed to commence at the beginning of the operations phase of the project, which is typically 25-30 years. The final amount received by neighbours will depend on the wind turbine layout, to be determined in the construction phase when final distances from dwellings to turbines will be confirmed.

The annual payments will begin once the Project commences operations, refer to **Appendix 6** for further information.

Negotiated agreements

In addition to the Neighbour Benefit Sharing Program, Neoen has a number of negotiated agreements in place with neighbouring landowners (identified as 'associated landholders') to address various impacts associated with the Project specific to their dwellings. The agreements were developed in accordance with the Wind Energy Guidelines' and have been signed by Neoen and the relevant landholder. The impacts of the Project on these residences whilst noted in the technical assessments as relevant, are addressed by the agreements in place.

Community Benefit Sharing Program

Neoen has developed a Community Benefits Sharing Program (CBSP) with the aim of providing significant and meaningful benefits to the communities surrounding the Project Area. The program was developed to ensure both short and long-term benefits flow through to the community as a result of the establishment and operation of the Project.

The CBSP will be designed to deliver benefits to key stakeholders in the community in a way that aims to meet their needs and aspirations. Specifically, our objectives are to:

- deliver significant and meaningful improvements to the community surrounding the Project
- ensure a wide range of different stakeholder groups benefit from the Project
- empower the community to shape the design and implementation of the different initiatives
- build support for renewable energy in the Kentucky, Bendemeer and Uralla area.

In alignment with Neoen's organisational vision, it is important that the benefit be a true benefit and be tailored to meet each distinct communities' need.

The Community Benefit Fund will commence once the Project is operational and will provide $100,000 annually based on the current size of the Project. Neoen has requested the community's feedback via the community feedback survey and during meetings to determine what types of local projects and initiatives the community would like to see the funding to go towards. The Community Benefits Fund may provide funding for local projects such as sports, clubs, tourism, heritage, arts and culture via a yearly competitive grants process. Refer to the Neoen Community Relations Plan for further information, see **Appendix 6**.

Voluntary Planning Agreement

A Voluntary Planning Agreement (VPA) will be developed for the Project with Uralla and Tamworth Regional Councils. Neoen has commenced consultation with the Councils and the proposed VPA for the Project will be subject to further consultation during the assessment process.

2.6 Project Justification

The development of renewable energy projects aligns with both Federal and NSW commitments to increase renewable energy generation and reduce carbon emissions across the NSW and Australian economies.

The proposed location of this Project is within the New England REZ, being an area identified by the NSW government to be targeted for renewable energy development. The NSW government has indicated that these REZs will play a vital role in delivering affordable energy generation to help prepare the State for the expected retirement of thermal power stations over the coming decades. The Project will contribute to meeting these Federal and NSW Government objectives and is located within a defined area planned for renewable energy development.

The Project Area is well positioned within a region identified as having high wind renewable energy resource potential, access to existing electricity infrastructure and access directly from the New England Highway. This position provides for direct access to the renewable energy source without the need to use any local roads in the vicinity of the Project Area for transport, or to construct high-voltage transmission lines outside of the Project Area to take power to the existing network. There may be limited use of local roads along the transport route from the Port of Newcastle for oversize vehicles where determined as part of the final transport route analysis.

Neoen has refined the Project based on feedback received from relevant stakeholders through the scoping and EIS phases. Neoen has considered a range of alternatives in planning the Project and in determining the concept layout included in this EIS. The preliminary WTG layout and infrastructure design was subject to a number of iterations in order to minimise environmental impact and maximise energy production. The environmental assessment findings outlined in **Section 6.0** indicate that while there will be some environmental and social impacts associated with the Project, there are low levels of impacts associated with many key issues given the design of the Project and the values of the Project Area. Where impacts are predicted, Neoen has committed to management and mitigation measures to address these residual impacts.

The Project will provide long-term, strategic benefits to the State of NSW, including:

- renewable energy supply to assist with fulfilling the current obligations under State and Federal renewable energy targets
- providing for cleaner reliable electricity generation, assisting with meeting current load demand while reducing greenhouse gas emissions and the impacts of climate change
- providing regional investment in the NSW renewable energy sector.
- make a positive contribution towards achieving the target of 8 GW of renewable energy generation from the New England Renewable Energy Zone.

The Project will also provide direct financial benefits to the regional and local community, including:

- infrastructure investment of approximately $373 million
- creation of 495 full time positions (direct and indirect) during the 18-24 month construction phase and 20 full time positions (direct and indirect) during operations
- indirect benefits to local services through the construction and operation phases
- additional host and benefit sharing with neighbouring landowners, resulting in financial contributions to the local community
- local community benefits through the implementation of a proposed community benefit fund that will invest in local community projects and initiatives to provide a direct and targeted local benefit.

3.0 Project Description

3.1 Project Area

The Project Area is approximately 5,918 ha and is accessed directly from the New England Highway (refer to **Figure 3.1**). The assessment of the Project has focused on a Development Corridor, which forms a buffer to the conceptual project layout (50 m buffer either side of the centreline of internal access tracks and a 140 m buffer to the WTG locations) and is approximately 568 ha, with a total disturbance area (contained within the Development Corridor) of approximately 215 ha (refer to **Figure 3.1**).

The conceptual layout has been developed to avoid and minimise impact to identified biodiversity and Aboriginal cultural heritage constraints. The layout has also been refined through the development of the EIS to reduce visual and noise impacts and optimise potential energy generation based on on-site wind monitoring data. The relevant specialist assessments have applied a worst-case scenario for the impacts of the Project, being full assessment of the Development Corridor, however, full disturbance of the Development Corridor will not occur. The Development Corridor is established and assessed to provide the necessary flexibility for the detailed civil design and refinement of the WTG layout through the assessment process and pre-construction phase. This approach provides for further design refinement and micro-siting practices to be applied post approval.

The proposed WTGs and associated infrastructure would be contained wholly within the Project Area, including the full extent of the WTG blades. The assessment also includes works associated with the construction of an intersection at the entrance to the Project Area on the New England Highway and associated works located both within and adjoining the Project Area.

3.2 Project Overview

The Project will include the construction, operation and maintenance of up to 32 WTGs. Associated infrastructure will include internal access roads, operation and maintenance buildings, civil works and electrical infrastructure (substations and switching station) required to connect to the existing 330kV transmission network.

The conceptual layout (refer to **Figure 3.2**) has been prepared to locate the WTGs within areas identified as having higher wind resources while also considering the relevant ecological, archaeological, visual, noise and other impacts. The conceptual layout will be subject to further refinement and detailed design as part of the pre-construction phase.

Table 3.1 provides an overview of Key Components of the Project.

Table 3.1 Overview of Key Project Components

Key Components	Approximate Dimensions/Detail	Quantity
WTGs		
Tip Height	Maximum of 260 m	Up to 32
Tower (hub) height	Maximum of 170 m	
Blade Length	Maximum of 90 m (split blade)	
Electrical Reticulation		
Transmission Line	33kV electrical cabling (underground and/or overhead)	NA
	330kV overhead transmission line connecting the switching station and substation	NA
Substation	Approx. 1 ha	1
Switching Station	Approx. 2.6 ha – the Project also includes subdivision to create a separate lot for the switching station for ownership to be transferred to Transgrid	1
Internal Access Roads	Road surface width ranging 6-9m (providing for delivery of WTG components and access during operations)	Approx. 50km
Project Access	Construction of an intersection with basic left (BAL) and short channelised right (CHRs) treatments	1
Meteorological Monitoring Mast	Height 170 m	Up to 6 to be installed during operations in proximity to turbines 1 temporary mast currently installed (80 m) to be removed prior to construction phase
Operations and Maintenance Buildings	Approx. 1 ha	1 – includes storage shed, office and parking
Access to Project Area	Construction of new intersection on New England Highway for direct access to Project Area	1
Operations Workforce		9 personnel
Temporary Construction Facilities		
Construction Compound and Laydown Areas	Main compound approx. 2.4 ha Satellite Compounds approx. 0.3 ha	1 x Main Compound (offices, amenities, parking, storage, laydown areas and associated facilities) 3 x Satellite Compounds
Mobile Concrete Batch Plant	Approx. 2 ha per batching plant	2 co-located plants – 3 possible assessed locations
Construction Workforce		190 personnel (average)

As required by the SEARs, **Table 3.2** provides a consolidated list and coordinates of the proposed infrastructure including identifying the distance to the closest non-associated dwelling.

Table 3.2 Proposed Infrastructure Coordinates

Proposed Infrastructure	Coordinates		Closest Non-associated Dwelling ID	Distance to non-associated dwelling
	Easting	Northing		
T1	335660.70	6594107.00	260	3483
T2	341225.00	6597378.00	222	2398
T3	340719.00	6596988.00	219	2740
T4	340162.00	6596552.00	41	3032
T5	339556.00	6596100.00	27	3087
T6	338931.00	6595599.00	29	2938
T7	338473.00	6595240.00	29	2769
T8	338834.00	6594805.00	29	2221
T9	338364.60	6594397.00	29	2120
T10	337854.00	6593964.00	29	2219
T11	337532.00	6593412.00	29	2284
T12	340014.00	6597494.00	219	2579
T13	339635.00	6597942.00	308	2094
T14	337718.00	6595842.00	29	3669
T15	337867.00	6597269.00	308	3056
T16	336629.00	6596361.00	308	4479
T17	336574.00	6597065.00	29	2769
T18	336850.00	6595039.00	29	3662
T19	337401.00	6595420.00	29	3524
T20	335739.00	6595504.00	260	4762
T21	335940.00	6594542.00	260	4000
T22	337676.00	6598098.00	308	2462
T23	336942.00	6599833.00	309	2275
T24	335882.90	6599958.00	226	2888
T25	335768.30	6600449.00	226	2401
T26	333549.00	6597099.00	55	3383
T27	333137.20	6597539.00	55	2873
T28	333131.00	6598418.00	55	2005
T29	338740.10	6597656.00	308	2396
T30	339527.00	6597038.00	308	2974
T31	338989.00	6596546.00	308	3462
T32	335555.00	6596610.00	55	4707
Met Mast	339685.95	6597063.00	41	3730
Operation and Maintenance Compound	338338.91	6595533.67	29	3091
Substation option 1	339171.33	6595780.30	27	3084
Substation option 2	338670.07	6595946.45	29	3347
Switching station	339294.15	6595656.64	27	2910

The objectives of the Project are to:

- provide a source of affordable, reliable power to NSW consumers and assist in reducing greenhouse gas (GHG) emissions
- make positive contributions towards achieving both NSW and Commonwealth renewable energy targets
- make a positive contribution towards achieving the target of 8 GW of renewable energy generation from the New England Renewable Energy Zone
- contribute to employment opportunities during construction and operation
- collaboratively work with members of the community and other stakeholders to limit environmental and social impacts
- work to the highest quality, safety and environmental standards
- facilitate construction and operation in an environmentally sustainable manner.

The Project will provide long-term, strategic benefits to the State of NSW, including:

- renewable energy supply to assist with fulfilling the current obligations under state and federal renewable energy targets
- providing for cleaner reliable electricity generation, assisting with meeting current load demand while reducing greenhouse gas emissions and the impacts of climate change
- providing regional investment in the NSW renewable energy sector.

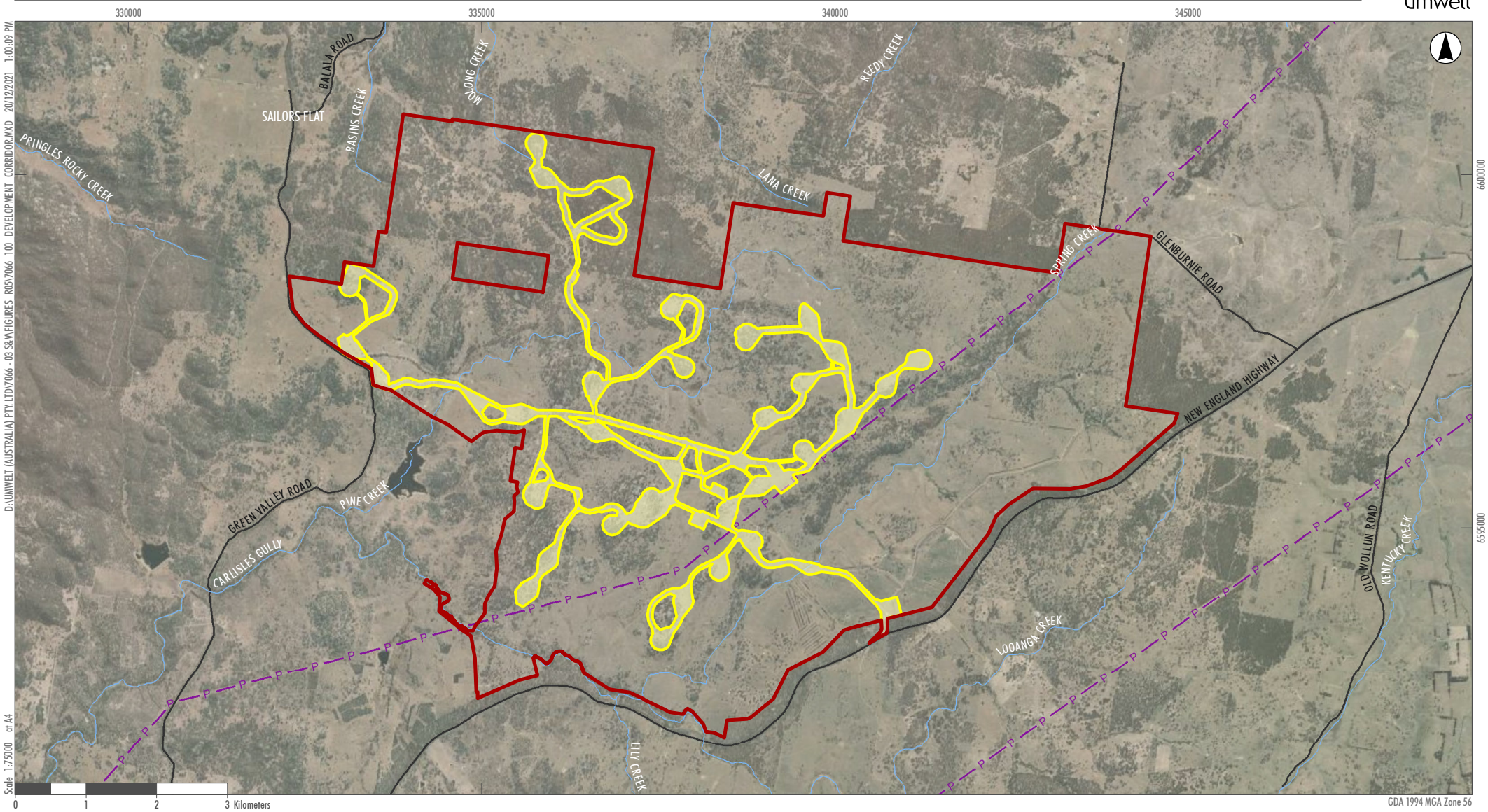
The Project will also provide direct financial benefits to the regional and local community, including:

- infrastructure investment of approximately $373 million
- the project will support a total of 495 full time positions (direct and indirect) during the 18-24 month construction phase and 20 full time positions (direct and indirect) during operations
- indirect benefits to local services through the construction and operation phases
- additional landowner income to involved landowners resulting in financial contributions to the local community
- local community benefits through the implementation of a proposed community benefit fund that will invest in local community projects and initiatives to provide a direct and targeted local benefit.

The Project is identified as being State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2007 (SRD SEPP). As SSD, the Project requires development consent under Part 4 of the Environmental Planning & Assessment (EP&A) Act. This EIS assesses the potential impacts associated with the Project in accordance with the Secretary's Environmental Assessment Requirements (SEARs), issued 16 December 2020 refer to **Appendix 1**.

On 28 October 2021, the delegate of the Federal Minister of the Department of Agriculture, Water and the Environment (DAWE) determined that the Project is a controlled action under Section 75 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act controlling provisions for the Project are listed threatened species and communities and listed migratory species.

This EIS has been prepared to address the guidelines for preparing assessment documentation relevant to the EPBC Act issued by DAWE on 28 October 2021, and the revised SEARs issued by the Department of Planning, Industry and Environment (DPIE) on 11 November 2021, as the Project will be assessed in accordance with the bilateral assessment agreement.



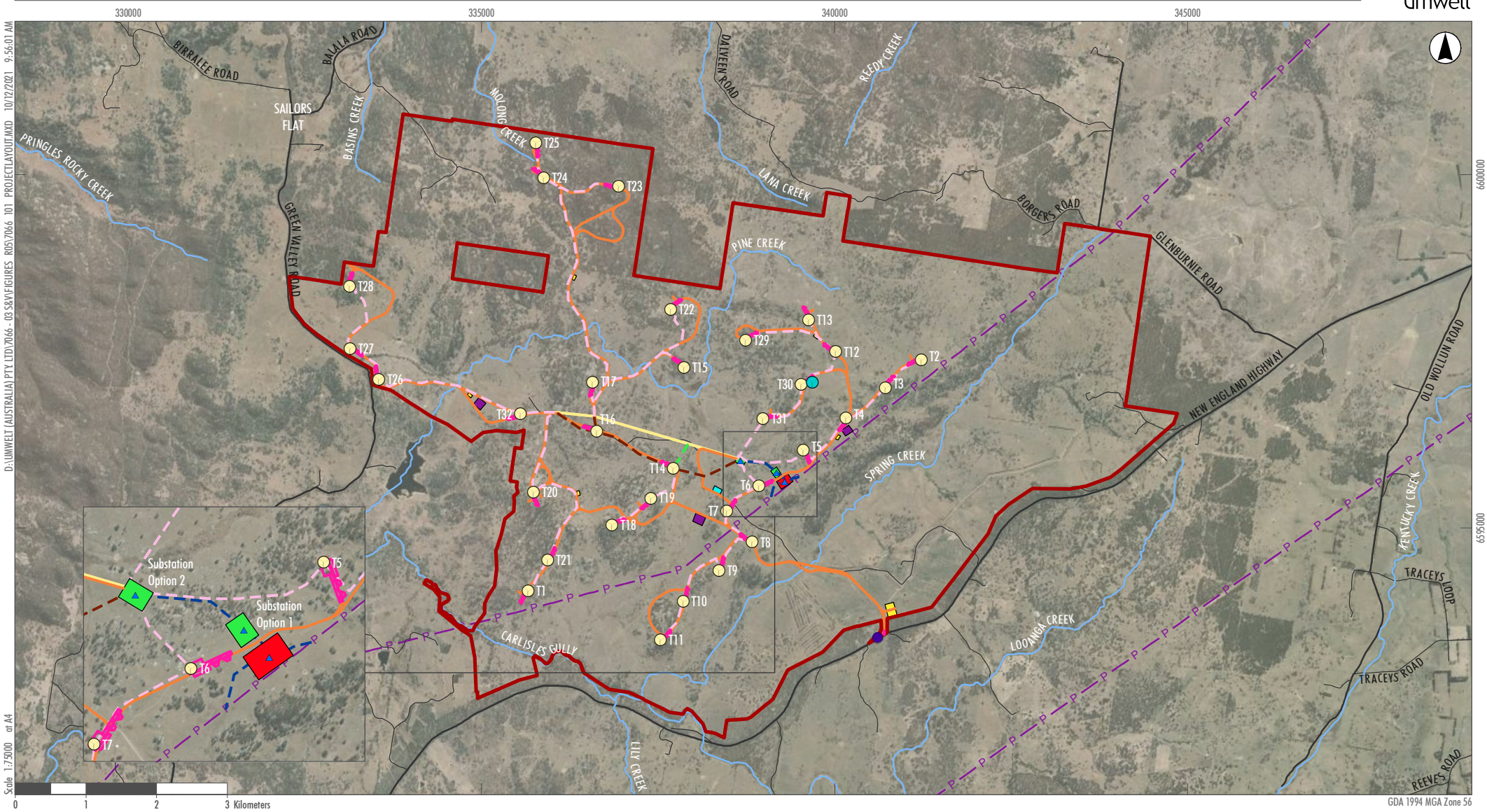
Legend

- Project Area
- Development Corridor
- P Existing 330kV Power Lines

FIGURE 3.1

Project Area and Development Corridor

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Proposed Access Point
- Conceptual Access Tracks
- Hardstand Area
- Batching Plants
- Laydown-Compounds
- Operation and Maintenance Compound
- Substation
- Switching Station
- Existing 330kV Power Lines
- Underground 33kv Cables
- Option 1 - MV Overhead Line Route
- Option 1 - Underground Trench to Overhead Line
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants

FIGURE 3.2

Conceptual Project Layout

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

3.3 Project Alternatives

Neoen has considered a range of alternatives in planning the Project, with the relevant project alternatives primarily relating to the determination of the Project Area and the conceptual layout included in this EIS. Neoen initially commenced consultation with potential involved landholders based on a study area of 35,000 ha. This area was then reduced to approximately 12,222 ha based on the entire Thunderbolt Energy Hub, with Stage 1 (the Project) forming approximately 5,918 ha.

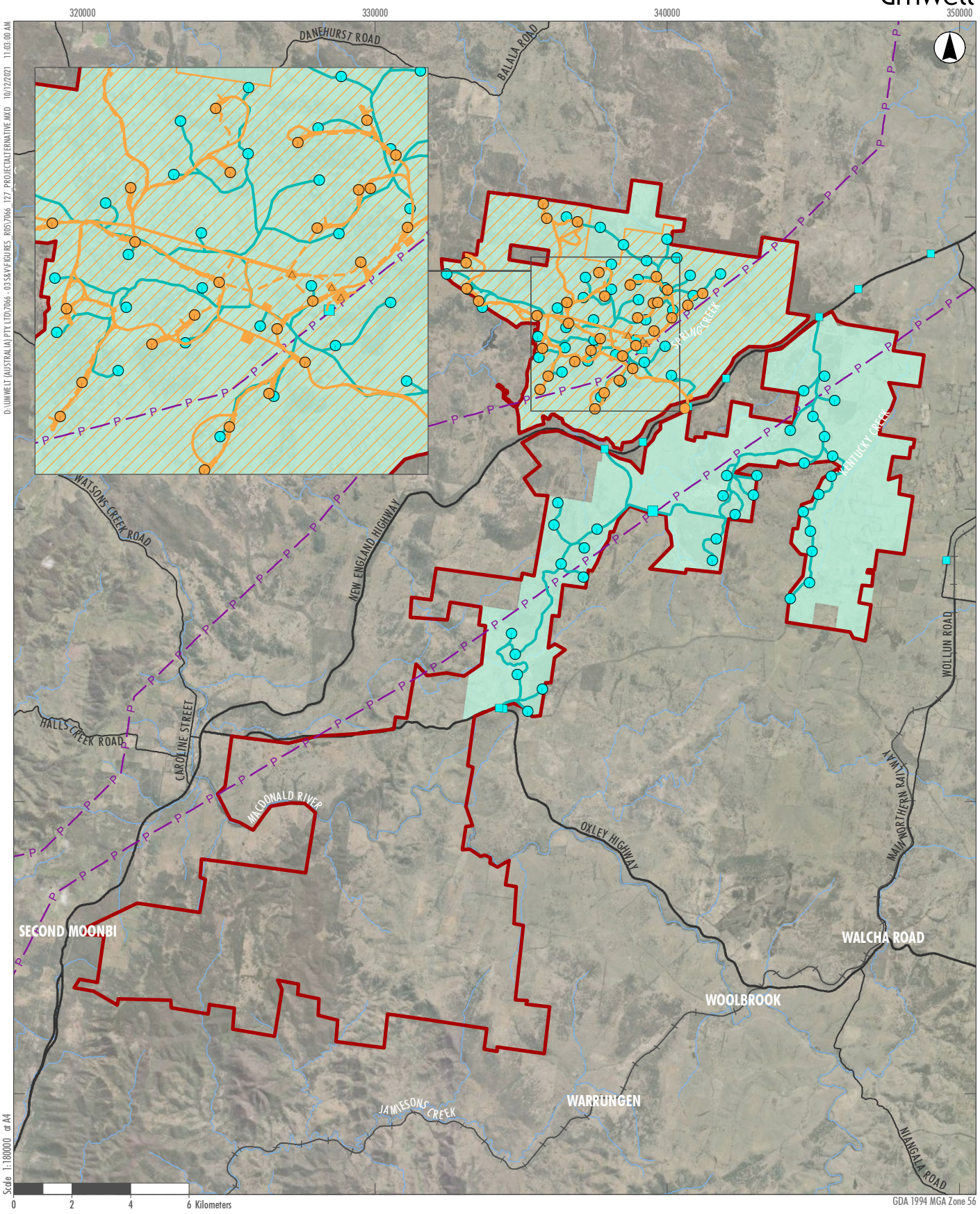
Neoen commenced consultation with the host landholders in 2018. This consultation included phone calls, online and face to face meetings conducted by Neoen employees. This initial consultation process resulted in the current involved landholders associated with Stage 1 confirming involvement in the Project during 2019 and 2020. Negotiations with some Stage 2 landholders are currently ongoing and are not necessary for this Project. For this Project, Stage 2 landholders are considered as 'non-associated' landholders.

The preliminary WTG layout and infrastructure design was subject to a number of iterations during consultation with the landowners, neighbours and community members and initial environmental investigation during the feasibility and scoping phases of the Project which has informed the development of the proposed conceptual Project layout presented in this EIS.

As previously discussed, the approach of separating the Thunderbolt Energy Hub into two stages is a direct response by Neoen to feedback received from local landholders, neighbours, local community groups and local community leaders. Particular concerns were raised in relation to the potential visual impact of Stage 2, which is located closer to Kentucky village, results in additional turbines in multiple directions from some non-involved dwellings, and will generally be more visible. As will be discussed in the sections of this EIS, the Stage 1 layout has been designed in a way to minimise impacts where practicable. Importantly, the residual visual impacts at all non-associated dwellings are low or negligible. While Neoen intends on progressing with Stage 2 in some form in the future as part of a separate assessment, Neoen elected to develop Stage 1 first to demonstrate its professionalism, build trust in the community, and demonstrate its contribution both socially and economically.

The evolution of the Project Area and conceptual layout is illustrated on **Figure 3.3**.

The alternative of not proceeding with the Project (the 'do nothing alternative') would result in the loss of significant financial benefit to the region (approximately $373 million – total), and contribution to the 8GW target applied to the New England REZ, supplying 192 MW, sufficient clean energy to power the equivalent of approximately 118,000 homes per annum, which represents approximately 2.7 times of the total annual residential requirements of the Region (Armidale, Tamworth, Uralla and Walcha LGAs - 43,300 dwellings).



Legend

- Thunderbolt Energy Hub Investigation Area
- Thunderbolt Wind Farm Project Area - Scoping Phase
- Thunderbolt Wind Farm Project Area - EIS Phase
- Conceptual Layout - Scoping Phase
- Conceptual Layout - EIS Phase
- Existing 330kV Power Lines
- Watercourse
- Road
- Railway

FIGURE 3.3

Project Alternatives

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2020)

3.4 Key Components of the Project

3.4.1 Wind Turbine Generators

The Project will include up to 32 WTGs with a maximum tip height of 260 m. The proposed layout of WTGs across the Project Area is shown on Figure 3.2 and each WTG will have a generating capacity of approximately 5 MW to 8 MW.

Each WTG will be constructed of composite metal and will consist of a foundation and tower, nacelle, rotor hub and blades. To achieve visual consistency through the landscape, the WTGs will:

- be uniform in the colour, design, height and rotor diameter
- finished in matt-white and non-reflective material to reduce visibility
- not have any unnecessary signage or lighting.

Typical components of a turbine are shown in **Figure 3.4**.

Each WTG will be mounted on a concrete foundation approximately 30 m x 30 m in size. WTG foundations will be excavated with mechanical plant and equipment, blasting may also be required in some locations if significant rock is present. The detailed design and construction requirements of each WTG foundation will depend on topography. Spoil and topsoil from excavation will be stockpiled and will be reused to backfill the foundation and for vegetation rehabilitation of the Project Area. Potential construction impacts related to soil and water will be managed through the implementation of a Soil and Water Management Plan (SWMP) (refer to **Section 6.9**).

The nacelle is a housing that includes the generator and control systems and is located at the top of the turbine tower. The housing also includes a transformer, gearbox, oil containment and sound insulation.

The wind turbine rotor captures energy from wind via a mechanism that connects the blades to the gearbox, with the energy transferred to a generator within the nacelle. The rotor is controlled by a central wind turbine control unit that controls the rotational speed and the pitch of the blades, facilitating maximum energy production and providing for safe and reliable operation of the WTG.

Three blades are attached to the rotor hub of each WTG. Blades will have a maximum length of 90 m, typically constructed of reinforced fibreglass, and attached to a steel shaft extending the length of the blade. A split blade (transported to the Project Area in two parts) is proposed for the Project in order to reduce the length of the components and avoid disturbance along the transportation route associated with road works to accommodate movement of over size and over mass (OSOM) vehicles. The steel shaft also serves as a lightning rod in the event that a WTG is struck by lightning. Blades typically start operating at wind speeds of 3m/s and cut out at wind speeds of 25m/s. WTGs are automatically shut down if wind conditions are deemed too strong for the WTG to operate safely.

No WTG lighting is proposed. The Aviation Impact Assessment (**Appendix 15**) indicates that the WTGs will not require obstacle lighting to maintain an acceptable level of safety to aircraft, this is discussed further in **Section 6.8.1**.

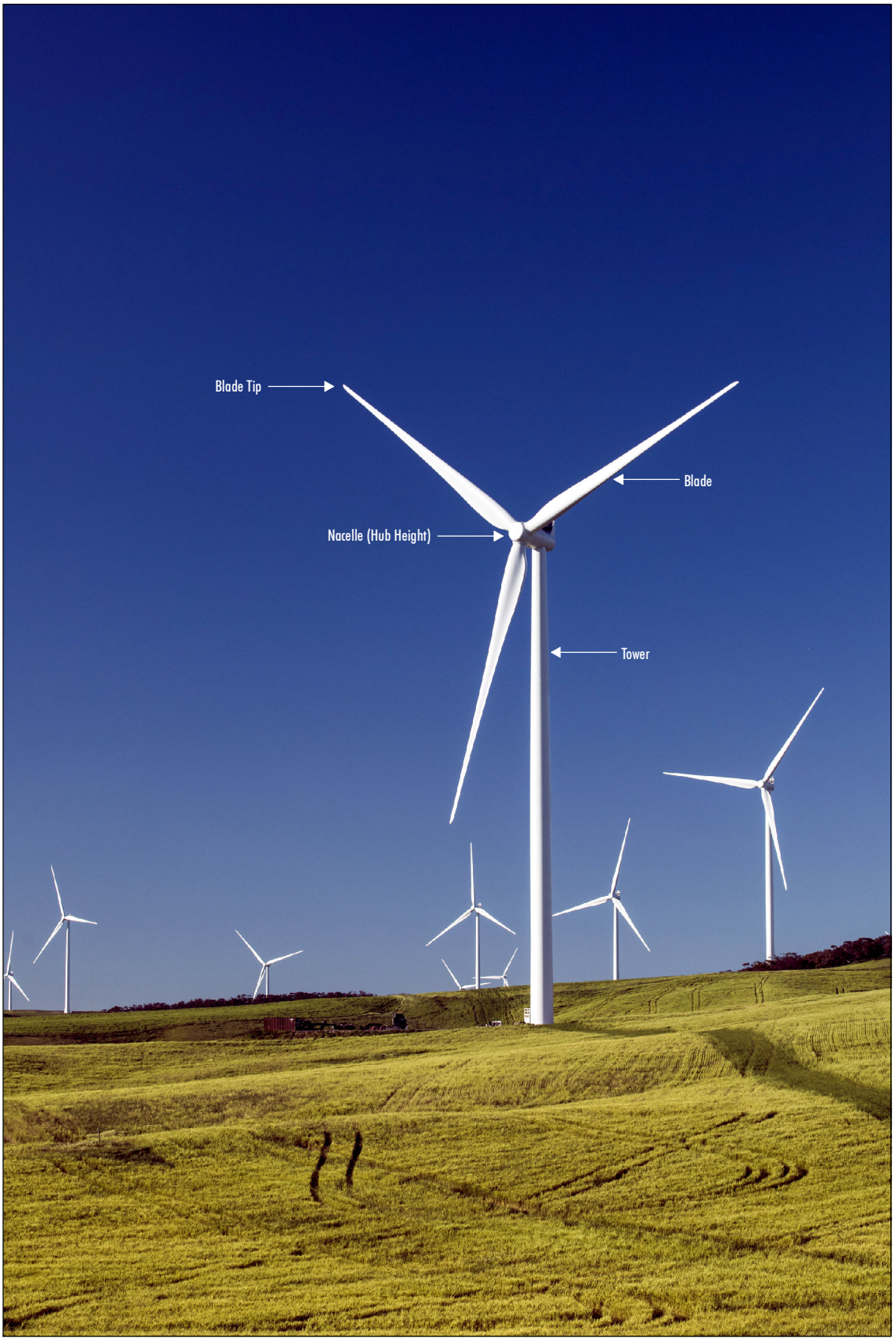


FIGURE 3.4

Wind Turbine Components

<bol>Image Source: Neoen (2021)

3.4.2 Electrical Reticulation

3.4.2.1 Transmission Line

The proposed WTGs will be connected back to the on-site substation via a network of underground cables. An option to install a short section of overhead 33kV cabling is also included in the conceptual layout to provide for flexibility during the detailed design phase (refer to **Figure 3.2**). A high voltage 330 kV overhead transmission line will be constructed to connect the on-site substation to the switching station, adjacent to the existing 330kV transmission lines.

3.4.2.2 On-site Substation

The Project will include one substation located at one of two sites (refer to **Figure 3.2**). Two site options have been included to provide flexibility in the final detailed design process and approval is sought for both options, with only one site to be used. Both sites have been assessed in this EIS. The substation will include a range of electrical equipment to manage and control the supply of electricity, such as transformers.

3.4.2.3 On-site Switching Station

A switching station (approximately 200 m x 130 m) will be included as part of the electrical reticulation network. The switching station will connect the Project transmission line (from the substation) to the existing 330 kV transmission lines. A switching station example is provided in **Photo 3.1**.

The Project also includes the subdivision of Lot 7 DP 627548 to create a separate lot for the switching station infrastructure and facilitate the transfer of ownership of the switching station and associated land to Transgrid. **Figure 3.5** indicates the location of the proposed switching station and indicative lot boundary. The lot size and configuration is indicative only and is subject to further detailed design and confirmation with Transgrid and the landholder during the detailed design phase.

Photo 3.1 Switching Station (source: Neoen)

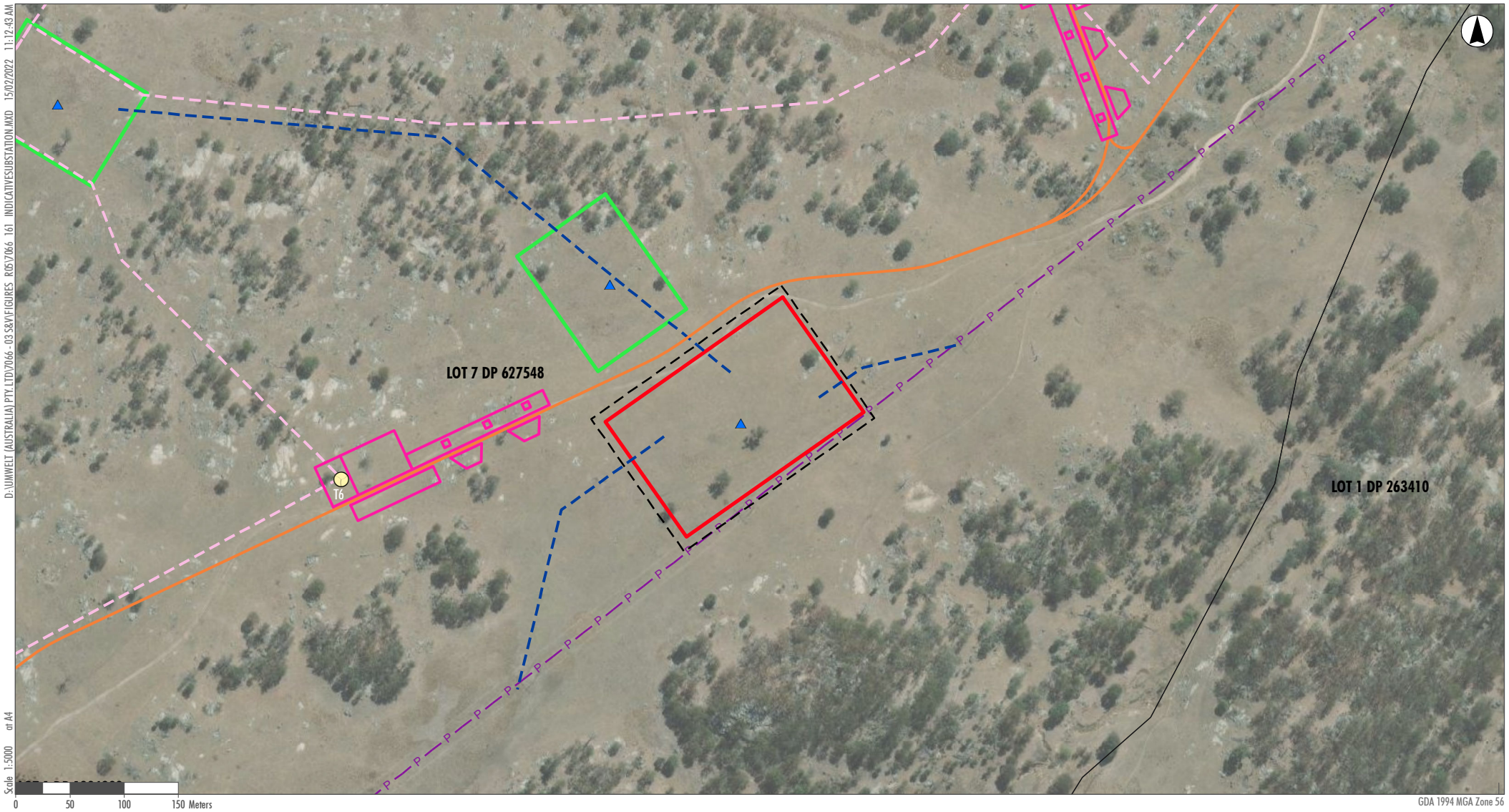


FIGURE 3.5

Indicative Subdivision Boundary

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

3.4.3 Access to Project Area

Major turbine components will be delivered to the Port of Newcastle and transported to the Project Area by truck via the New England Highway. Access to the Project Area will be provided via an existing access road, the Project includes the construction of an intersection with basic left (BAL) and short channelised right (CHRs) treatments providing for direct access from the New England Highway (refer to **Figure 3.2**). The conceptual intersection design for the intersection of the site access road with the Highway is provided in **Figure 3.6**. This design will be subject to further detailed design including further consultation with Transport for NSW (TfNSW) as part of Project implementation. Traffic and transport impacts and mitigation measures are addressed in **Section 6.5.4**.

Two routes are proposed to transport turbine components to the Project Area, refer to **Figure 3.7**. Minor treatments on the public road network will be required to generate sufficient space for oversized vehicle passage to facilitate the delivery of towers, nacelles and blades. The works are outlined in **Table 3.3**.

Table 3.3 Potential Minor Treatments

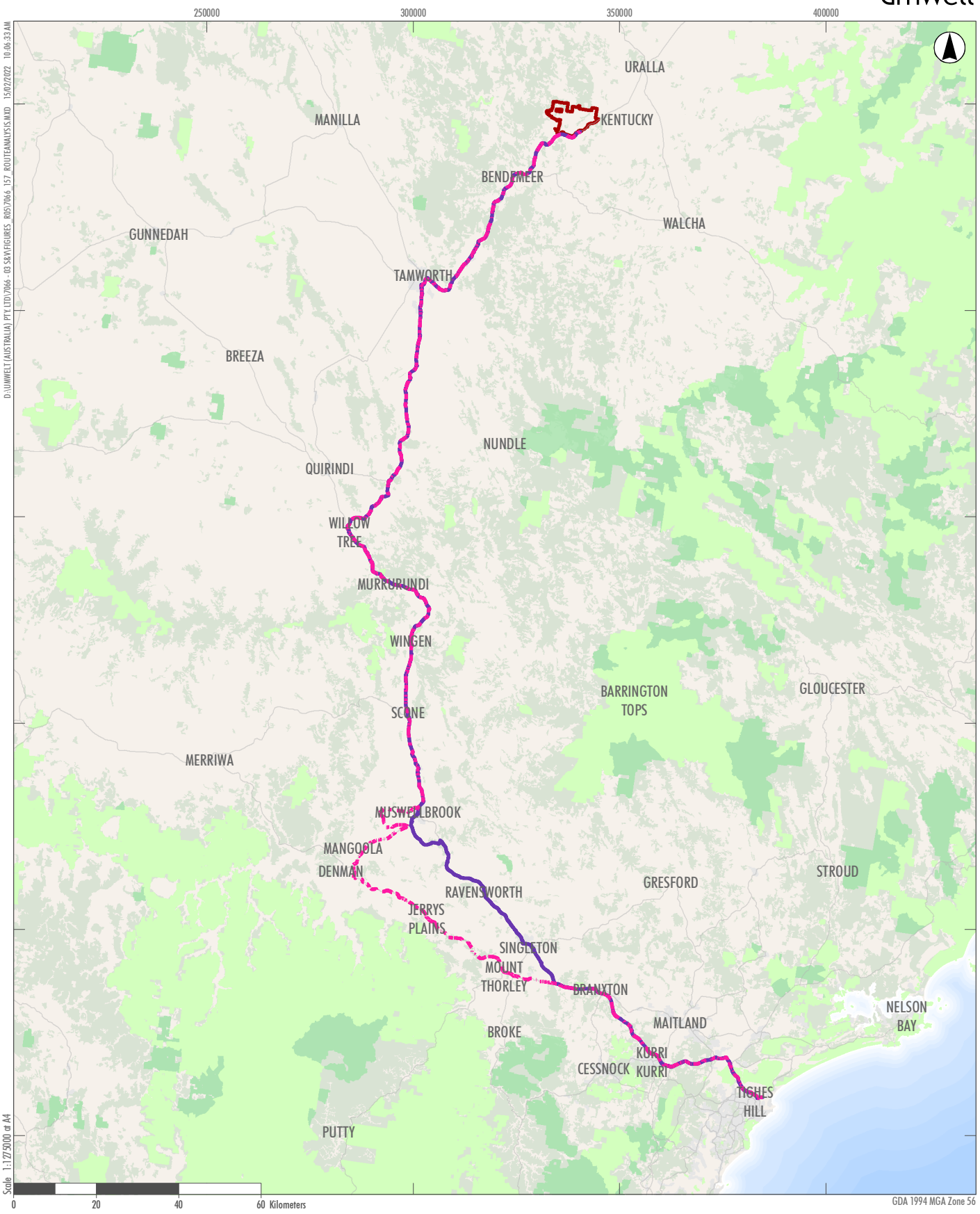
Location	Works
Mayfield #4 berth onto Selwyn Street	Hardstand added to the left side exit of the corner. Some signs will need to be relocated and or made removable and a section of fence will need to be relocated.
Selwyn Street onto Industrial Drive via George Street (Mayfield)	1 sign made removable and a disused pole on the overhang removed.
Thomas Mitchell Drive onto Denman Road (Muswellbook)	Some hardstand on the left side exit of the corner within road reserve. Signs will need to be made removable.
New England Highway onto the heavy vehicle bypass at Scott Road (Tamworth)	1 tree (planted street tree (exotic *Cedrus* sp.) located under electricity lines and subject to trimming) removed from street verge and various signs will need to be made removable.
Murray Street onto New England Highway (Tamworth)	Signs to be made removable and no parking areas to be put in place.

Proposed areas of extended hardstand to accommodate OSOM vehicles are proposed to be temporary and made using road base, subject to detailed design and consultation with TfNSW. It is noted that there are preceding wind farm projects using the same route that also require the same works and the required works will likely be addressed by these preceding projects. The works would be subject to a further Route Analysis and confirmation during the detailed design phase of the Project. The required upgrades are discussed further in **Section 6.5** and **Appendix 13**.

FIGURE 3.6

Conceptual Intersection Design

Image Source: ESRI Basemap Data source: NSW DFSI (2021), Access Traffic Consulting (2021)



Legend

- Thunderbolt Energy Hub
- Route 1
- Route 2
- National Parks (NPWS Estate)
- State Forest

FIGURE 3.7

Route Analysis

Image Source: Data source: NSW DFSI (2020)

3.4.4 Internal Access Roads

Approximately 50 km of internal access roads will be constructed to provide access to the proposed WTG locations. This includes upgrades to some existing access tracks currently formed within the Project Area and the establishment of new access tracks. The layout of the proposed access road is shown on **Figure 3.2** with micro-siting of the roads to be undertaken as part detailed design and construction process within the Development Corridor.

The road surface width will typically range from 6-9 m with additional works required for cut and fill batters and drainage structures (culverts etc.). The access roads and tracks will be maintained during the construction and operational phases of the Project providing access across the site.

3.4.5 Meteorological Monitoring Masts

One temporary 80m meteorological monitoring mast is currently located within the Project Area to record wind speed and other meteorological data (refer to **Figure 3.2**). Up to 6 additional monitoring masts will be erected (up to 170m high) located in proximity to the proposed WTGs within the Development Corridor. All masts will be designed and constructed to the appropriate aviation safety specifications.

3.4.6 Permanent Operations and Maintenance Facility

A permanent site operations and maintenance facility will be constructed to support the ongoing operation of the wind farm. The operations and maintenance facility will be used in an ongoing basis to support maintenance and repair activities associated with the operations phase of the Project. This will include an office with staff amenities (kitchenette, toilets, shower), car park, workshop/shed and laydown/temporary storage area. The facility will have a footprint of approximately 1 ha (refer to **Figure 3.2**).

Construction of the site operations and maintenance facility is described in **Section 3.4.7**.

3.4.7 Project Construction

3.4.7.1 Construction Period and Hours of Construction

A total construction period of approximately 18 - 24 months is expected. It is anticipated that construction works (excluding quiet works such as office-based work activities) will be mostly completed between standard construction hours in accordance with the *Interim Construction Noise Guideline* (DECC 2009), which are as follows:

- 7:00 am to 6:00 pm – Monday to Friday
- 8:00 am to 1:00 pm – Saturdays
- Sunday and Public Holidays – no work to be completed.

Due to the nature of the proposed works, it may be necessary to complete some of the aspects of the construction activities at night. These works would be subject to relevant night time noise criteria, discussed further in **Section 6.3**. These works may include:

- erection of turbines depending on availability of acceptable wind conditions
- works on the intersection with the highway to minimise impact on traffic

- pouring of concrete for turbine foundations where the length of time for the pour is longer than the standard construction hours. Concrete may also be poured for turbine foundations at night where climate conditions for correct curing of the concrete cannot be achieved during the day
- movement of some over mass vehicles to reduce disruption to traffic.

These works (outside of standard construction hours) would be subject to a formal notification and consultation process with any landowners potentially affected by noise-related impacts and would be carried out in accordance with the Construction Environmental Management Plan (CEMP) to be prepared for the Project.

3.4.7.2 Temporary Construction Facilities

To facilitate construction, a range of temporary buildings and facilities will be required including a construction compound (site offices, car parking and amenities for construction personnel), mobile concrete batching plants, laydown and storage areas for the temporary storage of plant, equipment, materials and WTG components.

A main construction compound (approx. 2.4 ha) and approximately 3 satellite compounds (approx. 0.3 ha each) will be required (located within the Development Corridor) for the duration of the Project construction phase (refer to **Figure 3.2**).

The temporary construction compound and laydown area will include a hardstand and blade storage area and a boom assembly area and auxiliary crane pads. Appropriate erosion and sediment controls would be implemented to ensure construction impacts are minimised and the sites would be stabilised and rehabilitated following construction. Relevant erosion and sediment controls are discussed further in **Section 6.9.7**.

Construction works will be subject to detailed management and mitigation measures to be developed through the detailed design and preparation of a CEMP for the Project. The CEMP will consolidate all relevant management measures and controls to be implemented during the construction phase.

Crane Pads and Assembly Areas

A crane pad hardstand and assembly area will be constructed next to the base of each WTG to facilitate assembly of the tower, nacelle and blade components. Each hardstand and assembly area will be composed of crushed rock and gravel, the final design will depend on the topography and will be subject to detailed geotechnical investigations.

WTG components including towers, nacelles and blades will be removed from delivery vehicles with mobile cranes. The cranes will assist in the assembly and erection of the rotor and the final installation of the WTGs.

Mobile Concrete Batch Plants

Two mobile, temporary concrete batching plants will be required to supply the concrete needed for the turbine footings. The area required for each plant is approximately 2 ha. The conceptual layout proposes three possible locations for these two plants (refer to **Figure 3.2**). On-site batching plants would significantly reduce project related construction costs and heavy traffic movements in the local area.

On-site batching plants would be subject to the following controls:

- a detailed layout plan that specifies the plant and equipment to be used on the site
- a site-specific stormwater management approach that contains potentially contaminated water on site and diverts clean stormwater runoff to natural drainage lines
- relevant management and mitigation requirements included in the CEMP for the Project (particularly relevant noise and air quality criteria).

3.4.7.3 Post-Construction Site Rehabilitation

When construction is complete, disturbed areas not required for the operational phase of the Project will be rehabilitated to allow for future agricultural land use. This will include reinstatement of fencing, access tracks or other infrastructure temporarily impacted during construction activities.

3.4.7.4 Construction Workforce

It is estimated that on average approximately 190 full time equivalent (FTE) personnel will be on-site during construction activities. Construction personnel are expected to include a mix of local workers and specialist contractors likely from outside the region.

3.5 Project Operation

The wind farm will operate 24-hours per day, seven days per week. The WTGs will be controlled by a central control system located at Neoen's Operations and Control Centre which is currently based in Canberra. The control system will allow remote operation of all WTGs and will provide the ability to shutdown individual or all WTGs if required. The control system will also provide for operation at optimal capacity by aligning operation of the WTG to wind conditions.

Security measures will be undertaken to limit public access to parts of the Project Area. These measures will include security fencing around electrical reticulation infrastructure and the operations and maintenance facility.

It is estimated that approximately 9 FTE technical and maintenance personnel will be required for ongoing operation. These personnel will carry out regular maintenance on WTGs and other facilities and undertake general management and operational requirements.

In some cases, WTG components may require replacement, and this would need to be undertaken using a crane similar to the installation process described in **Section 3.4.1**. WTGs may also be replaced throughout the operational life of the wind farm as more efficient technology becomes available. These construction activities would be managed using consistent controls with the initial construction work for the establishment of the wind farm.

Operation of the Project will be subject to a detailed in an Operation Environmental Management Plan (OEMP). Relevant controls that will be incorporated into the OEMP are outlined in **Section 6.0** and summarised in **Appendix 5**.

3.6 Decommissioning and Rehabilitation

The WTGs have an expected operating life of approximately 25-30 years and the agreement with the host landholders provide for the operations to continue for 30 years. Following this there are three main options for consideration:

- continued use of the Project Area as a wind farm utilising the existing WTGs (subject to condition of equipment)
- replacement of the WTGs with technology current at that time and continue the use of the Project Area as a wind farm for a further term (subject to contractual agreement with landowners and further development consent for the ongoing operation)
- decommission the wind farm and remove the WTGs and associated infrastructure in accordance with the OEMP and the development of a decommissioning and rehabilitation strategy 2 years prior to closure of the wind farm.

Should decommissioning be required:

- key stakeholders including relevant landholders would be consulted regarding the decommissioning and rehabilitation plan
- all above ground structures not required for the ongoing agricultural use of the land (some access tracks, for example, may be required to be retained by the landholder to enable ongoing access), including the WTGs and substation will be removed and the land rehabilitated so that it can return to agricultural use
- below ground infrastructure, including WTG foundations, hardstands and some cabling will be left *in situ* and covered in clean fill material, with the area adequately graded to reflect the slope of the surrounding area and to mitigate the risk of soil erosion.

It is anticipated that the decommissioning and rehabilitation phase, should the entire wind farm be decommissioned, would take up to 12 months to complete, with the Project Area being returned, as far as practicable, to its condition prior to the commencement of construction.

As discussed above, Neoen has entered into long-term lease agreement with the associated landholders for the construction and operation of the Project. The terms of these agreements make express provision for the Neoen's decommissioning obligations.

4.0 Statutory Context

This section details the statutory context for the Project and discusses the application of relevant legislation and planning provisions to the Project.

4.1 Commonwealth Legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) the approval of the Commonwealth Minister for the Environment is required for any action that may have a significant impact on a matter of national environmental significance (MNES). The Project does not interact with any World Heritage Properties, National Heritage Places, Ramsar Wetlands, Marine Environments, Commonwealth land, Commonwealth marine areas, the Great Barrier Reef Marine Park, a water resource in relation to coal mining and is not a nuclear action. The remaining potentially relevant MNES required further consideration in regard to the Project.

Approval under Part 9 of the EPBC Act is required for actions that may result in a significant impact on MNES. The Project was referred to the Commonwealth Minister for the Environment (EPBC Act referral 2021/9048).

On 28 October 2021, the Project was determined to be a Controlled Action requiring approval under the EPBC Act from the Commonwealth Minister for the Environment due to its potential impact on the following MNES:

- Listed Threatened Species and Communities
- Listed Migratory Species

A copy of the determination of the Project as a Controlled Action is provided in **Appendix 2**. The assessment path for the Project is under the bilateral agreement between the Commonwealth and NSW Governments and DAWE has issued its assessment requirements which have been incorporated into the SEARs for the Project (refer to **Appendix 1**). This EIS addresses the assessment requirements, with a summary of the assessment findings related to MNES included in **Section 6.4**.

4.1.2 Native Title Act 1993

The *Native Title Act 1993* (NT Act) recognises the interests and rights Aboriginal people have to land and aims to provide recognition and protection of common law native title rights. Parts of the Project Area are within the area subject to the Gomeroi People native title claim (NC2011/006, NSD37/2019), refer to **Section 6.6** for further detail.

The Project Area consists of freehold land which is exempt from native title claim and Crown Land. The proposed site access will cross crown land (DP7303/DP1162815). There is one public road reserve located within the Project Area which will not be impacted by the Project.

4.1.3 Civil Aviation Regulations 1988

The Civil Aviation Regulations require any potential aviation obstacles and hazards be assessed under the National Airports Safeguarding Framework Guideline D: Managing Wind Turbine Risk to Aircraft. An Aviation Impact Assessment has been undertaken to support the Project, refer to **Sections 5.0** and **6.8.1** for further detail.

4.1.4 Heavy Vehicle (Adoption of National Law) Act 2013

Relevant approvals under the Heavy Vehicle National Law will be required for the transport of wind turbines and associated infrastructure by OSOM vehicles. All relevant approvals will be sought by the Neoen, in accordance with any consent condition requirements, prior to construction.

4.1.5 Radio Communications Act 1992

Under Part 4.1 of the *Radio Communications Act 1992*, a legislative framework has been established to regulate equipment that uses or is affected by radio emissions. Radio communications can be impacted by proposed wind farms through electromagnetic interference (EMI) produced by the turbines.
An electromagnetic interference assessment has been undertaken for the Project, refer to **Section 6.8.2**.

4.2 NSW Legislation and Policies

There are a number of legislative instruments in NSW which regulate the environmental impact of development. The primary instrument is the EP&A Act which regulates the planning and environmental assessment and approval process for development in NSW. The application of the EP&A Act and relevant planning and environmental legislation to the Project is discussed in **Section 4.2.1** and **4.2.2.** The operation of other environmental legislation in regard to the Project is discussed in **Section 4.2.3** and in **Section 6.0** in relation to specific Project impacts, where relevant.

Section 4.2.4 discusses the key strategic guidelines that have relevance to the design and operation of the Project, and which have been considered in the environmental assessment, the application of these guidelines in relation to specific impact assessment requirements and results are discussed in the relevant impact assessment sections in **Section 6.0**.

4.2.1 NSW Environmental Planning and Assessment Act 1979

The EP&A Act is the primary instrument which regulates the environmental impact assessment and approval process for development in NSW. The relevant assessment pathway for a development are determined by environmental planning instruments such as local environmental plans and State Environmental Planning Policies (SEPPs).

4.2.1.1 Approval Pathway

State Significant Development

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) declares certain development to be SSD. Under the SRD SEPP, Schedule 1, clause 20(a) prescribes that development for the purpose of electricity generating works with a capital investment value of greater than $30 million is SSD. As the proposed wind farm will generate electricity and has a capital investment value of more than $30 million, it meets these criteria and is therefore SSD.

Permissibility

As discussed in **Section 2.2.5**, the Project Area falls within two different LGAs and is zoned RU1 – Primary Production under the Tamworth LEP and RU2 Rural Landscape under the Uralla LEP. Electricity generating works are permitted with consent within the RU1 and RU2 Zones. Therefore, the proposed wind farm is permissible.

Assessment Requirements

As SSD, the Project is subject to the general assessment requirements under Part 4 of the EP&A Act as amended by the requirements under Part 4 Division 4.1 and 4.7 of that Act. The requirements are discussed below.

Section 4.15 Matters for Consideration

Under Part 4 of the EP&A Act, the consent authority must have regard to the matters set out in section 4.15 of the EP&A Act. The matters for consideration by the consent authority and where they have been addressed in this EIS are provided in **Table 4.1**.

Table 4.1 Section 4.15 Matters for Consideration

Matters for Consideration	Relevant EIS Section
(a) The provisions of: (i) Any environmental planning instrument that apply to the land to which the development application relates	**Section 4.2.2**
(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 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 4.2.2**
(iii) Any development control plan that apply to the land to which the development application relates	Not applicable due to operation of Clause 11 of SRD SEPP, which excludes the application of development control plans (whether made before or after the commencement of the SEPP) 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	Neoen is involved with ongoing consultation with relevant Council's which includes discussion regarding planning agreements
(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	**Section 4.2.1**
(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	**Section 6.0**
(c) The suitability of the site for the development	**Sections 2.0, 6.0 and 7.0**

Matters for Consideration	Relevant EIS Section
(d) Any submissions made in accordance with this Act or the regulations	Comments to be received on the EIS during the public exhibition period will be addressed in the response to submissions process. Consultation has been undertaken with the community and other stakeholders to inform this EIS as discussed in **Section 5.0**.
(e) The public interest	**Section 7.0**

Schedule 2 of the EP&A Regulations

The consent authority must also have regard to an EIS which has been prepared in accordance with the requirements of Schedule 2 of the EP&A Regulation. The requirements of Schedule 2 of the EP&A Regulation and where they are addressed in this EIS are set out in **Table 4.2**.

Table 4.2 Schedule 2 EP&A Regulation Requirements

Regulation Clause	Requirement	Relevant EIS Section
Clause 6(1)(a)	The name, address and professional qualifications of the person by whom the statement is prepared	**Appendix 3**
Clause 6(1)(b)	The name and address of the responsible person	Joanna Murphy Neoen Project Manager Level 6 16 Marcus Clarke Street, Canberra ACT 2601
Clause 6(1)(c)	The address of the land: (i) in respect of which the development application is to be made (ii) on which the activity or infrastructure to which the statement relates is to be carried out	**Appendix 4**
Clause 6(1)(d)	A description of the development, activity or infrastructure to which the statement relates	**Section 3.0**
Clause 6(1)(e)	An assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule	**Section 6.0**
Clause 6(e)(f)	A declaration by the person by whom the statement is prepared to the effect that: (i) the statement has been prepared in accordance with this Schedule (ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates (iii) that the information contained in the statement is neither false nor misleading.	**Appendix 3**
Clause 6(2)	The person preparing the statement must have regard to the following: (a) for State significant development – *State Significant Development Guidelines*	**Section 4.2.2.2**
Clause 7(1)(a)	Summary of the EIS	**Executive Summary** and **Section 7.0**

Regulation Clause	Requirement	Relevant EIS Section
Clause 7(1)(b)	A statement of the objectives of the development	**Sections 1.0** and **3.2**
Clause 7(1)(c)	An analysis of any feasible alternatives to the carrying out of the development having regard to its objectives, including the consequences of not carrying out the development	**Section 3.3**
Clause 7(1)(d)(i)	A full description of the development, activity or infrastructure	**Section 3.0**
Clause 7(1)(d)(ii)	A general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected	**Section 6.0**
Clause 7(1)(d)(iii)	The likely impact on the environment of the development	**Section 6.0**
Clause 7(1)(d)(iv)	A full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment	**Section 3.0**, **6.0** and **Appendix 5**
Clause 7(1)(v)	A list of any approvals that must be obtained under any other Act or law before the development may be lawfully carried out	**Section 4.0**
Clause 7(1)(e)	A compilation of the mitigation measures referred to in Clause 7(1)(d)(iv)	**Appendix 5**
Clause 7(1)(f)	The reasons justifying the carrying out of the development in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development	**Section 7.0**

Secretary's Environmental Assessment Requirements (SEARs)

This EIS has addressed the SEARs provided for the Project which were issued by DPIE on 16 December 2020, and revised SEARs issued 11 November 2021 (refer to **Appendix 1**).

A checklist of the SEARs and where they have been addressed in the EIS is outlined in **Appendix 1**. The specific government agency requirements included as an attachment to the SEARs have been considered and addressed where relevant, throughout the EIS and the relevant technical studies.

4.2.2 Environmental Planning Instruments

There are a number of environmental planning instruments that are potentially applicable to the Project. These are discussed in the following sections.

4.2.2.1 Local Environmental Plans

The Project is subject to the Tamworth Regional Local Environmental Plan 2010 and the Uralla Local Environmental Plan (2012) and zoned RU1 – Primary Production and RU2 – Rural Landscape, respectively. As discussed in **Section 4.2.1**, the LEPs are relevant to SSD to the extent of permissibility and electricity generating works are permitted with consent within the RU1 and RU2 Zones. The objectives of the zones are outlined below.

The Project has been designed to reduce land use conflict and does not propose to change the current primary use of the land which will continue to be used for agriculture (primarily grazing). Wind farm developments are considered compatible with agricultural land use as they only occupy small parts of the land and do not prevent adjacent agricultural activities, in this case grazing. The agricultural use of the land will continue throughout the operational phase of the Project.

Tamworth LEP (2010) - Zone RU1- Primary Production

Objectives of zone

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To permit subdivision only where it is considered by the Council to be necessary to maintain or increase agricultural production.
- To restrict the establishment of inappropriate traffic generating uses along main road frontages.
- To ensure sound management of land which has an extractive or mining industry potential and to ensure that development does not adversely affect the extractive industry.
- To permit development for purposes where it can be demonstrated that suitable land or premises are not available elsewhere.

The Project Area is not subject to any existing exploration or mining titles and the Project allows for the ongoing agricultural use of the land. Extensive specialist assessment has been undertaken and appropriate mitigation and management measures can be applied to minimise land conflict use conflict within the Project Area and adjoining land. The proposed subdivision of the switching station is administrative only to allow the transfer of ownership to Transgrid during the connection of the Project to the transmission infrastructure and will not affect the ability to continue the agricultural use of the broader lot from which the switching station is subdivided.

The Project is considered to be consistent with the objectives of the RU1 Zone.

Clause 2.6 – Subdivision – Consent Requirements

Clause 2.6(1) states that land may be subdivided, but only with development consent. Development consent will be provided through the SSD development application. Clause 2.6(2) states that development consent must not be granted for the subdivision of land on which a secondary dwelling would be situated unless the resulting lots are not less than the minimum lot size shown on the Lot Size Map in relation to the land. Given the land is zoned RU1 primary production the minimum lot size is 800 ha. The proposed lot size does not meet this size requirement, however, as the subdivision does not relate to creating a lot for a secondary dwelling and will house the switching station infrastructure only, this clause does not apply. The subdivision is required for administrative purposes only to allow the transfer of the infrastructure to Transgrid. The Project intends for the agricultural use of the broader lot from which the switching station will be subdivided to continue during the operation of the wind farm, the proposed subdivision will not affect this continued use.

Uralla LEP (2012) - Zone RU2 - Rural Landscape

Objectives of zone:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.

- To maintain the rural landscape character of the land.
- To provide for a range of compatible land uses, including extensive agriculture.
- The Project proposes a compatible land use that provides for the ongoing agricultural use of the land. Appropriate management and mitigation measures would be applied to minimise the impact of the Project as far as practicable to maintain the existing rural landscape character. The Project is considered to be consistent with the objectives of the RU2 Zone.

4.2.2.2 State Environmental Planning Policies

State Environmental Planning Policy (Koala Habitat Protection) 2021

The Project Area is subject to the Tamworth LEP 2010 and the Uralla LEP (2012) and zoned RU1 – Primary Production and RU2 – Rural Landscape, respectively. State Environmental Planning Policy (SEPP) - Koala Habitat Protection 2021 states that any land zoned 'Rural' in these LGAs, the previous SEPP (Koala Habitat Protection) 2020 is to be applied.

A review of tree species observed within the Development Corridor indicates the vegetation does not meet the requirements of potential koala habitat (in accordance with Part 2 clause 8 of the SEPP 2020), as there are no tree species present within the Project Area that are listed under Schedule 2 of the SEPP 2020. It is therefore considered the SEPP does not apply to the Project.

The koala was recorded in the Project Area as part of biodiversity surveys undertaken for the Project and the potential impacts of the Project on the koala have been considered in detail as part of the biodiversity assessment.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33)

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) requires a consent authority to consider whether an industrial development is a potentially hazardous industry or a potentially offensive industry. A preliminary hazard assessment (PHA) is completed for potentially hazardous developments to assist the consent authority to determine acceptability.

A Preliminary Hazard screening has been undertaken which confirmed the Project does not trigger SEPP 33 threshold for hazardous materials storage and therefore a PHA is not required.

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) aims to provide a State-wide planning approach to the remediation of contaminated land and to reduce the risk of harm to human health and the environment by consideration of contaminated land as part of the planning process. Under SEPP 55, a consent authority must not consent to the carrying out of development on land unless it has considered any potential contamination issues. The Project Area is not identified as contaminated land on the Environment Protection Authority Contaminated Land Register and based on the low intensity agricultural use of the land there are no known contaminated areas within the Project Area.

The construction and operational phases of the Project will be appropriately managed to prevent contamination and any spills (e.g. hydrocarbons from mobile equipment during construction) will be cleaned up and the sites remediated. Decommissioning and rehabilitation following closure of Project will be undertaken in accordance with relevant consent conditions and legislation/licence requirements and will include consideration of any contamination risks and remediation requirement associated with Project infrastructure (e.g. WTGs and substations).

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) declares that the Project (being for the purposes of electricity generation with a capital investment value of greater than $30 million) is SSD.

The application of the SRD SEPP is largely limited to the issue of approval pathway, as discussed in **Section 4.2.1.1**.

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across the State. Amongst a range of other provisions it requires that for a development application which involves certain works related to or near electricity infrastructure, the consent authority must give written notice to the electricity supply authority for the area in which the development is carried out, inviting comments about potential safety risks. Neoen is involved in ongoing consultation with Transgrid in relation to the connection of the Project to the existing electricity infrastructure. The final location of connection infrastructure and potential transfer to Transgrid will be determined through the detailed design and pre-construction phase, any approvals associated with that process (including any required subdivision of land) will be subject to a separate approvals process.

4.2.3 Other Relevant Legislation

A summary of other State environmental and planning legislation potentially relevant to the Project subject to a development application under Divisions 4.1 and 4.7 of Part 4 of the EP&A Act and not previously addressed in the above sections is provided in **Table 4.3**.

Table 4.3 Other Relevant Legislation

State Legislation	Description
Biodiversity Conservation Act 2016 (BC Act)	Under the BC Act, biodiversity assessment in accordance with the Biodiversity Assessment Method (BAM) is required for any SSD project. A Biodiversity Development Assessment Report (BDAR) in accordance with the BAM has been prepared, refer to **Section 6.4** and **Appendix 11**.
Protection of the Environment Operations Act 1997 (POEO Act)	The POEO Act regulates pollution to the environment and requires licences for environmental protection including waste, air, water and noise pollution control. Wind farms are a scheduled activity under the POEO Act and require an Environment Protection Licence (EPL). Should the Project be approved an EPL would be sought in relation to the construction and operation of the Project.
Water Management Act 2000 (WM Act)	Any water extractions (take) from water sources (surface and groundwater) regulated by a Water Sharing Plan (WSP) required for construction purposes will require licensing under the WM Act. The potential water requirements during construction have been assessed as part of the Water and Soil Impact Assessment (refer to **Section 6.9**). Any necessary licences would be obtained for the Project prior to construction.
Roads Act 1993 (Roads Act)	A consent is required under section 138 to work on or above a road or to connect a road to a classified road. Consents under section 138 will be sought from the relevant authorities for the proposed road works, including from TfNSW to connect the site access road to the New England Highway.

State Legislation	Description
Crown Land Management Act 2016 (Crown Land Act)	The Crown Land Act provides for the administration and management of Crown Land in NSW. Crown land may not be occupied, used, sold, leased, licensed, dedicated, reserved or otherwise dealt with unless authorised by the Crown Land Act. There is one Crown Land lot within the Project Area, Crown Lands have provided landowners consent.
Contaminated Land Management Act 1997 (CLM Act)	The CLM Act establishes the process for investigating and if required, remediating land that the NSW EPA considers to be contaminated significantly enough to require regulation under Division 2 of Part 3. The Project Area does not contain land listed on the Contaminated Lands Register and is not known to contain any contaminated land. Relevant mitigation and management measures would be incorporated into the CEMP for the Project and the ongoing OEMP to address potential contamination issues and outline the requirements in relation to reporting any contamination incidents to the NSW EPA.

4.2.4 Relevant State Strategic Policies and Guidelines

4.2.4.1 Wind Energy Guidelines 2016

Wind energy projects in NSW are subject to *DPIE's Wind Energy Guideline for State significant wind energy development, 2016 (*Wind Energy Guideline). The Wind Energy Guideline provides the community, industry and regulators with guidance on the planning framework for the assessment of large-scale wind energy development proposals that are SSD. The Wind Energy Guideline was developed to assist with delivering the NSW Government's commitment outlined in the *NSW Renewable Energy Action Plan (2013)* to implement wind energy planning guidelines for NSW.

As part of the development of the Wind Energy Guideline, the Wind Energy Visual Assessment Bulletin, 2016 (Visual Bulletin) and the Wind Energy: Noise Assessment Bulletin, 2016 (Noise Bulletin) were also developed to provide guidance on the assessment of visual and noise impacts associated with wind energy projects.

The objective of the Visual Bulletin was to provide greater transparency, consistency and objectivity in visual impact assessments for wind energy development. The guideline outlines the required assessment of the impacts on landscape values and the amenity of landholders and communities, and the potential measures to avoid, reduce or otherwise manage these impacts. The Landscape and Visual Impact Assessment (LVIA) has been prepared in accordance with the Visual Bulletin. The assessment of the visual impacts associated with the Project is discussed further in **Section 6.2**.

The Noise Bulletin sets a required noise limit of 35 dB(A) or the prevailing background noise plus 5 dB(A), whichever is the greater for each operational wind speed and identifies the noise assessment requirements for SSD wind farm projects. The Noise and Vibration Assessment has been prepared in accordance with the Noise Bulletin. The assessment of the noise impacts associated with the Project is discussed further in **Section 6.3**.

5.0 Engagement

Neoen recognises the critical importance of stakeholder engagement to the success of this Project and have been liaising with stakeholders since landholder discussions commenced in 2018. The initial landholder discussions led to broader community and stakeholder engagement as the parameters of the Project started to form, and continued as the concept design was developed. In addition to community stakeholders, ongoing consultation has been undertaken with Council's and government agencies, functional stakeholders (e.g. service providers), businesses and various non-government organisations and interest groups. This engagement has informed the design of the Project and will be ongoing throughout the assessment process, and if the Project is approved, during the life of the Project.

In addition to the engagement undertaken by Neoen, further engagement has been undertaken as part of the Social Impact Assessment (SIA) undertaken by Umwelt for the Project following the requirements of the NSW Government guidelines and assessment standards including, but not limited to, the NSW DPIE Social Impact Assessment Guideline for State Significant Projects (2021) or 'the SIA Guideline' and the SEARs.

An overview of the Stakeholder Engagement Program including the identified stakeholders, engagement undertaken, and the outcomes of the consultation process is provided in this section. Further detail is provided in the SIA (refer to **Appendix 7**) and in the Community Relations Plan (CRP) developed by Neoen to guide the consultation process (refer to **Appendix 6**).

5.1 Stakeholder Engagement Program

A stakeholder identification process was undertaken for the Project to support the planning and delivery of community and stakeholder consultation, and to inform the SIA. This process involved identifying stakeholders with an interest, or those directly and indirectly affected by the Project, including identifying any potentially vulnerable or marginalised groups.

Key stakeholder groups that have been consulted or engaged are outlined in **Figure 5.1** with further detail provided in **Table 5.1**.

Figure 5.1 Key Stakeholder Groups

Table 5.1 Identification of Project Stakeholders

Stakeholder Category	Stakeholders
Landholders/Near Neighbours	Landholders and near neighbours in proximity to the Project (including Kentucky, Kentucky South, Wollun, Bendemeer and Balala)
Wider Community	Community members in Tamworth, Uralla, Walcha and Armidale LGAs
Local, State and Federal Government Agencies	• Department of Planning, Industry and Environment (DPIE) • Tamworth Regional Council • Uralla Shire Council • Walcha Council • Armidale regional Council • Department of Agriculture, Water and Environment (DAWE) • Environment Protection Authority (EPA) • Natural Resources Access Regulator (NRAR) • NSW Biodiversity, Conservation and Science (BCS) • Heritage NSW • Transport for NSW (TfNSW) • Airservices Australia • Department of Defence • NSW Rural Fire Service
Aboriginal stakeholders	• Armidale Local Aboriginal Land Council (LALC) • Tamworth LALC • Iwatta Aboriginal Corporation • Nyakka Aboriginal Culture Heritage Corporation • Gomeroi NT claimant
Community and Special Interest Groups	• Project Community Consultative Committee (CCC) • Uralla Business Chamber • Armidale Business Chamber • Tamworth Business Chamber • NSW Farmers Uralla Branch • ZNET Uralla • Kentucky Progress Association • Red4NE • Southern New England Landcare • Landcare Tamworth • Kentucky Hall committee • Friends of Kentucky Action Group (FOKAG) • New England Vision 2030 Institute

Stakeholder Category	Stakeholders

Local and Regional Businesses and Service Providers	• Service providers and local businesses targeted for consultation the SIA:
	  • Accommodation and housing providers
	  • Employment services and recruitment agencies
	  • Education and training providers
	  • Healthcare providers
	  • Tourism providers
	  • Community services
	  • Local Businesses and contracting services
	Service providers consulted as part of the broader EIS:
	  • Transgrid
	  • Mobile Phone/internet Service Providers - TPG, Optus, Vodafone, Telstra
	  • NBN
	  • BAI Communication
	  • Bureau of Meteorology
	  • State Emergency Services
	  • Aerial Application Association of Australia (AAAA)
	  • Royal Flying Doctor Service

5.1.1 Community Engagement

Neoen commenced engagement with the host landholders in 2018 and throughout 2019. This engagement included phone calls, group workshops and face to face meetings conducted by Neoen employees and resulted in the current host landholders associated with the Project confirming involvement during 2019 and 2020. Since this time Neoen has completed a range of community engagement activities with local landholders and key stakeholders. To support this process Neoen engaged a local community engagement officer in September 2020. Further detail regarding these engagement activities are outlined in the CRP (refer to **Appendix 6**).

To guide the engagement process, Neoen developed the CRP which details the Project's approach to engagement and community benefits sharing, which was submitted to DPIE together with the Scoping Report in November 2020. The CRP is a living document and has been updated through the EIS development phase.

The outcomes of community engagement activities undertaken by Neoen during the scoping and EIS preparation phases were reviewed and consolidated to inform the SIA and understand the range of community views, concerns, interests and feedback provided on the Project. This existing information has been complimented by a targeted consultation program for the SIA, undertaken between September and October 2021 by Umwelt in collaboration with Neoen.

The engagement mechanisms that have been used for the Project are summarised in **Table 5.2**, with the stakeholders consulted summarised in **Table 5.3**. Further detail is provided in the SIA (refer to **Appendix 7**).

Table 5.2 Engagement Mechanisms

Mechanisms	Description	Target stakeholders
Project newsletters and bulletins	To date, 3 newsletters and 4 bulletins have been developed for the Project: • December 2020: newsletter distributed to community members in Kentucky • July, September and October 2021: bulletins were emailed to approximately 140 - 200 community members Throughout 2020 and 2021 Neoen's Community Engagement Officer distributed physical copies of the information booklets to letterboxes of community members surrounding the project area who had not been met in person An information booklet with an advertisement for the September 2021 community information sessions was distributed to community members in Kentucky via Australia Post.	Wider community Near neighbours/Landholders
Community Consultative Committee (CCC)	A CCC was established in July 2021, comprising of an Independent Chairperson, representatives from Tamworth Regional Council, Uralla Shire Council and Walcha Council, Neoen employees, and five community members. Neoen's community engagement officer is the CCC minute taker. To date, two CCC meetings have been held, in August and September 2021. Meeting minutes are published on the Thunderbolt Energy Hub website.	Wider community Near neighbours/Landholders
Concerned neighbours group meeting	Meeting was held at the Kentucky Hall in February 2020. This meeting was attended by approximately 30 - 40 community members	Wider community Near neighbours/Landholders
Community drop-in session	A Community drop-in session was held at Uralla in September 2020, where the community was invited to view Project posters, maps and ask the Neoen team questions about the Project	Wider community Near neighbours/Landholders
Landholder Personal Meetings	Meetings with landholders and near neighbours to discuss the Project and any concerns. Approximately 188 community members were consulted (sometimes on multiple occasions) between December 2019 to October 2021. The host landholder group for Stage 2 comprises of approximately 8 families, who were consulted in addition to the 88 community members.	Near neighbours/Landholders
Community Survey	An online community survey was used to capture community feedback on the Project for incorporation in the SIA. The survey link was provided on Neoen's website and in Project newsletters and bulletins. The survey was available from July 2020 and was still available at the time of reporting. For the SIA, the results of the survey up until October 2021 were analysed.	Wider community Near neighbours/Landholders
SIA Interviews/Personal Meetings	Individual meetings held via telephone or video conference. Stakeholder were identified through a stakeholder identification process and through snowball sampling (where participants recommend additional people to contact). In addition, two landholders requested to be contacted by the SIA team through Neoen's online survey. Proactive calls/emails were made to facilitate these meetings. The purpose of the meetings were to: • understand 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 impacts/community benefits, such as identifying potential community partnerships and collaborations, community needs etc.	Near neighbours/Landholders Community and special interest groups Local industry groups Government agencies
Business and Service Provider Survey	Online survey distributed to 121 local and regional businesses and service providers with 6 service providers and 9 businesses completing the survey. The survey included questions relating to: • views on the project • the organisation/business and the types of goods or services they provide • the local economic market, opportunities and constraints for renewables projects • the town and region's current servicing capacity • the town and region's current workforce availability and capability • the business/service's current servicing capacity (including occupancy rates) and existing supply and demand, considering seasonal trends and other industry sectors • the business/service's interest to provide goods or services to the Project in the future	Local businesses and service providers in the Tamworth, Uralla, Walcha and Armidale LGAs Contractor and suppliers on Neoen's existing database (in the local and regional area and across Australia)
CCC SIA Briefing and Discussion	SIA briefing provided at scheduled Community Consultative Committee (CCC) meeting (in September 2021). SIA team member provided a briefing on the SIA and facilitated a short discussion on community feedback, including: • SIA process and Guideline requirements • Categories of social impact • SIA engagement - how community members could get involved • Initial feedback from the community on the Project A copy of the presentation and minutes were published on the Project website.	CCC members

Mechanisms	Description	Target stakeholders
Community Information Session	Two online community information and Q&A sessions were held in September 2021 to provide: • Project update (Neoen) • Summary of key findings from EIS technical studies • update on the SIA including an overview of the SIA process and how community members can be involved • Responses to participant questions The presentation material and recording, and a summary of the questions and answers was uploaded to Neoen's website following the sessions To complement the online sessions, Project information posters were displayed at the Kentucky Hall between 15-18 September 2021 with Neoen's Community Engagement Officer present to engage with interested people directly. A virtual community day was undertaken and made available on Neoen's website.	Wider community Near neighbours/Landholders

5.1.2 Agency/Authority Consultation

A summary of the Government agency and authority consultation undertaken to date is included in **Table 5.3**. Consultation with Government agencies has been undertaken through various mechanisms throughout the assessment process to keep agencies informed of progress and outcomes of the Project. No significant issues were raised during consultation with any of the Agencies or Authorities, however, guidance was provided on matters to be assessed in this EIS. Consultation included Project briefings, discussion of the scope of the specialist assessments and SEARs requirements and reporting of results of the specialist assessments.

5.1.3 State and Federal Ministers

The Project Area is located within the State electorates of Tamworth and Northern Tablelands and within the Federal electorate of New England. Neoen sent letters to the respective MPs for each electorate, informing them of the Project along with a preliminary Project information booklet. Ministers were also informed about the first Community Information Day held in September 2020 in Uralla.

Letters providing the respective MPs with Project updates were also sent in April, July and October 2021. The letters provided information on community consultation updates, establishment of the Community Consultative Committee, EIS assessment updates, Project staging, neighbour benefits sharing program, community benefits fund, and the community information sessions in September 2021.

Neoen met with a representative of Kevin Anderson MP's office, member for the State electorate of Tamworth in June 2021 to provide a presentation about the Project. Neoen also met with Adam Marshall MP, member for the State electorate of Northern Tablelands in June and July 2021 to provide a Project presentation and discuss relevant Project updates.

Table 5.3 Consultation with Agencies and Authorities

Agency/Authority	Consultation	Key Feedback/Detail
Department of Agriculture, Water and Environment (DAWE)	September 2021 - meeting	Referral pre-lodgement meeting, project overview with potential biodiversity impacts the key discussion point
DPIE	18/08/2020 - Scoping meeting	Key concerns in relation to the Project were the associated visual and cumulative impacts
	13/10/2021	Neoen provided DPIE with a letter including a project update, update on level of community support (74% at the time based on website survey responses), community benefits fund overview, neighbour benefit sharing overview, CCC update and overview of community information sessions hosted throughout 2020 and 2021.
	04/08/2021 - letter	DPIE provided with a letter outlining following amendments to the Project and request to confirm SEARs requirements: • separation of the Project into two stages with the EIS and development application currently being prepared to cover Stage 1 only • increase in turbine height from 250 to 260 metres (m) DPIE confirmed verbally no amendments to the SEARs were required.
	4/11/2021 - Meeting	Neoen and Umwelt provided an overview of the staging of the Project and discussed the assessment requirements for the rote analysis
NSW Biodiversity, Conservation and Science (BCS)	24/07/2020 – scoping meeting	BCS provided advice in regard to the installation of anabats (micro bat monitoring device) on wind monitoring masts to record micro bat calls during ecological surveying (preference for three anabats to be installed on an 80 m wind monitoring mast: one at ground level and two at height).
	04/11/21 - Meeting	Neoen and Umwelt provided BCS with an update on the Project and overview of staged approach. Assessment requirements for the route analysis were discussed – BCS confirmed desktop approach to calculating credit requirements acceptable however requested these are reported separately in a staged BDAR. BCS indicated concern regarding bird and bat strike and potential impacts to wedge tailed eagles within the Project Area. BCS indicated potential mitigation and management measures should be investigated (including research being undertaken in Europe to reduce bird strike through painting one WTG blade black) however BCS also noted it was not aware of any similar research undertaken in Australia.
Transport for NSW (TfNSW)	September 2020 – letter	TfNSW were informed of the Project via project information booklet
	October 2021 - letter	Project update and overview of proposed staged approach to the Project
	15/11/2021 - meeting	Umwelt, Neoen and Access Traffic met with TfNSW to provide an overview of the outcomes of the Traffic Impact Assessment and discuss the proposed approach to the route analysis. TfNSW provided the following key feedback: • traffic volumes should be based on 2019 traffic data as more representative of likely traffic volume compared to 2020 and 2021 data due to the reduced traffic volumes during the Covid-19 pandemic • consideration of ancillary services such as water and where and how it will be delivered to site • understanding of where materials would be sourced from, for example locations of local quarries • consultation with other road authorities such as local Councils • consideration of where staff may travel from during construction and whether a bus service from Tamworth and Armidale could be implemented to reduce excess traffic volumes. Consult with local Councils for pick-up and drop-off locations. This will be addressed through the development of the proposed TMP should the Project be approved. Additionally, the proposed intersection layout was provided to TfNSW for review. TfNSW provided the following feedback to be addressed by the Traffic Impact Assessment: • Details relating to the proposed intersection including design, traffic volumes, swept paths and requirement to undertake a route analysis • Safety including sight lines and interaction with access to adjoining properties with reference to Austroads Guide to Road Design Part 4: Intersections and Crossings. All feedback from TfNSW has been considered and addressed through the preparation of the Traffic Impact Assessment.
Heritage NSW	October 2021 – email	Project overview and offer of meeting to discuss EIS assessment outcomes
	February 2022 – email and phone	At the request of DPIE, specific consultation undertaken in relation to the approach to undertaken test excavation of areas of potential archaeological deposit during the detailed design stage (post approval) as the exact impact locations within the assessed development corridor are subject to detailed design. Heritage NSW recommended that test excavations be undertaken within the Development Corridor prior to approval of the development.
Tamworth Regional Council	July 2020 - email	Introduction to Neoen and the Project
	September 2020 - email	Notification of community drop in session and update on progress with scoping assessment
	December 2020 - email	Notification of submission of scoping document, including link to planning portal and community newsletter attached
	October 2021 - meeting	Project overview presentation
	February 2022 – meeting	Provided project update and overview of outcomes of specialist studies Council feedback in relation to the proposed subdivision of the switching station noted that a right of carriageway should be provided to the lot and the resulting lot must not involve the construction of a dwelling

Agency/Authority	Consultation	Key Feedback/Detail
Uralla Shire Council	July 2020 - email	Introduction to Neoen and the Project
	September 2020 - email	Notification of community drop in session and update on progress with scoping assessment
	October 2020 - meeting	Project overview presentation
	December 2020 - email	Notification of submission of scoping document, including link to planning portal and community newsletter attached
	July 2021 - meeting	Project overview presentation
	February 2022	Provided project update and overview of outcomes of specialist studies. No specific feedback was noted
Walcha Council	July 2020 - email	Introduction to Neoen and the Project
	September 2020 - email	Notification of community drop in session and update on progress with scoping assessment
	December 2020 - email	Notification of submission of scoping document, including link to planning portal and community newsletter attached
Muswellbrook Shire Council	August 2021 - meeting	Project overview presentation. Key discussion point was the route analysis for the Project which passes through the Muswellbrook Shire LGA. Neoen committed to keeping Muswellbrook Council informed as the project progresses towards construction
Department of Primary Industries – Agriculture	October 2021 – email	Project overview and offer of meeting to discuss EIS assessment outcomes
DPIE - Water	October 2021 – email	Project overview and offer of meeting to discuss EIS assessment outcomes
Natural Resources Access Regulator (NRAR)	October 2021 – email	Project overview and offer of meeting to discuss EIS assessment outcomes
Environment Protection Authority (EPA)	October 2021 - email	Project overview and offer of meeting to discuss EIS assessment outcomes
Mining, Exploration and Geoscience (MEG)	October 2021 - email	Project overview and offer of meeting to discuss EIS assessment outcomes
Airservices Australia	20 September 2021 - Email response received 28 October 2021	Airservices Australia's view is that the proposed wind farm would not have an impact on any Airservices designed instrument procedures, CNS facilities or ATC operations at Armidale Airport. Airservices Australia requests that the proponent completes the Vertical Obstacle Notification Form for tall structures and submits it to Airservices Australia as soon as the development reaches the maximum height. Refer to **Section 6.8** for mitigation.
Armidale Regional Council (Armidale Regional Airport)	20 September 2021 - Email response received 23 September 2021	The Armidale Regional Airport has conducted an assessment of the Project and found that it does not impact the operational requirements of the Armidale Regional Airport.
Department of Defence	20 September 2021 - Email response received 10 October 2021	Department of Defence has no objection to the Project provided compliance with conditions relating to the supply of "as constructed details", compliance with CASA requirements, and the painted colour of WTGs. Refer to **Section 6.8** for further detail.
NSW Rural Fire Service (RFS)	20 September 2021 - Email; response received 30 October 2021	The NSW RFS confirmed wind farms are treated like any other potential hazard to aircraft operations. Aerial firefighting strategies and tactics will be selected based on the fire location, what the fire is threatening and hazard in the area.

5.2 Service Providers

5.2.1 Transgrid - Lumea

Neoen commenced discussions in relation to the Project with TransGrid in late 2019 through the submission of a connection enquiry. In September 2020 a follow-up meeting was conducted to further discuss the proposed project connection. Neoen met with representatives of Lumea (Transgrid's unregulated arm) on 6 October 2021 to provide a project update. Lumea was interested in discussing the grid study undertaken to support the Project and confirmed a new connection enquiry for Stage 1 of the Project would be required given the changes made to the Project since the scoping phase. Neoen submitted a second connection enquiry for the Project in October 2021. A response was received from Transgrid in December 2021outlining that there is sufficient capacity to connect the Project under system normal conditions.

5.2.2 Royal Flying Doctor Service

As part of the Aviation Assessment the Royal Flying Doctor Service were also consulted in September 2021, however, no response was received.

5.2.3 Telecommunications

Neoen is currently consulting with the following service providers in relation to potential interference to communication services as a result of the Project:

- Digital Distribution Australia Pty Limited
- NSW Telco Authority
- Bureau of Meteorology
- Optus Mobile
- Vodafone Australia
- Pivotel Mobile
- TPG Internet
- NBN Co
- Various Digital Radio Service Providers

The outcomes of this consultation will inform the detailed design of the Project and any required management and mitigation measures, refer to **Section 6.8.2** for further detail.

5.3 Stakeholder Issues

During the online survey (conducted by Neoen July 2020 to October 2021) participants were asked to rate their support for the Thunderbolt Energy Hub Project, where 0 reflected limited support/opposition to the Project, and 10 indicated a high degree of support for the Project. On average, participants provided a score of 7.4 out of 10, with 44% of responses identifying a high level of support for the Project (with a score of 10/10) by those sampled (refer to **Figure 5.2**). Of the responses received, the majority (59%) indicated that they live in Kentucky or Kentucky South. The average level of support of respondents from Kentucky and Kentucky South was 7.2/10, indicating the majority of nearby residents are supportive of the Project.

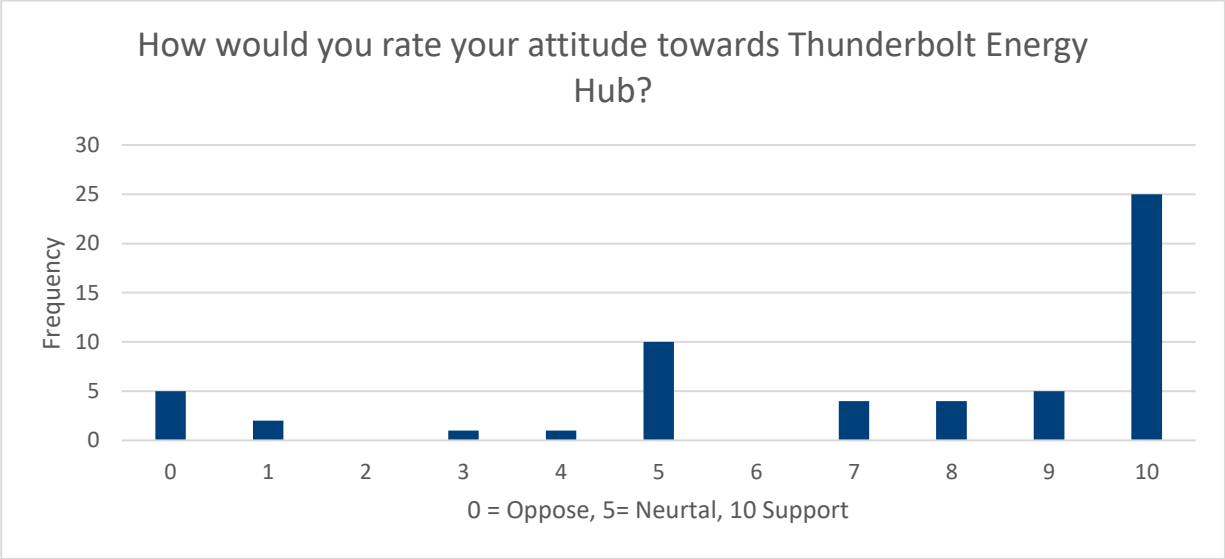


Figure 5.2 Attitude Towards the Thunderbolt Energy Hub

Data provided by Neoen, complied by Umwelt, N=68

A summary of the perceived social impacts (both positive and negative) identified through the SIA are outlined in **Figure 5.3**.

The SIA notes that during Umwelt's engagement for the SIA, some participants did not distinguish between the impacts of Stage 1 and Stage 2, and it is noted that the initial stages of the consultation process covered both stages of the Project. Following separation of the stages, while some participants noted that they may be less impacted by and were less concerned about the impacts of the Project (Stage 1) they still wanted to raise their concerns as they assumed that if Stage 1 was approved then Stage 2 would be more likely to be approved. This is not necessarily the case, however, with any future stage of the Thunderbolt Energy Hub Project to be the subject of a separate assessment and approvals process.

Concerns and feedback relating to the Project identified throughout the engagement undertaken by Neoen and Umwelt have been considered by Neoen and the Project team in refining the Project design and have been used to inform the preparation of this EIS including proposed management and mitigation measures.

The analysis of community issues and how these have been addressed through the preparation of the specialist studies and this EIS are discussed further in **Section 6.0** (and in particular **Section 6.12**) and **Appendix 7**.

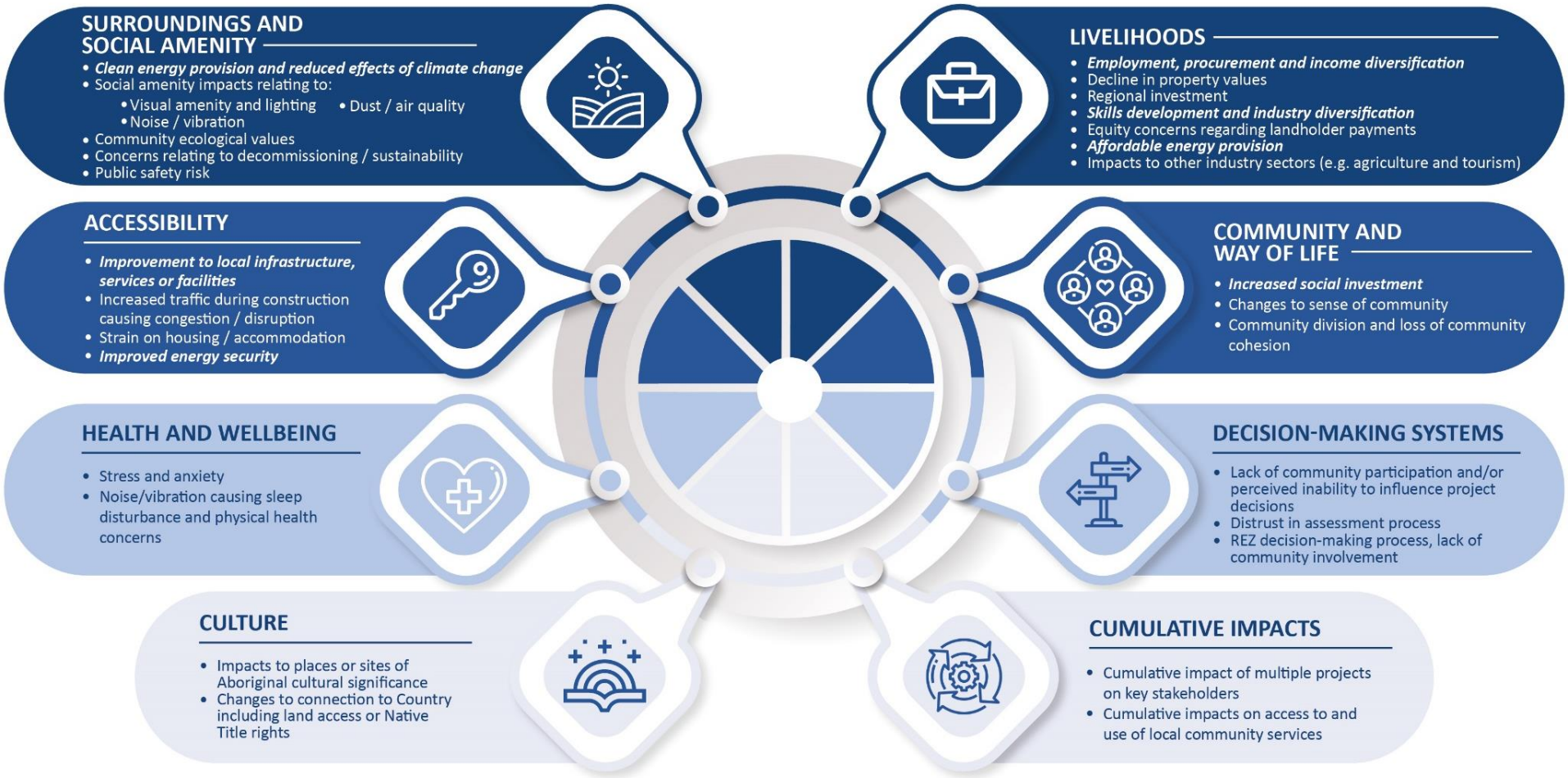


Figure 5.3 Summary of Perceived Social Impacts

(Note: The darker shading indicates the **higher significance to stakeholders and positive impacts are identified in italics**)

6.0 Assessment and Mitigation of Impacts

The identification of key environmental and community issues to be considered in this EIS is based on identification of:

- the environmental and planning context for the Locality (refer to **Sections 2.0** and **4.0**)
- outcomes of the stakeholder engagement process
- the SEARs for the Project (refer to **Appendix 1**)
- a risk analysis of potential environmental and social impacts associated with the Project
- specialist assessments completed as part of the preparation of this EIS

6.1 Preliminary Environmental Risk Analysis

The Scoping Report completed for the Project in November 2020 included a preliminary environmental and social risk assessment which included consideration of project specific and cumulative impacts.

As part of the preliminary environmental and social assessment the potential project issues were separated into 'Key Issues' and 'Other Issues', as presented in the scoping report. Key issues being issues where there is a reasonable likelihood that the Project will have a material impact and detailed assessment was required to fully understand such impacts and identify project-specific mitigation. Other issues are issues which are not of particular concern and are unlikely to have a material impact and/or the measures to manage the impacts are well understood and routinely used on similar projects.

The method used for the environmental risk analysis included:

- establishing the context for the risk analysis process
- identifying environmental and community aspects and potential risks
- analysing risks
- evaluating risks to determine the key issues requiring further assessment.

The environmental risk analysis identified range of issues that required further detailed assessment as part of the EIS. Based on the risk assessment, the identified key issues included:

- **Visual Amenity –** specifically the potential for the Project to impact the landscape character of the locality and result in loss of visual amenity to surrounding landholders (refer to **Section 6.2**)
- **Noise** – specifically the noise disturbance to surrounding landholders associated with traffic and construction activities, also the operation of the proposed WTGs and associated infrastructure (refer to **Section 6.3**)

- **Biodiversity** – the Project will result in disturbance to vegetation and potential loss of habitat, additionally the operation of the Project has the potential to impact threatened and endangered species associated with bird and bat strike (refer to **Section 6.4**)

- **Traffic and Transport** – the Project will result in increased traffic associated with the construction phase, including OSOM vehicles (refer to **Section 6.5**)

- **Aboriginal Cultural and Historic Heritage** – the construction and operation of the Project has the potential to impact Aboriginal and Historic Heritage objects and Aboriginal cultural values of the area (refer to **Section 6.6**)

- **Risk** – operation of the proposed WTGs and associated infrastructure has an associated safety risk including impact to aviation operations, telecommunications and hazard associated with blade throw, electromagnetic fields and bushfire (refer to **Section 6.8**)

- **Socio-Economic Impacts** – The Project has the potential to result in both positive and negative impacts. Potential positive impacts resulting from economic benefits locally through the implementation of community and neighbour benefit programs, employment generation and use of services and the potential resulting negative social impact due to potential environmental impacts to nearby landholders and demand on the workforce and services (refer to **Section 6.12**)

- **Cumulative Impacts –** the construction and operation of the Project has the potential to result in cumulative impact within the REZ (refer to **Section 6.13**)

Other issues addressed in this EIS include water and soils, waste management and air quality.

A detailed assessment of each of the identified environmental and social aspects identified for the Project is provided throughout the remainder of **Section 6.2**.

6.2 Landscape and Visual

As outlined in **Section 5.2**, during the stakeholder engagement process when discussing what participants valued most about the local area, the rural landscape and beauty of the area was most frequently mentioned. Potential changes to the rural landscape and visual amenity impacts associated with the Project were raised by some stakeholders as a key concern, including that the presence of the turbines would change the views in the areas which were highly valued by the community. However, there were also landholders that indicated they were not concerned about visual impact r of having visible turbines in the landscape . Stakeholder feedback is discussed further in **Sections 6.2.1** and **6.12**.

A detailed Landscape and Visual Impact Assessment (LVIA) has been prepared by Moir Landscape Architecture (Moir LA) to assess the potential visual impacts associated with the Project. The SEARs for the Project require that:

> the *EIS must include a detailed assessment of the visual impacts of all components of the project (including turbines, transmission lines, substations, and any other ancillary infrastructure and (if required) night lighting) in accordance with the NSW Wind Energy: Visual Assessment Bulletin (DPE, 2016), including detailed consideration of potential visual impacts on local residences.*

The LVIA has been prepared in accordance with the Visual Bulletin and includes:

- a baseline study that includes analysis of the landscape character, scenic quality and visibility from viewpoints of different sensitivity levels
- establishment of the visual influence zones from viewpoints using data collected in the baseline study
- assessment of the proposed conceptual layout against visual performance objectives
- justification for the final proposed conceptual layout and identification of mitigation and management measures.

A summary of the LVIA is provided in the following sections, with the full report attached as **Appendix 8**.

An assessment of shadow flicker (the intermittent shadow cast by the moving turbine blades) has also been completed. The Shadow Flicker Assessment was undertaken by DNV Energy Systems (DNV) to assess the expected annual shadow flicker durations associated with the Project in accordance with the SEARs. The assessment is summarised in **Section 6.2.8**, with the report attached as **Appendix 9**.

6.2.1 Visual Baseline Study

A Preliminary Visual Impact Assessment, including a preliminary landscape baseline study, was prepared by Umwelt as part of the scoping phase. This preliminary study was used by Neoen to further consider potential visual impacts in its design process prior to refining the design as proposed in this EIS. Moir LA developed upon the preliminary study undertaken in Phase 1 to provide a detailed baseline study for the LVIA.

In accordance with the Visual Bulletin, the baseline study considers the following inputs for the Project:

- elements of the landscape important to the community, including public and private viewpoints
- the sensitivity of the viewers who use those viewpoints, and the distances at which they may view the landscape and potential wind turbines and other ancillary facilities
- the character of the landscape involved, its key features and the relative scenic quality of the area
- the location of any existing operational or approved wind energy projects within both a regional and local context, including any nearby surrounding wind energy projects within 8 km which may have the potential to create direct or indirect visual impacts between the proposed and any other operational, approved or proposed wind energy projects.

As previously discussed, some participants in the stakeholder engagement process raised concern relating to potential changes to the rural landscape and associated visual amenity impacts, while others indicated they were not concerned about visual impacts. No specific key landscape features within the vicinity of the Project Area have been identified during consultation, however, during stakeholder surveys, in relation to what residents valued most about the local area, 'rural and landscape beauty' was the most frequent response.

As part of the visual baseline study, the Project Area and surrounding region (the Visual Study Area) were divided into Landscape Character Units (LCU). The designation of the LCUs has been informed by land use patterns, vegetation coverage, topographical maps, site images and site inspection. Due to the large scale of the Visual Study Area and varying landscape character, the area has been categorised into five LCUs to inform the LVIA.

Key factors which form a part of the existing landscape character include large areas of vegetation, undulating topography, roadside vegetation and riparian vegetation associated with creek lines which will assist in reducing the potential for viewing the Project. The assessment found the Project could be undertaken whilst maintaining the key visual features of the landscape.

The broad landscape character is dominated by established rural land which consists primarily of modified undulating hills. The predominantly rural landscape in which the Project Area is located has not been identified as significant or rare in the LVIA. Generally, the Scenic Quality Classes of the LCUs within the Study Area have been rated as low and moderate.

The LVIA indicates that the Project, regardless of how visible it actually is, would become a feature of the area. However, the degree to which the existing landscape character and significance is altered as a result of the Project, is determined by the dominance of the Project in relation to the existing landscape features.

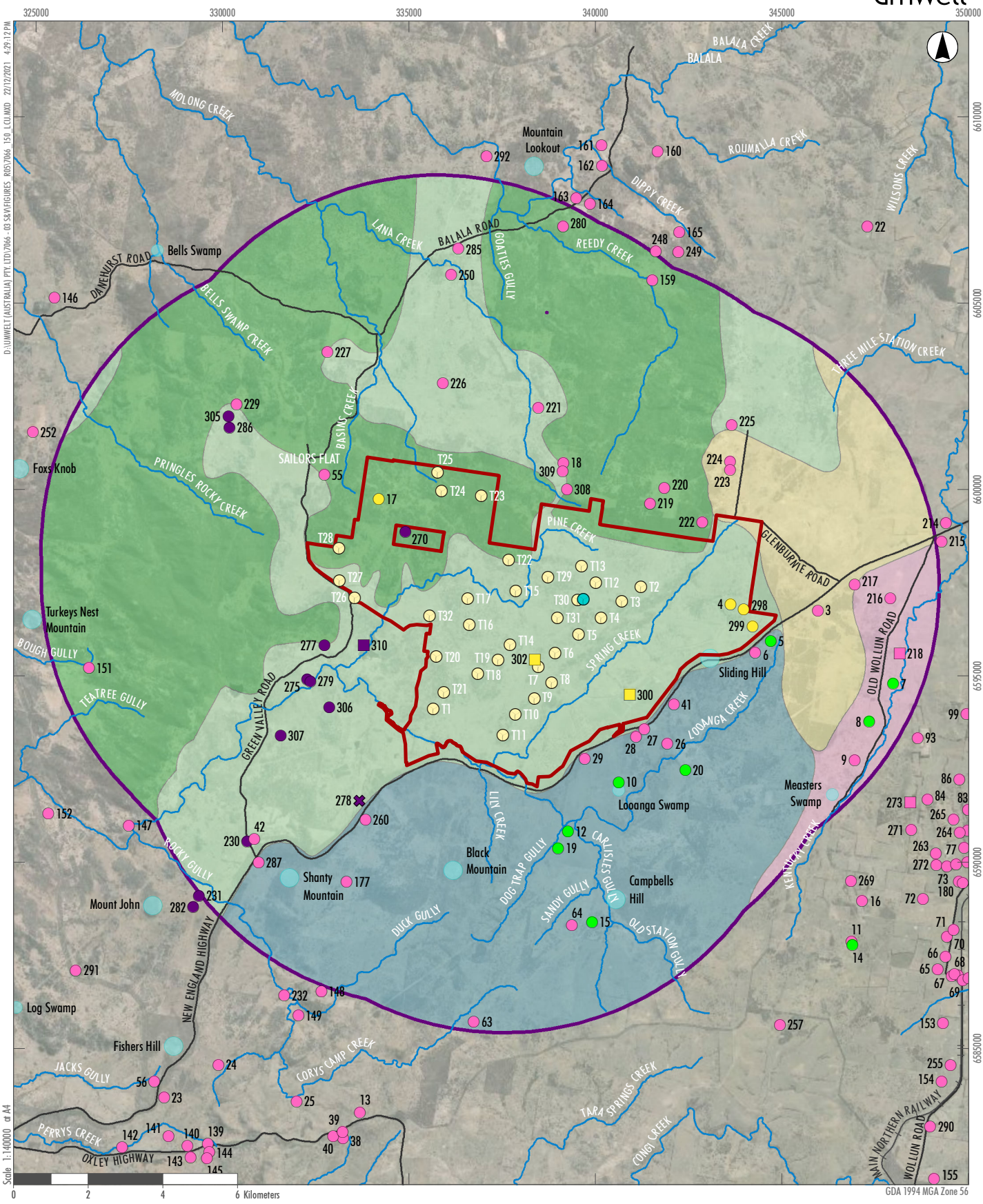
The LVIA anticipates that the character of areas in the vicinity of the Project Area, which are valued for their high landscape quality (those utilised for recreation and tourism) will remain intact. The Project will be visible from all 5 LCUs, to varying degrees. However, due to the undulating topography surrounding the Project Area, there are limited opportunities to view the Project in its entirety.

The LVIA found that in the broader region, the regionally identified significant landscape features would remain dominant features of the landscape and that it is unlikely the Project would degrade the scenic value of these landscape features.

The general extent of the LCUs is shown on **Figure 6.1** with an overview of the description of each LCU and scenic quality rating provided in **Table 6.1**. Further detail is provided in Appendix A of the LVIA, refer to **Appendix 8**.

Table 6.1 Overview of Landscape Character Units and Assessment of Potential Impact

LCU	Character	Project Visibility and Potential Impact	Scenic Quality Rating
LCU01: Densely Vegetated Hills	The LCU is characterised by undulating hills and ridges with dense vegetation that represents the New England Tableland character.	The LCU has limited accessibility and views from within the LCU are generally limited to private properties and roads. A small portion of the Project is located within land characterised by the LCU and dense vegetation and undulating hills generally contain views from within the LCU. The LVIA indicates that the scenic quality of the LCU will remain intact.	Moderate
LCU02: Partially Vegetated Hills	The majority of the Project Area is located within the Partially Vegetated Hills LCU. The LCU is characterised by gentle to rolling undulations that have been partially cleared to support grazing.	Generally, views from publicly accessible land are limited to the road network and views to the Project are contained by dense roadside vegetation. Views to the Project will be available from private property, however, due to the undulating character of the LCU there are limited opportunities to view the Project in its entirety. The Project will alter the character of the LCU.	Moderate
LCU03: New England Pastures	Generally defined as the gently rolling to flat topography to the north of Kentucky. Land has been extensively cleared to support agricultural activity - predominantly grazing.	The Project is unlikely to result in any alterations to the scenic integrity of the New England Pastures LCU. Views to the Project will be largely contained by topography to the east of the Project Area or roadside vegetation. Where views are available these will be long distance.	Low
LCU04: Oxley Pastures	This LCU defines the land to the south of the New England Highway running down to the Oxley Highway. The LCU consists of undulating farmlands that have been extensively cleared to support grazing and cropping.	Views from dwellings located to the north of the LCU are generally contained by the dense roadside vegetation associated with the New England Highway. Dwellings are generally orientated to the south to take advantage of expansive views across the LCU. Views to the Project from the Oxley Pastures LCU are limited. The scenic integrity of the LCU will remain intact.	Moderate
LCU05: Kentucky	Comprises of rural settlements Kentucky and its surrounds. The settlement is generally characterised by rural residential land running along Kentucky Road.	Visibility to the Project Area from the Kentucky Township LCU is limited. Although the WTGs are likely to be discernible from some areas within the LCU, the Project will not dominate the visual catchment of the Kentucky LCU due to views being long distance. The landscape elements which contribute to the scenic quality of the LCU will remain unchanged as a result of the proposal.	Low



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- 8,000 m from turbine
- Host Landholder - Dwelling
- Host Landholder - Vacant Dwelling
- Associated Landholder - Dwelling
- Associated Landholder - Vacant Dwelling
- Associated Landholder - Derelict Dwelling
- Non-Associated Landholder - Stage 2 Dwelling
- Non-Associated Landholder - Dwelling
- Non-Associated Landholder - Vacant Dwelling

Landscape Character Units

- LCU01: Densley Vegetated Hills
- LCU02: Partially Vegetated Hills
- LCU03: New England Pastures
- LCU04: Oxley Pastures
- LCU05: Kentucky

FIGURE 6.1

Landscape Character Units

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021), Moir Landscape Architecture Pty Ltd (2021)

6.2.2 Visual Magnitude

The visual magnitude is determined by a ratio of turbine height and distance, determining the visual extent of turbines relative to dwellings and key public viewpoints. This visual extent assists with identifying viewpoints that may require further assessment. This assessment does not determine the extent of visual impacts but is intended to identify locations which may be impacted, and which require further detailed consideration in the visual impact assessment.

In accordance with the Visual Bulletin *the proposed turbines below the black line must be identified along with the dwellings or key public viewpoints*. The proposed WTGs have a maximum tip height of 260 m. A buffer of 3,450 m (black line) and 5,100 m (blue line) are applicable to the proposed WTGs. The mapped black and blue lines required by the Visual Bulletin are shown on **Figure 6.2**. Based on the visual magnitude assessment, there are:

- 16 non-associated dwellings within 3,450 m of a proposed WTG (within the black line of visual magnitude)
- 7 associated dwellings (within the black line of visual magnitude)
- 11 non-associated and 3 associated dwellings within 3,450 - 5,100 m of a proposed WTG (within the blue line of visual magnitude).

The Visual Bulletin also requires consideration of what proportion of the viewshed a wind farm may be visible in from dwellings or key public viewpoints. It requires this to be done by dividing the 360° view into six sectors (60° each) and determining how many sectors have WTGs in them. The Bulletin states that *where wind turbines are visible within the horizontal views of the dwelling or key public viewpoints in three or more 60° sectors, the proponents must identify the turbines, relative dwelling and key public viewpoint, along with the relative distance*. These turbines then become a focus for assessment in the EIS.

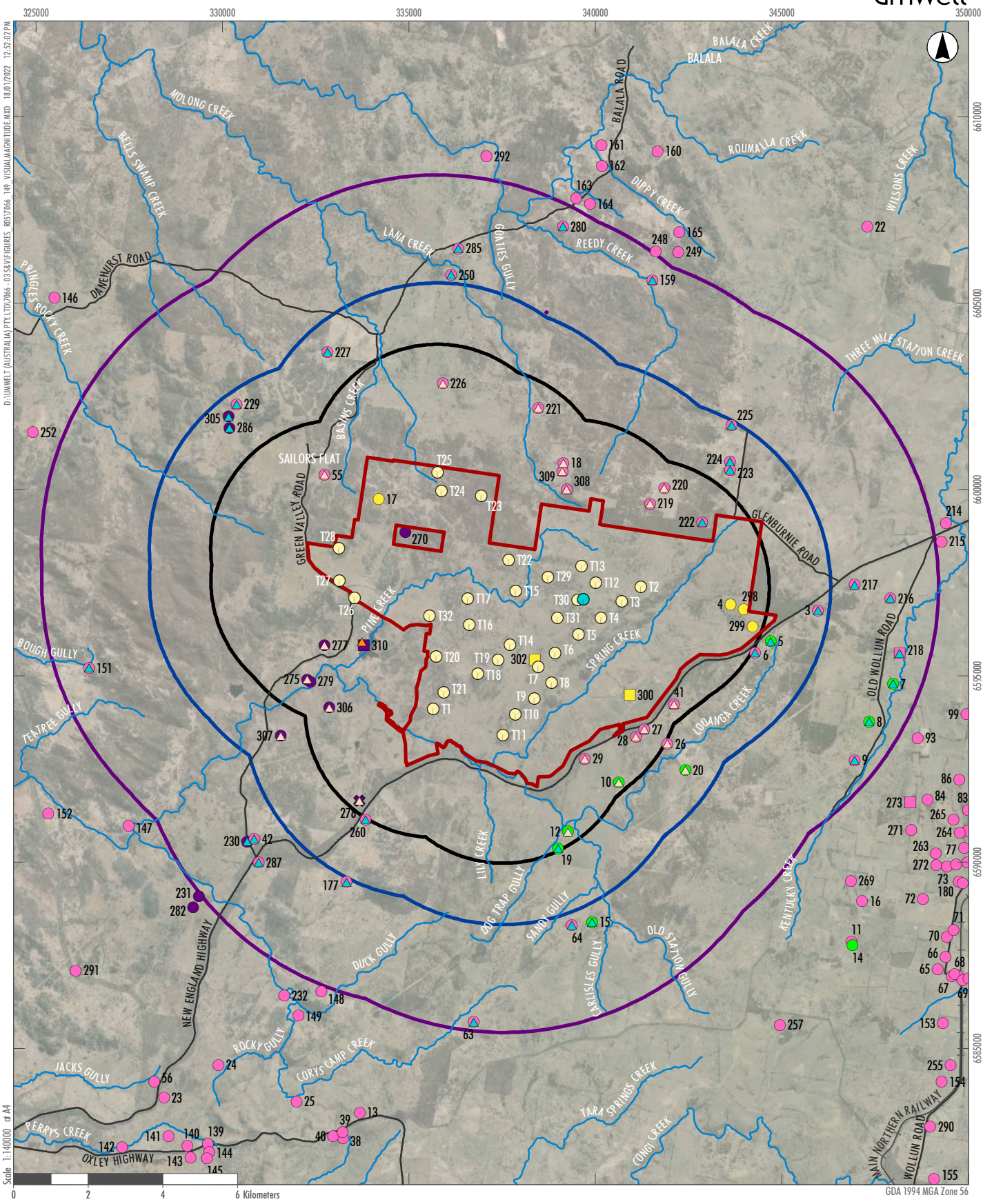
The preliminary dwelling assessment indicated, two non-associated dwellings (ID 308 and 309) would have WTGs located in up to three 60 degree sections (dwelling ID 308 and 309). However, the detailed dwelling assessment indicated that due to topography visibility from these dwellings would actually be restricted and up to one 60 degree sector for dwelling 308 and two 60 degree sectors for dwelling 309.

6.2.3 Zone of Visual Influence

The Visual Bulletin also requires the preparation of a Zone of Visual Influence (ZVI) as a further preliminary screening tool to identify residences or public viewing locations that require further consideration in the visual impact assessment. The ZVI has been determined through the use of digital topographic information and 3D modelling. The ZVI was assessed to a distance of approximately 20 km from the Project Area. Although it is possible for the development to be visible from further than 20 km away, it is generally accepted that beyond this distance visibility is diminished.

The ZVI indicates the area over which a development can theoretically be seen based on a bare ground scenario (i.e. assuming a landscape without screening, structures or vegetation) creating a worst-case scenario. Effectively, the ZVI identifies areas where it may be possible to see the Project and which areas require further consideration in the detailed visual impact assessment but does not confirm whether or not there will be views from these areas. The ZVI process was utilised to identify areas which required further detailed visual impact analysis. Ground truthing was undertaken to ascertain potential visibility from the locations identified in the ZVI as potentially having views taking into account structures and vegetation.

Mapping of the output of the ZVI showing the results from blade tip height (260m) and hub height (170 m) are provided in **Figure 6.3** and **Figure 6.4** respectively.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- 3,450 m from turbine (Black Line of Visual Magnitude)
- 5,100 m from turbine (Blue Line of Visual Magnitude)
- 8,000 m from turbine

Multiple Wind Turbine Tool Results

- One 60° Sector (60°)
- Up to two (2) 60° Sectors (120°)
- Up to three (3) 60° Sectors (180°)

- Host Landholder - Dwelling
- Host Landholder - Vacant Dwelling
- Associated Landholder - Dwelling
- Associated Landholder - Vacant Dwelling
- Associated Landholder - Derelict Dwelling
- Non-Associated Landholder - Stage 2 Dwelling
- Non-Associated Landholder - Dwelling
- Non-Associated Landholder - Vacant Dwelling

FIGURE 6.2

Visual Magnitude

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021), Moir Landscape Architecture Pty Ltd (2021)

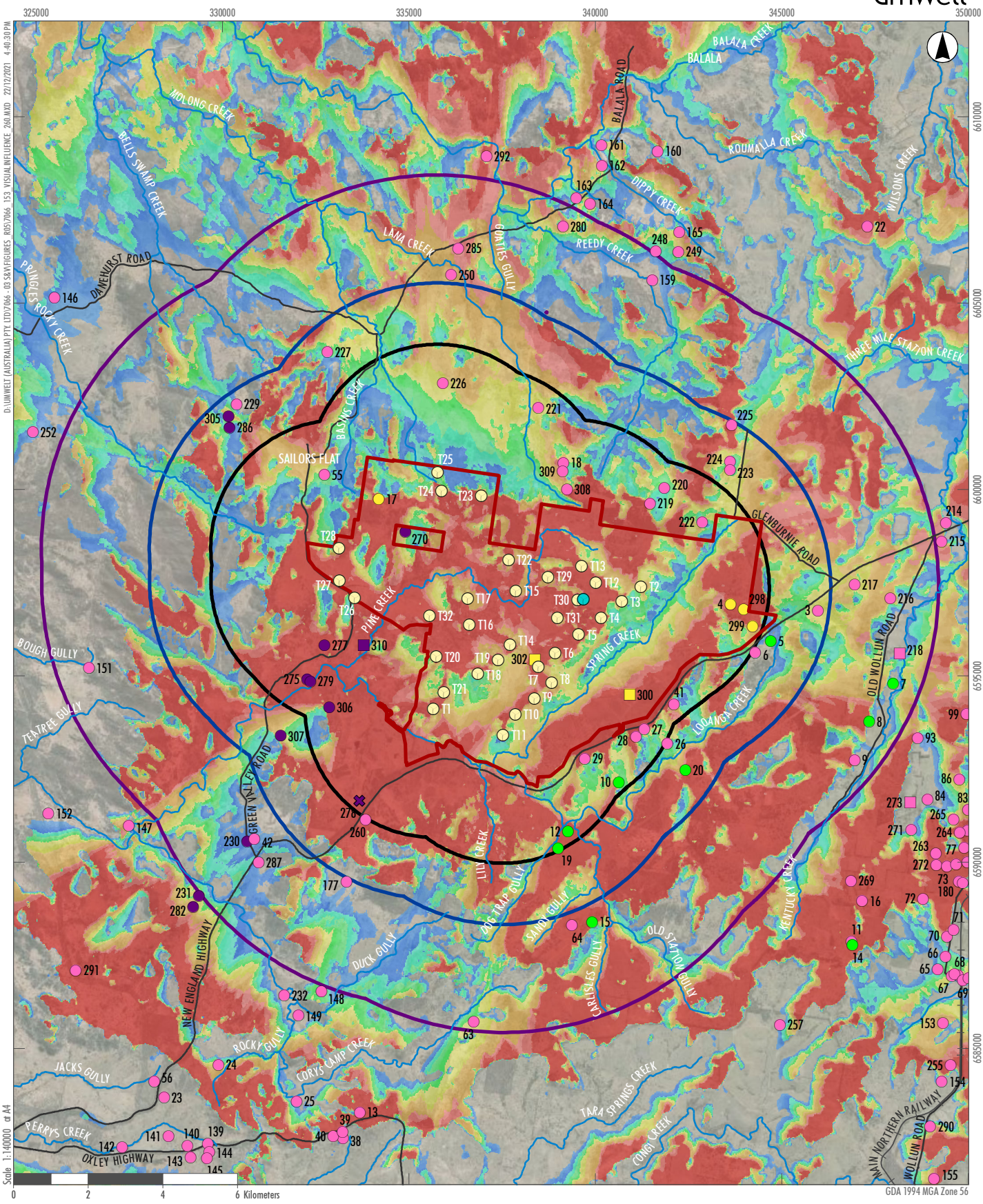


FIGURE 6.3

Zone of Visual Influence (Tip Height - 260m)

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021), Moir Landscape Architecture Pty Ltd (2021)

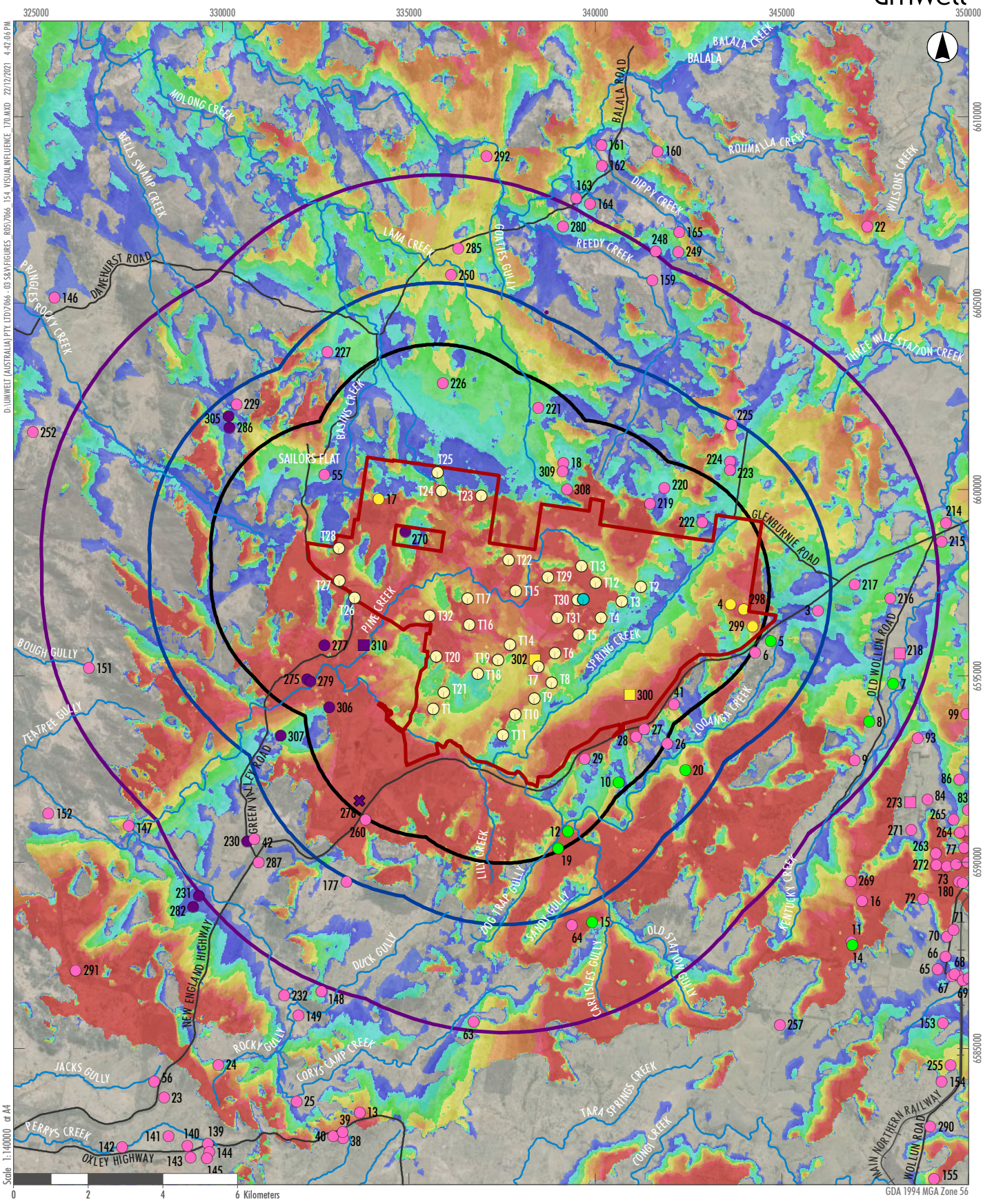


FIGURE 6.4

Zone of Visual Influence (Tip Height - 170m)

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021), Moir Landscape Architecture Pty Ltd (2021)

Based on the ZVI, the LVIA concludes that:

- due to the undulating topography that characterises the landscape, there are limited opportunities to view the Project in its entirety. Areas that have been identified as having potential to view the Project in its entirety are generally isolated, and it is likely intervening vegetation would reduce the potential to view of all the turbines.
- there may be high visibility from New England Highway, however further assessment during fieldwork indicates dense vegetation to the north of the New England Highway will predominately screen views to the Project.
- the Project will not be visible from Bendemeer, Uralla, Walcha Road Townships.
- views may be available from Kentucky, Kentucky South and Wollun. Further assessment was undertaken in these towns which indicated that the Project is generally screened by vegetation from these townships
- views to the Project will be screened by topography from large areas of land to the west of the Project Area.
- views to the Project Area are limited from distances of more than 8 km due to topography.

6.2.4 Photomontages and Wireframes

A photomontage combines a photograph of an existing view with a computer-rendered image of a proposed development. Photomontages are used to illustrate the likely view of a proposed development as it would be seen in a photograph (not as it would appear to the human eye in the field).

A wire frame is a computed generated image based on a digital 3D model of the landscape and the project. Wire frame images can be seen as a worst-case scenario as they do not take into account factors such as vegetation and/or building structures.

Wire frame diagrams were utilised in the LVIA to assist in the assessment of the Project from inaccessible locations. Wire frame images have also been utilised as a substitute for photomontages in areas where dense vegetation limits the capacity to align photographs accurately.

Six public viewpoint locations (roadside vantage points) were selected for the preparation of visual photomontages. The locations were guided by the preliminary assessment tools and based on feedback received from the community. Exact photomontage locations were selected on site to represent a worst-case scenario for the viewpoint location. Localised screening factors such as vegetation were avoided (where possible) to ensure maximum exposure to the Project.

Eleven photomontages and 14 wire frame diagrams have been prepared from private dwellings. The locations selected were based on those within close proximity to the Project Area. Although effort was made to undertake site assessments from all dwellings within 5,100 m, access to some properties was not granted. In some cases, wire frame diagrams have been utilised to illustrate potential visual impacts from dwellings where no access was available.

The photomontages are included as Appendix C in the LVIA (refer to **Appendix 8**).

6.2.4.1 Viewpoint Analysis

A total of 23 public viewpoints were assessed as part of the LVIA, taken from varying distances and locations surrounding the Project Area. Each viewpoint was assigned a Visual Influence Zone (VIZ) rating) based on their view sensitivity level, distance zone and scenic quality class combinations. Photomontages have been prepared from selected public viewpoints to illustrate the potential visual impacts associated with the Project, included as Appendix C of the LVIA, refer to **Appendix 8**.

Four viewpoints assessed were rated moderate impact and remainder rated as low in accordance with the methodology in the Visual Bulletin and are representative of the broader region. The four locations rated moderate are located to the south and southwest of the Project Area in close proximity where visibility is greatest. The low rating of the remainder of the viewpoints is generally due to the low viewer sensitivity level and / or distance to the Project Area. No viewpoints were rated high. Further detail is provided in the LVIA, refer to **Appendix 8**.

6.2.4.2 Dwelling Assessment

Based on the outcomes of the preliminary visual analysis described in the above sections, the non-associated dwellings requiring detailed visual assessment include:

- 3,450 m (black line) - 16 non-associated dwellings (four of which are classified as vacant and 1 uninhabitable/dilapidated structure)
- 3,450 – 5,100 m (blue line) - 11 non-associated dwellings

Ten associated dwellings (7 within the black line, 3 within the blue line) were also assessed, noting at the time of the assessment these dwellings were non-associated and have since entered into an agreement with Neoen.

Neoen offered on-site visual assessments to all private dwellings within 5,100 m of the proposed WTGs. Access was granted by nine of the landowners within the black line (3,450 m) and eight dwellings within the blue line (5,100 m), and Moir attended the properties in October 2021 to undertake photographic assessments from areas of potential concern identified by the landowner and to ground truth the desktop assessment. Where access was not granted to the property, Moir undertook a desktop assessment utilising 3D modelling and the most current available aerial imagery.

An overview of the outcomes of the dwelling assessment is provided in **Table 6.2**. Further detail is provided in the LVIA (refer to **Appendix 8**).

Table 6.2 Dwelling Assessment Overview

Visual Impact Zone	Distance WTG to Dwelling (m)	Number of dwellings	Assessment
VIZ1 (high)	Within 3,450	2 dwellings (277 and 310)	High visual impact rating Mitigation measures proposed to reduce impact from dwelling 277. Due to location of 310 on the constructed lake no practical mitigation measures can be applied. It should also be noted that 310 is a secondary dwelling and is currently un-occupied. Neoen has negotiated an agreement with the landowner of both of these dwellings.

Visual Impact Zone	Distance WTG to Dwelling (m)	Number of dwellings	Assessment
VIZ2 (Moderate)	Within 3,450	16 non-associated dwellings	No views/negligible impact (5 dwellings) Low visual impact (5 dwellings) Moderate visual impact (6 dwellings)
	3,450 – 5,100	9 non-associated dwellings	No views/negligible impact (5 dwellings) Low visual impact (3 dwellings) Moderate visual impact (1 dwellings)
VIZ3 (Low)	3,450 – 5,100	2 non-associated dwellings	No views/negligible impact (2 dwellings)

The visual impact rating was largely rated as nil, negligible or low (from 20 of the non-associated dwellings). Neoen has a negotiated agreement in place with the landowners relevant to dwelling ID 310 and 277, where high visual impact is predicted. The LVIA demonstrates that the application of mitigation methods where moderate visual impact has been identified at seven non-associated dwellings, such as screen and supplementary planting would reduce the potential visual impact rating.

Screen planting is identified as a potential mitigation measure for seven non-associated dwellings. **Table 6.3** provides an overview of the proposed mitigation options for these five dwellings with further detail provided in the LVIA (refer to **Appendix 8**).

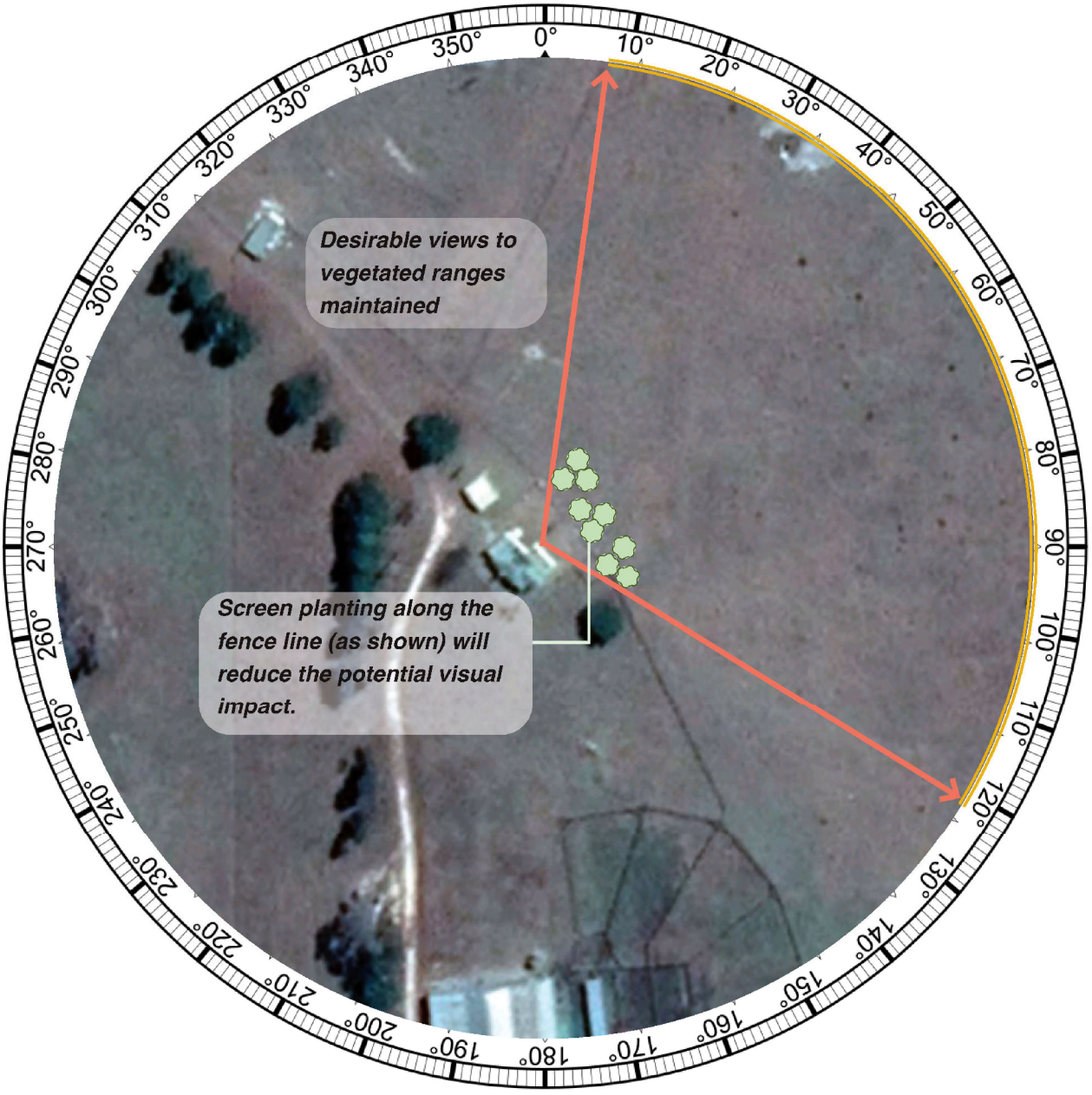
Table 6.3 Mitigation and Visual Impact Rating

Dwelling ID	Visual Impact Rating (no mitigation)	Proposed Mitigation	Visual Impact Rating (mitigation implemented
Black Line of Visual Magnitude			
12	Moderate	Screen planting to the north west of the dwelling	Negligible-Low
18	Moderate	Scattered screen planting to the south west of the dwelling	Negligible
19	Moderate	Screen planting to the north west of the dwelling	Negligible-Low
221	Moderate	Screen Planting to the south west of the dwelling	Negligible
226	Moderate	Scattered screen planting to the south west of the dwelling.	Negligible
309	Moderate	Screen planting to the south east of the dwelling	Negligible-Low
20	Moderate	Screen planting to the north west of the dwelling	Negligible-Low

Screen and supplementary planting (as identified in **Table 6.3**) would be undertaken in consultation with the relevant landowners to ensure that effective mitigation of the views of the WTGs is achieved without impacting on desirable views. Screen planting will also be provided (at the request of the landowner) to address moderate visual impact, at four associated dwellings (ID 275, 279, 306 and 307).

An example of how screen planting could be used to mitigate potential views towards visible WTGs from Associated Dwelling ID 306 is provided in **Figure 6.5** and **Figure 6.6**.

The landscape and visual screening will have a positive effect on reducing any visual impact of the Project from the non-associated dwellings identified as having a moderate visual impact, significantly reducing the visual impact to an acceptable level.



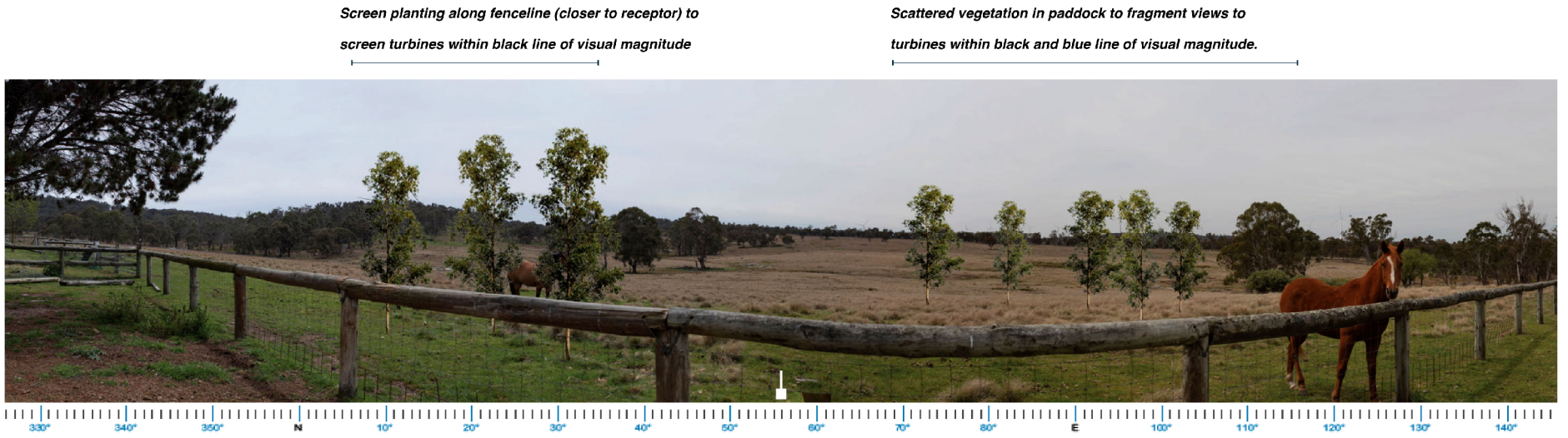
Example of mitigation principles (Dwelling 277)

FIGURE 6.5

Example of Mitigation Principles (Dwelling 277)

Image Source: Moir Landscape Architecture Pty Ltd (2021)

Proposed View from Dwelling 277



Proposed View from Dwelling 277 with mitigation measures implemented

FIGURE 6.6

View from Dwelling 277 with and without Mitigation

Image Source: Moir Landscape Architecture Pty Ltd (2021)

6.2.5 Associated Infrastructure

An assessment of visual impacts associated with the Project's ancillary infrastructure was also undertaken. The conclusions of this assessment are summarised in **Table 6.4**, with the ancillary infrastructure assessed as resulting in nil to negligible visual impact. Further detail is provided in **Appendix 8**.

Table 6.4 Associated Infrastructure – Impact Assessment Summary

Component	Distance to nearest non-associated dwelling	Visual Impact Rating
Switching Station	>2 km	Nil
Substation	> 2 km	Nil
Meteorological Masts	> 2 km	Negligible
High voltage (330 kV) power line	> 2 km	Nil
Temporary Batching Plant	> 2 km	Negligible
Temporary Laydown Area	> 2 km	Negligible
Internal Access Roads	Variable	Negligible

6.2.6 Night Lighting Assessment

Due to the relatively isolated location of the Project Area, few existing sources of lighting are present in the night time landscape. Some existing lighting associated with homesteads and motor vehicles is dispersed across the Project Area and surrounds.

Dark sky is a valued quality of the rural landscape, due to the lack of light pollution. Aviation lighting, if proposed, would have the potential to impact on receptors who view the landscape at night, in particular night-sky enthusiasts, photographers, star gazers, campers and some land owners with potential visibility of the turbine hub. However, no WTG lighting is proposed and the Aviation Assessment indicates that the WTGs do not require obstacle lighting. It is noted that this finding is subject to review by Civil Aviation Safety Authority (CASA), who may recommend lighting. Should lighting be required the LVIA indicates the potential impacts indoors at neighbouring dwellings and outdoors outside the Project Area, can be mitigated and such controls would be implemented should night lighting be required by CASA.

Night lighting of ancillary infrastructure will also be required including potentially for some construction works. These light sources will be limited to low-level lighting for security, night time maintenance and emergency purposes. During construction appropriate mitigation can be applied to lighting (including directional lighting and shields) in accordance with relevant Australian Standards to reduce any associated impact.

There is low visibility of the proposed infrastructure from surrounding dwellings and publicly accessible viewpoints. The LVIA indicates concluded that it is unlikely the proposed night lighting would create a noticeable impact on the existing night time landscape

6.2.7 Cumulative Impact

Given the distance to the closest neighbouring windfarm (27 km) (currently under assessment) cumulative impacts associated with the Project and other projects are not predicted when considering potential impacts to the landscape surrounding the Project Area.

There is some potential for cumulative visual impact when a number of wind farms are viewed in succession as a traveller moves through the landscape (eg. motorist travel routes or walking tracks). The LVIA found that the potential for the Project to result in cumulative visual impact in this context is very low. There are limited opportunities to view the Project sequentially along the New England Highway and the assessment found that it is unlikely the perception of the region's broad landscape character will be altered as a result of the Project.

The cumulative impact of Stage 2 of the Thunderbolt Energy Hub will be considered as part of the assessment process for that Project once the details of the proposed project are determined, however, should Stage 2 proceed, it will result in additional WTGs visible in the local landscape.

6.2.8 Management and Mitigation

The LVIA quantifies the visual impact of the proposed wind turbines, however, the overall visual impact of the wind farm will vary greatly depending on the individual viewer's sensitivity to and acceptance of change. The sensitivity towards change varies greatly depending on the user's connection with the landscape and perception of wind farms and their impact on the visual landscape. As indicated in the stakeholder engagement outcomes some stakeholders were concerned about wind farm views whereas others were not concerned. For example, visitors to the area may perceive the wind farm as an interesting feature of the landscape. This may contrast with a resident who passes the wind farm daily who may have a more critical perception of the visual presence of the wind farm.

The greatest visual effect of the Project is most likely to be felt by residents in the immediate vicinity. The LVIA found that that mitigation methods incorporated into the design process in conjunction with landscape and visual screening at the properties identified in **Section 6.2.4.2**, can sufficiently reduce any visual impact associated with the Project. The LVIA concludes that if the following mitigation is implemented, the Project can be undertaken with low impact on the surrounding environment:

- Neoen will provide screen and/or supplementary planting, at the request of the landowners identified in **Table 6.3**.
- Night lighting of ancillary infrastructure will be limited to low-level lighting for security, night time maintenance and emergency purposes. During construction appropriate mitigation will be applied to lighting (including directional lighting and light shields) to reduce any associated impact.
- Each WTG will:
    - Be uniform in the colour, design, height and rotor diameter
    - Be finished in matt-white and non-reflective material to reduce visibility
    - Not have any unnecessary signage or lighting.

6.2.9 Shadow Flicker and Blade Glint

The expected annual shadow flicker durations applicable to the Project has been assessed in accordance with the SEARs, the Visual Bulletin and the Environment Protection and Heritage Council's (draft) National Wind Farm Development Guidelines (2010) (Draft National Windfarm Guidelines). A summary of the assessment findings is provided below with the report included as **Appendix 9**.

The Visual Bulletin recommends a shadow flicker limit of 30 hours per year at dwellings in the vicinity of a wind farm. In addition, the Draft National Wind Farm Guidelines also recommend limits of 30 hours per year on the theoretical shadow flicker duration, and 10 hours per year on the actual shadow flicker duration. 'Theoretical Shadow Flicker' is the theoretical number of hours of shadow flicker experienced annually at a given location. This is calculated using a geometrical model which incorporates the sun path, topographic variation over the area and the WTG details (rotor diameter/hub height). 'Actual Shadow Flicker' considers factors which may reduce the incidence of shadow flicker that are not taken into account in the theoretical shadow flicker duration (such as cloud cover).

Predictions of theoretical shadow flicker durations at dwellings are based on worst case assumptions and are therefore conservatively high estimates. The actual shadow flicker duration likely to be experienced at each dwelling has also been predicted by estimating the possible reduction in shadow flicker due to WTG orientation and cloud cover.

Compliance with shadow flicker limits is assessed on the basis of shadow flicker of at least a moderate level of intensity which is expected to occur up to a distance of around 10 rotor diameters from a WTG. The shadow flicker durations are based on the proposed WTG parameters and are expected to represent the upper bound for the WTG options currently being considered for the Project. The Shadow flicker assessment notes that durations for WTGs with a smaller rotor diameter should typically be lower than those presented in the assessment, even if the hub height is marginally higher.

Dwellings within 2900 m of the Project WTGs have been considered for the assessment (which corresponds to 15 times the rotor diameter plus 50 m providing for a conservative assessment).

Blade glint is not expected to be an issue for the Project as Neoen will apply a non-reflective finish to the WTG blades. Therefore, no further assessment of blade glint is considered necessary.

6.2.9.1 Shadow Flicker Assessment Results

The results of the shadow flicker assessment indicate no non-associated dwellings are predicted to experience shadow flicker of at least a moderate level of intensity.

Four dwellings are predicted to experience shadow flicker above a moderate level of intensity (two host landholder dwellings and two associated dwellings). Of these, only two are predicted to experience theoretical shadow flicker durations above the applicable limits, both of which are host landholder dwellings and there are agreements in place with these landholders.

Associated Dwelling ID 310 is predicted to experience theoretical shadow flicker durations below the recommended limit of 30 hours per year within 50 m of the dwelling (16 hours per year). When considering the likely reduction due to cloud cover and rotor orientation, the shadow flicker duration at Dwelling ID 310 is also predicted to be below the recommended limit of 10 hours per year within 50 m of the dwelling (6 hours per year). Note this is a vacant dwelling which is associated with the Project.

Associated Dwelling ID 270 is predicted to experience theoretical shadow flicker durations below the recommended limit of 30 hours per year within 50 m of the dwelling (16 hours per year). When considering the likely reduction due to cloud cover and rotor orientation, the shadow flicker at the associated dwelling is also predicted to be below the recommended limit of 10 hours per year within 50 m of the dwelling (6 hours per year).

Based on the results of the shadow flicker assessment, the assessment concludes that the Project is predicted to meet the applicable shadow flicker limits and no specific mitigation measures will be required.

6.3 Noise and Vibration

A Noise and Vibration Assessment (NVA) has been prepared by Sonus Pty Ltd (Sonus) to assess the potential noise and vibration impacts associated with the Project. The NVA has also been subject to peer review undertaken by SLR Consulting Australia Pty Ltd (SLR) (refer to **Appendix 11**). Following completion of the Peer Review the comments and suggested edits made by SLR were considered by Sonus and relevant updates were made to the NVA. The assessment has been prepared to address the SEARs for the Project which specify that the NVA must:

- assess wind turbine noise in accordance with the NSW Wind Energy: Noise Assessment Bulletin (EPA/DPE, 2016) (Noise Bulletin)
- assess noise generated by ancillary infrastructure in accordance with the NSW Noise Policy for Industry (EPA, 2017) (NPfI)
- assess construction noise under the Interim Construction Noise Guideline (DECC, 2009)
- assess traffic noise under the NSW Road Noise Policy (DECCW, 2011)
- assess vibration under the Assessing Vibration: A Technical Guideline (DECC, 2006).

As outlined in **Section 2.3** , potential social amenity impacts associated with noise and vibration were raised as a concern by some members of the community during the stakeholder engagement process. The NVA addresses potential noise impacts associated with the construction and operation of the Project with particular focus on potential noise impacts to non-associated dwellings surrounding the Project Area. The outcomes of the assessment are summarised below with the full report attached as **Appendix 10**.

6.3.1 Methodology

The predictions of environmental noise from the Project were based on the CONCAWE noise propagation model and SoundPLAN noise modelling software. The CONCAWE noise propagation model is consistent with the requirements of the Noise Bulletin and is considered to accurately predict the noise from WTG operation. The sound propagation model considers the following influences:

- sound power levels of each individual noise source
- the locations of noise sources
- separation distances between noise sources and dwellings
- local topography
- influence of the ground
- air absorption
- meteorological conditions.

The CONCAWE model divides meteorological conditions into six separate “weather categories”, depending on wind speed, wind direction, time of day and level of cloud cover. Weather category 1 provides weather conditions with the lowest propagation of noise and weather category 6 provides worst cast (highest noise level) conditions. The assessment was based on weather category 6 (providing for a conservative assessment) representing temperature inversion and wind conditions that assist with the propagation of WTG noise.

6.3.1.1 Criteria

Noise criteria have been established in NSW to assist in minimising the noise impacts of development. By meeting the criteria, it is not intended that people will not to hear any noise from a development but that the noise is not intrusive. The Project has been assessed against the relevant criteria as outlined in **Table 6.5** as part of the NVA.

Table 6.5 Noise Impact Assessment Criteria

Aspect	Criteria
WTG operation	The predicted equivalent noise level (LAeq,10 minute), adjusted for tonality and low frequency noise in accordance with these guidelines, should not exceed 35 dB(A) or the background noise (LA90,10 minute) by more than 5 dB(A), whichever is the greater, at all relevant receivers for wind speed from cut-in to rated power of the WTG and each integer wind speed in between.
Tonality	The Noise Bulletin prescribes a 5 dB(A) penalty adjustment (added to the measured or predicted noise level) for the presence of repeated and excessive tonality and/or low frequency which occurs for more than 10% of an assessment period. The NVA reviewed tonality for the proposed WTGs and found that the turbines do not have tonal characteristics. Therefore, the NVA, does not apply an adjustment for tonality.
Low Frequency Noise	To determine if excessive low frequency noise is present, the Noise Bulletin requires that the low frequency noise be assessed at non-associated residential receiver locations.
Ancillary Infrastructure	35 dB(A) (LAeq, 15 minute) for ancillary infrastructure at all locations
Construction Criteria	The Interim Construction Noise Guideline (ICNG) (Department of Environment & Climate Change) provides an emphasis on implementing “feasible” and “reasonable” noise reduction measures and does not establish mandatory objective criteria. However, the Construction Noise Guideline does establish different “management levels” based on the existing RBL including: • Standard Construction hours: • Noise Affected – RBL + 10 dB = 45 dB(A) • Highly Noise Affected – 75 dB(A) • Outside Standard Construction hours: • Noise Affected – RBL + 5 =35 dB(A)
Blasting	Air-blast overpressure is 115 dB (Lin, Peak) the level of 115 dB may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB (Lin, Peak) at any time. Maximum level for ground vibration is 5mm/s (peak particle velocity (PPV) the level of 5mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10mm/s at any time.
Traffic Noise	Freeway/Arterial/Sub-Arterial Roads LAeq (15 hour) 60 (external) – Day 7am to 10pm

The traffic impacts associated with the Project will predominantly occur during construction. However, it should be noted that the NSW Road Noise Policy criterion/classification applies to an ongoing operation, as distinct to a temporary process and as such provides a conservative criterion for comparison with the predicted noise levels during construction.

6.3.1.2 Noise Monitoring Program

Background noise monitoring was undertaken at four dwellings in the vicinity of the Project Area between 6 May 2021 and 1 August 2021 (refer to **Figure 6.7**). The monitoring was conducted in accordance with the Noise Bulletin and locations were selected based on initial noise predictions for the preliminary Project layout. Local weather loggers were also deployed to determine the periods where weather may have influenced the measured background noise levels.

The background noise levels were then analysed in accordance with the Noise Bulletin to establish the operational noise criteria for non-associated dwellings (refer to **Table 6.6**). As noted in **Table 6.5**, in accordance with the Noise Bulletin, the criteria is based on measured background noise (LA90,10 minute) plus 5 dB(A). As indicated in the table, the criteria are different at different wind speeds as the background noise level changes at different wind speeds.

Table 6.6 Project Noise Criteria – WTG Noise

Dwelling ID	Noise Criteria for Integer Hub Height Wind Speed (dB(A))									
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s
6	37	36	36	36	37	38	39	40	40	40
29	38	37	37	37	38	38	39	39	40	39
219	35	35	35	35	35	35	35	35	37	38
270	35	35	35	35	35	35	35	35	35	35

6.3.2 Noise Impact Assessment

The key findings of the NVA are summarised in the following sections, further detailed is provided in **Appendix 10**.

Noise Predictions

The noise level from operation of WTGs has been predicted for all wind speed scenarios relevant for operation of the WTGs, as outlined in **Table 6.7** (note that results are only presented for non-associated dwellings where the predicted noise level is greater than 30 dB(A)). The assessment includes predictions at different wind speeds as the noise from the WTGs is different depending on how fast it is turning.

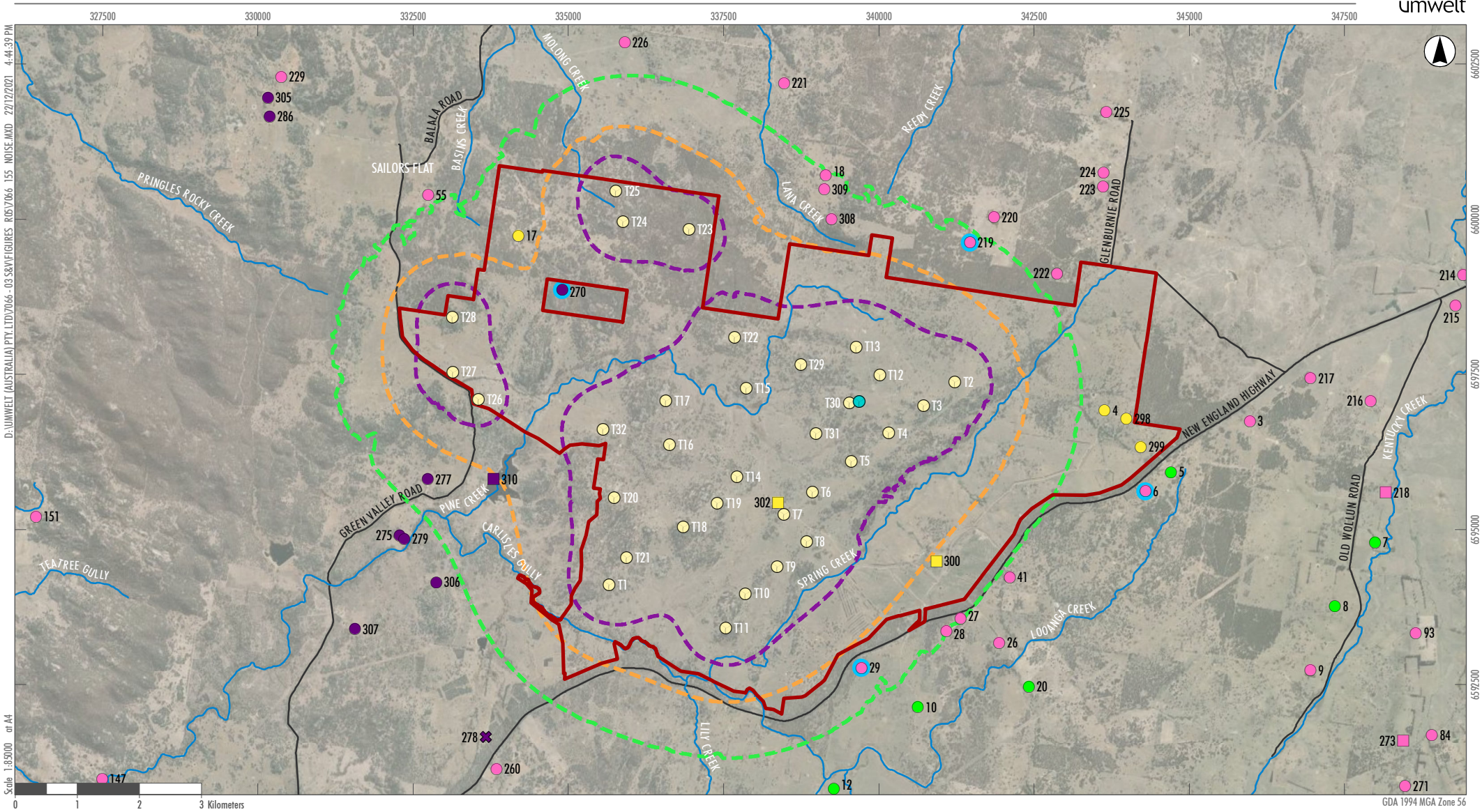
Table 6.7 Wind Farm Noise Predictions at Dwellings

Dwelling ID	Predicted Noise Level at Hub Height integer wind speeds (dB(A))																			
	3 m/s		4 m/s		5 m/s		6 m/s		7 m/s		8 m/s		9 m/s		10 m/s		11 m/s		12 m/s	
	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction
Non-Associated Dwellings																				
18	35	20	35	20	35	21	35	23	35	26	35	28	35	30	35	31	37	31	38	31
27	38	20	37	20	37	21	37	23	38	26	38	28	39	31	39	31	40	31	39	31
28	38	20	37	21	37	21	37	23	38	26	38	29	39	31	39	31	40	31	39	31
29	38	23	37	23	37	23	37	25	38	28	38	31	39	33	39	33	40	33	39	33
55	35	19	35	20	35	20	35	22	35	25	35	28	35	30	35	30	35	30	35	30
219	35	21	35	21	35	22	35	23	35	26	35	29	35	31	35	32	37	32	38	31
308	35	23	35	23	35	23	35	25	35	28	35	31	35	33	35	33	37	33	38	33
309	35	21	35	22	35	22	35	24	35	27	35	30	35	32	35	32	37	32	38	32

The NVA found that highest predicted low frequency noise level at any non-associated dwellings is less than 52 dB(C), which is less than the 60 dB(C) criterion. Therefore, further assessment of low frequency noise is not required for the Project.

Based on the predictions above, the noise from the 32 WTGs will achieve the operational noise criteria of 35dB(A) at all non-associated dwellings in the vicinity of the Project Area. The predicted noise level contours at the hub height wind speed corresponding to the WTG maximum sound power levels (wind speed of 10m/s) are shown on **Figure 6.7**. It is noted that these results do not mean that noise from the WTGs will not potentially be audible, but that the noise levels will meet relevant noise criteria which have been designed to protect noise amenity and avoid intrusive noise impacts.

The NVA notes that once the detailed design is complete, a pre-construction noise assessment will be made based on the final WTG model selection, layout, guaranteed sound power levels, consideration of tonality and low frequency noise from the WTGs, and final agreements with landowners. This pre-construction noise assessment will ensure that the noise impacts of the final design comply with the relevant criteria and are generally consistent with or lower than the noise impacts predicted in the NVA.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Noise Monitoring Location
- Host Landholder - Dwelling
- Host Landholder - Vacant Dwelling
- Associated Landholder - Dwelling
- Associated Landholder - Vacant Dwelling
- Associated Landholder - Derelict Dwelling
- Non-Associated Landholder - Stage 2 Dwelling
- Non-Associated Landholder - Dwelling
- Non-Associated Landholder - Vacant Dwelling

Predicted Noise Level

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

FIGURE 6.7

Noise Prediction Contours

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)

6.3.2.1 Ancillary Infrastructure

An assessment of noise from ancillary infrastructure has also been undertaken for the Project. The proposed substation will include a transformer and the noise from the transformer has been identified as the having the highest potential to generate noise impact and has therefore been assessed against the noise criteria. No other infrastructure are expected to generate any appreciable levels of noise.

A noise level of less than 15 dB(A) is predicted (well below the 35 dB(A) criteria) for the closest non-associated dwellings, under worst case weather conditions and therefore no noise impacts are predicted from ancillary infrastructure.

As for the WTGs, a pre-construction noise assessment will be undertaken for the proposed substation following completion of the detailed design.

6.3.2.2 Construction

The equipment and construction activities associated with the Project will vary throughout the construction phase. The predicted noise from construction activity is presented in the NVA as a typical worst case (highest noise level – weather conditions conducive for the propagation of noise when receivers are downwind) scenario for the various stages of construction. The assessment is based on construction activities occurring within standard and outside of standard construction hours.

All non-associated dwellings are separated by 2000m or more from the closest proposed WTG location and 2700m or more from the closest proposed temporary concrete batching plants.

Table 6.8 and **Table 6.9** provide summaries of the predicted noise levels for the construction of the WTGs and the construction of the access tracks, respectively, and identifies the minimum separation distance required to achieve the "noise affected" management level of 45 dB(A). These predictions conservatively assume that all main plant and equipment operates concurrently.

Table 6.8 Predicted WTG construction noise levels

Phase	Main Plant and Equipment	Separation to Achieve 45 dB(A)	Nearest Dwelling ID (non-associated)	Approx. Distance to Activity	Predicted Noise Level (dB(A)
Site Set-Up and Civil Works	Generator, Transport truck, Excavator, Low loader	1100 m	55	2000	37
Hard Stand Construction	Mobile crushing and screening plant, Dozer, Roller, Low loader, Tipper truck, Excavator, Scraper, Transport truck	1800 m	55	2000	43
Excavation and foundation construction	Excavator, Front end loader, Mobile crushing and screening, plant, Truck-mounted concrete pump, Concrete mixer truck, Mobile crane, Transport truck, Tipper truck	1700 m	55	2000	42

Phase	Main Plant and Equipment	Separation to Achieve 45 dB(A)	Nearest Dwelling ID (non-associated)	Approx. Distance to Activity	Predicted Noise Level (dB(A)
Electrical Installation	Rock trencher, Concrete mixer truck, Low loader, Tipper truck, Mobile crane	1800 m	55	2000	43
Turbine Delivery and Erection	Extendable trailer truck, Low loader, Mobile crane, Support crane, Grinder, Rattle Gun	1100 m	55	2000	37

The results in **Table 6.8** show that the WTG construction noise levels are predicted to be below the "noise affected" management level of 45 dB(A) at all non-associated dwellings.

Table 6.9 Predicted access construction noise levels

Phase	Main Plant and Equipment	Separation to Achieve 45 dB(A)	Dwelling ID	Approx. Distance to Activity	Predicted Noise Level (dB(A)
Road upgrades, Track Construction	Mobile crushing and screening plant, Dozer, Roller, Tipper truck Excavator, Scraper, Transport truck	1800 m	28	400	58
			27	600	54
			29	1100	52
			41	1300	49
			26	1300	49
			10	1300	49

Based on the predicted noise levels for access track construction in **Table 6.9**:

- during standard hours construction will potentially be at noise levels of greater than 45 dB(A) for some activities at six non-associated residences (being locations with Dwelling ID 10, 26, 27, 28, 29 and 41) when activity is occurring in the vicinity of these residences. However, the predicted noise levels are significantly less than 75 dB(A) (the point where there may be strong community reaction to noise).
- as road construction is linear work, the exceedance will be temporary as construction continues along the length of the road or access track.

In addition to construction activities during standard hours, some activities may need to be undertaken outside of these "standard hours". These activities may include the operation of a batching plant and concrete pouring at WTG sites early in the morning (prior to 7 am). The predicted noise level for these activities is outlined in **Table 6.10**. As indicated in the table, the outside of standard hours construction activities will satisfy the 35 dB(A) criterion. Any other construction proposed outside of standard hours would require assessment should such as need arise.

Table 6.10 Predicted construction noise levels outside standard construction hours

Phase	Main Plant and Equipment	Separation to Achieve 35 dB(A)	Dwelling ID	Approx. Distance to Activity	Predicted Noise Level (dB(A)
Batching	Front end loader, Truck	2400 m	29	2700m	33
Concrete Pour	Generator, Truck, Concrete pump	1900 m	55	2000m	34
Turbine Erection	Crane, lights, pressure washer, impact drivers, bolt tensioner	1500	55	2000m	25

It should be noted that separation distances greater than the distances presented in the above tables will result in lower noise levels. Additionally, it is important to note that the construction activities and associated noise impacts are temporary.

Neoen will develop a CEMP and OEMP which will include all feasible and reasonable noise control strategies. Noise mitigation and management requirements applicable to the Project are outlined in **Section 6.3.3**.

In relation to vibration, it is expected that the main sources of construction vibration will be the rock trenching equipment and roller operation during the road and hardstand construction. Typically, the distances required to achieve the relevant construction vibration criteria are in the order of 20 m. At a distance of 100 m, vibration from the proposed construction activities is unlikely to be detectable and no vibration effects are predicted at any non-associated dwellings during construction. As all non-associated dwellings are well beyond 100 m from all construction locations no vibration impacts are predicted.

In relation to blasting, the final blasting methodology will be designed by a suitably qualified blasting specialist during the detailed design and construction phase to ensure the Project criterion are achieved. A design and assessment will be undertaken for each blast prior to implementation and the scale of the blast managed to meet criteria.

The NVA indicates for a charge mass per delay of 80 kg, a minimum separation in the order of 500 m is estimated to be required for a confined blasthole charge to achieve an airblast overpressure no greater than 115 dB (Lin, peak). Therefore, this criteria can be achieved at all non-associated dwellings for blasting at all WTG sites as the nearest non-associated dwelling is approximately 2000 m from the nearest WTG. To achieve a ground vibration peak particle velocity (PPV) no greater than 5mm/s, a minimum separation distance in the order of 300 m is required based on a charge mass of 80 kg. The Project ground vibration criterion of 5 mm/s is therefore also expected to be readily achievable at all non-associated dwellings for blasting at all WTG sites.

In the event that blasting is required, a blast monitoring program will be developed and implemented as part of the CEMP.

6.3.2.3 Traffic Noise Impacts

Traffic generation associated with the Project will predominantly occur during construction and will include semi-trailers, low loaders, trucks, mobile cranes, water tankers, four-wheel-drive vehicles and passenger vehicles. Traffic movements associated with the operations phase will be minimal.

Dwelling setback distances in the vicinity of the Project Area are understood to be greater than 40 m from the New England Highway. Based on peak volume of traffic at all times, and assuming a 50/50 split of traffic approaching the Project Area from the north and south, a noise level of 50 dB(A) will be achieved.

The above assessment demonstrates that the additional vehicle movements would achieve the 60 dB(A) criterion and would not contribute to the criterion being exceeded when considered with the existing traffic volumes on the New England Highway.

Notwithstanding the above, in accordance with the general principles of dealing with temporary construction noise impacts, Neoen will implement appropriate mitigation measures to reduce construction traffic noise where feasible and reasonable (refer to **Section 6.3.3**).

6.3.3 Management and Mitigation

The NVA indicates that, without any noise mitigation measures, the noise from the operation of the 32 WTGs will achieve the operational noise criteria of 35dB(A) at all non-associated dwellings in the vicinity of the Project Area.

Based on the predictions, the relevant operation and construction noise and vibration criteria can be achieved under worst case meteorological conditions at all dwellings with the implementation of relevant noise management measures. The proposed mitigation and management measures are summarised below:

Scheduling:

- Construction works, other than non-noise generating works such as office work, including heavy vehicle movements into and out of the site, will generally be restricted to standard construction hours between 7 am and 6 pm Monday to Friday, and between 8 am and 1 pm on Saturdays. Works carried out outside of the hours will be limited to:
    - works that do not cause noise emissions above 35 dB(A) at any nearby non associated dwellings
    - the delivery of materials as requested by Police or other authorities for safety reasons
    - emergency work to avoid the loss of lives, property, and/or to prevent environmental harm, or
    - works where Neoen demonstrates and justifies a need to operate outside the recommended standard hours.

Location of Fixed Construction Noise Sources:

Fixed construction noise sources such as crushing and screening plant, concrete batching plant, generators and compressors will be located at the maximum practicable distance to the nearest non-associated dwellings, and where practicable, use existing topography (or raw or processed materials) to block line of sight between the fixed noise source and the non-associated dwelling.

Acoustic Screens around Fixed Noise Sources:

Neoen will provide acoustic screens or mounding for fixed crushing/screening plant and concrete batching plants wherever these noise sources are located within 2400 m of a non-associated dwelling and do not have direct line of sight blocked by site topography. These screens or mounds will be:

- located as close as practicable to the noise source

- constructed from mounding using excavated soil from the site or a material with a minimum surface density of 10 kg/m^2, such as 1.2mm thick sheet steel or 9mm thick compressed fibre cement sheeting, or use proprietary barriers such as the FlexShield “Sonic Quilt”
- constructed to a minimum height that blocks direct line of sight between the noise source and any non-associated dwellings within 2400 m
- constructed such that air gaps or openings at joints between sections of the acoustic screens are minimised.

Neoen will provide proprietary acoustic enclosures for site compressors and generators located within 2400 m of a non-associated dwelling.

Neoen will investigate and implement alternative construction processes where feasible and reasonable to reduce noise (e.g. hydraulic or chemical splitters as an alternative to impact rock breaking and the use of broadband reversing alarms in lieu of the high-pitched alarms).

The CEMP will include the following site management measures:

- site works will be centralised within the site and materials stored as far from dwellings as practicable
- works will be undertaken to reduce noise levels wherever possible (no excessive dropping of materials from height to reduce peak noise events)
- plant known to emit noise strongly in one direction, such as the exhaust outlet of generator set, shall be orientated so that the noise is directed away from noise sensitive areas if practicable
- machines that are used intermittently shall be shut down in the intervening periods between works or throttled down to a minimum
- worksite induction training will cover noise reduction requirements for all construction staff
- all equipment will have Original Equipment Manufacturer (OEM) mufflers (or better) installed
- equipment will be maintained and fitted with adequately maintained silencers which meet the OEM design specifications, additionally inspection monitoring will be undertaken. If plant and equipment is determined to be noisier than other similar machines replace or rectify as required.

Community Consultation

Neoen will implement the following noise related requirements into the overall community consultation process:

- community information newsletters (including via website) providing details of the construction plan, duration of the construction phases and contact details of relevant project team members (Project Manager and/or site Environmental Representative)
- a feedback mechanism for the community to submit questions to the construction team, and for the construction team to respond
- regular updates on the construction activities to local authorities to assist in complaint management if necessary.

Additionally, prior to any construction activity outside of standard work hours occurring within 2000 m of a non-associated dwelling, or significant construction traffic periods or impacts on local roads, Neoen will contact (within a reasonable timeframe before the proposed works) the local community potentially affected by the proposed works to provide the location of the work, the day(s) and date(s) of the work, the hours involved and the contact details of the Project Manager and/or site Environmental/Community Representative.

Blasting

In the event that blasting is required:

- a blasting methodology will be designed by a blasting specialist during the detailed design phase to design blasts to comply with the criterion
- a monitoring regime will be developed and implemented as part of the CEMP to monitor compliance with relevant blasting criteria.

Traffic Noise

To reduce potential noise impacts associated with construction traffic movements, Neoen will:

- communicate with the affected community in accordance with the commitments outlined above
- manage traffic movements to avoid excessive acceleration of trucks and the use of truck engine brakes in close proximity to non-associated dwellings, particularly through towns and in the vicinity of the proposed intersection providing access to the Project Area
- provide information regarding the transport route to all construction staff and the need to minimise impacts through driver operation (e.g. restricting use of engine brakes) at certain locations
- schedule construction traffic deliveries such that they are as evenly dispersed as practicable
- restrict traffic movements to the day-time operating hours (as far as practicable), subject to the justifications for activity outside of this time as detailed above.

6.4 Biodiversity

A detailed assessment of the impacts of the Project has been completed and a Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt. During the stakeholder engagement process impacts to biodiversity associated with effects on the natural landscape and altered land use were raised as a concern by the community (refer to **Section 5.1**).

Neoen has sought to avoid, minimise and mitigate biodiversity impacts in the first instance as part of the Project design and has preferentially utilised already cleared and/or disturbed vegetation within the Development Corridor instead of impacting intact patches of native vegetation. To provide a conservative assessment of potential impacts on biodiversity, the predicted impacts associated with the Project represent worst-case conservative estimates and opportunities to further reduce biodiversity impacts will be explored during detailed design. Neoen is committed to managing biodiversity impacts during the construction and operations phase of the Project through implementation of management plans that will include controls to minimise impacts on biodiversity, refer to **Section 6.4.3.2**.

As discussed in **Section 3.1**, The assessment of the Project has focused on a Development Corridor, which forms a buffer to the conceptual project layout (50 m buffer either side of the centreline of internal access tracks and a 140 m buffer to the WTG locations). The BDAR includes the assessment of the Development Corridor, however, full disturbance of the Development Corridor will not occur. The Development Corridor is established and assessed to provide the necessary flexibility for the detailed civil design and refinement of the WTG layout through the assessment process and pre-construction phase. This approach provides for further design refinement and micro-siting practices to be applied post approval.

The findings of the BDAR (including proposed mitigation and offsetting strategies) are summarised in the following sections with the full report attached (refer to **Appendix 12**).

The BDAR has been prepared in accordance with the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the SEARs which require:

- assessment of biodiversity values and the likely biodiversity impacts of the development, including impacts associated with transport route road upgrades, in accordance with the BC Act including a detailed description of the proposed regime for 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
- assessment of the impact of the Project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines and considering cumulative effects of other wind farms in the vicinity
- assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities and a description of the measures to minimise and rehabilitate impacts.

6.4.1 Methodology

The BDAR included a detailed biodiversity field survey that was initially undertaken across both the Stage 1 (this Project) and Stage 2 areas of the Thunderbolt Energy Hub project. When the Project was reduced to just the Stage 1 area, the survey then refined in on this area using the results from the Stage 2 area where appropriate. The progressive results of the surveys and the vegetation mapping were used by Neoen to assist in designing the Project to minimise impacts on biodiversity.

Targeted and opportunistic surveys for threatened species were undertaken across the wider Project Area during 2020 and 2021. **Table 6.11** outlines the dates, methods and species targeted during the surveys.

Table 6.11 Biodiversity Survey Overview

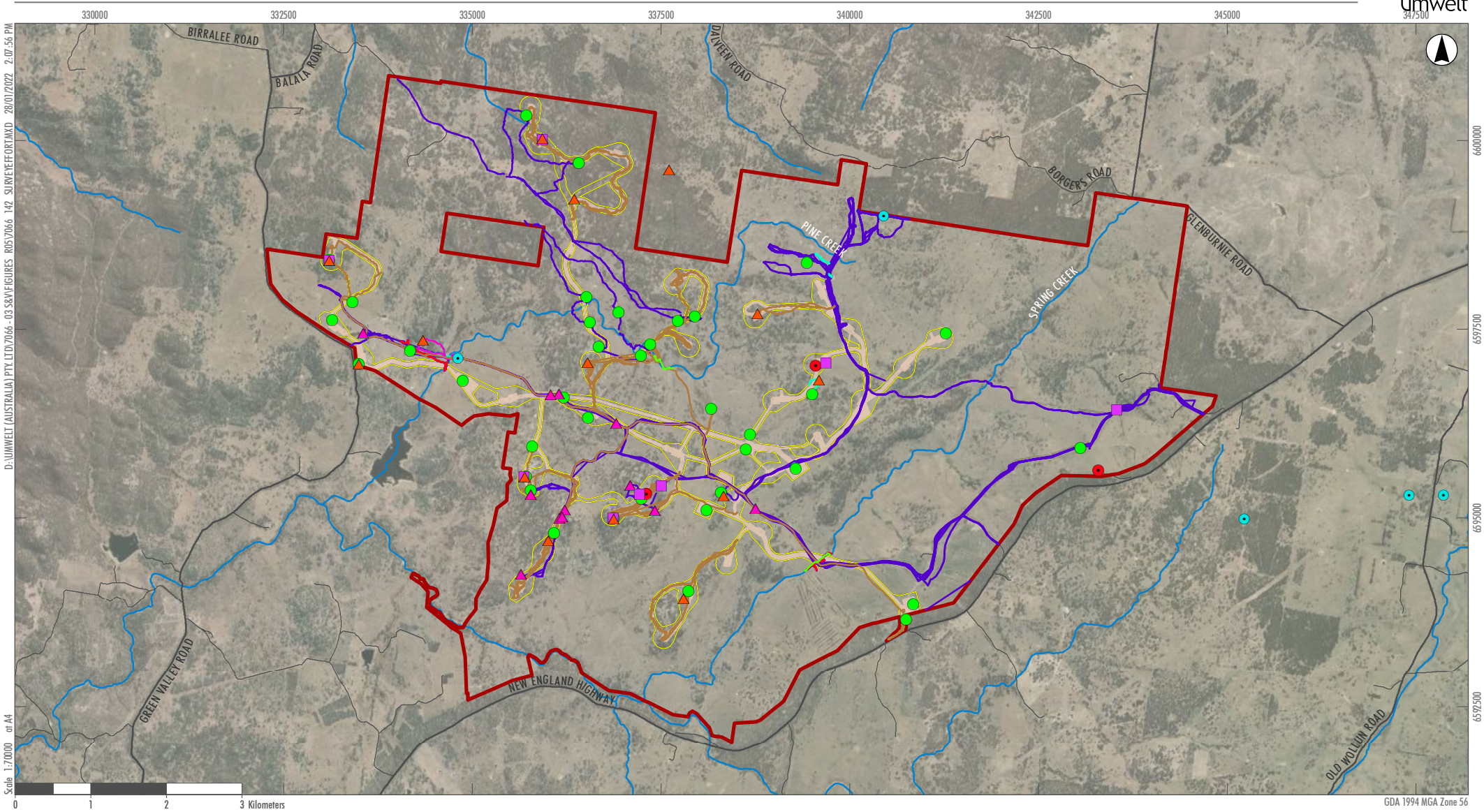
Survey Date	Method	Species Targeted
3 May 2020 - 4 May 2020	BAM vegetation integrity plots Rapid vegetation assessments General meandering transects Habitat assessment	*Dichanthium setosum,* silky swainson-pea, large-leafed monotaxis, finger panic grass, Mckies stringybark Narrow-leaved black peppermint, Muellers eyebright *Thesium austral,* Bush stone-curlew, Glossy Back Cockatoo, Forest owls, Koala, Pale-headed snake
19 May 2020 – 22 May 2020	Rapid vegetation assessments General meandering transects Anabat ultrasonic detectors	*Dichanthium setosum,* finger panic grass, Mckies tringybark, Narrow-leaved black peppermint, Large-eared Pied bat, Eastern bent wing bat

Survey Date	Method	Species Targeted
25 August 2020 – 27 August 2020	Winter bird survey Call playback Bird utilisation surveys General meandering transects Habitat assessment	Glossy black cockatoo, Regent honey-eater, Swift parrot Little eagle, Square-tailed kite, White-bellied sea-eagle Koala, powerful owl, masked owl, barking owl, squirrel glider, Bush stone-curlew, Mckies stringybark, Narrow-leaved black peppermint
2 December 2020 -4 December 2020	Amphibian Survey transects Reptile Survey transects	Booroolong Frog, Tusked Frog , Pale-headed snake
8 February 2021 – 11 February 2021	Summer bird survey Call playback Rapid vegetation assessments General meandering transects Habitat assessment	*Dichanthium setosum,* silky swainson-pea, Large-leafed monotaxis, finger panic grass, Mckies stringybark, Narrow-leaved black peppermint, Muellers eyebright *Thesium austral,* Regent Honeyeater, Swift Parrot, Bush Stone-curlew, Glossy Black Cockatoo, Forest owls, Koala Pale-headed snake
08 February 2021 – 12 March 2021	Baited trail cameras	Eastern Pygmy possum, Koala, Rufus bettong, Squirrel glider
9 March 2021 - 12 March 2021	BAM vegetation integrity plots Rapid vegetation assessments General meandering transects Habitat assessment Spotlight Survey Amphibian Survey Reptile Survey	*Dichanthium setosum,* silky swainson-pea, large-leafed monotaxis, finger panic grass, Mckies stringybark, Narrow-leaved black peppermint, Muellers eyebright *Thesium austral,* Bush Stone-curlew, Tusked frog Booroolong frog, Pale-headed snake
16 June 2021 – 18 June 2021	Winter bird survey Bird utilisation surveys General meandering transects Habitat assessment	Glossy black cockatoo, Regent honey-eater, Swift parrot Little eagle, Square-tailed kite, White-bellied sea-eagle Koala, Mckies stringybark, Narrow-leaved black, peppermint
26 August 2021 - 27 August 2021	BAM vegetation integrity plots General meandering transects Bird utilisation surveys	Glossy black cockatoo, Regent honey-eater, Swift parrot Little eagle, Square-tailed kite, White-bellied sea-eagle Koala, Mckies stringybark, Narrow-leaved black peppermint
5 October 2021 – 8 October 2021	BAM vegetation integrity plots Rapid vegetation assessments General meandering transects Habitat assessment Bird utilisation surveys	silky swainson-pea, large-leafed monotaxis, Mckies stringybark, Narrow-leaved black peppermint, Muellers eyebright, *Thesium austral,* Small snake orchid, Bush Stone-curlew, Glossy Black Cockatoo, Koala
5 October 2021 – 8 October 2021	Anabats	Large-eared Pied bat, Eastern Bent-winged Bat
5 October 2021 – 21 January 2022	Baited trail cameras (10)	Eastern Pygmy possum Koala Rufus bettong Squirrel glider
17 January 2022 – 21 January 2022	BAM vegetation integrity plots Targeted threatened flora survey Targeted amphibian surveys Reptile Surveys	Mckies stringybark Narrow-leaved black peppermint Bluegrass finger panic grass Muellers eyebright *Thesium australe* Tusked frog Booroolong frog *Broad-tail gecko*

In addition to the above threatened species surveys, a total of 38 BAM vegetation sampling plots were undertaken within the Stage 1 Project Area (refer to **Figure 6.8**).

Threatened flora species were targeted during vegetation and habitat assessments across the wider Study Area. Surveys for these species focused on plot-based transect surveys and general site wide meanders. No threatened flora species were detected.

Bird and bat utilisation surveys were also undertaken for the Project Area to identify species that could potentially be impacted by WTGs. These surveys include both identifying species present and their utilisation of the airspace that would be impacted by the WTGs.



Legend

- Project Area
- Development Corridor
- Conceptual Layout
- Flora Survey Tracks
- Flora Survey Tracks Jan 22
- Reptile Survey March 21
- Amphibian Survey Dec 20
- Amphibian Survey Jan 22
- Spotlight Survey Mar 21
- Bird Survey Site
- Owl Site
- Rapid Data Points
- BAM Plots
- Camera Trap
- Anabat Location

FIGURE 6.8

Survey Effort

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)

6.4.2 Biodiversity Assessment Results

6.4.2.1 Plant Community Types and Vegetation Zones

Surveys identified five Plant Community Types (PCTs), with various condition types, as well as exotic vegetation (refer to **Figure 6.9**). These were:

- PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion: Moderate Good (51.42 ha)
- PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion: Derived Native Grassland (72.23 ha)
- PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion: Exotic (50.30 ha)
- PCT 510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion: Derived Native Grassland - Low (5.39 ha)
- PCT 510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion: Moderate Good (4.58 ha)
- PCT 510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion: Derived Native Grassland - Moderate (1.55 ha)
- PCT 542 Stringybark - Rough-barked Apple - cypress pine shrubby open forest of the eastern Nandewar Bioregion and western New England Tableland Bioregion: Moderate Good (4.12 ha)
- PCT 559 Youmans Stringybark - Mountain Gum open forest of the western New England Tableland Bioregion: Moderate Good (18.14 ha)
- PCT 582 Sedgeland fens wetland of impeded drainage of the Nandewar Bioregion and New England Tableland Bioregion: Moderate (3.21 ha).
- PCT 510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion: Planted Vegetation (0.56 ha)

Detailed descriptions of the vegetation zones are outlined in the BDAR (refer to **Appendix 11**).

6.4.2.2 Threatened Ecological Communities

Three of the vegetation zones mapped within the Project Area conform to State and/or Commonwealth listed Threatened Ecological Communities (TEC).

Two State listed (BC Act) TECs occur within the Development Corridor (refer to **Table 6.12**).

Table 6.12 Summary of TECs listed under the NSW BC Act located within the disturbance area

Threatened Ecological Community listed under the NSW BC Act	Vegetation Zone	Impact Area (ha)
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions CEEC	VZ4: PCT 510- Moderate Good VZ5: PCT 510 – DNG – Low VZ6: PCT 510 - DNG - Good VZ10: PCT 510 – Planted Vegetation	5.39 4.58 1.55 0.56
Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregion EEC	VZ8: PCT582- Moderate	3.21

One EPBC Act listed TEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC occurs in the Development Corridor (refer to **Table 6.13**).

Table 6.13 Summary of TECs listed under the Commonwealth EPBC Act

Threatened Ecological Community listed under the Commonwealth EPBC Act t	Vegetation Zone	Area (ha)
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland **CEEC**	VZ4: PCT 510- Moderate Good VZ6: PCT510 – DNG Good	5.39 1.55

6.4.2.3 Threatened Species

The NSW BAM that guided the completion of the BDAR categorises threatened species as ecosystem credit species and species-credit species. Credits are required for impacts on species-credit species but not for ecosystem credit species as they are considered to be already covered by credits generated for impacts on native vegetation. The BAM calculator used for the BDAR predicts the species-credit species that may occur in the Project Area and requires consideration of these species in the assessment.

Threatened species recorded during field surveys are displayed on **Figure 6.11.**

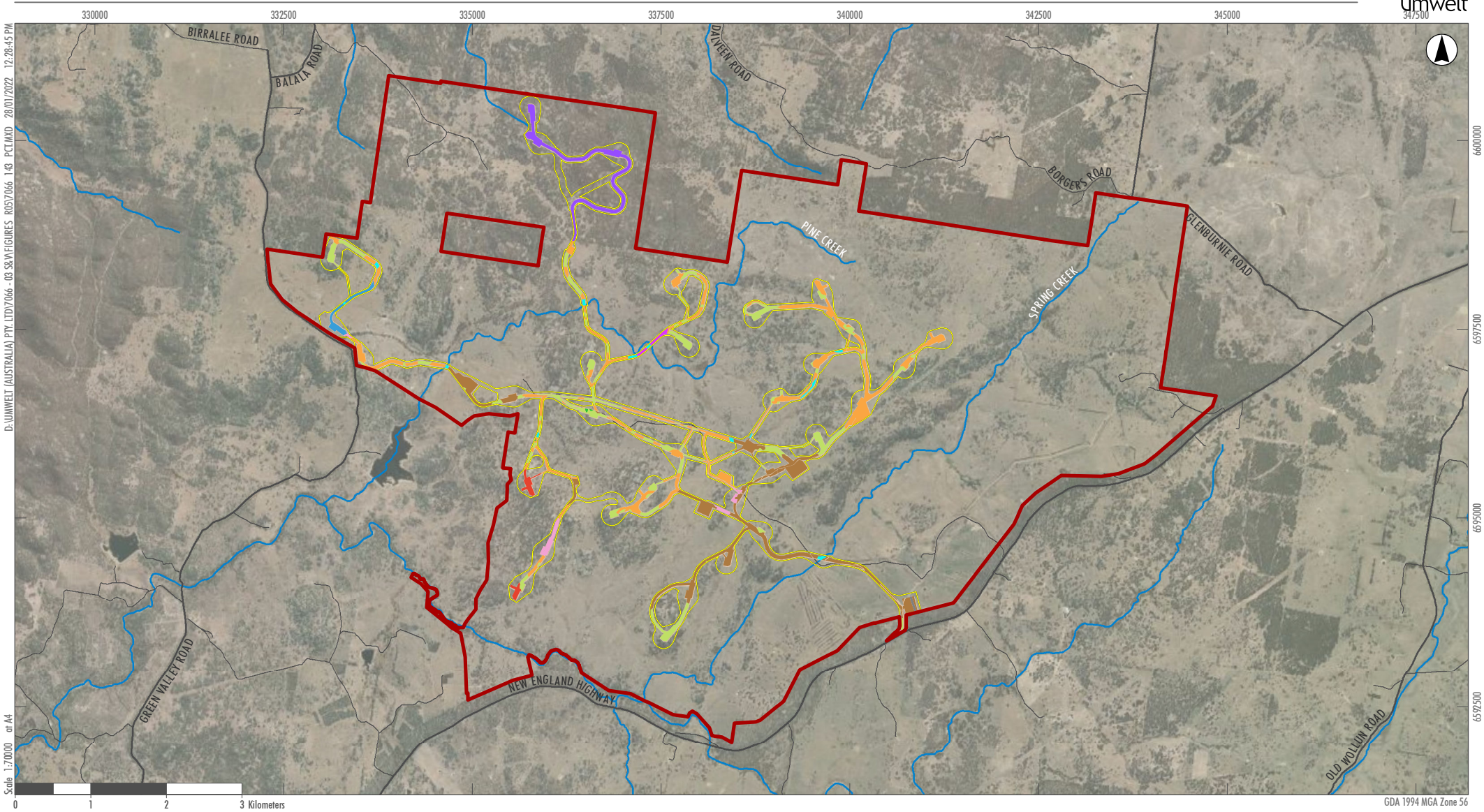
Two koalas (*Phascolarctos cinereus*) were recorded within the Development Corridor whilst undertaking vegetation surveys during October 2021 and on four remote trail cameras between October 2021 and January 2022. The two koalas observed during vegetation surveys were in the same tree (*Angophora floribunda*). It appeared that one koala was an adult and the other a possible juvenile individual. The two individuals were observed within a patch of vegetation dominated by rough-barked apple (*Angophora floribunda*) and silvertop stringybark (*Eucalyptus laevopinea*). This patch is located within a corridor of wooded vegetation connecting vegetation from the south-west which is predominantly Blakely's red gum (*Eucalyptus blakelyi*) to larger patches of remnant vegetation in the north-east.

The four cameras where Koalas were recorded were spread across the Development Corridor. At one location a Koala was recorded on six separate nights across the four months. The camera that was located near the visual observation of the Koalas captured a mother carrying a juvenile on her back.

The area of habitat for the koala in the Development Corridor has been determined through consideration of vegetation composition including presence of potential koala feed trees and is shown on **Figure 6.12**. The mapped area covers approximately 80 ha.

Vegetation with a canopy and moderate to good connectivity is present throughout the wider Development Corridor which would allow for Koalas to move across the landscape relatively unimpeded and within vegetated areas that would provide a level of protection from predators in the locality. While it is recognised that the koala may at times utilise the grassland areas as a passage to move between better quality habitat, the lack of trees that could be used by the koala means that these areas are unlikely to sustain a population.

The threatened flora species *Dichanthium setosum* (Blue Grass) was detected during vegetation mapping surveys within the Stage 2 area (south of the New England Highway). The Development Corridor shares similar vegetation attributes with Stage 2, where adequate targeted surveys for this species has not occurred and potential habitat is likely to be present, this species has been assumed present within the Development Corridor. The area of habitat for this species is shown on **Figure 6.13** and occupies approximately 69 ha.



Legend

- Project Area
- Development Corridor
- Conceptual Layout

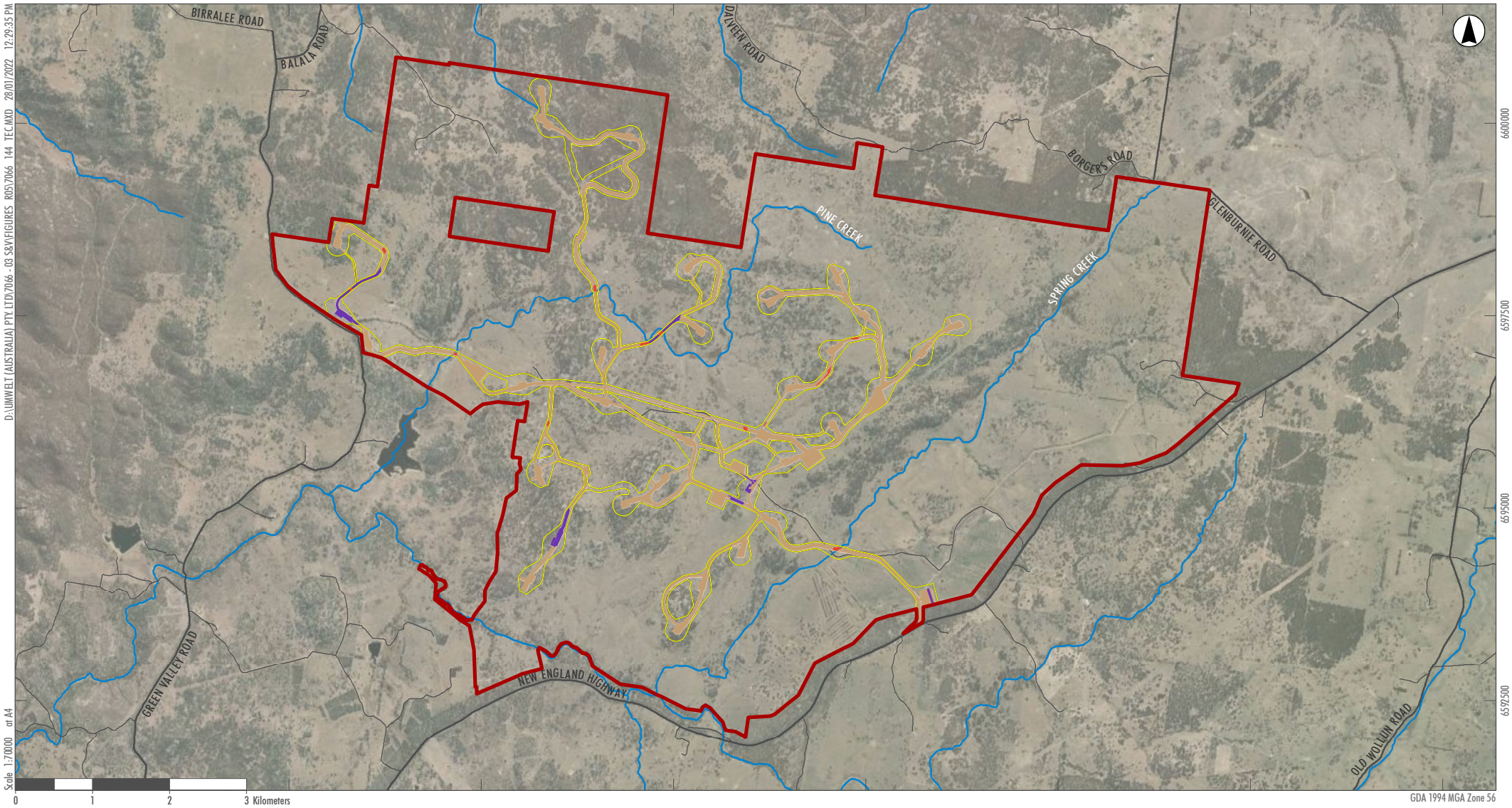
PCT Code and Condition

- N/A - Cleared and disturbed land
- N/A - rock
- PCT 501 - DNG
- PCT 501 - Exotic Grassland
- PCT 501 - Moderate Good
- PCT 510 - DNG Low
- PCT 510 - DNG Moderate
- PCT 510 - Moderate Good
- PCT 510 - Planted Vegetation
- PCT 542 - Moderate Good
- PCT 559 - Moderate Good
- PCT 582 - Moderate

FIGURE 6.9

Plant Community Types

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)



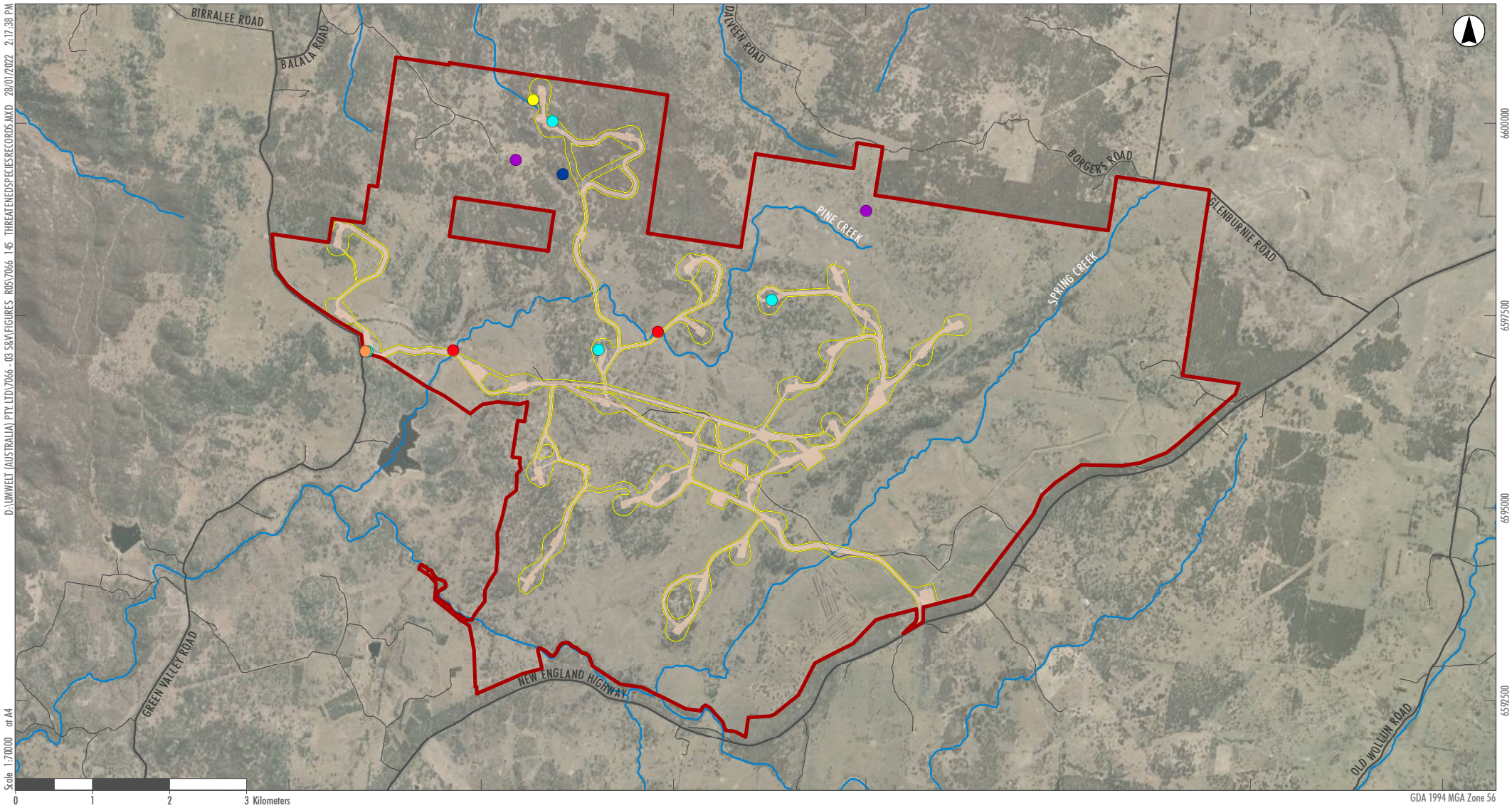
Legend

- Project Area
- Development Corridor
- Conceptual Layout
- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions EEC
- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
- Nil

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)

FIGURE 6.10

Threatened Ecological Communities



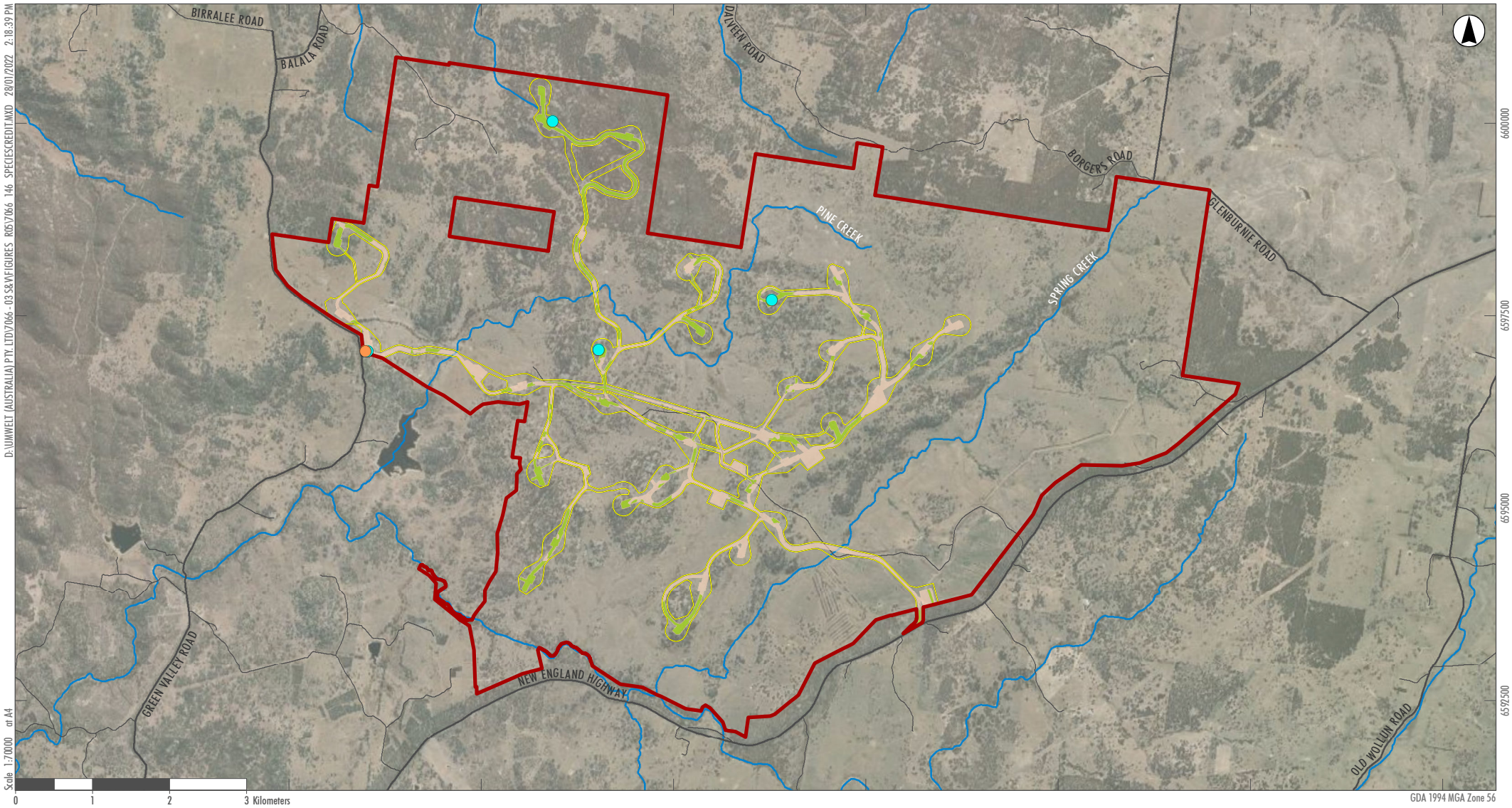
Legend

- Project Area
- Development Corridor
- Conceptual Layout
- Dusky woodswallow
- Latham's snipe
- Scarlet robin
- Speckled warbler
- Koala (Camera Trap)
- Koala (Observed)

FIGURE 6.11

Threatened Species Records

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)



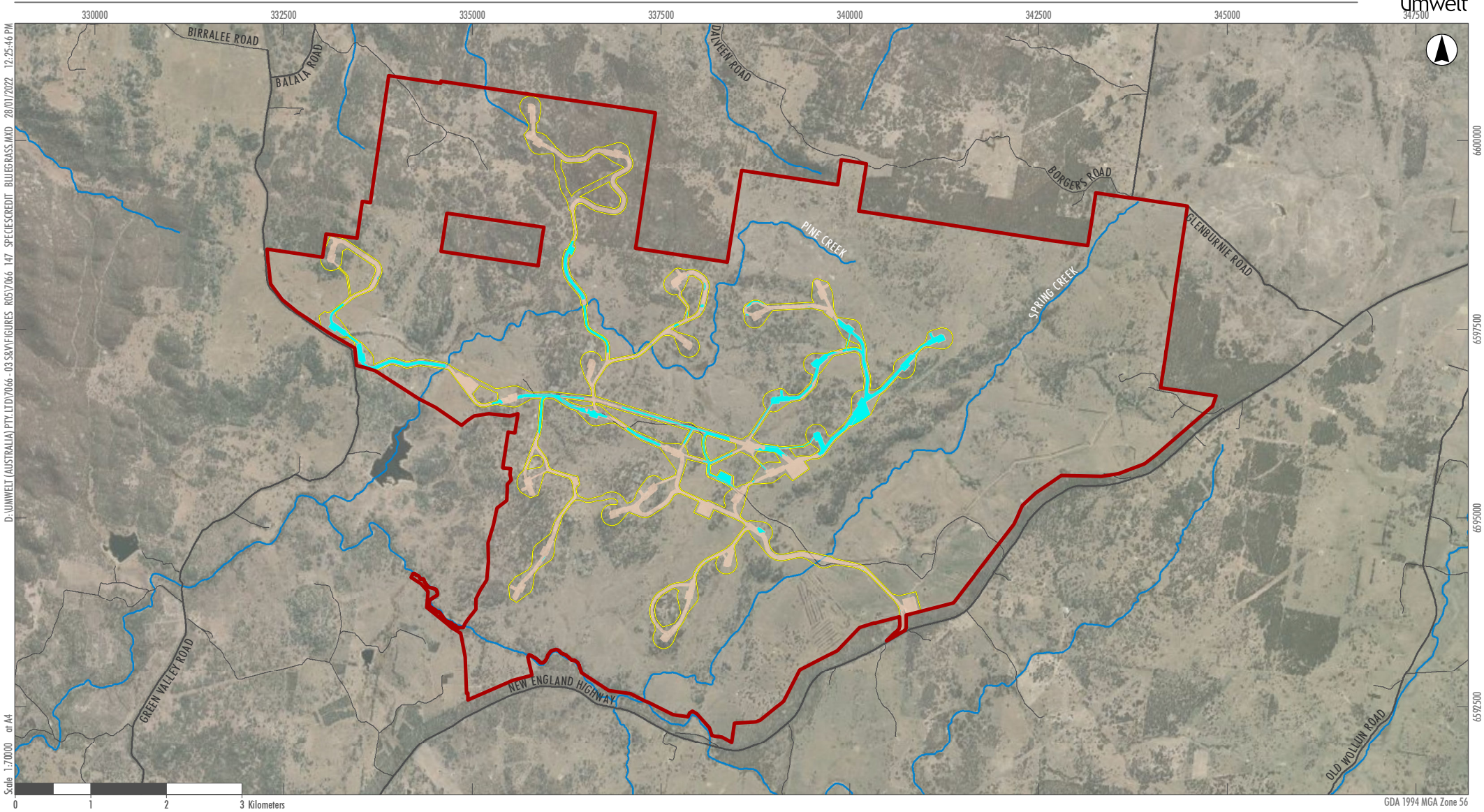
Legend

- Project Area
- Development Corridor
- Conceptual Layout
- Koala (Camera Trap)
- Koala (Observed)
- Koala Habitat

FIGURE 6.12

Species Credit Species Polygons
Koala

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)



Legend

- Project Area
- Development Corridor
- Conceptual Layout
- *Dichanthium setosum* Habitat

FIGURE 6.13

Species Credit Species Polygons
Dichanthium setosum

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2021)

6.4.2.4 Aquatic Habitats

The Development Corridor intersects Pine Creek (3rd order) and Spring Creek (4th order). These two tributaries were observed to be intermittent flowing streams with patchy vegetation instream that has created areas of standing water. Both creeks have exposed habitat features such as rocky banks and a mixed exotic and native sedge/grass cover along each bank. Canopy cover was generally absent from the two creeks during survey where they intersect with the Development Corridor but was observed to persist along Pine Creek in areas where amphibian surveys were undertaken outside the Development Corridor.

Several un-named, ephemeral, first and second order tributaries also occur within the Development Corridor. These are degraded drainage lines that have been subject to ongoing pastoral and agricultural disturbances, and do not provide high quality habitats for threatened flora and fauna species.

Neither the Development Corridor nor the Project Area support aquatic habitat identified as threatened Freshwater Fish Communities, Key Fish Habitat or Species Habitat as listed and mapped by Department of Primary Industries (DPI).

6.4.3 Avoidance and Mitigation of Impacts

The biodiversity assessment commenced early in the design process which has allowed initial ecological survey works to inform the conceptual layout of the Project. To avoid impacts on native vegetation the current design has focused on locating as much of the infrastructure and temporary construction areas within exotic and/or previously cleared grassland areas (some of which is derived native grassland) with low biodiversity value. This method has resulted in the majority of the associated impacts being within these areas. Avoiding remnant vegetation in the higher elevation areas has been difficult considering the requirement to locate WTGs in elevated locations in order to access stronger wind resource. Where possible, previously cleared areas on hill tops and existing tracks have been prioritised for the location of infrastructure to reduce the overall impacts on native vegetation. Impacts are also minimised by the nature of the Project, with most of the required infrastructure being narrow linear roads and easements that will still facilitate the movement of threatened species within the landscape.

Areas of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC have been avoided, where possible, with only a relatively small area of 8.56 ha of moderate to good condition vegetation and a further 5.66 ha of heavily grazed DNG proposed to be impacted.

6.4.3.1 Avoidance of Prescribed Impacts

The following impacts are considered 'prescribed impacts' under the *Biodiversity Conservation Regulation 2017*:

- impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation
- impacts on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- impacts of wind turbine strikes on protected animals, and
- impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

As discussed above, Neoen has sought to avoid and minimise the potential impacts on the ecological values of the Project Area primarily through general avoidance of remnant vegetation and careful placement of the proposed infrastructure. The Development Corridor has been located in an area of relatively low biodiversity value (primarily on cleared agricultural lands), resulting in reduced disturbance to native vegetation and fauna habitats.

Further detail on the assessment of prescribed impacts is outlined in **Section 6.4.4.3**.

6.4.3.2 Minimisation and Management of Impacts

Neoen has committed to the design and implementation of a comprehensive biodiversity mitigation and management strategy to minimise the unavoidable impacts of the Project on biodiversity values. The following Management Plans will be prepared and implemented post approval as part of the Biodiversity Management strategy:

- Biodiversity components as part of the CEMP and OEMP, including the measures outlined below
- Bird and Bat Adaptive Management Plan (BBAMP).

The BBAMP will be prepared to measure any impacts on aerial fauna by the Project. The plan will develop trigger levels and mitigation measures designed to manage such impacts through Project operation, in consultation with BCD. The BBAMP will including monitoring impacts which will include baseline monitoring and ongoing monitoring. The development and implementation of the BBAMP is an integral part of understanding and managing impacts to bat and bird species and a key mitigation measure to address the prescribed impacts associated with turbine strike (refer to **Section 6.6.7**).

The following specific control measures will be implemented to minimize the impacts of the Project:

- Salvage of biodiversity features, including habitat resources (e.g. hollow logs, tree hollows, fallen timber and rocks/boulders) from areas to be cleared
- implementation of a pre-clearing procedure to minimise the potential for impacts on native fauna species (focusing on threatened species, including hollow-dependent and ground-dwelling fauna)
- Koala sighting register
- Non-inhibiting fauna fencing
- Traffic control
- weed management
- fencing and access control
- bushfire management
- erosion and sedimentation control
- workforce education and training on minimising biodiversity impacts including on the key measures in place around clearing.

Each of these minimisation and management measures will be included in the CEMP and OEMP. Further detail is provided in **Appendix 5** and **Appendix 11**.

6.4.4 Assessment of Biodiversity Impacts

6.4.4.1 Impacts on Native Vegetation and Habitat

Direct impacts associated with the Project include the loss of vegetation and fauna habitat as a result of the construction and operation of the Project. The disturbance area associated with the Project generally contains habitat features such as fallen logs and hollow-bearing trees, and threatened species habitat amongst patches of remnant vegetation and scattered trees in derived grasslands. In addition, species credit species have been recorded, therefore these species and their habitat will be directly impacted.

Table 6.14 below outlines the direct impacts on native vegetation. It is important to note that although the assessment has focused on the development corridor, this approach is to provide flexibility in detailed design. The entire Development Corridor will not be disturbed, the total Project related disturbance within the Development Corridor is estimated to be approximately 215 ha. An additional 3.54 ha of non-native vegetation consisting of cleared tracks and rocky substrates would also be directly impacted.

Table 6.14 Direct Impacts on Biodiversity Features

Species	Area within the Development Corridor (ha)
Plant Community Type	
TCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion moderate good condition	51.42
PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion derived native grassland condition	72.23
PCT 501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion exotic condition	50.30
PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion moderate good condition	5.39
PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion Derived Native Grassland	4.58
PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion Derived Native Grassland - Moderate	1.55
PCT 542 Stringybark - Rough-barked Apple - cypress pine shrubby open forest of the eastern Nandewar Bioregion and western New England Tableland Bioregion moderate good condition	4.12
PCT 559 Youman's Stringybark - Mountain Gum open forest of the western New England Tableland Bioregion moderate good condition	18.14
PCT Sedgeland fens wetland of impeded drainage of the Nandewar Bioregion and New England Tableland Bioregion moderate condition	3.21
PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion – Planted Vegetation	0.56
Species Habitat	
Blue grass (*Dichanthium setosum*)	68.96
Koala (Phascolarctos cinereus)	79.56

6.4.4.2 Indirect Impacts

The Project is unlikely to result in any substantial indirect impacts on biodiversity values outside of the disturbance area with the exception of the prescribed impacts discussed in the section below. Indirect impacts associated with noise, dust and weeds may occur during construction and operation. With regard to potential impacts on biodiversity, there will be little substantial change to water, weed species, pest animal, lighting or air quality related impacts given that the land is already disturbed as a result of on-going agricultural practices and the Project will not result in significant changes to these impacts. Whilst noise impacts will occur, they will generally comply with relevant guidelines and construction impacts will be primarily daytime only. It is not expected that noise will result in significant indirect impacts on fauna. While the Project itself is permanent, construction, which is where many of the impact will occur, is a temporary activity. Any additional impact resulting from the Project is not expected to be of any level of significance in relation to threatened species, populations, and communities, given that the Development Corridor occurs in an already disturbed landscape surrounded by tracks, roads and agricultural activities.

6.4.4.3 Prescribed Impacts

The BDAR includes an assessment of prescribed impacts (as described in **Section 6.4.3.1**). The potential prescribed impacts associated with the Project include impacts to habitat connectivity, wind turbine strike and vehicle strike.

Habitat connectivity

The Development Corridor is located within a landscape of fragmented patches of woody vegetation amongst large areas of agricultural lands used for grazing. Woody vegetation that is likely to be utilised by arboreal species such as the koala, is generally restricted to the upper hills and hill slopes. However, the Project will result in areas of woody vegetation being removed. The linear nature of the Project would see narrow areas of vegetation removal that would result in minor impacts on connectivity across the landscape. At no point will vegetation removal result in the cessation of a movement corridor, as the retention of surrounding vegetation would facilitate movement of threatened species across the wider Development Corridor.

The removal of paddock trees within DNG areas may result in minor impacts to movement corridors, mainly associated with highly mobile species, as these trees act as ‘stepping stones’ within the wider landscape.

Impacts of wind turbine strikes on protected animals

Detailed Prescribed Impact Assessments have been prepared as part of the BDAR to consider the potential impacts from turbine strikes on significant avifauna species. These assessments have been prepared in accordance with Section 6.1.5 of the BAM (DPIE 2020a) and are provided in full in Appendix F of the BDAR (refer to **Appendix 12**).

Species considered to be the most aerial threatened species and therefore the most likely to be impacted by WTGs were selected for inclusion in this assessment based on the results of bird and bat utilisation surveys. One non-threatened species, the wedge-tailed eagle was also assessed due to its known susceptibility to blade strike.

Of the 15 species assessed, 4 are assigned a High-risk rating and 11 are assigned a Moderate risk rating of being impacted by the Project (refer to **Table 6.15**). No species returned a Very High-risk ranking.

The resultant risk rating for the High-risk species is primarily due to:

- relative abundance in the Project Area and their predicted or observed flight behaviour in the Project Area (large bentwing-bat)
- known susceptibility to blade strike at wind farms in south-east Australia (white-throated needletail)
- potential to fly within the rotor swept area (RSA) and consequence of blade strike to threatened populations (regent honeyeater and swift parrot).

Table 6.15 Risk Assessment Summary

Common Name	Species Name	Likelihood	Consequence	Risk Rating
Large bentwing-bat	*Miniopterus schreibersii oceanensis*	High	Moderate	High
Regent honeyeater	*Anthochaera phrygia*	Moderate	High	High
Swift parrot	*Lathamus discolor*	Moderate	High	High
White-throated needletail	*Hirundapus caudacutus*	High	Moderate	High
Barking owl	*Ninox connivens*	Moderate	Moderate	Moderate
Black-chinned honeyeater	*Melithreptus gularis*	Moderate	Moderate	Moderate
Brown falcon	*Falco berigora*	High	Low	Moderate
Dusky woodswallow	*Artamus cyanopterus*	High	Low	Moderate
Little eagle	*Hieraaetus morphnoides*	Moderate	Moderate	Moderate
Painted honeyeater	*Certhionyx variegatus*	Moderate	Moderate	Moderate
Powerful owl	*Ninox strenua*	Moderate	Moderate	Moderate
Square-tailed kite	*Lophoictinia isura*	Moderate	Moderate	Moderate
Turquoise parrot	*Neophema pulchella*	Moderate	Moderate	Moderate
Wedge-tailed eagle	*Aquila audax*	High	Low	Moderate
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*	Moderate	Moderate	Moderate

The nature of impacts to aerial fauna species from wind energy projects include direct turbine blade strike and barotrauma, the latter being injury caused by a sudden or substantial change in air pressure. While literature exists as to the nature of such impacts, the rate of occurrence and likelihood of impact is very difficult to accurately determine. A contributing factor to this difficulty is the range of environmental variables that interact with such impacts, variables which can differ within a single project at any given time as well as varying between different projects. Additionally, the wind farm industry is currently dealing with challenges relating to vast inconsistencies with the way in which baseline and ongoing monitoring surveys are being undertaken, including how and what data is being collected. Such inconsistencies either prevent or inhibit comparative analysis. It is understood that State and Federal guidelines are currently being prepared to address these challenges.

A Bird and Bat Adaptative Management Plan will be prepared (incorporating baseline and ongoing monitoring programs) to provide a Project-specific framework to measure impacts on aerial fauna species. This plan will include trigger levels and mitigation measures designed to manage such impacts through Project operation.

Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

The Project will result in an increase of vehicle activity within the Development Corridor through the construction and the operation of the Project. The proposed internal access tracks will not be open for public use as they are restricted to the private properties of landholders involved with the Project. Use of these access tracks will be restricted to landholders, Project employees and associated contractors. Internal access tracks will have enforced speed restrictions to adequately reduce the risk of interaction between animals and vehicles. The majority of vehicular traffic will be during construction with only relatively small traffic movements along internal access roads during operation.

Due to the disturbed condition of the Development Corridor, it is unlikely that any threatened species would be adversely impacted by the increase in vehicle movements. The need for avoidance of fauna impact whilst driving, in particular on the koala, including the need to observe site speed limits will be included in site induction training.

6.4.4.4 Serious and Irreversible Impacts

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with the principles prescribed in the BC Regulation. 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.

Six species-credit species predicted by the BAM calculator to occur within the Development Corridor are also listed as serious and irreversible impact (SAII) entities in the *Guidance to Assist a Decision-Maker to Determine a Serious and Irreversible Impact* (DPIE 2019a). For these species the Project is not expected to have an impact that is serious and irreversible and further assessment against the principles is therefore not required.

6.4.4.5 Impacts on MNES

As previously discussed, a "Controlled Action" decision was made by the Minister on 28 October 2021 indicating that the Project will results in a significant impact on MNES.

DAWE determined that the Project will have a significant impact on the following MNES:

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
- Bluegrass (Dichanthium setosum) – Vulnerable.
- koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (*Phascolarctos cinereus*)
- spot-tailed quoll, spotted-tail quoll, tiger quoll (south-eastern mainland population) (*Dasyurus maculatus maculatus*)
- white-throated needletail (*Hirundapus caudacutus*)

In addition, the Commonwealth considered that there is a real possibility that the Project will significantly impact the following species without further detailed assessment of the potential impacts associated with the Project:

- Border-tailed Gecko (*Uvidicolus sphyrurus*) – Vulnerable
- McKie's Stringybark (*Eucalyptus mckieana*) – Vulnerable

Targeted surveys undertaken in accordance with the BAM within the Development Corridor since the Controlled Action decision was made did not record any individuals of these three species and therefore it has been determined they will not be impacted by the Project. Further information is provided in the section below in relation to the species and communities predicted to be impacted, including consideration of the impact of the 2019/2020 bushfires that impacted the northern tablelands region.

Since the preparation of the referral, refinement of the Project and additional impact avoidance and minimization measures have been implemented, reducing the predicted Project impacts from approximately 568 ha to an area of approximately 215 ha. The impact area identified in the Controlled Action decision has therefore been substantially reduced for threatened EPBC Act listed fauna such as the koala, spotted-tail quoll and the white-throated needletail. Additionally, further analysis has also been undertaken of the impacts of the 2019/2020 bushfires to determine whether the outcomes presented in the original referral documentation remain applicable to the refined Project.

A summary of the outcomes of the assessments of significance for the four MNES that are considered by DAWE to be significantly impacted is provided below with further detail provided in the BDAR (refer to **Appendix 12**).

6.4.4.6 Summary of Assessment of Significance Outcomes

White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

The referral assessed impacts of up to 7 ha of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. The Project was considered to have the potential to have a significant effect on the local extent and long-term viability of the box-gum woodland CEEC.

The BDAR notes that refinement of vegetation mapping following the submission of the referral has resulted in a minor decrease in the extent of the community located within the Development Corridor, with a total of 6.94 ha occurring within the proposed disturbance area.

Additionally, further consideration of the impacts of the Project on White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC in the context of the 2019/2020 bushfires since the preparation of the referral has not changed the outcome of the assessment.

DAWE has determined that the Project will significantly impact White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, and the community will require a 'like-for-like' offset through the retirement of credits associated with PCT 510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion.

Bluegrass (Dichanthium setosum)

This species was not recorded in the Development Corridor, however it was recorded by Umwelt within the Stage 2 Area as part of the contextual surveys. This species has been assumed present within the Development Corridor where adequate targeted surveys of potential habitat as it shares (similar vegetation attributes with Stage 2) have not been completed.

Impacts to bluegrass have been amended from the 261 ha presented in the referral to 68.96 ha (reduction of 192.04 ha). The species has been assumed within PCTs which are associated with the species in the Threatened Biodiversity Data collection (TBDC) and condition classes assessed as suitable habitat for the species. The PCTs listed are PCT 501 and PCT 510. The status of PCT 501 is listed as "in progress' therefore a cautionary approach has been taken to include this PCT.

DAWE has considered that there is a real possibility that the Project will significantly impact the bluegrass without further detailed assessment. Based on the assumed impact to 68.96 ha of potential habitat for bluegrass, the species will require a 'like-for-like' offset through the retirement of 1630 species-credit credits.

Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (*Phascolarctos cinereus*)

The referral assessed impacts of approximately 272 ha of potential foraging and breeding habitat for the koala.

With the refinement of the Project, impacts to koala habitat have been reduced from 272 ha to 79.56 ha (reduction of 192.54 ha)**.**

DAWE has determined that the Project will significantly impact the koala, and the species will require a 'like-for-like' offset. This will occur through the retirement of 3220 species credits, as determined by the BDAR.

Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (south-eastern mainland population) (*Dasyurus maculatus maculatus*)

The referral assessed impacts of up to 529 ha of suitable habitat for the spotted-tail quoll. Habitat was assessed in the form of woodland, forest, water and grassland. The referral noted that this was a maximum extent of impact, and the actual impact was expected to be much lower.

The habitat was considered marginal given that it is highly fragmented and there is a low abundance of potential den sites owing to a history of disturbance. There are a handful of records in the local area, but these date back to 2004 and 1980. The Northern and New England Tablelands population outlined in the conservation advice is likely to be an important population, however this population is chiefly resident in Guy Fawkes National Park (~115km), New England National Park (100km) and Oxley Wild Rivers National Park (~70km) in the east. The previous records of the spotted-tailed quoll in the vicinity of the Development Corridor are likely individuals moving through the region and the Development Corridor is unlikely to support a geographically distinct regional population, or collection of local populations of this species given the low-quality habitat present.

The refinement of the area of the Development Corridor and area of disturbance since the referral reduces the impact on suitable habitat for spotted-tail quoll from 529 ha habitat to approximately 215 ha, a reduction of approximately 314 ha.

Further consideration of the impacts of the Project on the spotted-tail quoll in the context of the 2019/2020 bushfires since the preparation of the referral has not changed the outcome of the assessment. While the species is considered to have been significantly affected by the bushfires and noting that any impacts on habitat for the species in bushfire affected areas would have a greater level of significance, the overall outcomes of the assessment have not changed.

DAWE has determined that the Project will significantly impact the spotted-tail quoll, and the species will require a 'like-for-like' offset through the retirement of ecosystem credits.

White-throated Needletail (*Hirundapus caudacutus*)

Potential habitat for the species occurs over the canopy of up to 273 ha of habitat that may potentially be impacted as part of the Project. Thus, the referral assessed impacts of up to 273 ha of potential habitat for white-throated needletail, however it was stressed that this was the maximum area of impact and actual impacts were expected to be much less.

Impacts to the white-throated needletail have been reduced from 273 ha presented in the referral to approximately 215 ha (reduction of approximately 58 ha). Further consideration of the impacts of the Project on potential habitat for this species in the context of the 2019/2020 bushfires since the preparation of the referral has not changed the outcome of the assessment.

DAWE has determined that the Project will significantly impact the white-throated needletail, and the species will require a 'like-for-like' offset through the retirement of ecosystem credits. In addition, prescribed impacts on this species will be managed and mitigated through the implementation of the BBAMP.

6.4.4.7 Aquatic Impacts

Impacts to the creeks within the Project Area will be minor and generally restricted to impacts associated with the construction of crossings over the tributaries. It is anticipated that water quality will be temporarily affected at these locations during construction and impacts will be controlled through the implementation of proposed erosion and sediment control mitigation measures (refer to **Section 6.9.7**).

6.4.5 Biodiversity Credit Impact Summary

The NSW BAM requires the use of an online calculator and project specific survey and impact data to calculate the number of biodiversity credits that account for the impact of a project on biodiversity. The proponent must then offset these credits as part of progressing the development if it is approved.

The biodiversity credits generated by Project impacts are provided in **Table 6.16**. These credits will require offsetting under the BAM as part of the implementation of the Project.

Table 6.16 Impacts Requiring Offset

Veg Zone	PCT/Species-credit species	Area (ha)	Credits Required
1	501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion - *Moderate Good*	51.42	2,192
2	501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion - *Derived Native Grassland*	72.23	1,047
3	501 Bendemeer White Gum - Silvertop Stringybark - Rough-barked Apple +/- Moonbi Apple Box grassy open forest of the southern New England Tableland Bioregion - *Exotic*	50.30	0
4	510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion - *Moderate Good*	5.39	262
5	510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion - *Derived Native Grassland*	4.58	62

Veg Zone	PCT/Species-credit species	Area (ha)	Credits Required
6	510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion Derived Native Grassland - Moderate	1.55	36
7	542 Stringybark - Rough-barked Apple - cypress pine shrubby open forest of the eastern Nandewar Bioregion and western New England Tableland Bioregion - *Moderate Good*	4.12	143
8	559 Youmans Stringybark - Mountain Gum open forest of the western New England Tableland Bioregion - *Moderate Good*	18.14	640
9	582 Sedgeland fens wetland of impeded drainage of the Nandewar Bioregion and New England Tableland Bioregion - *Moderate*	3.21	71
10	510 Blakelys Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion – Planted Vegetation	0.56	17
		Ecosystem Credit Total	**4,470**
-	Blue grass (*Dichanthium setosum*)	138.3	1,594
-	Koala (*Phascolarctos cinereus*)	80.5	3,220
		Species Credit Total	**4,814**

6.4.6 Biodiversity Offset Strategy

Neoen is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. The biodiversity offset strategy will be developed during the assessment process in consultation with BCDS, DPIE and DAWE; and based on the credits required to be retired to offset the impacts of the Project and the offset options available under the BC Act and BC Regulation including:

- Land based offsets through the establishment of new Stewardship Sites (and subsequent retirement of credits) or by retiring credits from existing Stewardship Sites
- Securing (purchasing) credits through the open credit market, and/or
- Paying into to the Biodiversity Conservation Fund (BCF).

The current base case option for credit retirement will be the use of the NSW Biodiversity Conservation Fund which will enable retirement of all required credits at the time required. Whilst the use of the fund is currently planned, Neoen is actively investigating other options and has actively consulted with landholders in the locality about the potential to establish Stewardship Sites for the purpose of generating suitable ecosystem and species credits to retire for the Project through the available like-for-like and variation rules.

If the option of a local Stewardship Site is pursued, any surplus ecosystem and/or species credit liability for the Project will be done so through the other approved offsetting options within NSW.

6.5 Traffic and Transport

A Traffic and Transport Impact Assessment (TIA) has been prepared by Access Traffic to assess the potential traffic impacts associated with the Project. The TIA has been prepared to address the SEARs for the Project which required the EIS to:

- assess the construction, operational and decommissioning traffic impacts of the development on the local and State road network (including New England Highway, Kentucky Road, Noalimba Avenue, Oxley Highway, Wollun Woolbrook Road, Old Wollun Road, Traceys Road, Reeves Road, Westvale road, Gunnalong road, Pine Creek road, Walcha Stock Route Road, Borgers Road Rimbanda road and any other roads proposed to be used)
- 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)
- assess 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
- assess 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
- an assessment of the likely transport impacts to the site access and haulage routes, site access point, any rail safety issues, any Crown Land, 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
- 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.

The outcomes of the assessment are summarised below, with the full report attached as **Appendix 13**.

6.5.1 Existing Road Network

The Project Area is accessed directly from the New England Highway. The main construction transport route applicable to the Project Area is the section of the New England Highway between Tamworth and Armidale. The road links identified to form part of the turbine transport routes from the port facilities in Newcastle to the Project Area are shown in **Figure 3.7**. The construction phase of the Project is not anticipated to lead to increases in traffic on Kentucky Road, Noalimba Avenue, Oxley Highway, Wollun Woolbrook Road, Old Wollun Road, Traceys Road, Reeves Road, Westvale Road, Gunnalong Road, Pine Creek Road, Walcha Stock Route Road, Borgers Road and Rimbanda Road as these roads are unlikely to be used.

The TIA has established an estimate of the road link volumes for the relevant section of the New England Highway from the available count data from the TfNSW Station ID T0257 (located 140 m south of Caroline Street in Bendemeer). Station ID T0257 is located south of the Project Area at the intersection of the New England Highway with the Oxley Highway (at Bendemeer) and is therefore likely to have recorded slightly higher volumes than those expected on the relevant section of the New England Highway adjacent to the Project Area. However, the station is expected to provide an appropriate representation of the current background volumes.

At the request of TfNSW, current (2021) background traffic volumes were established using the historical data for 2019 and applying a growth rate of 1% per annum (compound). This is in lieu of the recently recorded count data for 2020 and 2021 which indicate reduced vehicle movements on the network due to the COVID-19 pandemic.

The existing two-lane rural highway configuration of the relevant section of the New England Highway (between Tamworth and Armidale) is considered to have adequate capacity (approximately 12,000 vehicles per day (vpd)) to cater for the current (2021) volumes on the link (approximately 4,330 vpd).

The existing Project Area access point currently caters for a limited number of vehicle movements, including heavy vehicles. The approach of the existing access point to the New England Highway is currently unsealed, with no designated turn lane or property access treatments provided on either New England Highway approach to the access. The TIA indicates that suitable sight distances are available in both directions to/from the existing access point. Although the TIA notes that the crest on the north-east bound New England Highway approach to the access does somewhat restrict sightlines, the elevated side road approach to the highway enables the required safe intersection sight distances to be achieved.

The TIA found that the existing access point on the New England Highway is operating satisfactorily based on current (pre-Project traffic volumes) with a level of service A and an average intersection delay of 0.2 to 0.5 seconds during peak AM and PM periods.

The TIA does not estimate the current operation of the entire transport route associated with the OSOM turbine component delivery (from Newcastle Port to the Project Area) as these movements are expected to be temporary in nature, undertaken outside of peak hours under escort and in relatively low volumes (maximum 18 vpd including 6 OSOM vehicles). It is not anticipated that there will be a significant ongoing impact to the operation or capacity of the relevant road links.

The interactive crash statistic data available from the TfNSW Centre for Road Safety database for the period between 2016-2021 indicates there are 3 recorded crashes within the relevant section of the New England Highway (within 1 km of the Project Area access point in either direction). No crashes have been recorded at the Project Area access point. Based on the low number (3) of recorded crashes, and the spread of the locations along the relevant section of the highway, the TIA concludes there is not any particular existing road feature or design deficiency which is likely to be contributing to crashes in the vicinity of the Project Area.

6.5.2 Methodology and Assumptions

The TIA considers the potential impacts associated with three distinct periods of traffic generation, including the construction, operation and decommissioning phases of the Project. A number of conservatively high assumptions were applied in order to establish the relevant vehicle movements applicable to each phase of the Project.

6.5.2.1 Construction Phase

As previously discussed, the Project will require a construction period of 18-24 months. For the purposes of the TIA, it was conservatively assumed that the overall duration of the construction phase would be 18 months. This represents a worst-case scenario as a shorter timeframe will result in generation of higher daily and peak hour traffic volumes from the construction works. Based on currently estimated Project timing, the construction phase is expected to commence in Q1 2024 (subject to approval) and be completed by the end of Q2 2025 with the peak period of construction expected to occur between Q2 and Q3 2024.

The materials required for the construction of the Project have been estimated to inform the TIA and a number of conservative assumptions have been applied to estimate the number of vehicles associated with potential traffic generating activities including:

- heavy vehicle movements associated with the transport of the various construction materials and equipment, assuming:
    - six OSOM vehicle movements per day associated with the delivery of turbine components
    - 100% of gravel materials for the internal access roads, infrastructure areas and concrete aggregates will be imported from external quarry sources in both Tamworth and Armidale, with no internal sources currently identified within the Project Area
    - 100% of the construction water requirements are currently planned to be imported from external sources in both Tamworth and Armidale.
    - concrete will be sourced from the on-site batch plant facility, with 100% of the associated materials (cement, aggregates etc.) imported to the Project Area.
- Construction workforce vehicle movements including:
    - Maximum (peak) construction workforce of approximately 190 staff (travelling from either Tamworth (50%) or Armidale (50%)).
    - Outside of the peak construction period, construction workforce of approximately 115 staff.
    - Construction staff are expected to commute to the Project Area using a mix of private vehicles (50%) (light vehicles and 4WDs) and minibuses (50%), with an average capacity of 2 staff per vehicle and 15 staff members per bus.

6.5.2.2 Operation Phase

The estimated workforce during the proposed 25–30 year operation phase of the Project (following the completion of the construction stage) is anticipated to be approximately 9 staff who are expected to reside locally to the Project Area and commute daily (most likely to/from Tamworth and/or Armidale). Heavy vehicle movements during the operations phase of the Project are likely to be extremely low (approximately 1 heavy vehicle per week) which is considered to be negligible from a traffic engineering or transport planning perspective.

6.5.2.3 Decommissioning Phase

Given the timeframe associated with the decommissioning works (30 years in the future) the exact nature of the works and associated traffic movements are difficult to predict. However, should the Project be decommissioned at the end of the 25-30 year life, decommissioning works are anticipated to be completed over a 12 month period, with the peak traffic movements to/from the Project Area during decommissioning conservatively estimated to be approximately 70% of the peak construction movements to/from the Project Area (both daily and during AM and PM peak periods).

6.5.3 Traffic Impact Assessment

For the purposes of the TIA, the critical elements of the relevant road network were the identified road links forming the proposed transport routes for the Project, in particular the section of the New England Highway between Tamworth and Armidale and the Project Area access point on the New England Highway (Project Area Intersection) (refer to **Figure 3.6**).

The TIA provides the forecast traffic volumes on the relevant sections of the road network for two scenarios (with and without the Project) for the construction, operation and decommissioning phases. These volumes were then utilised to assess the potential impacts associated with Project Area intersection, road link capacity, pavement impact, road safety and cumulative impacts.

The outcomes of the assessment are summarised below, with further detail provided in **Appendix 12**.

6.5.3.1 Access and Frontage Impact Assessment

The TIA establishes the appropriate turn treatments at the Project Area Intersection with the New England Highway based on the requirements specified in *Austroads Guide to Traffic Management - Part 6: Intersections, Interchanges and Crossings* to reflect the high-speed rural highway traffic environment.

Based on the expected peak hour traffic volumes at the Project Area Intersection during the critical periods of the construction, operations and decommissioning phases of the Project, the TIA indicates that the required intersection treatments at the Project Area Intersection are a basic left and short channelised right turning treatments. This is consistent with the intersection configuration proposed for the Project (refer to **Figure 3.6**).

In addition to the proposed intersection design, the TIA recommends the following:

- required turn treatments at the Project Area Intersection be designed in accordance with Figure 8.2 of Austroads Guide to Road Design Part 4A and Figure A7 of Austroads Guide to Road Design Part 4 respectively.
- Implementation of traffic management measures including advisory ‘truck turning’ signage installed on the New England Highway approaches to the Project Area Intersection during the peak construction phase of the Project, to highlight to motorists the presence of the Project Area Intersection and the potential for turning heavy vehicles to/from the side roads.

6.5.3.2 Intersection Impact Analysis

Traffic modelling (SIDRA analysis) was undertaken to establish the operational performance of the proposed Project Area Intersection considering the AM and PM peak periods for the construction, operation and decommissioning phases of the Project.

This analysis indicates that the proposed Project Area Intersection is expected to operate satisfactorily during the peak construction, operation and decommissioning phase traffic scenarios identified for the Project. All values for intersection degree of saturation, level of service, average delay and vehicle queue lengths being within acceptable limits of operation for a priority-controlled (give-way) intersection.

A summary of the SIDRA results for each the construction stage of the Project (worst case) is provided in **Table 6.17**. The modelling provides a level of performance that represents the quality of service, measured on an A to F scale, with level of service A representing best operating conditions from the traveller's perspective and level of service F the worst.

Table 6.17 Construction Phase SIDRA results – Project Area Intersection/New England Highway

Analysis Scenario	Intersection Degree of Saturation	Level of Service**	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Peak Construction (2024) – Proposed Site Access Intersection Configuration				
2024 AM Peak (Project Traffic)	0.075	LOS A	3.4	1.0
2024 PM Peak (Project Traffic)	0.097	LOS B	1.8	3.0
2024 AM Peak (New England Highway)	0.113	LOS B	1.1	1.4
2024 PM Peak (New England Highway)	0.120	LOS B	1.1	1.4

** LOS value identified is for worst movement at the intersection, not the overall intersection

6.5.3.3 Road Link Capacity Assessment

The assessment of the relevant road links identifies the expected increase in daily traffic volumes on the road network during the key construction, operation and decommissioning phases of the Project, and establishes the level of impact the increase in traffic is anticipated to have on the operation of the relevant road links.

The assessment is primarily focussed on the section of the New England Highway between the regional centres of Tamworth and Armidale, as this link is proposed to be utilised by the majority of the traffic generated by the Project. The results of the assessment indicate the expected construction, operations and decommission phase traffic volumes from the Project would have minimal impact on the relevant section of the New England Highway, with all increases in daily traffic volumes forecast to be less than 5%. All road link volumes including Project traffic were shown to be well within the operating capacity for a two lane rural highway (generally 12,000-15,000 vpd).

On this basis, the TIA indicates that the existing configuration of the relevant section of the New England Highway is easily adequate to cater for the additional traffic volumes generated during all phases of the Project.

6.5.3.4 Pavement Impact Assessment

The TIA includes a high-level review of the potential increases in pavement loading as a result of the construction, operation and decommissioning phases of the Project.

Heavy vehicle movements associated with the construction phase of the Project are expected result in a minor increase in pavement loadings on the relevant section of the New England Highway, with calculated values in the order of 10%. This calculated increase of 10%, when considered over the proposed overall construction period of 18 months, is not considered to lead to a significant impact or reduction to the design life (typically 20 years).

The majority of the turbine component transport routes are comprised of higher order (and volume), State controlled roads. As such it is expected that the existing road pavements on these links would be more than adequate to cater for the increase in pavement loadings from the proposed OSOM turbine transport vehicle movements associated with the Project.

However, the two identified turbine component transport routes, refer to **Section 3.4.4**, propose the use of lower order, local government-controlled road links. These include the City of Newcastle controlled Selwyn Street and George Street (both routes) and the Muswellbrook Shire Council controlled links of Bengalla Road, Wybong Road, Kayuga Road, Ivermein Street, Stair Street and Dartbrook Mine Access Road (Route 2 only). Minor activities may be required along these local roads in order to accommodate the movement of OSOM vehicles. These minor actives are summarised in **Section 3.4.4**.

The operations phase of the Project will only generate relatively low traffic volumes on the network (approximately 10 vpd) with negligible heavy vehicle movements (approximately 1 heavy vehicle per week). Therefore, negligible impact is expected to the operation (and pavement loadings) of all relevant road links.

The decommissioning phase of the Project is forecast to generate lower traffic volumes than the construction phase and for a shorter period and will therefore have minimal impact to the road pavements on the relevant section of the New England Highway.

6.5.3.5 Road Safety

The TIA includes a road safety assessment which establishes the level of risk regarding the existing and expected post development road safety considerations relevant to the Project. The Project is expected to result in an increase in OSOM vehicle movements, an increase in turning vehicle movements at the Project Area Intersection and an increase in vehicle movements along the relevant section of the New England Highway (Tamworth to Armidale). This increase in vehicle movements has the potential to lead to an increase in vehicle conflicts along the relevant sections of the New England Highway.

As previously discussed in **Section 6.5.3.3**, the assessment indicates that even with the addition of the Project traffic (construction, operations and decommissioning) the road link volumes would remain within the capacity of the road link (two lane rural highway – approx. 12,000vpd). Additionally, the proposed intersection would operate with an acceptable level of service during all phases of the Project (refer to **Section 6.5.3.2**).

A Traffic Management Plan (TMP) will also be developed as part of the detailed design phase of the Project. The TMP would also include proposed measures to reduce the impact of Project traffic on the adjacent road network and manage road safety.

6.5.3.6 Cumulative Traffic Impact Assessment

The TIA includes a review of the approved and proposed SSD Projects in the region to determine which projects could potentially lead to an increase in traffic volumes on the sections of the road network relevant to the Project. The majority of the other relevant projects in the region are not considered to contribute to the cumulative traffic impacts of the Project. This is due to either the projects being located in areas which would not lead to an increase in traffic volumes on the relevant section of the New England Highway or the timing of the associated construction phase is expected to be prior to or following that of the Project. The review did, however, identify eight projects (wind, solar and battery storage) located to the north of the Project Area where associated transport movements have the potential to align with the construction phase of the Project.

To assess the cumulative impact a sensitivity analysis was undertaken, applying a 20% increase in the background traffic volumes of the relevant section of the New England Highway for the road link and intersection impacts associated with the Project. This increase is considered conservative and sufficient to account for any likely increase in traffic due to the potential concurrent transport movements of turbine, solar and battery components from the identified projects.

The results of this analysis indicate that the proposed configuration of the Project Area Intersection is expected to operate satisfactorily considering the potential increase in traffic volumes on the New England Highway (refer to **Table 6.18**).

Table 6.18 Construction Phase SIDRA results – Project Area Intersection/New England Highway - Cumulative

Analysis Scenario	Intersection Degree of Saturation	Level of Service**	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Cumulative Peak Construction (2024) – Proposed Site Access Intersection Configuration				
2024 AM Peak (Project Traffic)	0.085	LOS A	3.1	1.0
2024 PM Peak (Project Traffic)	0.116	LOS B	1.6	3.2
2024 AM Peak (Adjacent Road)	0.134	LOS B	1.0	1.5
2024 PM Peak (Adjacent Road)	0.142	LOS B	1.0	1.6

** LOS value identified is for worst movement at the intersection, not the overall intersection

In regard OSOM movements associated with the delivery of turbine components associated with the other identified projects, it is expected that all movements will originate from the Port of Newcastle and follow a similar route to that identified for the Project, via the New England Highway. As all of these OSOM movements will be required to be undertaken under permit, it is expected that restrictions and management measures will be implemented such that it is likely that movements from one site only will occur at any time, to minimise the impacts on the operation of the road links forming part of the identified transport routes. As such, the additional OSOM traffic in the vicinity of the Project Area from the identified projects to the north is anticipated to be limited to turbine transport volumes from one wind farm only at any one time (approximately 20 vpd).

6.5.4 Management and Mitigation

The TIA concludes that the increase in traffic generation anticipated as a result of the construction, operation and decommissioning phases of the Project will have minimal impact on the safety and efficiency of the State and local road network. Neoen proposes the following mitigation measures to appropriately manage and mitigate any potential traffic impacts associated with the Project:

- Completion of minor activities along the identified transport route to accommodate the swept paths of the OSOM turbine component transport vehicles, as outlined in **Section 3.4.3** and identified in the Preliminary Transport Route Assessment for the Project (refer to **Appendix 12**). These works (outlined in **Section 3.4.3**) will be subject to further detailed design prior to construction once the turbine component and transport vehicle configurations are confirmed and consultation with the relevant roads authorities for the proposed works areas.

- Construction of the proposed Project Area Intersection with the New England Highway to provide basic left and short channelised right turn treatments on the New England Highway approaches (refer to **Figure 3.6**), as per Austroads standards.
- Installation of advisory 'truck turning' signage on the approaches to the Project Area Intersection with the New England Highway, to highlight to motorists the potential for turning heavy vehicles to/from the side road.
- Preparation of a TMP in consultation with TfNSW, outlining proposed traffic and transport management measures and processes for all phases of the Project. The management measures will be designed to minimise the impact of Project traffic (including OSOM turbine component transport vehicles) on the external road network.
- Neoen will undertake further consultation with the City of Newcastle (CoN) and Muswellbrook Shire Council (MSC) regarding an infrastructure or maintenance agreement to cover any required mitigation works to manage the expected pavement impacts of the Project on the lower order, local government-controlled road links of Selwyn Street and George Street (CoN - both routes) and Bengalla Road, Wybong Road, Kayuga Road, Ivermein Street, Stair Street and Dartbrook Mine Access Road (MSC - Route 2 only). This would also include pre and post dilapidation inspections to be undertaken on the sections of the local government roads used by Project traffic, with these inspections to be completed by representatives of the Neoen and the relevant Council.

6.6 Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment (ACHA) for the Project was undertaken by Umwelt in consultation with the Registered Aboriginal Parties (RAPs) to assess the Aboriginal heritage values (cultural and archaeological) of the Project Area and surrounds (refer to **Appendix 13**). The ACHA has been prepared to address the SEARs which require an assessment of the impacts of the Project on 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)". The ACHA has considered the Project Area, the Development Corridor, and the broader vicinity.

A summary of the key findings of the ACHA is provided in this section and the full report is provided as **Appendix 13**.

6.6.1 Assessment Approach

The ACHA has been prepared to satisfy the requirements of the:

- *National Parks and Wildlife Act 1974* (NPW Act)
- National Parks and Wildlife Regulation 2009 (NPW Regulation)
- principles of The Burra Charter (Australia ICOMOS 2013)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010)
- key elements of the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010).

The approach taken acknowledged and respected that Aboriginal people have the right to directly participate in matters that may affect their heritage, and have the right to maintain culture, language, knowledge and identity.

The objective of the ACHA was to ensure that Aboriginal people have the opportunity to participate in and improve the outcomes of the assessment by:

- providing relevant information about the cultural significance and values of the Aboriginal objects and/or places
- influencing the design of the method to assess cultural and scientific significance of Aboriginal objects and/or places
- actively contributing to the development of cultural heritage management options and recommendations for any Aboriginal objects and/or places
- being provided with a draft of the assessment report and inviting comment on the draft before they are finalised and submitted as part of this EIS.

6.6.2 Consultation Process

As a result of the Project Notification process, 14 RAPs registered an interest in the Project and have been part of an active consultation process in relation to identifying and assessing the significance of the Aboriginal Cultural Heritage Values/Aboriginal objects and/or places and determining and carrying out appropriate strategies to mitigate impacts upon Aboriginal heritage.

Throughout all stages of the assessment process, the RAPs were invited to identify how they would like to participate in the Project's ACHA process, including what cultural information they wanted to share to inform the assessment process, and what information (if any) should remain non-disclosed in the assessment and reporting process. The understanding of significance and the management recommendations provided by the RAPs have informed Neoen in its development of cultural heritage management measures for the Project.

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 Clause 60 of the NPW Regulation.
- **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 works.

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. The consultation process is outlined in **Table 6.19** with further detail relating to the consultation is provided in **Appendix 14**.

Table 6.19 ACHA Consultation Process Overview

Consultation	Timing
Public advertisement providing notification of assessment and opportunity to register interest for consultation.	14 November 2020
Provision of letter (via email) requesting identification of Aboriginal parties with cultural knowledge/interest in the Project area	16 November 2020
Provision of letter (via email or post) to identified Aboriginal parties requesting registrations of interest	14 December 2020
Methodology letter sent via email to the representative Aboriginal Parties with EOI for fieldwork	18 January 2021
Fieldwork – in field consultation	28 April – 12 May 2021
Email to RAPs advising of change in project and requirement for additional survey	11 August 2021
Fieldwork – in field consultation	15-17 September 2021
Draft ACHA provided to RAPs for review and comment	10 November 2021
Follow up email sent to RAPs regarding review of ACHA	17 December 2021

Following the completion of initial survey, the extent of the Project was modified separating the Project into two stages, with the Project as proposed in this EIS to include Stage 1 only. In addition, the turbine and infrastructure layout within the Stage 1 Project Area was refined and incorporated some changes from that subject to survey in April/May 2021. The RAPs were advised on this change and the requirement to undertake additional survey (consistent with the previous survey methodology) was identified. The second survey period was undertaken in September 2021.

A copy of the draft ACHA was provided to all registered Aboriginal parties in November 2021 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 ACHA, noting that information on cultural significance and any recommendations provided from an Aboriginal cultural perspective would be documented in the final ACHA. The comments received from the RAPs are included in Appendix 1 of the ACHA which was finalised in January 2022.

6.6.3 Environmental and Cultural Context

Based on a review of the environmental context of the site, it is apparent that much of the Project Area comprises elevated rocky slopes within limited access to reliable water and the associated resources. However, the Project Area does contain two key watercourses (being Spring Creek and Pine Creek) that provided semi-reliable freshwater and supported a range of plant and animal resources used by Aboriginal people. The Project Area has been impacted by land clearance and used for grazing over an extended period, with areas of disturbance concentrated in proximity to water.

A search of the Aboriginal Heritage Information Management System (AHIMS) register and a review of Aboriginal cultural heritage assessments completed in the local area indicates there are twenty-eight sites recorded in the search area (none located within the Project Area), all of which remain valid. Sites containing stone artefacts (artefact scatters and isolated artefacts) are the most common site type, followed by scarred trees (refer to **Appendix 14**).

As previously discussed in **Section 4.1.2**, a portion of the Project Area is within a registered Native Title Claim held by the Gomeroi People. For the purposes of ACHA, it was assumed that the Native Title Claim boundary approximates the extent of Gomeroi (or Gamilaroi) Country in this area. Based on mapping provided by Tindale (1974) and the knowledge held by Aboriginal people in the region today, the remaining portion of the Project Area is within the country of the Anaiwan people of the language group Nganyawana. This is supported by Belshaw (1974) who described the New England Tablelands (hereafter the Tablelands) as a boundary area between 'strong tribal groups in the east and west' and referenced the central section of the Tablelands as being occupied by the Anaiwan.

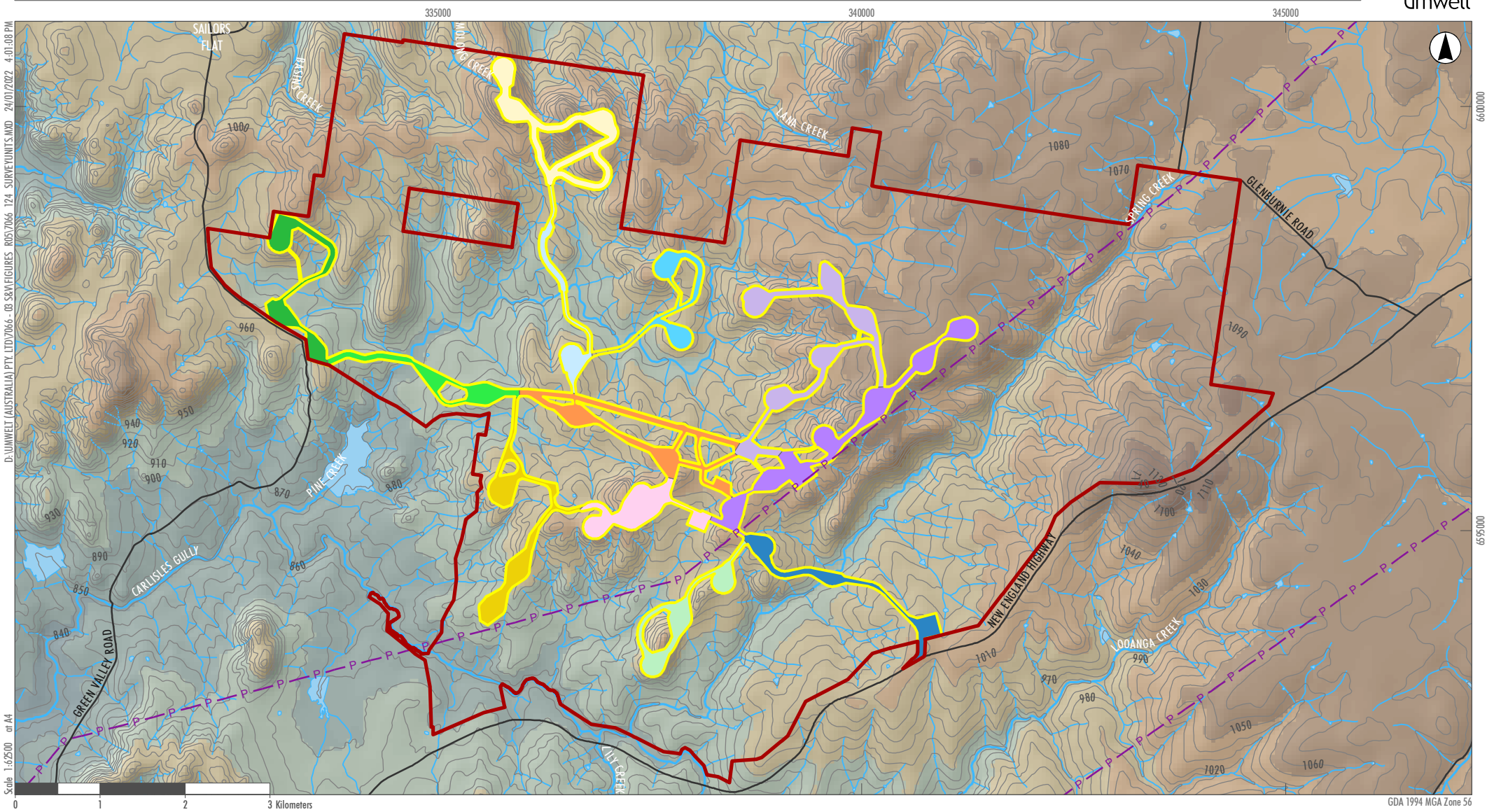
The ACHA notes that there are conflicting historic reports of occupation of the Tablelands by Aboriginal people indicating both seasonal occupations, moving west and east off the table land to avoid colder winter months and year round occupation based on the available resources associated with upland wetlands.

6.6.4 Survey Methodology

The focus of the survey and assessment was the Development Corridor, as Project impacts will be limited to this footprint. The survey was undertaken to ensure a representative sample of all landforms within the Development Corridor was obtained, in compliance with the Code of Practice.

In accordance with the Code of Practice, the survey coverage description includes landform unit, the total area surveyed within the landform unit and the quantification of the level of ground surface visibility and exposure.

The survey of the Development Corridor was conducted by the RAPs and two Umwelt archaeologists over the course of two survey periods. The first survey period extended from 28 April 2021 to 12 May 2021 and included 12 survey units within the Development Corridor (within Stage 1 and 2 Areas) the second survey extended from 15 to 17 September 2021 and focused on the Stage 1 Development Corridor. (refer to **Figure 6.14**).



Legend

- Project Area
- Development Corridor
- P Existing 330kV Power Lines
- Major Watercourse
- Watercourse
- 10m Contours

Survey Unit

- SU1
- SU2
- SU3
- SU4
- SU5
- SU6
- SU7
- SU8
- SU9
- SU10
- SU11
- SU12

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

FIGURE 6.14

Location of Survey Units

6.6.5 Survey Results

6.6.5.1 Potential Sites

During the survey, the RAPs identified several sites that they felt may have cultural value even if not necessarily meeting archaeological criteria for the recording of sites of this type. These sites include four possible scarred trees and five potential stone arrangements, as outlined in **Table 6.20**.

Table 6.20 Potential sites (as requested by Aboriginal parties)

Name	Description
Possible scarred tree 1	Large red gum with irregularly shaped scar approximately 0.75 m long x 0.3 m wide with bulging callus regrowth. The scar twists substantially from top to bottom, potentially as a result of growth of the limb present just above the scar. From an archaeological perspective, this was considered unlikely to be a scar of Aboriginal cultural origin due to the irregularity of the scar and the indication that the scar once extended to the ground but has since healed.
Possible scarred tree 2	Dead tree with relatively small diameter trunk. The scar is present on the south-western face of the tree and measures approximately 1.5 m by 0.1 m with approximately 0.2 m of regrowth. The tree has been subject to significant insect and lightning damage. Based on the size of the tree, the size and shape of the scar and the comprehensive damage to the tree from an archaeological perspective it is considered highly unlikely to be a scar of Aboriginal cultural origin.
Possible scarred tree 3	Large stringybark located on a crest with sub-ovoid scar approximately 2m long x 0.5m wide with up to 30 cm of regrowth. Scar twists from base to top, has irregular scarring at top and extends almost to ground level. Based on the shape of the scar and the presence of comparable damage on the tree, from an archaeological perspective it is considered unlikely to be a scar of Aboriginal cultural origin.
Possible scarred tree 4	Large eucalypt with small scar. Based on the location and dimensions of the scar, it is considered unlikely to be a scar of Aboriginal cultural origin.
Potential stone arrangement 1	This site was identified by Aboriginal parties based on the presence of a group of medium sized rough-edged granite boulders located on top of a large slightly domed granite outcrop. The Aboriginal parties felt that the boulders formed an approximate circle. Water was seeping from an area nearby and it was thought that there may be some association. From an archaeological perspective, there was no clear formation to the boulders nor was there significant difference to the appearance of other rock outcrops in the local area.
Potential stone arrangement 2	This site was identified by one Aboriginal party representative as potentially being a stone arrangement in the form of a seasonal or sun movement calendar. It comprises a large domed granite outcrop with multiple boulders present on the surface over an area of approximately 3.8 m x 1.5 m. From an archaeological perspective, there was no clear formation to the boulders nor was there significant difference to the appearance of other rock outcrops in the local area.
Potential stone arrangement 3	This site comprises an accumulation of granite boulders on a granite exposure. One of these is roughly triangular in shape and sits on edge. Based on the lichen growth, the triangular boulder previously sat flat but has then been turned on edge. From an archaeological perspective, there is insufficient evidence to demonstrate that the stones are in a clear arrangement.
Potential stone arrangement 4	This site was identified by the Aboriginal parties on the basis that there is a larger slab of rock with two small rocks underneath it, making it semi-level off the surface of the underlying granite. From an archaeological perspective, it is noted that rock slabs appear to fracture and stack in similar ways and there is insufficient evidence to demonstrate that this is an archaeological site.

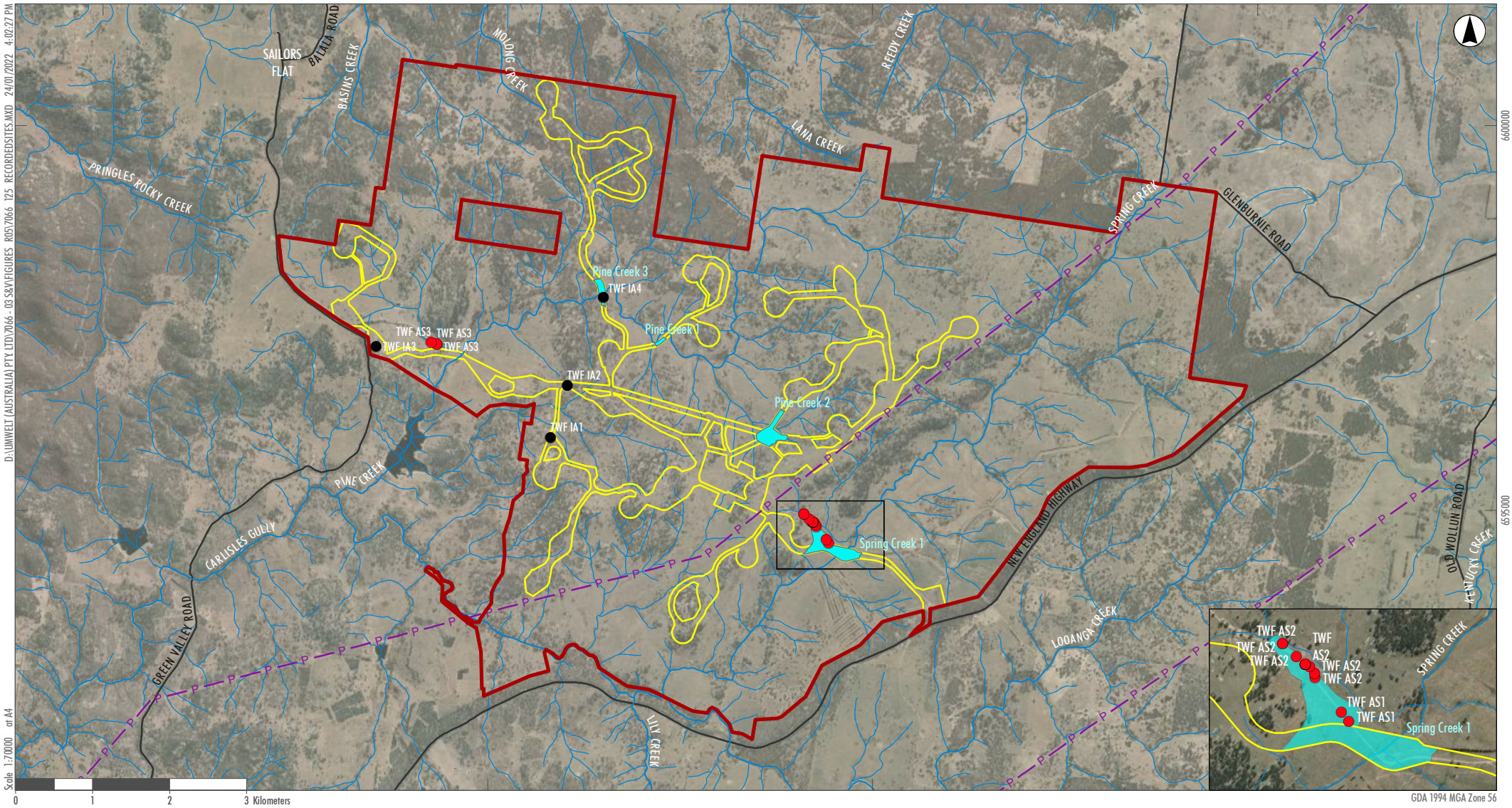
Name	Description
Potential stone arrangement 5	This site was identified by Aboriginal parties based on the presence of stacked slabs on the edge of a large granite outcrop. The slabs overlie each other in two sets of three slabs sitting on top of each other. From an archaeological perspective, it is noted that rock slabs appear to fracture and stack in similar ways and there is insufficient evidence to demonstrate that this is an archaeological site.

6.6.5.2 Newly Recorded Sites

A number of new Aboriginal sites were recorded in the Project Area. The location of these newly recorded sites is shown in **Figure 6.15**. Descriptions of the sites are provided in **Table 6.21**, and site images are provided in **Appendix 14**. The sites were named in the field with the acronym TWF (for Thunderbolt Wind Farm) followed by AS (artefact scatter) or IA (isolated artefact) and then numbered sequentially.

Table 6.21 Newly Recorded Sites

TWF AS1	TWF AS1 is an artefact scatter containing two artefacts located approximately five metres apart on an existing access track and outside the development corridor. The artefacts are a quartz flake with potential retouch and a flake of dark grey volcanic material (likely basalt). The artefacts were exposed on the access track which is subject to ongoing rill and gully erosion in sections. It is the main access track for the property, is subject to regular vehicle traffic and appears to be graded periodically. Based on the levels of disturbance, TWF AS1 has limited archaeological integrity and the artefacts are not in their original depositional context.
TWF AS2	TWF AS2 is an artefact scatter containing 14 artefacts distributed along an access track at eight locations, covering an area of approximately 200 m. The site has been significantly affected by erosion, with artefacts frequently exposed on the edges of the access track where the access track has been incised into the natural soil profile and is subject to ongoing erosion. AS2 has limited integrity and is located outside the Development Corridor
TWF AS3	TWF AS3 is a scatter of three artefacts visible in an access track adjacent to a tributary of Pine Creek. The access track has been graded into the hillslope and is subject to significant ongoing erosion and repair. The artefacts were identified adjacent to a large gravel borrow pit and there is introduced material (including road base gravel) in the vicinity. Based on the level of impact at this location from earthworks to establish and maintain the access track, the artefacts do not retain archaeological integrity and it is likely that in situ artefacts and deposit has been removed.
TWF IA1	TWF IA1 is a small broken flake of banded coarse-grained material (likely quartzite) located in a small area of enhanced visibility at the base of an apple box tree. Despite the presence of a range of other exposed stone lag, no additional artefacts were present. The artefact is present on a gently inclined slope with frequent bedrock exposures approximately 100 m from a minor tributary of Pine Creek.
TW IA2	TWF IA2 is a small quartz flake located on a graded section of vehicle track extending along a gently inclined slope approximately 200 m from a tributary of Pine Creek. The track appears to have been relatively recently graded, with excellent visibility and exposure along the track. Despite the high levels of visibility and exposure, no additional artefacts were visible.
TWF IA3	TWF IA3 is a silcrete broken flake located on the edge of a large granite exposure on a gently inclined slope approximately 250 m from a minor tributary of Pine Creek. No further artefacts were identified in the area.
TWF IA4	TWF IA4 is a small silcrete flake (with potential use-wear on distal margin) located on the edge of a large granite exposure on a gently inclined slope. This landform trends gradually towards the main channel of Pine Creek.



Legend

- Project Area
- Development Corridor
- P Existing 330kV Power Lines
- Potential Areas

Recorded Sites

- Artefact scatter
- Isolated artefact

FIGURE 6.15

Location of Recorded Sites and Areas of Archaeological Potential

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

6.6.5.3 Areas of Archaeological Potential

Four areas of archaeological potential were identified within the Development Corridor (refer to **Figure 6.15**). These areas were assessed as having low-moderate or moderate archaeological potential, as described below:

- **Pine Creek 1** This area is a low elevation level rise directly above a substantial rockbound bend in the main channel of Pine Creek at which there are also confluences with smaller tributaries. Disturbance appears to be limited to general land clearance and grazing. This area is preliminarily assessed as having moderate archaeological potential, noting that this may be revised on further inspection.
- **Pine Creek 2** This area comprises gently inclined lower slopes at the confluence of two minor tributaries and the main channel of Pine Creek. Based on exposures along the creek line, there is likely to be a considerable depth of topsoil remaining in situ and disturbance appears to be limited to general land clearance and grazing. This area is assessed as having moderate archaeological potential outside of areas of erosion immediately bordering the drainage lines.
- **Pine Creek 3 (including TWF IA4)** This area consists of low inclination slopes bordering the main channel of Pine Creek. Based on the presence of substantial bedrock exposures within this area, it is likely that the depth of topsoil may be limited, thereby limiting the potential for subsurface deposits with integrity however pockets of deeper topsoil may be present. There is one artefact visible on an exposure within this area (TWF IA4). On this basis, this area is assessed as having low-moderate archaeological potential.
- **Spring Creek 1(including TWF AS1 and AS2)** This area comprises a relatively large section of gently inclined slopes bordering the main channel of Spring Creek adjacent to the confluence with an associated tributary and bordering this tributary. The area includes the highest volume of stone artefacts identified during the survey (16 in total) exposed in a vehicle track. The area has been disturbed immediately along Spring Creek and in association with the existing vehicle access track. On this basis, the area is assessed as having low-moderate archaeological potential in areas of access track and creek line disturbance and moderate archaeological potential outside these areas.

6.6.6 Aboriginal Cultural Heritage Impact Assessment

The micro-siting of infrastructure allows for some flexibility in the management of Aboriginal cultural heritage. In relation to the sites identified during the assessment, the following considerations apply:

- Impacts to sites TWF AS1, TWF AS2, TWF AS3 and to Possible Scarred Trees 1-4 and Potential Stone Arrangements 1 and 5 can be avoided during works as these sites sit outside the Development Corridor.
- Impacts to sites TWF IA1, TWF IA2, TWF IA3, TWF IA4 and to areas of potential identified as Pine Creek 1-3 and Spring Creek 1 and to Potential Stone Arrangements 2-4 are located within the Development Corridor and may be subject to impact. Based on the nature of the proposed works and with some flexibility in terms of micro-siting, during final design and construction planning, all consideration will be given to minimising impacts to these sites and areas of potential. However, in applying the precautionary principle, it is assumed that partial or complete impact to these sites/areas may occur when assessing impact to Aboriginal cultural heritage.

- From an archaeological perspective, the stone artefact scatters, and isolated artefacts are identified as having low value for rarity, representativeness, educational potential and integrity. Artefact scatters and isolated artefacts are a common site type in the local area and well represented in the archaeological record. These sites are located on private land holdings and are inaccessible to the general public, thereby limiting their educational potential. All surface artefacts have been subject to disturbance and are unlikely to retain integrity. These sites are therefore assessed as having low archaeological potential.
- The assessment of significance for areas of archaeological potential is inherently difficult as any such assessment can only be based on the nature of the evidence that the area may contain. For this reason, the assessment of significance of areas of archaeological potential remains a provisional assessment of potential significance only and is linked almost entirely to the research potential of the site. That is, areas of low-moderate archaeological potential have a provisional assessment of low-moderate archaeological significance and areas of moderate archaeological potential have a provisional assessment of moderate archaeological significance.

6.6.7 Management and Mitigation Strategies

There are a range of management strategies that are available in relation to the Project that include varying levels of mitigation of identified or potential harm to Aboriginal cultural heritage, as summarised below:

Conservation/Avoidance - The application of a conservation management strategy would involve the avoidance of ground disturbance activities in association with the recorded sites/areas of archaeological potential and the subsequent active management of these sites/areas of archaeological potential to ensure ongoing protection from future impacts. Given the location of these sites/areas of archaeological potential on privately-owned land, Neoen cannot directly commit to this management option.

However, the nature of impacts associated with the Project is such that the Neoen can potentially avoid impacts to discrete sites/areas. Currently, impacts can be avoided to sites TWF AS1, TWF AS2, TWF AS3 and to Possible Scarred Trees 1-4 and Potential Stone Arrangements 1 and 5. Appropriate protection and controls (e.g. appropriate fencing/site demarcation) will be put in place during construction to ensure ongoing site avoidance and protection for these sites.

Mitigation of Predicted Impacts - When impacts to sites or areas of archaeological potential are unavoidable, this strategy involves implementing appropriate measures to manage and mitigate these impacts with reference to the archaeological and Aboriginal cultural significance of the sites/areas of potential. Based on current designs, partial or complete impact may occur at TWF IA1, TWF IA2, TWF IA3, TWF IA4 and to areas of potential identified as Pine Creek 1-3 and Spring Creek 1.

Impacts without Mitigation - This strategy would involve proceeding with the construction of the Project and the subsequent disturbance to any cultural material that may be present in the Development Corridor without any further salvage. As discussed above, the Development Corridor contains recorded sites of a level of cultural significance and archaeological significance such that this management strategy is not suitable. However, the remainder of the Development Corridor does not contain recorded Aboriginal objects and is assessed as having low archaeological potential. From an archaeological perspective it is therefore justifiable to undertake the proposed works in the areas of low archaeological potential without undertaking salvage activities (noting that if objects are identified over the course of the proposed works, additional management requirements will apply).

6.6.7.1 Management and Mitigation Measures

The assessment recommendations outlined in the ACHA have been developed in consideration of in-field and ongoing consultation with the RAPs and in light of the archaeological context of the region, the potential impacts of the Project, current cultural heritage legislation and the nature and extent of archaeological sites and areas of archaeological potential identified within the Development Corridor.

Neoen has committed to implementing the following recommendations which were developed with reference to the archaeological outcomes of the ACHA:

- Neoen will ensure that all employees and contractors are aware that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm has been subject to approval as part of the necessary approvals process.
- An Aboriginal Cultural Heritage Management Plan (ACHMP) for the Project will be developed in consultation with the RAPs, including measures that will be implemented for:
    - Protecting the Aboriginal archaeological sites and areas of archaeological potential identified in **Table 6.20**, including establishing appropriate fencing/site demarcation prior to the commencement of construction and ensuring ongoing protection during construction and operation.
    - Impacts to sites and areas of archaeological potential identified in **Table 6.22** that cannot be practically avoided. This will include the provision of methodologies for the completion of the recommended mitigation activities, as referenced in **Table 6.22**. In relation to areas of archaeological potential subject to impact, this will comprise test excavation prior to submission of the Submissions Report for the Project. For all other sites and where test excavation identifies the need for further salvage this will occur prior to or during the course of construction activities.
    - Protocols to be followed in the instance that additional ground disturbance works are required outside the Development Corridor. This will include requirements for further survey and assessment of any such works.
    - The management of any new Aboriginal archaeological sites or Aboriginal skeletal remains that may be identified during the course of construction or operational activities for the Project.
    - Monitoring and reporting on the effectiveness of these measures and to compile a report on the outcomes of any approved mitigation works.
    - Ensuring that all staff and contractors working on the Project receive Aboriginal cultural heritage awareness training and are informed of their obligations to comply with the requirements of the ACHMP.

Table 6.22 Recommendations by site/area of archaeological potential

Sites	Proposed Management Strategy	Requirements
TWF AS1 **TWF AS2** **TWF AS3** **Possible Scarred Trees 1-4** **Potential Stone Arrangements 1 and 5**	Outside Development Corridor therefore no impacts required (avoidance)	Establish appropriate fencing/site demarcation prior to the commencement of construction and ensure ongoing protection during construction and operation

Sites	Proposed Management Strategy	Requirements
TWF IA1 **TWF IA2** **TWF IA3** **TWF IA4** **Potential Stone Arrangements 2, 3 and 4**	Minimise impacts (micro-siting/final design demonstrates that impacts to sites can be fully or partially avoided)	Establish appropriate fencing/site demarcation of the site/area (or portion thereof that is not being impacted) prior to the commencement of construction and ensure ongoing protection during construction and operation
	Minimise impacts (micro-siting/final design demonstrates that impacts to sites cannot be fully or partially avoided)	Surface collection of identified surface artefacts In relation to Potential Stone Arrangements 2-4, further consultation with Aboriginal parties regarding appropriate mitigation measures for these potential sites (if required) can be undertaken as a component of the development of an Aboriginal cultural heritage management plan for the Project.
Spring Creek 1 **Pine Creek 1** **Pine Creek 2** **Pine Creek-3**	Minimise impacts (micro-siting/final design demonstrates that impacts to sites can be fully or partially avoided)	Establish appropriate fencing/site demarcation of the area (or portion thereof that is not being impacted) prior to the commencement of construction and ensure ongoing protection during construction and operation
	Minimise impacts (micro-siting/final design demonstrates that impacts to area of archaeological potential cannot be fully or partially avoided)	Undertake test excavation within the area of PAD prior to submission of the response to Submissions Report for the Project. Outcomes of test excavation will inform additional management requirements which may include: • No further works required • Additional salvage works required

^Surface collection only to be undertaken at TWF IA1-3

6.7 Historic Heritage

An Historical Heritage Assessment (HHA) has been prepared by Umwelt (refer to **Appendix 14**) to address the SEARs. The SEARs require the EIS to *assess the impact to historic heritage having regard to the NSW Heritage Manual*.

The HHA includes the identification and assessment of:

- listed heritage items located within or in proximity to the Project Area
- items, buildings, structures, or other elements of potential historical heritage significance (i.e., those which are not listed) located within or in proximity to the Project Area
- any areas of historical archaeological potential within or in proximity to the Project Area
- the likelihood, extent, and nature of potential impacts to any listed or unlisted items of heritage significance located within or in proximity to the Project Area
- appropriate measures to avoid, manage and/or mitigate any identified impacts.

6.7.1 Methodology

The HHA was undertaken in accordance with guidelines set out in the NSW Heritage Manual 1996 (Heritage Office and Department of Urban Affairs & Planning). The HHA was also prepared with consideration of the best practice principles contained in the:

- The Burra Charter: The Australian ICOMOS Charter for Places of Cultural Significance 1999 (Australia ICOMOS. 2000) (The Burra Charter)
- NSW Heritage Branch (now Heritage NSW), Department of Planning 2009, Assessing Significance for Historical Archaeological Sites and 'Relics'
- NSW Heritage Office (now Heritage NSW), Department of Planning 2006, The Historical Archaeology Code of Practice.

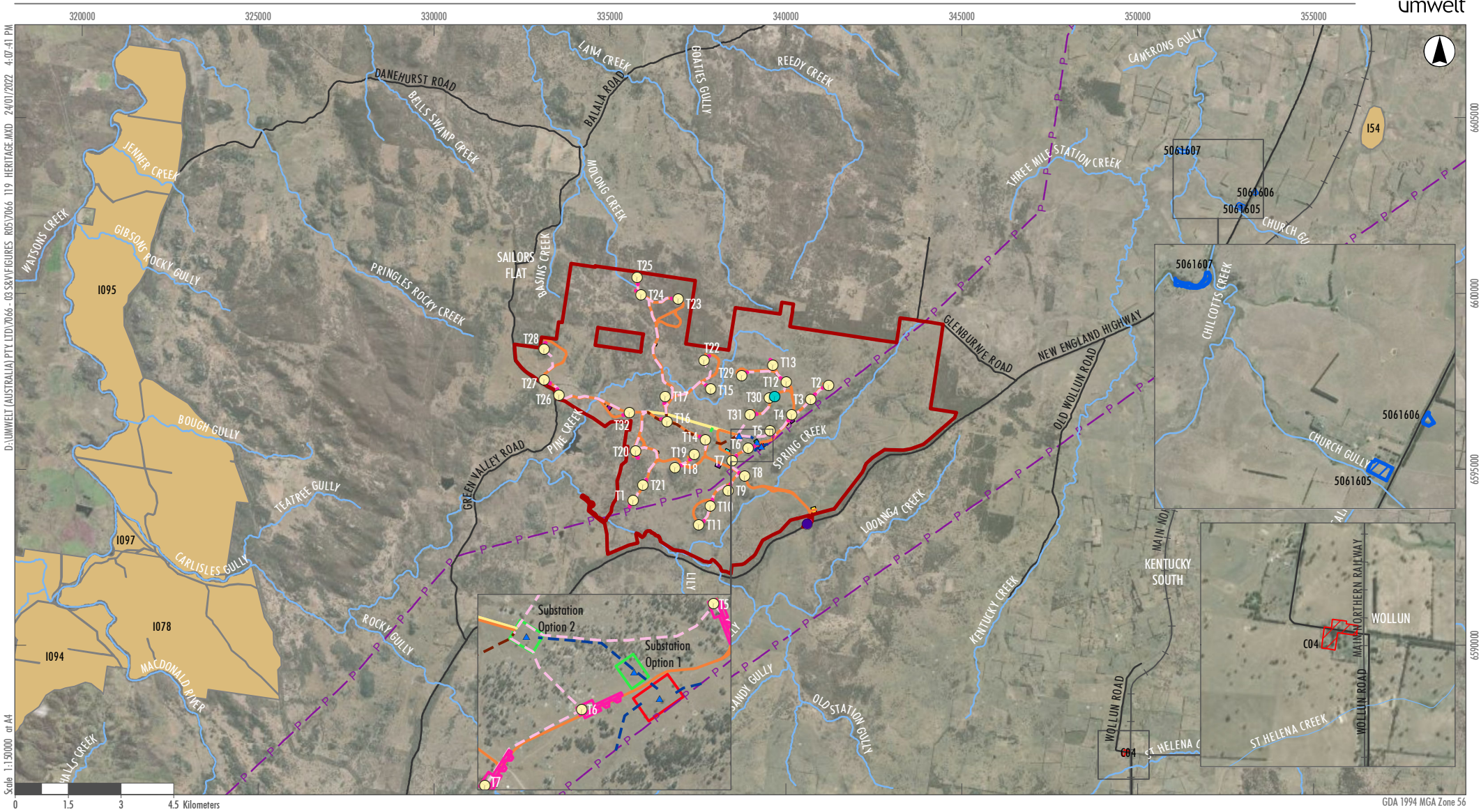
6.7.2 HHA Results

6.7.2.1 Impacts to Heritage Items

There are no listed heritage items within the Project Area and no potential heritage items were identified during the preparation of the HHA.

A number of listed items were identified in the vicinity of the Project and are listed in **Table 6.23**, none of which will be impacted by the Project. The nearest listed items (the Captain Thunderbolt Sites) are located between approximately 8.5 km and 10 km from the Project Area. Overall, the Project would not have an adverse impact on significant heritage fabric, views to, or the setting of any places of heritage significance, within the Project Area or within the vicinity.

Refer to **Figure 6.17** for the location of these sites.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Proposed Access Point
- Conceptual Access Tracks
- Hardstand Area
- Batching Plants
- Laydown-Compounds
- Operation and Maintenance Compound
- Substation
- Switching Station
- Existing 330kV Power Lines
- Underground 33kv Cables
- Option 1 - MV Overhead Line Route
- Option 1 - Underground Trench to MV Overhead Line
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants
- State Heritage Act
- Conservation Area - General
- Item - General

FIGURE 6.16

Recorded Heritage Items in Proximity to the Project Area

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

Table 6.23 Listed Heritage Items within 15km of the Project Area

Heritage Item	Address	Listing Details	Distance from Project Area
State Heritage Items			
The Captain Thunderbolt Sites - Blanch's Royal Oak Inn	New England Highway URALLA NSW 2358	NSW SHR Item 01889 (Group Listing)	9.5km
The Captain Thunderbolt Sites - Thunderbolt's Death Site	n/a	NSW SHR Item 01889 (Group Listing)	8.6km
The Captain Thunderbolt Sites - Thunderbolt's Rock	New England Highway URALLA NSW 2358	NSW SHR Item 01889 (Group Listing)	10km
Local Heritage Items			
Airlie Station House and Woolshed	Airlie Station Road BENDEMEER NSW 2355	Tamworth LEP 2010 Item I078	9km
Longford Station	Longford Retreat Road BENDEMEER NSW 2355	Tamworth LEP 2010 Item I095	10km
Wollun Village Precinct Conservation Area	Wollun Road WOLLUN NSW 2354	Uralla LEP 2012 Item C04	11km
Balala Station Homestead	Kingstown and Balala Roads BALALA NSW 2358	Uralla LEP 2012 Item I03	11km
Salisbury Court	3031 Thunderbolts Way SALISBURY PLAINS NSW 2358	Uralla LEP 2012 Item I14	12km
Yaccamunda	Rocky Gully Road	Tamworth LEP 2010 Item I097	12.5km
Dangar's Lagoon	Thunderbolts Way (Main Road 73) URALLA NSW 2358	Uralla LEP 2012 Item I54	13.5km
Haning	Longford Retreat Road BENDEMEER NSW 2355	Tamworth LEP 2010 Item I094	14.5km

The HHA also considered the potential for impacts to historical archaeology (sub-surface heritage remains). The HHA concludes that due to the land use history, any archaeological remains are likely to be fragmented or previously disturbed. This includes any evidence of goldmining and associated settlement which is known to have occurred throughout the region. Truncated or fragmented remains are unlikely to provide new information about the history of the Project Area, except to confirm that gold mining occurred as indicated by other documented sources. Overall, the Project is unlikely to impact on historical archaeological remains.

6.7.3 Summary of Key Mitigation Measures

Neoen propose the following management and mitigation measures associated with historic heritage:

- Prior to and during construction, an unexpected heritage finds protocol will be established and included in the CEMP and OEMP.
- Prior to and during construction, all Project team members and construction contractors will undertake a heritage-specific induction to support the use of the heritage finds protocol.

- During construction, in the unlikely event that unexpected historical archaeological material is discovered, all work in the area will cease and a suitably qualified archaeologist consulted to determine an appropriate course of action. Depending on the extent and significance of the archaeological remains encountered, consultation with Heritage NSW may also be required prior to the commencement of works.

6.8 Hazards and Risk

The SEARs require the EIS to address the hazards and risks associated with the Project. This includes Aviation Safety, Telecommunications, Health, Bushfire and Blade Throw. The following sections provide an overview of the outcomes of the relevant assessments undertaken to address the SEARs.

6.8.1 Aviation Impact Assessment

An Aviation Impact Assessment (AIA) for the Project was undertaken by Aviation Projects (refer to **Appendix 15**). Given the agricultural nature of the Project Area and surrounding region, potential impacts to aerial agricultural practices and aerial bushfire fighting were raised as a concern by the community during the stakeholder consultation process. These concerns have been addressed below and also in **Section 6.8.4**.

The SEARs require the AIA to:

- assess the impact of the development under the National Airports Safeguarding Framework Guideline D: Managing Wind Turbine Risk to Aircraft
- provide associated height and co-ordinates for each turbine assessed
- 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, considering, defined air traffic routes, aircraft operating heights, approach/departure procedures, radar interference, communication systems, navigation aids
- identify aerodromes within 30 km of the turbines and consider the impact to nearby aerodromes and aircraft landing areas
- address impacts on obstacle limitation surfaces
- 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.

The AIA and supporting technical data provide evidence and analysis for the Project to demonstrate that appropriate aviation risk mitigation strategies have been identified. The AIA assesses the potential aviation impacts associated with the Project and provides aviation safety advice in respect of relevant requirements of air safety regulations, guidelines and procedures and informs and documents consultation with relevant aviation agencies.

The AIA includes an Aviation Impact Statement (AIS) and a qualitative risk assessment to determine the need for obstacle lighting and marking, and has been provided to the aviation regulators, Airservices Australia. Consultation was also undertaken with relevant aviation stakeholders including aerodrome operators, Airservices Australia, Defence and relevant Councils.

6.8.1.1 AIA Assessment Results

The following provides a summary of the results of the AIA. Further detail is provided in **Appendix 15**.

Planning Considerations

The Project satisfies the planning provisions of Tamworth Regional Council regarding Tamworth Airport and Armidale Regional Council regarding Armidale Airport and will not impact current and planned airport operations. The Project also satisfies Uralla Shire Council planning provisions regarding aviation considerations.

Certified Airports

The Project Area is located within 30 nautical miles (nm) (55.56 km) of 2 Certified airports – Tamworth (YSTW) and Armidale Airport (YARM). The Project Area is located inside the 25 nm (+5 nm buffer) minimum sector altitude (MSA) of Tamworth (YSTW) and Armidale (YARM) Airports.

WTG 18 is the highest WTG (overall height of 1302 m Above Height Datum (AHD) with 5 m buffer (4272 ft above mean sea level (AMSL)) located within the horizontal extent of the 25 nm MSA buffer area of Tamworth Airport and will be below the controlling altitude of the relevant sector by approximately 328 ft (100 m).

WTG 24 is the highest WTG (overall height of 1,352 m AHD with 5 m buffer (4436 ft AMSL)) located within the horizontal extent of the 25 nm MSA buffer area of Armidale Airport and will be below the controlling altitude of the relevant sector by approximately 664 ft (203 m).

The Project is located beyond the horizontal extent of circling areas at Tamworth and Armidale Airports.

The Project is therefore not predicted to impact on the operation of any Certified airports.

Aircraft Landing Areas

There are a number of aircraft landing areas (ALAs) within the area surrounding the Project Area. These are typically earth/grass landing strips that are used by landowners. Landowner ALA 1, 2 and 3 (refer to **Figure 6.17**) will be impacted by the Project:

- ALA 1 (host landholder) is within the Project Area and may be restricted to landing towards the north-west and take-off towards the southeast and may be affected by downstream wake turbulence
- ALA 2 may be restricted to northern circuit operations only and may be affected by downstream wake turbulence
- ALA 3 may be affected by downstream wake turbulence.

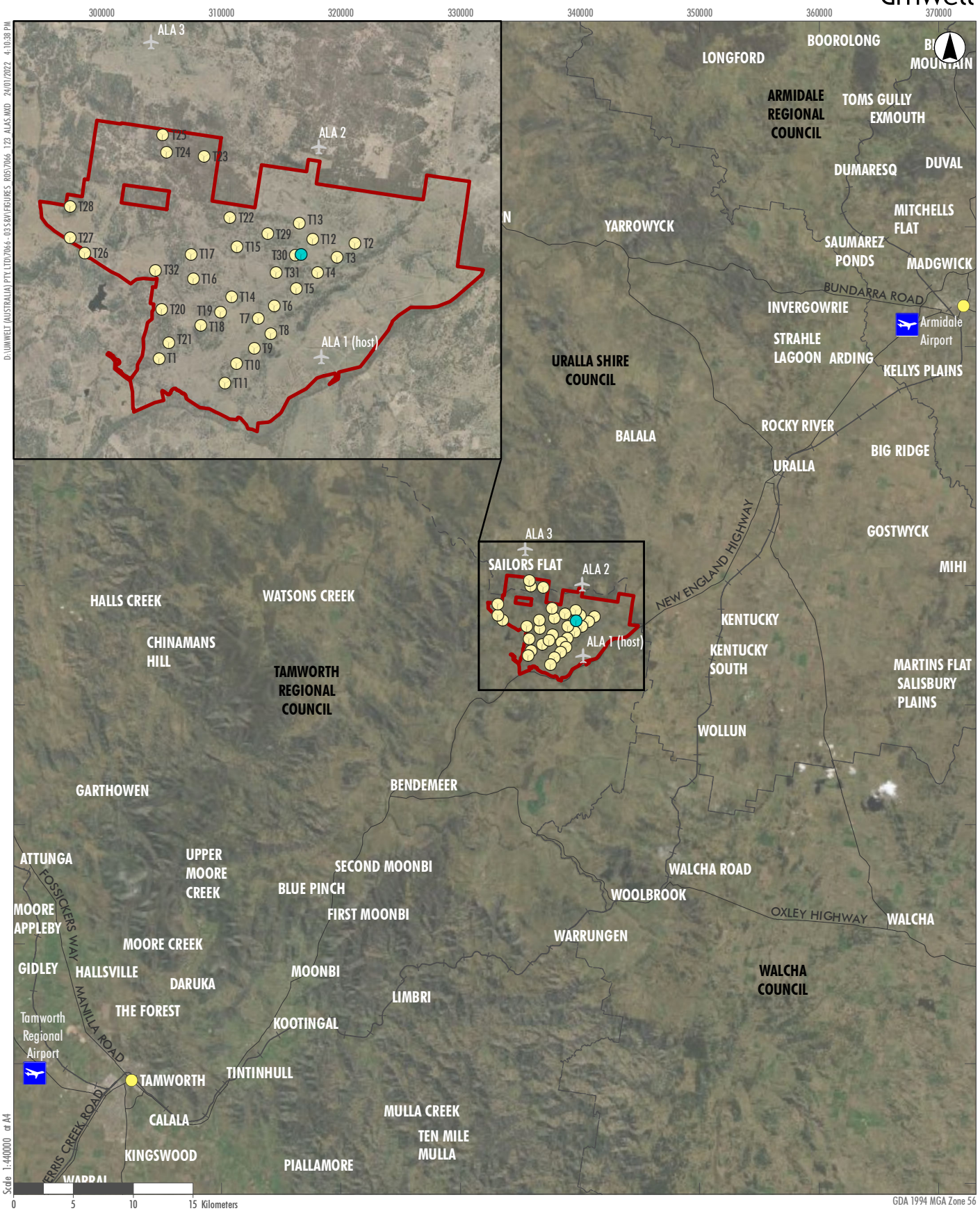
All other validated ALAs are further than 3 nm from the Project Area and will not be adversely affected by any wind turbines of the Project.

Obstacle Limitation Surfaces

The obstacle limitation surfaces of Tamworth and Armidale Airports will not be impacted.

Air Routes and Lowest Safe Altitude

The Project will not impact any air routes or grid lowest safe altitudes.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Certified Airports
- Landholder ALA
- Town
- Railway
- Roads
- Local Government Area (LGA)

FIGURE 6.17

Certified Airports and ALAs

Image Source: ESRI Basemap Data source: Umwelt (2021), NSW DFSI (2021).

Airspace

The Project Area is located outside of controlled airspace (wholly within Class G airspace - uncontrolled).

Aviation Facilities

The proposed WTGs will not penetrate any protection areas associated with aviation facilities.

Radar

The Project Area is located in Zone 4 (accepted zone) and outside the radar line of sight of Mt Sandon Secondary Surveillance Radar and is not anticipated to interfere with the serviceability of this aviation facility.

Aviation Impact Statement

Based on the conceptual layout and overall turbine blade tip height limit of 260 m AGL, the blade tip elevation of the highest WTG (WTG T24), will not exceed 1,352 m AHD (4436 ft AMSL).

The AIS concludes that the Project:

- will not penetrate any obstacle limitation surface (OLS) surfaces
- will not penetrate Procedures for Air Navigation Services - Aircraft Operations PANS-OPS surfaces
- will not impact any nearby designated air routes
- will not have an impact on the grid lowest safe altitude (LSALT)
- will not have an impact on prescribed airspace
- is wholly contained within Class G airspace
- is outside the clearance zones associated with aviation navigation aids and communication facilities
- wake turbulence may affect aircraft operations in the circuit at Landholder ALAs 1, 2 and 3.

Obstacle Lighting Risk Assessment

The AIA includes a safety risk assessment of the Project which concludes that the proposed WTGs and wind monitoring towers will not require obstacle lighting to maintain an acceptable level of safety to aircraft.

Firefighting

The Australasian Fire and Emergency Services Council (AFAC) has developed a national position on wind farms in relation to bushfire prevention, preparedness, response and recovery which is set out in the Wind Farms and Bushfire Operations (2018) guideline. The Wind Farm and Bushfire Operations guideline advises that wind farm operators should be responsible for ensuring that the relevant emergency protocols and plans are properly executed in an emergency event. During an emergency, operators need to react quickly to ensure they can assist and intervene in accordance with their planned procedures. This includes:

- liaison with the relevant fire and land management agencies that is ongoing and effective
- access is available to the wind farm site by emergency services response for on-ground firefighting operations
- wind turbines are shut down immediately during emergency operations – where possible, blades should be stopped in the 'Y' or 'rabbit ear' position, as this positioning allows for the maximum airspace for aircraft to manoeuvre underneath the blades and removes one of the blades as a potential obstacle

- aerial bushfire fighting personnel are required to assess risks posed by aerial obstacles, wake turbulence and moving blades in accordance with routine procedures.

The relevant operational requirements will be addressed via a Bushfire Emergency Management Plan to be prepared as part of the implementation of the Project in consultation with the RFS.

As outlined in **Section 5.1.2**, the RFS has been consulted in relation to the Project and has indicated that with regard to aerial firefighting, wind farms are treated like any other potential hazard to aircraft operations. Additionally, aerial firefighting strategies and tactics in relation to the area will continue to be selected based on the fire location, what the fire is threatening and hazard in the area.

Agricultural Practices

As part of the Aviation Assessment the Aerial Application Associated of Australia (AAAA) were consulted via email in September 2021. The email response advised that AAAA is opposed to all windfarm developments – including related infrastructure such as wind monitoring towers – in agricultural areas.

The Aviation Assessment indicates that safe aerial application operations would still be possible on properties within the Project Area and neighbouring the Project Area. As a consideration, the use of helicopters enables aerial application operations to be conducted in closer proximity to obstacles than would be possible with fixed wing aircraft due to their greater manoeuvrability. To facilitate the flight planning of aerial application operators, details of the Project, including 'as constructed' location and height information of WTGs, WMTs and overhead powerlines will be provided to landowners for provision to aerial application pilots.

Summary of Key Mitigation Measures

A summary of the key mitigation measures recommended in the AIA appears below. The mitigation measures have been informed by consultation with key aviation stakeholders as discussed in **Section 5.1.2**. Further detail is provided in **Appendix 15**.

Neoen has commenced engagement with the owners of the three ALAs impacted by the project to discuss impacts and mitigation measures. A letter of advice was provided to the owners of the three ALAs by Aviation Projects in November 2021, outlining implications of potential wake turbulence and restrictions to use of the ALA's.

Overhead transmission lines and/or supporting poles associated with the Project that are located where they could adversely affect aerial application operations will be identified in consultation with local aerial agriculture operators and marked in accordance with Part 139 Manual of Standards (MOS) Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8) where applicable. It is anticipated that the impact of these will be negligible.

To facilitate the flight planning of aerial application operators, the location and height of 'as constructed' WTGs and the WMT will be provided to landowners so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information.

'As constructed' details of WTG and WMT coordinates, and elevations will be provided to Airservices Australia.

Neoen will engage with local aerial agricultural operators and aerial firefighting operators in developing procedures for such aircraft operations in the vicinity of the Project, noting that there is no statutory requirement to do so.

Details of the final wind farm layout will be provided to local and regional aircraft operators prior to construction in order for them to consider the wind farm for their operations.

The rotor blades, nacelles and towers of the WTGs will be painted in white to provide sufficient contrast with the surrounding environment.

Consideration will be given to marking the temporary and permanent meteorological monitoring masts according to the requirements set out in Manual of Standards (MOS) Part 139 Chapter 8 Division 10 (as modified by the guidance in NASF Guideline D).

6.8.2 Telecommunications

Wind farms can theoretically impact on some telecommunications systems if they are operating in the area of the wind farm and management measures may need to be implemented to address these impacts. Where such measures are necessary, they can be built into the Project implementation plan.

The SEARs require the EIS to 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. DNV has prepared an electromagnetic interference (EMI) assessment to assess the potential impact of the Project on telecommunications systems (refer to **Appendix 17**).

The EMI assessment has been prepared in accordance with the SEARs, the NSW Wind Energy Guideline (DPIE, 2016) and the National Wind Farm Development Guidelines – Draft (Draft National Guidelines) prepared by the Environment Protection and Heritage Council (EPHC) (2010)

The EMI assessment investigates the potential EMI impact of the Project on:

- fixed point-to-point links (communication links between two static sites)
- fixed point-to-multipoint links (communication links between one or more static site and multiple points and/or between the points)
- radiocommunication assets belonging to emergency services
- meteorological radars
- trigonometrical stations
- citizens band (CB) radio and mobile phones
- wireless internet
- satellite television and internet
- broadcast radio and television.

“Radiocommunications” is used as a broad term in this report to encompass all services that rely on microwave or radio frequency electromagnetic waves to transfer information, including those listed above.

The results of the assessment are summarised in the following sections with further detail provided in **Appendix 16**.

6.8.2.1 EMI Assessment Results

Broadcast towers and transmission paths around the Project Area were investigated to determine if EMI would be experienced as a result of the Project. DNV applied a conservative assessment method to capture any potential for impact.

The assessment concludes that there is some potential for the proposed WTGs to interfere with point-to-area style services such as mobile phone signals and terrestrial television broadcasting, particularly in areas where there is already poor or marginal signal coverage. Dwellings located within approximately 5-10 km of the Project Area that are currently receiving weak signals from either the Armidale or Upper Namoi television broadcast towers may experience interference to those services. These impacts are more likely for signals from the Upper Namoi tower, as many of the dwellings in the potential interference zone for the Armidale tower may not be using that service due to an existing lack of coverage.

However, the assessment notes that it is also possible that some dwellings in the potential interference zone for the Upper Namoi tower may be able to receive an alternative signal from the Armidale tower, which could be used to mitigate any potential interference that may occur. Neoen has committed to management measures to address any potential impacts as outlined below.

Mobile phone services may be more susceptible to interference in areas that are currently receiving a weak signal to the north and west of the Project Area. However, the EMI assessment indicates that previous advice from the network operators has generally indicated that they do not expect wind farm developments to interfere with their services. If unexpected interference to these services is experienced during operation of the Project, Neoen has committed to investigating the issue and developing appropriate mitigation in consultation with the relevant service provider and the landowner.

The proposed WTGs are not expected to interfere with any satellite television or internet services intended for Australian audiences. Interference is possible for international satellite television and internet signals, however the signals that may be intercepted are from satellites that do not provide services designed for Australian audiences and are therefore unlikely to be used by nearby residents.

Interference to fixed point-to-point links passing over the Project Area is considered unlikely as there are no WTGs located within the calculated exclusion zones for those links. Nevertheless, consultation with the operators of these links, to confirm the required clearances and that impacts to their services is unlikely, has commenced and is ongoing.

Consultation is also being undertaken with the operators of point-to-multipoint links, emergency services, wireless internet services, and meteorological radar in the vicinity of the Project Area to confirm any potential for the Project to cause interference to these services, further detail is provided in **Appendix 17**. Although the likelihood of impact to these services is generally expected to be low, Neoen has committed to developing appropriate mitigation in consultation with the relevant operators in the event that interference is experienced as a result of the Project.

Potential EMI impacts on other services considered in the assessment, including radio broadcasting, trigonometrical stations and CB radio are not expected, or are considered to be minor.

The EMI assessment concludes that overall, the EMI-related impacts associated with the Project are generally expected to be minimal. Where the potential for interference exists, the overall likelihood is typically low and impacts are likely to be manageable through further consultation and mitigation once the Project is operational. The overall results of the EMI assessment, the proposed consultation and mitigation are summarised in **Table 6.24**.

Table 6.24 Summary of EMI Assessment Results

Licence or service type	Assessment Summary	Potential Impact	Consultation	Mitigation
Radio-communication towers	No towers within 2 km of proposed WTG locations	None	Consultation not considered necessary	Not required
Fixed point-to-point links	21 links over 9 link paths crossing Project Area, operated by: • Digital Distribution Australia Pty Limited (Digital Distribution) • New South Wales Government Telecommunications Authority (NSW Telco Authority) • NSW Electricity Networks Operations Pty Limited (Transgrid) • Optus Mobile Pty Limited (Optus) • Vodafone Australia Pty Limited (Vodafone) Diffraction effects: no WTGs in exclusion zones established by DNV Reflection/scattering and near-field effects: WTGs are considered sufficiently far from towers to avoid impacts	Unlikely to cause interference	DNV has contacted the relevant operators to confirm required clearances and that impacts are unlikely, and to identify suitable options to avoid any potential disruptions No concerns raised by Optus No other responses have been received to date	Mitigation is unlikely to be required, if there are material impacts, Neoen will apply appropriate mitigation in consultation with the relevant operator
Fixed point-to-multipoint links	64 assignments within 75 km of Project Area No base stations within 20 km of Project Area	Potential interference if link paths cross the Project Area near WTGs, however unlikely given distances and likely nature of services	DNV has contacted or is attempting to contact the relevant operators to confirm link paths and likelihood of impacts	Mitigation is unlikely to be required, if there are material impacts, Neoen will apply appropriate mitigation in consultation with the relevant operator
Other licence types	Point-to-area style communications - mobile phones, radio broadcasting, and television broadcasting	Unlikely to cause interference	DNV has contacted or is attempting to contact the	Not required

Licence or service type	Assessment Summary	Potential Impact	Consultation	Mitigation
Emergency services	Point-to-point links: 3 NSW Telco Authority links crossing Project Area, unlikely to be affected (see "Fixed point-to-point links") Mobile radio systems: unlikely to be affected		relevant operators to confirm that impacts are unlikely	Mitigation is unlikely to be required, if there are material impacts, Neoen will apply appropriate mitigation in consultation with the relevant operator
Meteorological radar	Nearest radar is Namoi, 105 km from Project Area	Potential for interference if proposed WTGs can be detected by radars	DNV has contacted the Bureau of Meteorology to evaluate likelihood of WTGs being detected by radars	To be determined through consultation with the Bureau of Meteorology
Trigonometrical stations	Unlikely to be affected	Unlikely to cause interference	DNV has contacted the relevant operators to confirm that impacts are unlikely	Not required
Citizen's band radio	Unlikely to be affected	Unlikely to cause interference	Consultation not considered necessary	Not required
Mobile phones	Unlikely to be affected in areas with good coverage, may experience interference in areas with marginal coverage	Low likelihood of interference	DNV has contacted the relevant operators to confirm that impacts are unlikely	Mitigation is unlikely to be required, if there are material impacts, Neoen will apply appropriate mitigation in consultation with the relevant operator once the Project is operational
Wireless internet	Likely service providers: Pivotel Mobile, TPG Internet, mobile phone networks, NBN Co NBN: available as a satellite service only	No impact expected for NBN services Low likelihood of interference to other services	DNV has contacted relevant operators to confirm that impacts are unlikely No concerns raised by NBN Co No other responses have been received to date	Mitigation is unlikely to be required, if there are material impacts, Neoen will apply appropriate mitigation in consultation with the relevant operator

Licence or service type	Assessment Summary	Potential Impact	Consultation	Mitigation
Satellite television and internet	Services intended for Australian audiences: unlikely to be affected Services intended for international audiences: signals from 12 satellites intercepted at 12 dwellings (2 host landowner dwellings, 10 non-associated dwellings)	No impact expected for Australian services Low likelihood of interference to services intended for international audiences, as services are unlikely to be used by nearby residents	Consultation with operators not considered necessary Consultation with residents of identified dwellings to be undertaken prior to construction to determine whether potentially affected services are being used and potential for interference	If impacts are material, Neoen will apply appropriate mitigation in consultation with the relevant operator and landowner.
Radio broadcasting	AM and FM signals: may experience interference in close proximity to WTGs (within several tens of metres) Digital radio signals: Project Area is outside the intended service area	Low likelihood of interference to AM and FM signals, as receivers are unlikely to be located sufficiently close to WTGs	Consultation not considered necessary	AM/FM Signals – mitigation is unlikely to be required, if impacts are material, Neoen will apply appropriate mitigation in consultation with the relevant operator Digital Radio – not required
Television broadcasting	May experience interference in areas with poor or marginal reception **Armidale tower**: 'poor' to 'variable' coverage across Project Area and in south and west, 'variable' to 'good' coverage in north and east 11 dwellings (1 host landowner dwelling, 1 associated dwelling, 9 non-associated dwellings) in potential interference zone **Upper Namoi tower**: 'variable' coverage across Project Area and surrounding area 17 dwellings (5 host landowner dwellings, 12 non-associated dwellings) in potential interference zone	Low likelihood of interference at identified dwellings, as dwellings may not currently be receiving signals Likely to cause interference at some identified dwellings, as dwellings may currently be receiving a weak signal	Consultation being undertaken to confirm likely impacts	Neoen will undertake pre-construction measurements of signal strength at selected dwellings within 3 km of the Project Area to enable any interference after construction to be investigated If there are material impacts, Neoen will apply appropriate mitigation in consultation with the relevant operator or landowner once the Project is operational

6.8.3 EMF and Health

Electric and magnetic fields (EMF) occur wherever electricity flows and so are found commonly in everyday life situation. Given that the Project will include electrical infrastructure, EMF requires assessment as part of the Project.

The SEARs require the EIS to consider and document any health issues having regard to the latest advice of the National Health and Medical Research Council (NHMRC), and identify potential hazards and risks associated with EMF and demonstrate the application of the principles of prudent avoidance. An EMF assessment has been prepared for the Project by DNV. The outcomes of the assessment are summarised in the following sections with the report attached as **Appendix 16**.

6.8.3.1 Assessment Overview

EMF is produced by a moving electric charge that consists of both an electric field component and a magnetic field component. The strength of the electric field is proportional to the voltage of the EMF source, while the strength of the magnetic field is proportional to the current. The strengths of both electric and magnetic fields decrease with increasing distance from the source. Electric fields are shielded by opaque objects such as building materials, vegetation and human skin, whereas magnetic fields can pass through most materials without attenuation.

EMF associated with the generation, distribution, and use of electricity is classified as extremely low frequency (ELF) EMF. In Australia, ELF EMF is often called power frequency EMF and corresponds to a frequency of 50 Hertz (Hz). The amount of energy transported by EMF is proportional to its frequency. ELF EMF contains very little energy. In comparison, microwave frequency EMF ranges from approximately 1 GHz to 30 GHz and contains enough energy to heat tissues. Although high-level exposure to ELF EMF has the potential to cause biological effects in humans, there is currently no evidence to conclusively link ELF EMF to any long-term adverse health effects.

Current advice from the NHMRC states that *'there is no direct evidence from which to draw any conclusions on an association between electromagnetic radiation produced by wind farms and health effects'.* However, research commissioned by the NHMRC acknowledges that there are possible mechanisms by which EMF produced by the flow of electrical current in WTGs and associated electrical cabling and infrastructure could impact on human health. It is for this reason that design controls are implemented to avoid potential risks associated with EMF.

The Australian Energy Networks Association (ENA) has published an EMF Management Handbook (2016), which recommends that electricity generation, transmission, and distribution systems be designed and operated in compliance with recognised international EMF exposure guidelines. The ENA Handbook also provides advice and guidance on using a prudent avoidance approach to minimise the possible risks of adverse health effects associated with EMF from generation, transmission and distribution of electricity.

In wind farms, ELF EMF is produced by transmission lines, electrical transformers, underground network cabling, any overhead cabling, and electrical cabling and equipment within the WTGs. At ground level, the EMF generated by transmission lines, underground cabling, overhead cabling and WTGs is generally comparable to background levels experienced in a modern home. Other electrical components are typical of similar equipment used in other installations and do not pose a unique risk of EMF.

DNV has conducted an assessment to characterize the EMF in terms of the electric and magnetic field strengths in the vicinity of the Project Area, to identify any potential hazards and risks to human health associated with EMF.

The production of EMF will be considered in the detailed design process, and the substation and switching station will be designed in accordance with standard industry practices to ensure appropriate electrical grounding and EMF levels, consistent with the principles of prudent avoidance. Additionally, the substation and switching station will be fenced off from public access and the clearances from the electrical equipment to the outer fencing will be sufficient to ensure that the EMF levels at the Project Area boundary are within the recommended exposure limits.

Similarly, the new section of high voltage (330 kV) transmission line within the Project Area will be designed in accordance with relevant guidelines for EMF exposure and installed at a height that will mitigate any risks for people at ground level. Therefore, the potential risks associated with EMF produced by the proposed substation, switching station, and high voltage transmission line are expected to be low or negligible at publicly accessible locations in and around the Project Area and are therefore not considered in the EMF assessment.

6.8.3.2 EMF Assessment Results

The EMF assessment was performed by modelling the underground cable and the overhead lines to determine EMF levels at nearby locations. The maximum electric and magnetic field strengths modelled for the underground cabling and overhead lines proposed for the Project are summarised and compared to the limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the World Health Organisation (WHO) for general public exposure in **Table 6.25**.

Table 6.25 Summary of Electric and Magnetic Field Strengths evaluated for the Project

Source and measurement location	Maximum electric field [kV/m]	Maximum magnetic field [µT]
Overhead line, measured at 1.5 m AGL	1.2	25
Overhead line, measured at 2 m AGL	1.3	39
Underground cable, measured at ground level	Not Evaluated[1]	12.5
ICNIRP 2010 reference level for general public exposure	5	200
WHO recommendation for general public exposure	Not Specified	100

[1] Due to attenuation effects, the electric field strength at ground level for underground cables is expected to be negligible.

These maximum values are observed immediately below the overhead line at a point half-way along its length, and at ground level immediately above the underground cable. Since electric and magnetic field strengths decrease as the distance from the source increases, the field strengths at all other locations are expected to be less than these maximum values. For the parameters and conservative assumptions considered in the EMF assessment, the modelled EMF at the range of heights above ground level that humans are most likely to occupy is well within the recommended exposure limits and so the risks to human health from EMF associated with the Project are considered low.

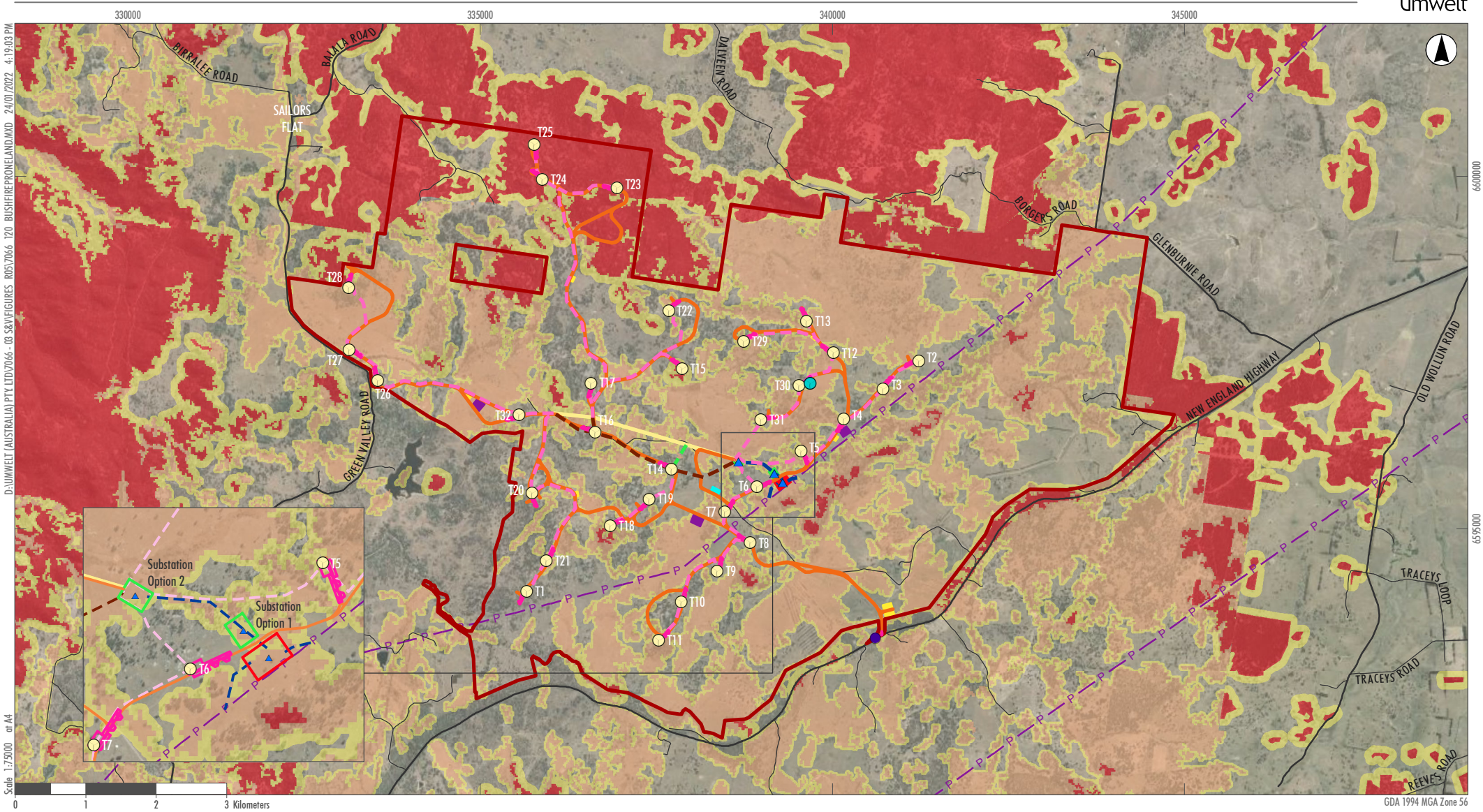
The closest dwelling to the Project infrastructure (a host landholder dwelling) is located approximately 180 m away from the underground cabling network and approximately 600 m away from the overhead lines. As the electric and magnetic field strengths decrease with increasing distance from the source, the EMF produced by the proposed cabling and overhead lines within the Project Area will be significantly below the relevant exposure limits at this dwelling and is expected to be indistinguishable from background levels. All other dwellings are located more than 1,000 m from the underground cabling and 1,800 m from the overhead lines, at which distance the EMF from the Project will be negligible.

The EMF levels produced by the Project are therefore expected to be well within the recommended exposure limits at all publicly accessible locations in and around the Project Area. The EMF assessment therefore concludes that the risks to human health from EMF associated with the Project are considered low and further prudent avoidance is not required.

6.8.4 Bushfire

The Project Area is identified as bushfire prone land by the NSW Rural Fire Service (RFS) bushfire prone land mapping (RFS, 2021) (refer to **Figure 6.18**). The SEARs require an assessment of hazards and risk associated with bushfire and to address this requirement an assessment of the Project has been undertaken following Planning for Bushfire Projection (PBP) 2019.

Land within the Project Area has been subject to extensive clearing and the Project design has prioritised the placement of infrastructure within cleared areas where practicable. The northern end of the Project Area supports steep slopes and remnant woodland vegetation which extends into the adjoining land which forms more densely forested vegetation to the north and west of the Project Area. These vegetated areas represent the most significant potential bushfire threat to the Project.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Proposed Access Point
- Conceptual Access Tracks
- Hardstand Area
- Batching Plants
- Laydown-Compounds
- Operation and Maintenance Compound
- Substation
- Switching Station
- P Existing 330kV Power Lines
- Underground 33kv Cables
- Option 1 - MV Overhead Line Route
- Option 1 - Underground Trench to Overhead Line
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants

Bushfire Prone Land Vegetation Category Mapping

- Vegetation Buffer ((100m to Category 1 Vegetation and 30m to Category 2 Vegetation)
- Vegetation Category 1 (High Risk)
- Vegetation Category 2 (Medium Risk)

FIGURE 6.18

Bushfire Prone Land

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

6.8.4.1 Bushfire Assessment

PBP 2019 requires wind farm developments to have adequate clearances to combustible vegetation as well as adequate access and water supply for firefighting purposes. At a minimum, a 10 m Asset Protection Zone (APZ) is required for the proposed turbines and associated buildings/infrastructure (with the APZ being maintained to the standard of an Inner Protection Area (IPA)) for the life of the development.

The IPA provides a defendable space within which firefighting efforts can be safely undertaken to defend structures before and after the passage of bushfire. Vegetation within the IPA is required to be well maintained and kept to a minimum level (disconnected vegetation including tree canopies and shrubs, mown grass, ground free of leaves and debris).

Essential equipment associated with the wind farm is also required to be designed and housed in such a way as to minimise the impact of bush fires on the capabilities of the infrastructure during bush fire emergencies and reduce bush fire risk to surrounding land.

Asset Protection Zones

As discussed in **Section 3.4.1**, the proposed turbine locations include a concrete foundation (approximately 30 m x 30 m in size) providing an appropriate defendable space between the proposed turbines and the surrounding vegetation. Associated infrastructure (site operations and maintenance facility, substation and switching station) is located on the southern side of the Project Area which is predominately cleared of vegetation and adequate space is available to accommodate a minimum APZ of 10 m. Proposed overhead electrical cabling will include the establishment of an easement with minimum clearing widths of 20 m wide for 33kV cabling and 60 m wide for 330kV transmission lines.

The wind farm will be appropriately maintained over the life of the Project including vegetation and site maintenance required to maintain APZs.

Access

One single access is proposed to the Project Area, directly from the New England Highway which runs the length of the southeast boundary. In an emergency access could also be provided via Green Valley Road on the western side of the Project Area, via Balala Road to the northwest and Glenburnie Road to the northeast. Internal access roads consisting of compacted gravel, approximately 6 - 9 m wide, would be constructed to accommodate construction, movement of OSOM vehicles, operational traffic movements and emergency access throughout the Project Area. The indicative location of the access roads is shown on **Figure 6.18**.

As discussed in **Section 6.8.1**, the Australasian Fire and Emergency Services Council (AFAC) has developed a national position on wind farms in relation to bushfire prevention, preparedness, response and recovery which is set out in the Wind Farms and Bushfire Operations (2018) guideline. The Wind Farm and Bushfire Operations guideline advises that wind farm operators should be responsible for ensuring that the relevant emergency protocols and plans are properly executed in an emergency event. During an emergency, operators need to react quickly to ensure they can assist and intervene in accordance with their planned procedures. This includes:

- liaison with the relevant fire and land management agencies that is ongoing and effective
- access is available to the wind farm site by emergency services response for on-ground firefighting operations

- wind turbines are shut down immediately during emergency operations – where possible, blades should be stopped in the 'Y' or 'rabbit ear' position, as this positioning allows for the maximum airspace for aircraft to manoeuvre underneath the blades and removes one of the blades as a potential obstacle.
- aerial bushfire fighting personnel are required to assess risks posed by aerial obstacles, wake turbulence and moving blades in accordance with routine procedures.

The relevant operational requirements will be addressed via a Bushfire Emergency Management Plan to be prepared as part of the implementation of the Project in consultation with the RFS.

The RFS has been consulted in relation to the Project and has indicated that with regard to aerial firefighting, wind farms are treated like any other potential hazard to aircraft operations. Additionally, aerial firefighting strategies and tactics in relation to the area will continue to be selected based on the fire location, what the fire is threatening and hazard in the area.

Water Supply

An appropriate dedicated water supply for bushfire protection will be provided on site in the vicinity of the site operations and maintenance facility (subject to agreement with the RFS). The volume of water to be stored on site will be developed through consultation with the RFS through the development of a Bushfire Emergency Management Plan during the detailed design and pre-construction phase of the Project. Water supply for the Project would likely be sourced from commercial suppliers in the nearby region (via water trucks), farm dams or licensed groundwater bores located within the Project Area (subject to availability). A water cart will also be available for use through the construction and operations phase of the Project.

Mitigation and Management

A Bushfire Emergency Management Plan will be developed for the Project in accordance with PBP 2019 and in consultation with the RFS (including any requirements in relation to aerial firefighting). The plan will identify all relevant bushfire risks and mitigation measures associated with the construction and operation of the Project, including:

- detailed measures to prevent or mitigate fires igniting, outlining:
  - APZ locations and management requirements
  - access locations, passing bays and any alternate emergency access
  - management requirements in relation to aerial firefighting
  - water supply and location and any other bush fire suppression systems (including any drenching systems, static water supply, natural water sources)
  - work that should not be carried out during total fire bans
  - availability of fire-suppression equipment
  - storage and maintenance of fuels and other flammable materials
- notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate
- and appropriate bush fire emergency management and evacuation plan.

With the implementation of a Bush Fire Emergency Management Plan in consultation with the RFS, it is considered that potential bushfire risk associated with the Project can be appropriately managed.

6.8.5 Blade Throw

Consistent with the requirements of the SEARs, an assessment of blade throw risk has been prepared by DNV (refer to **Appendix 18**). Blade throw is an incident where the WTG blade detaches and is thrown into the surrounding area. Such incidents may involve the detachment of the entire blade or a large portion of the blade (if the failure occurs at or near the base of the blade where it attaches to the hub of the WTG rotor) or a relatively smaller blade fragment, such as a blade tip section or a piece of the outer shell of the blade. Reasons for WTG blade failure may include physical damage to the blade caused by external factors such as erosion or lightning, extreme wind conditions (causing the WTG to exceed load design capacity) material or manufacturing defects. As noted below, for modern wind farms, blade throw is a rare occurrence but prudent planning requires that the risk be considered in the design process.

Modern WTGs and components supplied by major manufacturers are generally designed and certified in accordance with recognised international standards to ensure structural integrity and safe operation over the lifetime of the WTG. International Standard IEC 61400-1 *Wind turbines - Part 1: Design requirements*, Edition 4.0, IEC 61400-1:2019, establishes the minimum requirements for the design of WTGs and related components with the objective of avoiding structural failure and consequential risk of personal injury or damage to property. International Electrotechnical Commission (IEC) standards that apply to the design and certification of WTG blades include Wind turbines - Part 23: Full-scale structural testing of rotor blades Edition 1.0, IEC 61400-23:2014, 2014, which specifies the requirements for testing the structural integrity of blades, and IEC 61400-24 Wind energy generation systems - Part 24: Lightning protection, Edition 2.0, which describes the requirements for lightning protection systems installed on WTGs.

In addition to meeting the required design and manufacturing standards, modern WTGs incorporate sophisticated control systems that are designed to shut the WTG down during high wind speed conditions and in response to a range of faults or abnormalities detected during operation. These control systems include redundant monitoring and protection systems that are intended to prevent situations where the WTG rotor could accelerate to speeds higher than its rated speed. Other conditions that may indicate a structural blade failure and which will cause a WTG to automatically shut down include abnormal vibration, rotor imbalance, or reduced power output. The WTGs also have lightning protection systems, which prevents damage caused by lightning strikes and is usually limited to the blade surface where it can be seen and repaired during preventative maintenance operations.

Operational monitoring and maintenance programs implemented at wind farms help to increase the likelihood that WTG faults or minor damage are prevented or are detected and rectified at an early stage, thus reducing the risk of serious or dangerous problems developing. Neoen maintains a 24-hour Operations and Control Centre as well as on-site monitoring and maintenance, that will allow the Project to be monitored remotely and may assist in detecting potential faults or damage early and quickly.

Compliance with international standards, implementation of high-quality maintenance programs, and continual improvements in WTG design and materials mean that blade failure is relatively rare for modern WTGs and does not typically result in the detachment of blades or blade fragments. The likelihood of a blade throw incident causing injury to a person in the vicinity of a wind farm depends on the probability of a WTG blade failing, the probability of the blade or part of the blade detaching as a result of that failure, and the probability of a person being struck by the thrown object, all of which are very low.

Based on a conservative assessment methodology and assumptions, DNV has evaluated the risks of death caused by a blade throw incident at dwellings, roads, and neighbouring properties in the vicinity of the Project Area. The results show that, in most cases, the potential risks are at least 35 times less than the blade throw risks considered acceptable in other jurisdictions, and considerably lower than existing risks.

The high-level assessment undertaken by DNV suggests that the blade throw risk may be above the limit considered acceptable at one host landholder dwelling (Dwelling ID 302), which is currently vacant. Should the dwelling remain uninhabited throughout the operating life of the Project, the risk limit will not be applicable to that dwelling. If the dwelling has the potential to be inhabited during the life of the Project, detailed site-specific blade throw modelling can be undertaken prior to construction, during the detailed design phase, once the WTG model is confirmed and in consultation with the host landholder. The detailed site-specific assessment will confirm the expected blade throw risks and determine if refinement to the Project layout or operation are required to mitigate those risks.

At all other host, associated and non-associated dwellings and roads in the vicinity of the Project Area, the risk of injury or property damage associated with blade throw for the proposed WTG layout and parameters is considered very low.

6.8.6 Preliminary Hazard Risk Screening

Under *State Environment Planning Policy 33 – Hazardous and Offensive Development* (SEPP 33), a preliminary risk screening of a proposed development is required to determine the need for a preliminary hazard analysis (PHA). The preliminary screening involves the identification and assessment of the storage of specific dangerous goods classes that have the potential for significant off-site effects. If, at the proposed location, and in the presence of controls, the risk level exceeds the acceptable criteria for impacts on the surrounding land use, the development is classified as 'hazardous' and may not be permissible within most land use zones in NSW. A 'hazardous industry' under SEPP 33 is one which, when all locational, technical, operational and organisational safeguards are employed continues to pose a significant risk.

An 'offensive industry' is one which, even when controls are used, has emissions which result in a significant level of offence e.g. odour or noise emissions. Note potential impacts associated with noise and air quality to address potentially offensive impacts and are discussed in **Section 6.3** and **6.11** and are not considered as part of the hazard screening.

A proposal cannot be considered hazardous until it is firstly identified as 'potentially hazardous' and subjected to the assessment requirements of SEPP 33. A PHA is required if a proposed development is 'potentially hazardous'.

A proposed development may also be 'potentially hazardous' if the number of traffic movements for the transport of hazardous materials exceeds the annual or weekly criteria outlined in Table 2 of Applying SEPP 33 (DoP 2011b). If these thresholds are exceeded a route evaluation study is likely to be required.

Hazardous Industry Planning Advisory Paper (HIPAP) *No. 6 – Guidelines for Hazard Analysis* (DoP 2011f) and *Multi-level Risk Assessment* (DoP 2011a) notes that a PHA should identify and assess all hazards that have the potential for off-site impact. The expectation is that the hazards would be analysed to determine the consequence to people, property and the environment and the potential for hazards to occur.

6.8.6.1 Preliminary Risk Screening

A preliminary risk screening is undertaken to determine the requirement for a PHA. SEPP 33 contains a number of assessment criteria for the storage quantities as well as transport quantities and frequencies of hazardous material that have the potential to create off-site impacts.

Storage Quantity Screening

Permanent storage of hazardous materials during the construction and operation phases of the Project will be limited in quantities with maximum inventories below SEPP 33 screening thresholds.

Diesel fuel (a class C1 combustible liquid) will be stored within the Project Area in a self-bunded bulk tank during the construction phase, however, combustible liquids are not subject to a SEPP 33 screening threshold limit. Storage of diesel fuel, and any flammable and combustible liquids (fuels and oils), will be undertaken in accordance with *AS1940:2017 The storage and handling of flammable and combustible liquids* and flammable liquids will be stored separately from combustible liquids.

Project construction will potentially require the blasting of rock and therefore the use of explosives within the Project Area. Quantities of explosives will be confirmed during the detailed design phase however, if blasting is required, Ammonium Nitrate Emulsion (ANE), a division 5.1 oxidiser and explosive precursor, will be sensitised on site in a mobile manufacturing unit to become an explosive and used immediately. Based on a conservative assumption it is estimated that Project construction will require up to two blasts per week requiring on average approximately 12 tonnes of ANE per week (two separate six tonne quantities) over a period of approximately six months as well the following Class 1 initiating explosives:

- 500 x boosters (Division 1.1D) per week (two deliveries of up to 250)
- 500 x detonator cord downlines (non-electric signal tube) (Division 1.1B) per week (up to two deliveries of 250)
- 500 x No.6 non-electric detonators (Division 1.1B) per week (up to two deliveries of 250)

Based on the above assessment, the Project is not considered to trigger SEPP 33 threshold for hazardous materials storage and therefore a PHA is not required.

Transport Screening

The only hazardous materials that will be transported to the Project in significant quantities are diesel fuel (Class C1 combustible liquid) and ANE (Division 5.1 oxidiser). As noted above, combustible liquids are not subject to SEPP 33 transport screening thresholds. Class 5 materials are subject to the transport screening thresholds provided in **Table 6.26**.

Table 6.26 SEPP 33 Transport Screening Thresholds – Class 5 Materials

Vehicle Movements		Minimum Quantity (tonnes)	
Cumulative Annual	Peak Weekly	Bulk	Package
>500	>30	2	5

On average, it is estimated that two separate six tonne deliveries of ANE will be transported to the Project Area each week over a period of approximately six months. While the bulk quantity of ANE transport to the Project Area exceeds the minimum bulk quantity threshold, the number of peak weekly (i.e. approximately two per week) and cumulative annual (i.e. approximately 52 over approximately six months) vehicle movements is well below the vehicle movement screening thresholds. Therefore, a route evaluation study is not considered to be required based on ANE transport.

SEPP 33 does not provide transport screening for Class 1 explosive materials. Rather, the estimated transport quantities and frequencies for Class 1 materials are required to be provided to the DPIE Hazard team to determine whether a transport route evaluation is required. The Class 1 transport quantities listed in the storage quantity screening above were provided to the DPIE Hazard team, which indicated that a route evaluation study would not be required.

Hazardous Materials Properties and Management

ANE is an explosive precursor and requires careful storage to avoid decomposition and detonation. Additionally, Class 1.1 materials will decompose in a fire and may detonate if exposed to heat from a fire under confinement. The *NSW Explosives Act* and *NSW Explosives Regulation* set out safety and security requirements for the handling of explosives (prescribed in clause 4 of the *NSW Explosives* Regulation) and explosive pre-cursors (prescribed as sensitive dangerous substances (SSDSs) in schedule 1 of the *NSW Explosives Regulation*). The *General explosive licence and security clearance conditions under the NSW Explosives Act* and *NSW Explosives Regulation* (General Explosive Conditions 2013) establish the conditions for explosive licences and security clearances issued under the *NSW Explosives Act* and the *NSW Explosives Regulation*. The *NSW Explosives Regulation* requires a licence or security clearance holder to comply with:

- AS2187 – Explosives: Storage, transport and use
- AS4326 – The storage and handling of oxidizing agents
- The Australian Explosives Code (titled Australian Code for the Transport of Explosives by Road and Rail)
- The Australian Dangerous Goods Code.

ANE (an explosive pre-cursor and SSDS) and Class 1.1 materials require SafeWork NSW security clearances and licences to purchase, possess, use, store, transport and dispose of. Neoen will ensure that all suppliers and contractors handling ANE and Class 1.1 materials possess the required SafeWork NSW licences. Neoen will also ensure that that all suppliers and contractors supplying, transporting and handling ANE and Class 1.1 materials have systems in place to ensure that safety and security risks are managed in accordance with the *NSW Explosives Act* and the *NSW Explosives Regulation* which includes the requirement to comply with *Code of Practice, Mobile Processing Units* (Australian Explosives Industry Safety Group Inc., 2018).

6.9 Water and Soils

The SEARs require the EIS to address potential impacts to soil and water resources associated with the Project. The soil and water assessment is required to:

- quantify water demand, identify water sources (surface and ground water), including any licensing requirements, and determine whether an adequate and secure water supply is available for the development

- assess potential impacts on the quantity and quality of surface and groundwater resources, including impacts on other water users and watercourses, including Namoi, Gwydir and Mcleay catchment areas, Pine Creek, Carlisles Gully, Spring Creek, Looanga Creek, Kentucky Creek, which traverse the site
- where the Project involves works in 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 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 and Guidelines for Fish Habitat Conservation and Management (DPI, 2013)
- describe the measures to minimise surface and groundwater impacts including how works on steep gradient land or erodible soil types would be managed and any contingency requirements to address residual impacts.

The soil and water assessment to address the requirements of the SEARs is provided in the following sections.

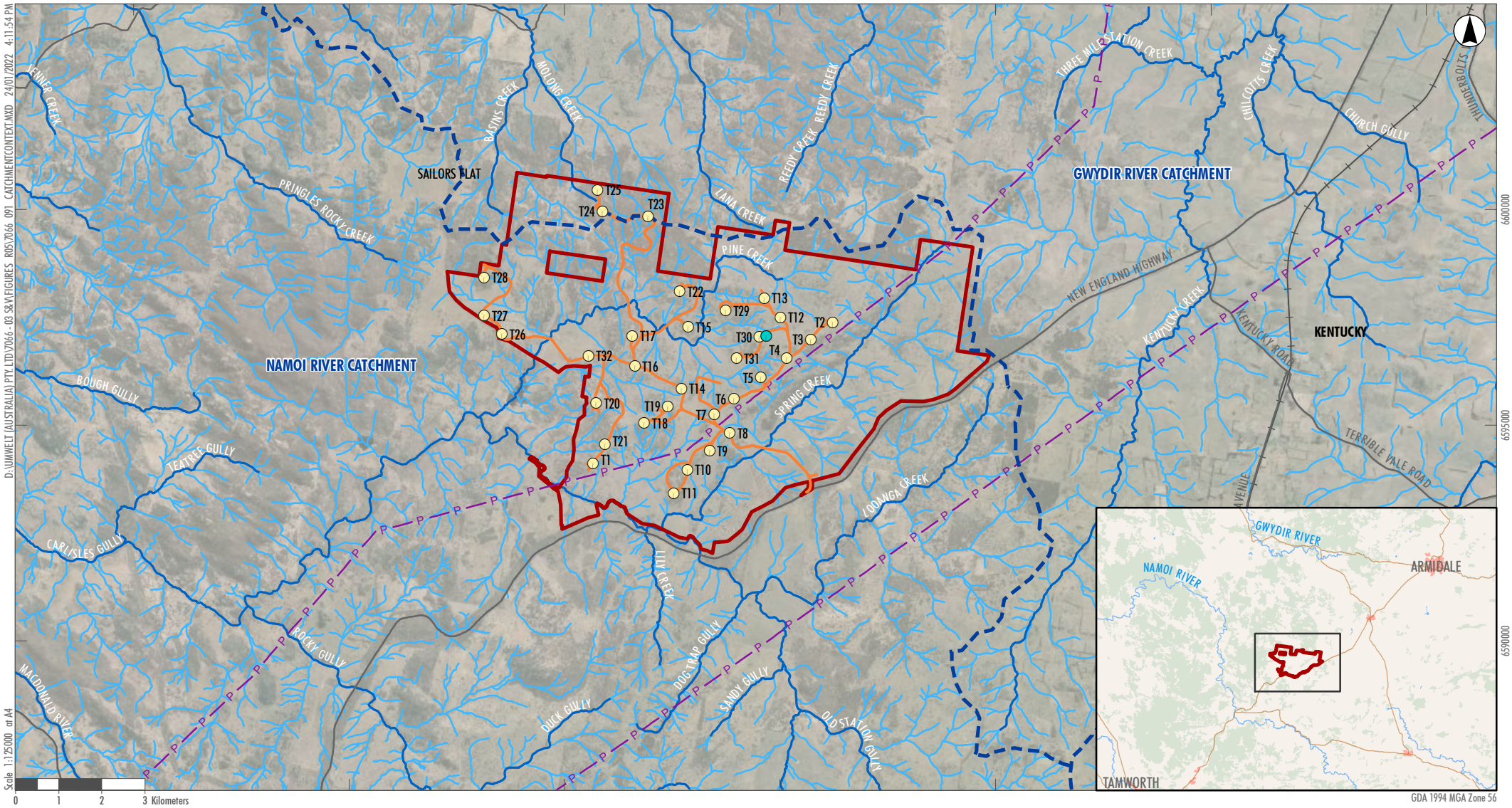
6.9.1 Surface Water Environment

6.9.1.1 Catchments and Drainage

The Project Area occupies land within the headwaters of the Namoi River and the Gwydir River catchments (refer to **Figure 6.19**). Approximately 5,559 ha (94%) of the Project Area lies within the Carlisles Gully Catchment which flows westerly from the Project Area to the Macdonald River which drains to the Namoi River 30 km north west of the Project Area. At the confluence with the Macdonald River, Carlisles Gully is a 7th order stream with flow contributions to Carlisles Gully from numerous unnamed minor tributaries as well as 3rd order streams Old Station Gully, Sandy Gully, Dog Trap Gully and Lily Creek, 4th order streams Looanga Creek, Spring Creek, 5th order Pine Creek and 6th order Rocky Gully[1].

Approximately 361 ha (6%) of the northern section of the Project Area drains to Roumalla Creek via the 4th order Basin Creek, 5th order Molong Creek, 4th order Lana Creek and 4th order Reedy Creek. Roumalla Creek drains to the Gwydir River approximately 34 km north of the Project Area[1].

[1] The stream ordering was based on the application of the Strahler stream ordering methodology using the NSW Water Management (General) Regulation 2018 sourced from the NSW Department of Planning, Industry and Environment web mapping portal in October 2021.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Conceptual Access Tracks
- Catchment Boundary
- P Existing 330kV Power Lines
- Road
- Railway
- Major Watercourse
- Watercourse

Scale 1:125000 at A4

GDA 1994 MGA Zone 56

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FIGURE 6.19

Catchment Context

Image Source: ESRI Basemap Data source: DFSI (2020), Neoen (2020), Data.gov (2019), Data.gov (2020)

6.9.1.2 Water Extraction and Users

Regulatory Framework

The *Water Management Act 2000* is the key piece of legislation for water resource management in NSW. Under the Act, Water Sharing Plans (WSPs) have been developed to protect the environmental health of water sources, whilst securing sustainable access to water for all users. The WSPs specify maximum water extractions and allocations and provide licenced and unlicensed water users with a clear picture of when and how water will be available.

The Project Area is subject to the WSPs for the Namoi and Peel Unregulated Rivers Water Sources 2012 and the Gwydir Unregulated River Water Sources 2012.

The WSP for the *Namoi and Peel Unregulated Rivers Water Sources* is divided into 31 management zones and the Project Area is located in the Mid Macdonald River Tributaries Management Zone. The WSP for the *Gwydir Unregulated River Water Sources 2012* consists of 28 individual water sources and the Project Area is located in the Roumalla Creek Water Source.

All water extraction in NSW, apart from some exemptions for basic landholder rights extractions and pollution control, must be authorised by a water access licence (WAL). This means that should Neoen wish to extract water for use as part of the Project from any water sources a WAL would be required.

Water Users

Licensed surface water use in the management zone and water sources occupied by the Project Area is primarily for agricultural (irrigation) use. The number of WALs and total share entitlement in each management zone/water source as well as the number and type of shares for the 2020/2021 year are presented in Table 6.27.

Table 6.27 Catchment Water Access Licences

Management Zone/Water Source	Number of WALs 2020/2021	Number of Shares		
		Domestic and Stock	Unregulated River	Total
Mid-Macdonald Tributaries Management Zone	6	13.5	98	111.5
Roumalla Creek Water Source	11	12	242	662.5

Data Source: NSW Water Register. Note: each share represents an entitlement to extract 1 ML/year of water from the water source during periods where full allocations are made available by DPIE Water.

6.9.2 Land Use, Topography and Soils

As discussed in **Section 2.2**, land within and surrounding the Project Area has been subject to extensive vegetation clearing associated with historic agricultural land uses and is predominately utilised for grazing activities, with some horticulture, forestry and areas of nature conservation. It has an elevation ranging from 840m AHD to 1140m AHD, comprising of hills and ridgelines with intervening valleys.

The majority of the soils within the Project Area are identified as erodible rudosols and tenosols (refer to **Figure 2.5**). Tenosols are typically very sandy, have a weakly developed soil profile without obvious horizons, generally have low fertility and poor water holding capacity (highly permeable). Rudosols also have a weakly developed soil profile and are often shallow with minimal organic matter accumulated at the surface and weathered parent material. These sandy low fertility soil types are representative of the granite parent geology of the area.

Modelled soil properties and modelled soil erosion (sourced from the NSW Office of Environment and Heritage's online mapping tool eSpade) for the Project Area are presented in **Table 6.28** and **Table 6.29** respectively.

Table 6.28 Modelled Soil Properties

Parameter	Depth 0 - 30 cm	Depth 30 - 100 cm	Units	Comments
pH ($CaCl_2$)	>4 to 6	>4 to 6.5	-	Subsoil pH generally greater than topsoil
Electrical Conductivity (EC)	<0.05 to 0.1	<0.05 to 0.2	dS/cm	EC generally higher on lower slopes. Salinity effects considered mostly negligible.
Clay Fraction	5 to 20	10 to 40	%	Topsoil predominately 10 to 20% clay Subsoil predominately 20 to 30% clay
Silt Fraction	5 to 15	5 to 20	%	Topsoil and subsoil predominately 10 to 15% silt
Sand Fraction	30 to 80	25 to 60	%	Topsoil generally >50% sand
Exchangeable Sodium Percentage (ESP)	>2 to 8	>2 to 10	%	Topsoil ESP predominately <4% upper slopes and <6% lower slopes and are considered generally non-sodic and not likely to be dispersible Subsoil ESP predominately <6% upper slopes and <8% lower slopes and are considered slightly sodic and may be dispersive
Organic Carbon (OC)	0.5 to 2	0.25 to 1	%	Assuming Organic Matter (OM) is 50% OC, the topsoil has low (<1%) to moderate (4%) OM content (a good range is considered to be 3 to 6%)
Cation Exchange Capacity (CEC)	<5 to 15	<5 to 15	$cmol_c/kg$	Topsoil predominately in the low CEC range of 6 to 12 $cmol_c/kg$

Table 6.29 Modelled Soil Erosion

Parameter	Value	Units	Comments
Soil Erosion (bare)	<20 to <2,000	T/ha/y	Slope dependent
RUSLE K Factor[2]	0.05 to 0.07	-	Highly erodible

The soil data presented in **Table 6.28** and **Table 6.29** indicates:

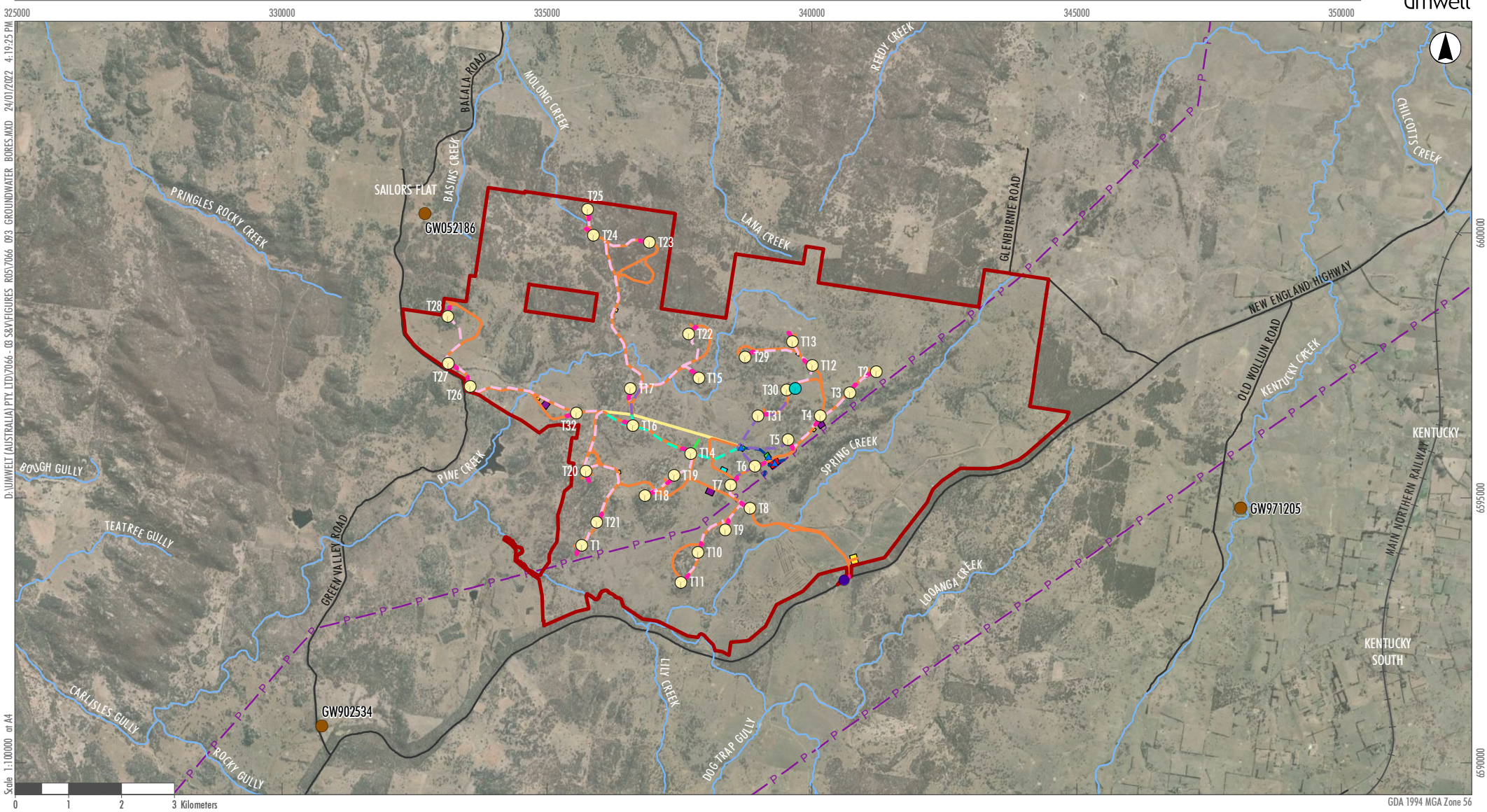
- that topsoils are likely to be coarse to fine grained, generally non-sodic and non-dispersive with low fertility
- subsoils are likely to be finer grained than topsoils, slightly sodic and possibly dispersive with low fertility
- soils in the Project Area are highly erosive and given the steep topography, the Project Area is generally considered to have a high erosion hazard.

6.9.3 Groundwater Environment

The Project Area is located within the area covered by the WSP for the *NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020* and specifically, the New England Fold Belt Murray Darling Basin Groundwater Source. Groundwater licensing in this catchment is therefore governed by the Water Management Act 2000.

A search of the Bureau of Meteorology's Groundwater Explorer identified a number of bores in the vicinity of the Project Area, however, none within the Project Area. Bore logs for these groundwater bores were sourced from the NSW Water Register. Three bores within 5 km of the Project Area had recorded water bearing zone depths and are shown in **Figure 6.20** and detailed below:

- 21.0 metres below ground level (mbgl) for bore GW971205 located approximately 3.6 km east of the Project Area
- 34.6 mbgl for bore GW052186 located approximately 1.0 km west of the Project Area
- 48.7 mbgl for bore GW902534 located approximately 4.5 km south west of the Project Area.



Legend

- Project Area
- Conceptual Turbine Layout
- Temporary Met Mast
- Proposed Access Point
- Conceptual Access Tracks
- Hardstand Area
- Batching Plants
- Laydown-Compounds
- Operation and Maintenance Compound
- Substation
- Switching Station
- Existing 330kV Power Lines
- 33kV Trenches
- 33kv Underground Trench
- Option 1 - MV Overhead Line Route
- Option 1 - Underground Trench to MV Overhead Line
- Option 2 - Full MV Underground Reticulation
- High Voltage TXL Route
- High Voltage Plants
- Groundwater Bores

FIGURE 6.20

Groundwater Bores

Image Source: ESRI Basemap Data source: NSW DFSI (2020), Neoen (2021)

6.9.4 Environmental Values and Water Quality Objectives

The NSW Water Quality Objectives (WQOs) have been developed to guide plans and actions to achieve healthy waterways. The WQOs are based on measurable environmental values for protecting aquatic ecosystems, recreation, visual amenity, drinking water and agricultural water. The WQOs for the Gywdir River, Namoi River and Macleay River catchments have been developed to achieve suitable water quality for the protection of:

- aquatic Ecosystems
- livestock Water Supply
- irrigation Water Supply
- homestead Water Supply
- drinking Water
- primary and Secondary Contact Recreation
- visual Amenity
- aquatic Foods.

Based on the likely construction activities and operations associated with the Project and the environmental values listed above, the water quality objectives presented in **Table 6.30** are considered relevant to the Project Area.

Table 6.30 Project Relevant Water Quality Objectives

Parameter	Units	Value/Range
pH	-	6.5 to 8.0
Electrical Conductivity	µS/cm	30 to 350
Turbidity	NTU	2 to 25
Total Phosphorus	µg/L	20
Total Nitrogen	µg/L	250
Visual clarity and colour	-	Natural visual clarity should not be reduced by more than 20%. Natural hue of the water should not be changed by more than 10 points on the Munsell Scale. The natural reflectance of the water should not be changed by more than 50%.
Surface films and debris	-	Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. Waters should be free from floating debris and litter.

6.9.5 Potential Soil and Water Resources Impacts

In the absence of appropriate controls, the potential impacts to soil and water resources associated with the Project are:

- Increased rate of loss of topsoil resource as a consequence of increased erosion during construction and demolition (at end of Project life) and during operation should site stabilisation (e.g., soil amelioration, revegetation and other permanent erosion control measures such as rock armouring of drainage channels) be ineffective
- Degradation of downstream surface water quality (primarily during construction and demolition but also potentially during operation) due to:
    - Elevated concentrations of sediment in runoff
    - Elevated concentration of nutrients in runoff (primarily associated with nutrients adhered to sediment)
    - Elevated pH and fine sediment concentrations in runoff from mobile concrete batching plant areas
    - Chemical spills/leaks entering streams (e.g., diesel fuel or hydraulic oils from mobile plant)
- Increased erosion and scour in stream due to:
    - Damage to stream bed and bank from construction activities adjacent to and in-stream (e.g., stream crossings)
    - Damage to riparian vegetation from construction activities on waterfront land
    - Increased runoff volumes due to the increase in impervious areas associated with the Project
    - Obstruction of fish passage associated with stream crossings
    - Alteration of flood flows and levels due to infrastructure located in close proximity to streams
    - Loss of catchment yield during construction
    - Depressurisation of groundwater aquifers and a reduction in bore yields to groundwater source users due to excavation/drilling during turbine foundation construction
    - Degradation of groundwater quality due to chemical spills/leaks during wind turbine foundation construction
    - Loss of catchment yield associated with sourcing water (harvesting on-site or via agreement with host or local landholders) to meet construction water demands
    - Impacts on local groundwater supply associated with sourcing water from nearby licenced bores via agreement with host or local landholders.

The soil and water assessment for the Project has considered and assessed each of these potential impacts and where the potential for impacts to occur, has identified appropriate management measures to mitigate these risks.

6.9.6 Soil and Water Impact Assessment

6.9.6.1 Soil and Surface Water

Soils and Surface Water Quality

As discussed in **Section 6.9.2**, the soils within the Project Area are highly erodible and some of the subsoils have the potential to be dispersive. The steep gradients across the Project Area and the infrastructure (access tracks and cables) that will cross streams further add to the potential for erosion of soils and the subsequent pollution of surface water resources. It should be noted, however, that the extent of disturbance is small when compared to the overall Project Area which limits the overall potential for erosion related impacts.

Erosion and sedimentation are therefore considered the primary risk to soil and surface water resources for the Project. The key mitigation measure applied during construction and operation of the Project will be the implementation of appropriately designed erosion and sediment controls (ESCs). ESCs will be designed, installed and maintained in accordance with *Managing Urban Stormwater: Soils and Construction Volume* 1 (Landcom, 2004) and *Volume* 2 (DECC, 2008) (the 'Blue Book'). Erosion and sedimentation risk is highest during the construction and decommissioning phases. Erosion and sedimentation risk during operations will be controlled through the establishment of effective site stabilisation measures following construction in relation to maintenance of access tracks, waterway crossings and other areas susceptible to erosion.

An erosion hazard assessment has been undertaken for the Project Area in accordance with Chapter 4.4.1 of Volume 1 of the 'Blue Book'. This includes all proposed works on the bed and bank of streams and land within 40 m of the high bank of any streams which are assessed as having a very high erosion hazard. Effective controls for works in these zones will be implemented during works to mitigate this hazard. This assessment also determined that on average the Project Area has a low erosion hazard. As such, enhanced erosion control measures are not required across the entire Project Area.

The soil loss class for Project Area has been estimated using the Revised Universal Soil Loss Equation (RUSLE) and Table 4.2 of Volume 1 of the 'Blue Book' for an average slope of 10% and an upper slop of 20%. The annual Project Area soil loss has been estimated using RUSLE as follows:

$$A = R \times k \times LS \times C \times P$$

where:

		Value	Units
A	is the annual soil loss rate	to be calculated	tonnes/ha/year
R	is the annual average rainfall erosivity calculated based on the 2 year, 6 hour duration ARI storm event intensity	1,495	-
k	is the soil erodibility (refer to **Table 6.29**, use highest k value for worst case)	0.07	-
LS	is the slope length gradient factor sourced from Table A1 of Managing Urban Stormwater Volume 1 (Landcom, 2004) based on the average slope of the Project Area	2.81 (10% slope) 7.32 (20% slope)	-
C	is the ground cover factor sourced from Figure A5 of Managing Urban Stormwater Volume 1 (Landcom, 2004) (assume worst case of no groundcover)	1.0	-
P	the erosion control practise factor sourced from Table A2 of Managing Urban Stormwater Volume 1 (Landcom, 2004) and is dependent on level of compaction and roughness of the disturbed surface (assume Compacted and smooth)	1.3	-

The calculated soil loss rates and corresponding soil loss class and erosion hazard are presented in **Table 6.31**.

Table 6.31 Project Area Soil Loss Class

Slope	Soil Loss Rate (tonnes/ha/year)	Soil Loss Class[1]	Erosion Hazard[1]	Construction Works Timing Restrictions[2]
10%	382	4	moderate	No
20%	996	6	very high	Yes

[1]Based on Table 4.2 of the Blue Book Volume 1 (Landcom, 2004)
[2] Based on Table 4.3 of the Blue Book Volume 1 (Landcom, 2004) for rainfall distribution zone 2

While not all areas within the Project Area to be disturbed are considered to have a high erosion hazard, those disturbance areas on steep slopes (above 20%) will be managed as Soil Loss Class 6 lands. Table 4.3 of Volume 1 of the 'Blue Book' indicates that construction works timing restrictions apply for sites in rainfall distribution zone 2 with soil loss Class 6 (including waterfront lands) as indicated in **Table 6.32** unless enhanced erosion control measures have been implemented. An erosion and sediment control plan will be implemented as part of the CEMP to be approved prior to the start of construction

Table 6.32 Construction Timing Restrictions for Soil Loss Class 6 Lands in Rainfall Distribution Zone 2[1]

Half of Month		
Month	1st	2nd
January	Yes	Yes
February	Yes	Yes
March	Yes	Yes
April	Yes with enhanced erosion control measures	Yes with enhanced erosion control measures
May	Yes with enhanced erosion control measures	Yes with enhanced erosion control measures
June	Yes with enhanced erosion control measures	Yes with enhanced erosion control measures
July	Yes with enhanced erosion control measures	Yes with enhanced erosion control measures
August	Yes with enhanced erosion control measures	Yes with enhanced erosion control measures
September	Yes with enhanced erosion control measures	Yes with enhanced erosion control measures
October	Yes with enhanced erosion control measures	Yes
November	Yes	Yes
December	Yes	Yes

[1]Adapted from Table 4.3 of the Blue Book Volume 1 (Landcom, 2004) for rainfall distribution zone 2

Where scheduling to avoid works on waterfront land (within 40m of top of bank) during high rainfall erosivity is not possible or is impractical, erosion control measures will be implemented to ensure disturbed lands only have C-factors in excess of 0.1 (i.e., approximately 60% ground cover) when the three-day forecast indicates that rain is unlikely. Management regimes will be established so that the Project Area can be stabilised (i.e. C-factor 0.1 or less) within 24 hours if the forecast is incorrect.

Further to the erosion control measures noted above, a detailed CEMP and OEMP will be developed during the detailed design phase which will incorporate relevant soil and water management measures. Under these plans, progressive erosion and sediment control plan drawings will be prepared for Project. The CEMP will likely include the following ESC measures:

- undertake targeted soil testing (in particular, to identify any dispersive soils) to determine topsoil and subsoil properties in high-risk areas to be disturbed (e.g. steep slopes, in close proximity to streams).
- diversion of clean water around disturbed areas.
- staging of works to minimise the extent of ground disturbance at any one time and progressive rehabilitation
- stockpiles managed in accordance with 'Blue Book' standard drawing *SD 4-1 Stockpiles*
- constructed batters with maximum slopes consistent with Figure 4.7 of *Volume 1* of the 'Blue Book'
- access tracks that are constructed and maintained consistent with *Volume 2C Unsealed Roads* of the 'Blue Book'
- fuels, chemicals and liquids are stored in impervious bunded areas, a minimum of 50 m away from:
    - rivers, creeks or any areas of concentrated water flow
    - flooded or poorly drained areas
    - slopes above 10%
- chemical spill kits will be available and personnel will be trained in spill response
- all vehicles and mobile plant will be appropriately maintained and subject to daily pre-start checks for fluid leakage
- bunded concrete wash-out bunds lined with plastic sheeting will be provided and sign posted so they are clearly identified by contractors and concrete agitator/pump drivers. No concrete wash-out will occur within 50 m of drainage lines or waterways.
- inspection and maintenance of installed erosion and sediment controls
- monthly downstream water quality monitoring (pH, turbidity and TSS). An appropriate downstream water quality monitoring location(s) will be identified during preparation of the CEMP.
- soil amelioration and rehabilitation:
    - minimum 200 mm of topsoil to cover any dispersive subsoils (outside of rocky areas)
    - ameliorate dispersive subsoils with gypsum around hard surfaces (e.g. turbine foundations) where concentrated flows have the potential to erode non-dispersive topsoil
    - use of biodegradable rolled erosion control products (e.g. jute mesh or mat) to provide stability during revegetation of disturbed areas
    - use appropriate species suited to the low fertility soils
- undertake trenching in accordance with *Volume 2A Installation of Services* of the 'Blue Book'

Mobile Concrete Batching Plants

All mobile concrete batching plants will be located in appropriately sized bunded areas to contain surface runoff that has the potential to have elevated pH and concentrations of fine sediment. Water captured within the bunds will be utilised for concrete production or removed from site by a suitably licenced waste contractor.

6.9.6.2 Surface Water Quantity

Water demands for the construction phase (18-24 months) of the Project are estimated to be in the order of 80 to 100 ML. The Project construction water demands will include:

- dust suppression
- concrete production
- concrete washout
- vehicle and equipment wash down
- firefighting water provisions
- amenities.

Water demands for the operational phase of the Project will be limited to amenities usage and are expected to be minimal.

Potable water demands for both the construction and operational phases of the Project will be supplied via water tanker and stored in on-site water tanks. Potable water storages will be routinely tested to ensure water quality meets the requirements of the Australian Drinking Water Guidelines (ADWG) (National Health and Medical Research Council, 2011) and an appropriate maintenance regime will be implemented to ensure water quality ADWG water quality standards are maintained.

Sources for non-potable water demands to meet construction 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 under agreement with host or local landholders
- groundwater from licenced bores under agreement with host or local landholders
- purchasing and transporting water to site by tanker.

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

All other water sourced from either surface water or groundwater sources to meet Project construction demands will be licenced and managed, as required, in accordance with the requirements of the *Water Management Act 2000*, the *Water Management (General) Regulation 2018* and relevant WSPs (i.e. the WSPs for the Namoi Unregulated River and Peel River Water Sources Unregulated Water Sources, the Gwydir Unregulated *River Water Sources 2012* and the *NSW Murray-Darling Basin Fractured Rock Groundwater Sources*).

6.9.6.3 Amenities Wastewater

Wastewater generated by amenities during the Project construction phase will be collected in a tank(s) and periodically removed by a suitably licenced waste contractor. During the operational phase of the Project, the volume of amenities wastewater will be significantly lower than that generated in the construction phase and will be managed by either collection in a tank(s) and periodic removal by a suitably licenced waste contractor or in an on-site wastewater management system.

6.9.6.4 Stream Stability, Riparian Health and Fish Passage

There are a number of ephemeral streams traversing the Project Area (refer to **Figure 6.19**). While the Project design has aimed to avoid works close to or within waterways, several waterway crossings will be required for site access, internal access roads and the electrical cabling layout. Project waterway crossings will be designed to minimise impacts on stream stability and fish passage and will be designed with reference to:

- *Guidelines for Controlled Activities on Waterfront Land* (the CAA Guidelines) (Department of Planning, Industry and Environment (DPIE) Water, 2018)
- Why Do Fish Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Department of Primary Industries (DPI) Fisheries, 2003)
- Fisheries NSW Policy and guidelines for fish habitat conservation and management, (NSW DPI, 2013).

For works on waterfront land (within 40m of top of bank of a defined stream) the following measures will be incorporated into the design of the works and controls included in the Soil and Water Management Plan:

- a site specific erosion and sediment control plan will be prepared for all works on waterfront land
- where practicable, infrastructure will be maintained outside of the vegetated riparian zone
- utilise stream crossings for co-location of services to avoid the need to trench through stream beds wherever practicable
- rehabilitate disturbed areas and provide scour protection to bed and banks as required to mitigate any areas with increased potential for erosion due to changes in flow regimes associated with Project infrastructure
- where practicable, undertake works on waterfront land from April to mid-October when fish passage is unlikely to occur.

During detailed design, consultation will be undertaken with DPI Fisheries to determine if any of the proposed waterway crossings require consideration of fish passage. For any crossings that do require consideration of fish passage, the relevant DPI Fisheries guidelines will be considered during the detailed design process.

6.9.6.5 Flood Regimes

Flood Review

Due to the rural location of the Project Area no existing flood mapping is available to define flooding hazard. In the absence of existing flood mapping, a flood risk assessment was conducted using hydrologic and hydraulic modelling in accordance with *Australian Rainfall and Runoff* guidelines and the *NSW Floodplain Development Manual* to assess a range of flood events. This included the 5%, 1%, 0.5% and 0.2% Annual Exceedance Probability (also referred to as the 1 in 20, 1 in 100, 1 in 200 and 1 in 500-year events respectively) and Probable Maximum Flood using flood depth, velocity and hazard levels.

The flood assessment concluded that the Project Area is located outside areas of major flood hazard with flood risk confined to waterways for events up to and including the 0.2% Annual Exceedance Probability event. The proposed turbine and substation locations are located on ridges and are categorised as not flood prone. Additionally, the proposed locations of the Batching plants and site operations and maintenance facility as well as construction compound and laydown areas were also found to be not flood prone. The proposed access roads cross Spring Creek and Pine Creek at several locations and therefore may be subject to flooding during high rain events. The design of these waterway crossings (i.e., culverts) will be undertaken at the detailed design phase. An Emergency Response Plan may also be required to be prepared in consultation with NSW State Emergency Services (NSW SES) and local Councils covering the management and response to flooding, prior to construction commencement.

Overall, there is low risk of flooding, with design options available during detailed design to further mitigate creek crossings where some flooding is possible.

Fluvial Geomorphology

The topography across the Project Area is steeply undulating. Slopes along tributaries are often 1% to 15%, with steeper slopes up to 30% along some watercourses.

Most of the drainage features are located on sloping terrain draining from the ridgeline (about RL 1000 m to 1140 m) that crosses the Project Area to the watercourses that leave the Project Area about 200 m lower. Streams are mostly constrained to confined valleys with little potential to develop floodplains, and are narrow, mostly less than 15 m (based on aerial topography).

Streams within the Project Area are mostly unnamed tributaries which are considered drainage features with no significant fluvial geomorphological characteristics. The drainage features appear to be incised in many locations. Many of the watercourses within the Project Area have been impounded for stock watering. No significant impacts on the fluvial geomorphological characteristics of the streams are predicted as a result of this Project.

Potential Impacts to Stormwater Quantity

A qualitative assessment of the potential impacts of the Project on stormwater discharge from the Project Area was undertaken based on aerial photography and the conceptual layout of the Project. The Project will also require the construction of access tracks and platforms around the turbines, operation and maintenance facilities and substations. During the construction phase, construction compounds and laydown areas will also be required. The construction will increase imperviousness within localised areas of the catchment resulting in localised increases in runoff rate and volume.

Peak stormwater discharges from the Project Area for impervious areas may increase slightly. However, potential impacts to drainage features and downstream watercourses are predicted to be minimal due to the relative size of the Project Area in relation to the size of the receiving catchments, and the distributed nature of minor impacts. It is expected that the extensive vegetated buffer strips alongside roads and other infrastructure, and grassed table drains will attenuate any localised increases in peak flows and no significant impacts on stream condition, infrastructure or downstream water users are predicted.

6.9.6.6 Groundwater

The construction of individual turbines could incorporate either gravity foundations or rock anchor foundations. Excavations for gravity foundations will be limited to up to 5 m below ground level, while rock anchor foundations are anticipated to require drilling to depths of up to approximately 16 m (subject to detailed design).

Given the depths to groundwater in bores in the vicinity of the Project Area are in excess of 20 m (refer to **Section 6.9.3**), interception of the regional groundwater table is not anticipated. As such, no depressurisation impacts on groundwater are expected as a consequence of the Project.

As the groundwater table is not expected to be intercepted the only potential pathway for impacts on groundwater quality will be infiltration of a hydrocarbon/chemical spill to the groundwater table. The risk of a hydrocarbon/chemical spill to impact on groundwater quality is considered negligible as:

- only relatively minor quantities of hydrocarbons/chemicals will be stored on site during Project construction and operation
- all fuels, chemicals and liquids will be stored in an impervious bunded area
- chemical spill kits will be available and personnel will be trained in spill response
- any hydrocarbon/chemical spills will be immediately contained and all contaminated soils will be removed from site for disposal by a suitably licenced waste contractor
- all vehicles and mobile plant will be appropriately maintained and subject to daily pre-start checks for fluid leakage.

In the unlikely event that the detailed design determines that the depth required for drilling for rock anchor foundations is greater than currently planned and that it could result in interception of the groundwater table, an assessment of potential groundwater impacts will be undertaken in accordance with the *NSW Aquifer Interference Policy* (NSW Government, 2012). It is noted that if the groundwater table were to be intercepted the impacts are expected to be minimal and short term. Any groundwater taken during construction that intercepts the groundwater table (by all aquifer interference activities) up to a volume of 3 ML in a water year is considered exempt under Schedule 4 of the *Water Management (General) Regulation 2018.* Any groundwater taken in excess of 3 ML in a water year would need to be licenced and managed in accordance with the requirements of the *Water Management Act 2000*, the *Water Management (General) Regulation 2018* and relevant WSPs (i.e. the WSP for the *NSW Murray-Darling Basin Fractured Rock Groundwater Sources*).

6.9.7 Management and Mitigation Measures

Overall the risk to soil and water resources form the Project is considered low, with the greatest risk posed associated with the erosion and sedimentation during the construction and decommissioning phases of the Project. It should be noted that the extent of disturbance is small when compared to the overall Project Area which limits the overall potential for erosion and that not all areas of the site have a high erosion hazard (i.e. areas with lower gradients). Only areas with a high erosion hazard will be subject to enhanced erosion control measures.

There is also an ongoing risk of erosion and sediment during operation should site stabilisation measures following construction be ineffective and maintenance of access tracks, waterway crossings and other areas susceptible to erosion be inadequate. However, the risk to soil and water resources due to erosion and sedimentation can be effectively managed through the implementation of the measures identified in **Section 6.9.6.1**. Any potential impacts to fish passage associated with waterway crossings and instream works will be adequately managed by designing and maintaining crossings as outlined in **Section 6.9.6.4**.

Impacts to groundwater resources are not expected given the groundwater table is unlikely to be intercepted during Project construction and the depth to groundwater at the Project site means that any hydrocarbon/chemical spills are unlikely to infiltrate to the groundwater table. Should the detailed Project design identify that construction activities will require deeper foundation excavations than currently envisaged and may result in the interception of the groundwater table, an assessment of impacts will be undertaken in accordance with the *NSW Aquifer Interference Policy* (AIP) (NSW Government, 2012) and appropriate management measures be developed to mitigate any potential impacts.

Should the Project be approved, a detailed CEMP will be developed including relevant erosion and sediment control measures, developed in accordance with *Managing Urban Stormwater: Soils and Construction Volume* 1 (Landcom, 2004) and *Volume* 2 (DECC, 2008) (the 'Blue Book'). The erosion and sediment control measures will capture the management requirements identified in **Section 6.9.6** and detail any other relevant construction and operational phase erosion and sediment controls based on the detailed design of the Project. The OEMP and decommissioning and rehabilitation strategy will also include relevant surface water and erosion sediment control management measures. The erosion and sediment control measures are to be prepared by a suitably qualified soil and water specialist, e.g., a Certified Professional in Erosion and Sediment Control.

6.10 Waste

The SEARs require the EIS to 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.

Appropriate and best-practice waste management will be implemented as part of the Project in accordance with the following legislation and guidelines:

- *Protection of the Environment Operations Act 1997* (POEO Act)
- Protection of the Environment Operations (Waste) Regulation 2014
- *Waste Avoidance and Resourse Recovery Act 2001* (WARR Act).

The Waste Classification Guidelines (EPA, 2014) have also been referred to in the preparation of this assessment. Best practice waste management involves implementation of resource management hierarchy principles as specified in the WARR Act, and the principles of ecologically sustainable development, which include:

- avoidance of unnecessary resource consumption
- resource recovery (including reuse, reprocessing, recycling and energy recovery)
- disposal.

6.10.1 Waste Classification

The potential waste types expected to be generated by the Project during the construction and operations phase are included in **Table 6.33**.

Table 6.33 Waste Generation Activities, Classification and Expected Waste Types

Activity	Waste Classification	Expected Waste Type
Construction	Liquid Waste	Waste oils, lubricants and liquids, paint, and sewage ablutions
	General Solid Waste (Non-Putrescible)	Green waste from site establishment and clearing of Disturbance Area, spoil from site earthworks, concrete, footings and laydown area waste, timber and packaging (including pallets), plastic packaging, other plastics (PET), cardboard packaging, paper, glass, empty chemical drums, oil spill clean-up material, metal offcuts and damaged metal (ferrous and non-ferrous), electronics and electrical infrastructure, recyclable domestic waste, and PPE
	General Solid Waste (Putrescible)	Domestic waste
Operations	Liquid Waste	Waste oils, lubricants and liquids, paint, and sewage ablutions
	General Solid Waste (Non-Putrescible)	Timber and packaging (including pallets), plastic packaging, other plastics (PET), cardboard packaging, paper, glass, empty chemical drums, paint, oil spill clean-up material, metal offcuts and damaged metal (ferrous and non-ferrous), electronics and electrical infrastructure, recyclable domestic waste, and PPE
	General Solid Waste (Putrescible)	Domestic waste

6.10.2 Waste Management

As part of the detailed design and construction phase 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 Waste Management Plan will outline the measures and strategies to be implemented on site to manage, reuse, recycle and safely dispose of waste including:

- separation and storage of recyclable and non-recyclable materials

- reuse and collection/transportation of waste
- procedures for tracking waste storage and disposal.

On-site waste management will include the appropriate separation and storage of waste streams to enable recycling and reuse wherever possible to reduce associated environmental impacts and impact to the capacity of local waste management facilities.

A decommissioning and rehabilitation plan will be developed for the Project prior to closure which will include a detailed review of the associated waste streams and recycling/disposal options available at the time. It is noted that some members of the community has expressed concerns regarding the recycling of WTG components and whether components would be buried on site. If the wind farm is decommissioned, Neoen as the owner of the facility will be responsible for the removal of the wind turbines and all above ground structures and for the rehabilitation of the site. Neoen has indicated that no infrastructure will be buried on site, however, some below ground infrastructure (such as concrete pads and electrical cabling) may remain in place. After the assets are removed, most of the materials are reclaimed or recycled, given the significant value of the steel, copper, aluminium, and other materials. Wind farm manufacturers are in the process of investigating recycling of wind turbine blades and Neoen has outlined that they will undertake best practice to reuse, recycle and dispose of turbine components at the time of decommissioning.

Potential management actions that may be required to manage waste have been identified for each potential waste type identified in **Table 6.33**, including indicative quantities (construction and operations phase). It is noted that the majority of the indicative waste quantities are applicable to the construction phase (95%) of the Project, as outlined in **Table 6.34**.

Table 6.34 Indicative Waste Generation and Management Actions (construction and operation phase)

Waste Type	Indicative Quantity	Waste Stream	Management Actions
Green waste	N/A (Reuse)	Reuse	Reused on-site where appropriate or recycled
Spoil	N/A (Reuse)	Reuse	Reused on-site where appropriate or reused offsite if classified Virgin Excavated Natural Material
Concrete	10 tonnes	Recycle	Separated on site and stored. Reused on-site where possible or offsite, alternatively transported offsite for recycling by appropriately licenced contractor
Plastic packaging	20 kg		Separated on site and stored. Transported offsite by appropriately licenced contractor for recycling
Plastics (PET)	50 kg		
Cardboard packaging/paper waste	50 tonnes		
Glass	100 kg		
Recyclable Domestic waste	1 tonne		Stored in recycling bins for periodic transportation offsite to applicable recycling facilities by appropriately licenced contractor
PPE	300 kg		Recyclable PPE will be stored on site if recyclable for periodic transportation offsite to applicable recycling facilities by appropriately licenced contractor

Waste Type	Indicative Quantity	Waste Stream	Management Actions
Metals (ferrous and non-ferrous)	50 tonnes		Scrap metal will be stored on-site for transportation to appropriate recycling facilities by appropriately licenced contractor
Empty chemical drums	100 drums	Reuse/Recycle	Reused on-site or stored for recycling (if possible) then transported to appropriate recycling facilities by appropriately licenced contractor
Timber	80 kg	Reuse/General Solid Waste (Non-Putrescible)	Pallets reused where possible or returned to source (if possible). All other timber reused on-site where possible or stored and transported offsite for recycling by appropriately licenced contractor
Electronics and electrical infrastructure	20 kg	Reuse/ Recycle/General Solid Waste (Non-putrescible)	Stored appropriately on site then transported to appropriate waste facility by appropriately licenced contractor. Where possible components will be reused, sold as scrap, recycled or re-purposed
Paint	50 litres	Liquid Waste	Stored appropriately then transported from site and disposed of by appropriately licenced contractor
Oil spill clean-up material	20 kg	Hazardous Waste	Material (oily rags/spill clean-up) will be stored in regulated waste bins and transported to licensed waste facility by appropriately licenced contractor
Waste oils, lubricants and liquids	500 litres	Hazardous Waste	Stored appropriately on site and transported to licensed regulated waste facility by appropriately licenced contractor
Septic tank waste	200 kL	Sewage	Waste will be collected and transported for disposal at appropriately licenced waste facility by appropriately licenced contractor
Domestic waste	4 tonnes	General Solid Waste (Putrescible)	Stored appropriately on site and transported to licensed regulated waste facility by appropriately licenced contractor

6.11 Air Quality

The Project will generally contribute to positive air quality outcomes through reductions in greenhouse gas emissions in comparison to other electricity generating sources, including traditional coal-fired power stations.

Air emissions from the Project Area would be predominately associated with the proposed construction activities. Construction air emissions would include dust generated through ground disturbance, civil construction activities and plant/vehicle exhaust emissions. These emissions would be temporary, for the duration of the construction phase (i.e. 18 – 24 months).

During construction, dust particles and other emissions may be released from a range of activities including:

- vegetation clearing
- upgrades of access tracks and roads
- stockpiles

- open and exposed areas
- excavation works
- mobile concrete batching plants
- rock crushing
- processing and handling of material
- construction activities and associated earthmoving and construction equipment
- transfer points
- loading and unloading of material
- haulage activities along unsealed roads, and
- blasting.

The construction activities that may generate dust will be localised and small at any one time in the context of the overall scale of the Project Area, and with appropriate controls in place as outlined in **Section 6.11.1**, are not predicted to result in material air quality impacts.

During operations, the lowest WTG blade edge point for the Project will be approximately 70 m above the ground. While turbine rotation does cause some downstream wake effects (a type of turbulence) for a distance beyond the wind turbine, the effect is very high above ground, such that it is not noticeable at ground level, and not to a degree that could draw up air to spread dust and seeds.

The primary source of air emissions during operations will be emissions from vehicle movements along site tracks, however, the risk will be much lower than for construction given the much lower intensity of vehicle movements and can be mitigated via effective road maintenance and vehicle speed management.

With the implementation of the mitigation measures discussed below, the construction and operation phases of the Project are not predicted to result in significant air quality impacts.

6.11.1 Mitigation and Management Measures

The temporary impacts to air quality during construction would be subject to a range of management and mitigation measures through the implementation of a CEMP. The CEMP would be developed during the detailed design and pre-construction phases and would include management measures to limit dust generation and the potential for off-site dust impacts. Specific measures in the CEMP to address air quality impacts will include:

- minimise dust emissions from areas exposed by construction through the application of water and/or dust suppressants using a water cart (as required)
- locate, shape and seed longer-term topsoil stockpiles in a strategic manner to minimise dust erosion from exposed surfaces
- implement and enforce speed limits for construction vehicles and equipment on unsealed access tracks and hardstand areas
- limit construction activities during unfavourable (windy) weather conditions

- dust controls (such as water sprays or dust capture systems) for the construction phase concrete batching plants
- undertake blasting activities in accordance with a detailed methodology prepared by a suitably qualified person and implement a blast monitoring program (refer to **Section 6.3.3**)
- regular inspections/audits to ensure appropriate air quality controls are being implemented during construction activities.

Air quality emissions during the operations phase would be limited. The OEMP, to be developed during the detailed design phase, would include on-site management measures to limit off-site air quality emissions. Specific measures in the OEMP to address air quality impacts would include:

- implement and enforce speed limits for operations vehicles and equipment on unsealed access tracks and hardstand areas
- minimise dust emissions from exposed areas through the application of water and/or dust suppressants using a water cart (as required)
- limit operational maintenance activities during unfavourable (windy) weather conditions
- regular inspections/audits to ensure appropriate air quality controls are being implemented during operations and maintenance activities.

6.12 Social and Economic

The SEARs require the EIS to include an assessment of the social and economic impacts and benefits of the project for the region and the State as a whole, including consideration of any increase in demand for community infrastructure services.

In accordance with the SEARs an Economic Impact Assessment has been prepared by Ethos Urban (refer to **Appendix 19**) and a Social Impact Assessment (SIA) has been prepared by Umwelt (refer to **Appendix 7**). These are assessments are summarised in the following sections with further detail provided in the relevant appendices.

6.12.1 Economic Impact Assessment

During the stakeholder engagement program, community responses regarding the economic impacts of the Project most frequently identified positive economic impacts, particularly relating to the provision of clean energy provision and employment/procurement (refer to **Section 5.2**). However, community concerns raised in relation to negative economic impacts included:

- effects on other prominent industry sectors
- disruption to farming practices
- changes to availability and/or accessibility of community infrastructure and services.

These positive impacts and economic related concerns are addressed in the Economic Assessment, including the proposed management measures developed to address any potential impact. The results are summarised below, with further detail provided in **Appendix 19**.

6.12.1.1 Methodology

The Economic Assessment has been prepared in accordance with the SEARs and addresses the economic benefits and impacts associated with the Project. The Economic Assessment includes an assessment of Project investment, employment, business and industry participation opportunities, agricultural impacts, accommodation and housing, economic stimulus and cumulative impacts.

The Economic Assessment Study Area comprises the following LGAs:

- Armidale Regional Area Council
- Tamworth Regional Area Council
- Uralla Shire Council
- Walcha Council.

The Economic Assessment includes the following summary of the Study Area:

- The population of the Study Area totalled 101,300 persons as of June 2020. Over the period 2020-2036, annual population growth in the Study Area is forecast to be minimal at +0.5% per annum (pa), compared to the forecast NSW growth rate of 1.3% pa (DPIE, State and Local Government Population Projections, 2019). However, the Uralla and Walcha LGAs are forecast to experience notable population decline over the same period. The assessment indicates that local investment projects (such as the Project) can generate new employment opportunities for residents and diverse income streams for local farmers. These factors may then contribute to retaining, and potentially expanding, population levels within the Uralla and Walcha LGAs.
- The Study Area had an unemployment rate of 5.1% in March 2021, compared to the NSW rate of 6.4%, with 2,630 jobseekers unemployed at that time. Construction of the Project has the potential to provide new short-term employment opportunities for the Study Area's labour force participants (subject to suitable skills), and a small amount of ongoing employment once the facility is operational.
- The Study Area's occupational and business structure indicate a good base exists to service the needs of the Project, with approximately 13,850 workers and 1,930 businesses located within the Study Area involved in construction-related activities.
- The major regional cities/townships of Tamworth and Armidale have significant capacity to service many aspects of the Project, with smaller settlements such as Uralla, Bendemeer, Walcha, Kentucky, Moonbi and Kootingal, also likely to play a role in providing labour, accommodation and other general services to the Project.

6.12.1.2 Economic Impact Assessment Overview

The net economic outcomes presented in the EIA are summaries in **Table 6.35**.

Table 6.35 Net Economic Outcomes

Factor	Value
Negative Community Outcomes	
Temporary loss of agricultural land (30 years)	Approximately 250 ha
Loss of employment (includes direct and indirect jobs)	0

Factor	Value
Positive Community Outcomes	
Construction Phase	
Capital investment	+$373 million
Study Area investment (including wage stimulus)	+$56.0 million (assumes 15% of total investment)
Construction employment (direct plus indirect jobs)	495 FTE direct and indirect jobs (over 18-24 months), including - study Area jobs 135 FTE direct on-site 75 FTE indirect off-site **Total: 210 FTE in the Study Area**
Operations Phase	
Operational employment (direct and indirect jobs)	20 FTE direct and indirect total jobs (for 30 years), including - study Area jobs: 5 FTE direct on-site 4 FTE indirect off-site **Total: 9 FTE in the Study Area**
Operational Study Area Economic Stimulus (Total net local economic stimulus (host landowner returns, Neighbourhood Sharing Program payments, operational wage stimulus, Community Benefit Fund payments, increased Council land tax returns)	+$99.0 million (over 30 years)
Total Study Area Economic Benefits (Construction and Operational Phases)	+$155.0 million (Construction period plus 30 years operation)

Overall, the Project will involve approximately $373 million in investment and have the capacity to supply sufficient clean energy to power the equivalent of approximately 118,000 homes per annum, which represents approximately 2.7 times of the total annual residential requirements of the Study Area (43,300 dwellings). Further discussion of both the positive and negative community economic outcomes reported in the EIA are discussed further below.

Employment

During the construction phase, the Project will support a total of 495 FTE positions (direct and indirect). Once operational, a total of 20 FTE jobs (direct and indirect) will be supported by the Project. Employment generated by the Project within the Study Area (direct and indirect) is estimated at approximately 210 FTE jobs during the construction phase and approximately 9 FTE jobs during the operational phase.

The EIA indicates that the Project will provide significant participation opportunities for businesses and workers located in the Study Area (subject to skills and available resources). Neoen has indicated that they intend to be proactive in the pre-construction phase in connecting the Engineering, Procurement and Construction (EPC) contractors with local business and workers.

Services

The Project will support increased/new revenues for accommodation providers and private homeowners over the construction phase, particularly in off-peak seasons. The 'external' Project labour requirement (non-local workers temporarily relocating to the Study Area) would be expected to generate an accommodation need for 85 FTE workers at the peak of the construction phase. The EIA notes that this represents only 5% of total commercial accommodation rooms/cabins within a 60-minute drive of the Project Area, with further capacity available in caravan parks (powered sites), and private rentals (e.g. Airbnb).

The 55 FTE construction workers expected to relocate to the Study Area are expected to inject approximately $2.7 million in new spending into the economy over the construction phase, supporting approximately 18 FTE jobs in the service sector across the Study Area over this period.

Land Use

Approximately 250 ha of existing agricultural land will be required to host the Project, which represents just 4% of the broader Project Area (5,918 ha). The Project is compatible with agricultural land use and no change to the land use associated with the Project is proposed. Therefore, no loss of employment associated with the Project Area is anticipated, either directly (on-site) or through the supply chain, as existing agricultural activity can continue across the Project Area. The agricultural land use of the Project Area would also benefit from the construction of approximately 50 km of internal tracks across the Project Area providing increased access.

Additionally, ongoing economic stimulus associated with the operation of the Project is estimated at approximately $99.0 million over 30 years, (2021 dollars, CPI adjusted) associated with host landowner lease returns, Neighbourhood Sharing Program payments, operational wage stimulus, Community Benefit Fund payments and increased Council land tax returns from the Project Area. It is considered this economic stimulus will assist with supporting the agricultural land use within the region.

6.12.1.3 Cumulative Economic Impacts

The EIA includes an assessment of the potential and proposed SSD projects located within 100 km of the Project Area, as outlined in **Section 2.1.3** and **Figure 2.1**. In relation to cumulative impacts the Project may need to compete for labour, accommodation and other resources with these identified Projects.

The EIA notes the following in relation to the other relevant projects considered as part of the cumulative impact assessment:

- A number of the projects are approved and therefore likely to be completed prior to the construction phase of the Project commencing, including Gunnedah Solar Farm, Metz Solar Farm, Sapphire Solar Farm, UNE Solar Farm, New England Solar Farm Stage 1, Tamworth BESS and Armidale BESS.
- Several projects are either community or small-scale projects requiring limited resourcing, including Stringy Bark Solar Farm, Taminda Solar Farm, Guyra Solar Farm, and Manilla Solar Farm. Additionally, some of these projects will also be completed prior to 2024 (e.g. Guyra Solar Farm).

- The development status of remaining projects is either 'pre-scoping' or 'under assessment' through the assessment process. It is recognised that most of these proposals are associated with SSDs and will require major resourcing during the construction phase. However, until development consent is granted, it is difficult to predict the expected construction timing of these projects. The EIA also notes the following in relation to general factors associated with moving from the planning approval to construction phases for major renewable energy projects that will influencing construction timing:
    - some projects may need to be on sold to a developer for construction to progress
    - grid connection will need to be secured, noting potential transmission constraints associated with multiple new large-scale projects trying to access the grid simultaneously
    - power purchasing agreements may need to be secured to provide investment surety prior to construction progressing
    - external project financing may need to be secured prior to proceeding with construction
    - some developers with large portfolios may prioritise construction of projects in other locations for financial or strategic reasons
    - some developments may not proceed past planning approval stage for a variety of reasons, including challenging market and investment conditions, competitive factors or reduced policy support.

The EIA includes the following in relation to regional economic capacity in consideration of the potential cumulative impacts of the Project:

- The Study Area has significant capacity in terms of construction-related workers (13,850 workers) and construction-related businesses (1,930 businesses), including some located in the immediate region to service multiple concurrent infrastructure projects.
- The Study Area currently contains significant accommodation (1,890 rooms and cabins)
- The Study Area currently contains 2,630 unemployed labour force participants, some of whom could work on these infrastructure projects (subject to suitable skills mix).
- The ongoing transformation of the region over the coming years into a key national renewable energy hub will provide significant upskilling and training opportunities for local workers building specialist workforce capacity capable of servicing the expanding sector.
- Improved investment certainty, stimulated by the New England REZ, will provide confidence to industry and business suppliers to the renewable sector that a sustainable pipeline of major projects exists allowing them to invest and expand operations to meet increasing demand for their services. Increased demand certainty may also entice new entrants into the sector, further increasing industry and business capacity.

In consideration of the likelihood of the construction phase of other projects in the region overlapping with the construction phase of the Project and the economic capacity of the region, the EIA considers that the potential cumulative impacts associated with the Project will be manageable.

Neoen has committed to the development and implementation of workforce, procurement and accommodation strategies which will assist in the management of the cumulative impacts. These strategies will be developed in the lead up to the construction phase of the Project to reflect and respond to actual regional demand conditions at that time, especially in relation to concurrent projects principally being serviced out of Tamworth and Armidale.

6.12.1.4 Mitigation and Management Measures

In order to manage potential cumulative impacts and maximise benefits to the local and regional economy and communities, the EIA includes the following mitigation measures:

- Prior to commencing construction and responding to actual regional demands at that time, Neoen will prepare an Accommodation, Procurement and Employment Strategy (as part of the Neoen Local Participation Plan) for the Project in consultation with relevant stakeholders. This would include:
    - an updated review of accommodation availability to ensure there is sufficient accommodation for the workforce associated with the construction phase of the Project and identification of any required management measures
    - measures to addresses any specific cumulative impacts arising associated with the other identified concurrent SSD projects under construction.
- Neoen has also committed to the development and implementation of a Community Benefit Program. The Community Benefit Program will include the following:
    - provision of annual payments to non-host properties neighbouring the wind farm benefitting landowners with land adjacent to the project boundary, who are not directly associated with the Project infrastructure.
    - a Community Benefit Fund (CBF) providing annual finance for local community projects through a competitive grants process. Appropriate guidelines and management structures to administer the CBF will be developed prior to its operation.

6.12.2 Social Impact Assessment

The SEARs require the EIS to include an *assessment of the social and economic impacts and benefits of the project for the region and the State as a whole, including consideration of any increase in demand for community infrastructure services, assessment of impact on agricultural resources and agricultural production on the site and region*. The Social Impact Assessment (SIA) has been prepared by Umwelt, in line with the key principles and processes outlined in the NSW Government's Social Impact Assessment (SIA) Guideline (DPIE 2021) to address the SEARs in combination with the Economic Assessment discussed in **Section 6.12.1**.

A key component of the SIA is the process of understanding, from the local community and business perspective, the issues, values and uses associated with the assessment area, and specifically the identified issues of concern and potential opportunities associated with the Project. These impacts are then further assessed to predict any significant social impacts in relation to the Project which may require mitigation or enhancement.

The SIA provides a comprehensive description of community views of the Project from the perspectives of those involved, in a personal, community, social and cultural sense. Social impacts may be physically observable or may manifest as rational or justified fears or aspirations; may be experienced positively and negatively by different stakeholders; and may be tangible or more intangible (SIA Guideline, 2020).

Concerns and feedback relating to the Project identified throughout the engagement undertaken by Neoen and Umwelt, have been considered by Neoen and the Project team, and have been used to inform the refinement of the Project design and the development of this EIS including proposed management and mitigation measures.

As discussed in **Section 5.1**, Neoen developed a Community Relations Plan (CRP) which details the Project's approach to engagement and community benefits sharing, which was submitted to DPIE together with the Scoping Report in November 2020. Outcomes from community consultation activities undertaken by Neoen during the scoping and EIS preparation phases were reviewed and consolidated to inform the SIA and understand the range of community views, concerns, interests, and feedback provided on the Project. This existing information has been complimented by a targeted consultation program for the SIA, undertaken between September and October 2021 by Umwelt in collaboration with Neoen.

The outcomes of the SIA are summarised in the following sections with the full SIA report contained in **Appendix 7**.

6.12.2.1 Methodology

As outlined in **Figure 6.21**, and consistent with the SIA Guideline, the SIA process involved three key phases.

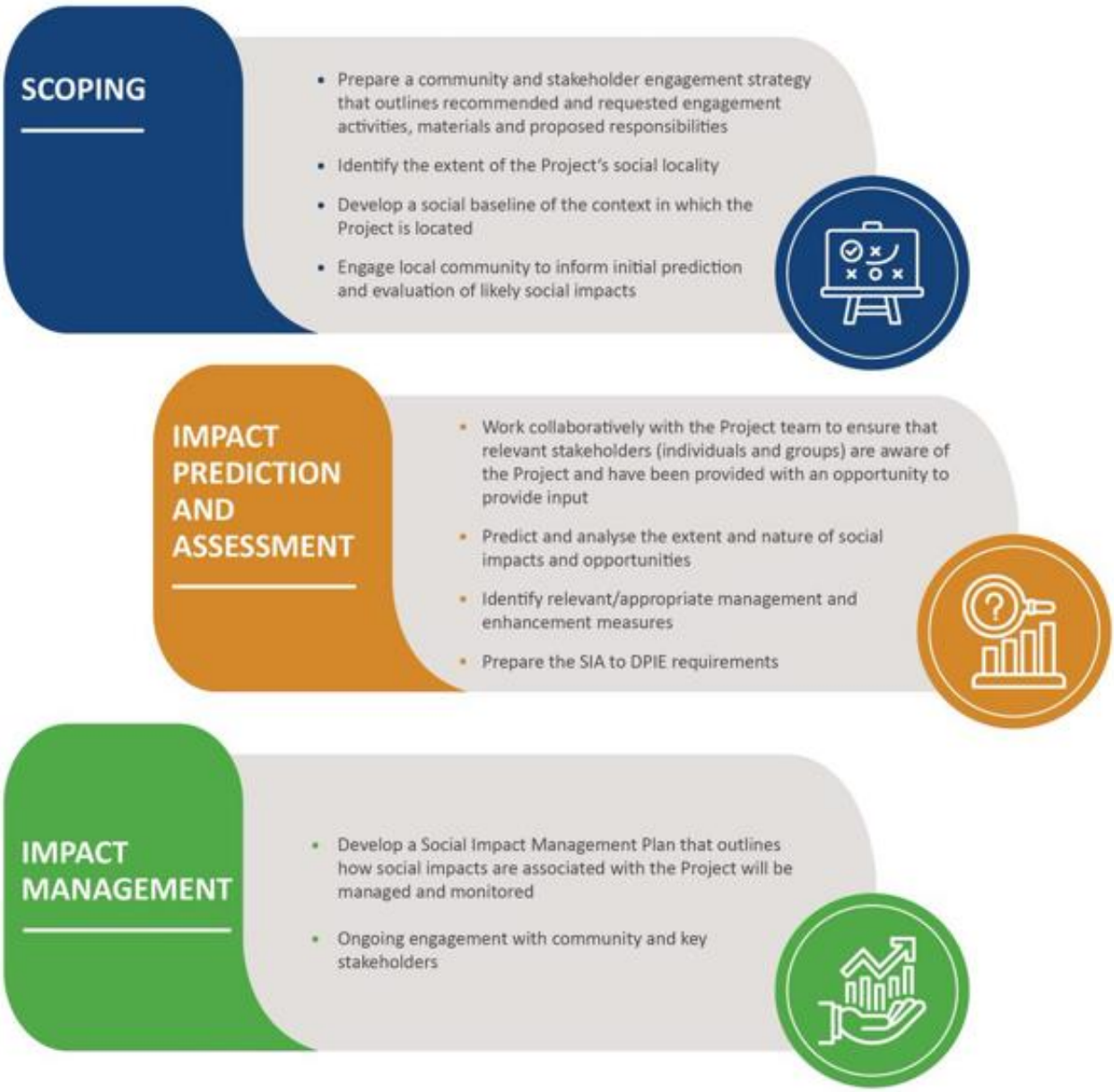


Figure 6.21 SIA Program Phases

6.12.2.2 Evaluation of Impacts

Table 6.36 provides a summary of the evaluation of social impacts for the Project. Further detail in relation to the issues raised and relevant perceived social impacts is provided in the SIA (refer to **Appendix 7**). It is important to note that unlike in the context of other technical studies undertaken to inform this EIS, there are no thresholds in the social space with the identification of possible consequences largely due to making a qualitative assessment. Therefore, the social risk assessment is also informed by the socio-economic baseline data, outcomes of literature reviews and experiences with other projects, outcomes of consultation that reflect the felt or lived experiences of consulted stakeholders and findings of technical studies.

An important component of the SIA has been the integration of technical results with the risk ranking of a Project factor or impact as identified by consulted stakeholders i.e. the sensitivity/susceptibility/ vulnerability of people to adverse changes caused by the impact and/or the importance placed on the relevant social matter. Consequently, stakeholder ratings of risk were determined by assessing impacts identified through the consultation process. The resulting ranking (i.e. low, moderate and high) is determined by the frequency that an issue was raised by a particular stakeholder group in the engagement process. These views have been presented in Table 6.36 as stakeholder perceived significance.

In line with the SIA Guideline, to assess the overall social risk, the magnitude is cross-referenced with the likelihood to determine an overall risk assessment rating (i.e. low, moderate, high, or very high). In the case of some impacts, this risk assessment has involved reference to the relevant technical reports of the EIS (e.g. traffic, noise, blasting, air quality etc.), however, the associated social impacts have been assessed through the social risking process. It should be noted that the residual social risk ratings represent the risk post implementation of mitigation measures with the majority of residual social impact rated low.

Table 6.36 Evaluation of Social Impacts

Social impact theme	Project aspect	Social impact description	Duration[2]	Extent/affected parties	Stakeholder Perceived significance[3]	Significance rating[4]			Social mitigations/ enhancement measures	Residual significance
						L	M	S		
Community/ Accessibility/ Way of Life	Project construction	Population influx caused by the construction workforce resulting in temporary change in community composition and township service capacity in select towns	C	Broader community Local government Local service providers	L	D	2	L	Prepare accommodation, employment, and procurement strategy prior to construction (as part of the Local Participation Plan)	L
Surroundings Livelihoods	Project construction and operations	Altered landscape affecting people's sense of place, rural character, visual amenity, and community values	C & O	Some neighbouring landholders	H	C	3	M	Implement visual mitigation measures to address landholder concerns where possible, Communicate outcomes of the Stage 1 LVIA to interested stakeholders Avoid ecological sites where possible	L
				Local community (Kentucky, Kentucky South, Wollun) Community and environmental groups	H	D	2	L		L
				Broader community	M	D	2	L		L
	Project construction and decommissioning	Impacts on surroundings and future land uses post decommissioning	C & O	Host landholders	L	D	2	L	Decommissioning plan to be develop pre-closure of the wind farm in consultation with relevant stakeholders	L
				Neighbouring landholders	H	D	2	L		L
				Community and environmental groups	H	D	2	L		L
				Broader community	L	D	2	L		L

[2] C = Construction Phase; O = Operations Phase
[3] Level of concern or interest from the perspective of the affected party
[4] L = Likelihood (A: Almost Certain, B: Likely, C: Possible, D: Unlikely, E: Very Unlikely); M = Magnitude (1: Minimal, 2: Minor, 3: Moderate, 4: Major, 5: Transformational); S = Significance rating (L: Low, M: Medium, H: High, VH: Very High)

Social impact theme	Project aspect	Social impact description	Duration[2]	Extent/affected parties	Stakeholder Perceived significance[3]	Significance rating[4]			Social mitigations/ enhancement measures	Residual significance
						L	M	S		
	Project operation	Perceived public safety and health risk due to reduced access for bushfire management	C & O	Host and neighbouring landholders Emergency services Community and environmental groups Broader community	H	D	2	L	Development of a Bush Fire Emergency Management Plan in consultation with the RFS Ongoing engagement with local community regarding concerns	L
	Project construction and operations	Social amenity and way of life impacts due to noise, vibration, lighting due to changes in how people experience their surrounds	C	Some neighbouring landholders	H	C	2	M	Construction management planning to consider proximity of activities to residential properties	L
				Residents along the transport route	M	C	2	M	Construction management planning to consider activities affecting local community	L
			O	Neighbouring landholders	H	C	2	M	Feedback mechanisms for community to submit questions / complaints	L
				Local community (Kentucky, Kentucky South, Wollun)	M	D	2	L		L
	Project construction and operations	Social amenity and way of life impacts due to air quality/ dust	C	Neighbouring landholders Local community (Kentucky, Kentucky South, Wollun)	L	D	2	L	Construction management planning to consider proximity of activities to residential properties	L
			O	Neighbouring landholders Local community (Kentucky, Kentucky South, Wollun)	L	D	1	L	Feedback mechanisms for community to submit questions / complaints	L

Social impact theme	Project aspect	Social impact description	Duration[2]	Extent/affected parties	Stakeholder Perceived significance[3]	Significance rating[4]			Social mitigations/ enhancement measures	Residual significance
						L	M	S		
Accessibility/ Surroundings	Project operation	Renewable energy provision reducing effects of climate change	O	Broader community NSW community Australia	H (+)	A	4	VH (+)	Consideration of local energy provision projects through Community Benefit sharing program	
Livelihood	Project construction and operations	Decline in property values due to proximity of the Project	C & O	Neighbouring landholders	H	D	2	L	Community benefits sharing program Neighbour Benefits Sharing Program	L
	Project construction	Provision of employment, training and upskilling of local people. Commercial benefit through procurement opportunities for local business and service providers	C	Local and regional businesses, contractors and suppliers Local and regional service providers Job seekers Local Government Broader community	M	B	4	H (+)	Prepare Accommodation, Employment and Procurement Strategy prior to construction in consultation with local stakeholders Indigenous Participation Plan co-developed with Aboriginal stakeholders	
	Project construction and operations	Loss of agricultural land and impacts to land use	C & O	Host landholders/farmers	L	D	2	L	Long-term lease agreement with the associated landholders includes provision for Neoen's decommissioning obligations Provision of information to landholders regarding key research outcomes Ongoing engagement with neighbouring landholders	L
		Disruption to farming practices and land use	C & O	Neighbouring landholders/farmers Broader community Local Government Community and environmental groups	M	D	2	L		L
	Presence of the Project	Increased tourism activity	O	Tourism providers Broader community	L	C	2	M (+)	Engagement with tourism providers	L

Social impact theme	Project aspect	Social impact description	Duration[2]	Extent/affected parties	Stakeholder Perceived significance[3]	Significance rating[4]			Social mitigations/ enhancement measures	Residual significance
						L	M	S		
	Project construction and operations	Distributive equity issues between host and neighbouring landholders	C & O	Host and neighbouring landholders	M	C	1	L	Proactively consult with Project neighbours to collaboratively develop Community Benefit Strategy and associated programs targeted to nearby residents	L
	Project construction and operations	Income diversification for property owners through host and neighbour payments	C & O	Host landholders	M (+)	A	2	M (+)	Ensure Project benefits are equitably distributed	
				Near neighbours	M (+)	B	2	M (+)		
	Project construction	Strain on accommodation and housing market due to construction workforce demand, affecting accessibility and availability for other users	C	Accommodation service providers Visitors and tourists Local Government Broader community	L	C	3	M	Develop Accommodation, Employment and Procurement Strategy (as part of the Local Participation Plan) in consultation with local stakeholders ahead of construction	L
	Project construction	Impacts relating to road access and way of life as a result of increased traffic movements during construction	C	Broader community Road users	L	C	2	M	Construction Management Plan to include traffic management measures and local road changes	L
Community	Project construction and operations	Increased social investment at the local level through provision of Community Benefits Fund	C & O	Local community (Kentucky, Kentucky South, Wollun) Broader community	M (+)	B	2	M (+)	Ensure targeting of Community Benefit Strategy to local needs, priorities, and aspirations Ensure neighbouring landholders and other sensitive or vulnerable groups are considered as a discreet recipient	

Social impact theme	Project aspect	Social impact description	Duration[2]	Extent/affected parties	Stakeholder Perceived significance[3]	Significance rating[4]			Social mitigations/ enhancement measures	Residual significance
						L	M	S		
Decision-Making Systems/ Community	Presence of the Project	Impacts on sense of community, community cohesion and sense of place		Host and neighbour landholders Local community (Kentucky, Kentucky South, Wollun)	M	C	2	M	Proactive, thorough, and transparent consultation process through Project planning, assessment, and development phases Community benefit sharing program Neighbour Benefits Sharing Program	L
Surroundings	Presence of the Project	Impacts on community ecological values (including access to water)	C & O	Host and neighbour landholders Local community (Kentucky, Kentucky South, Wollun) Community and environmental groups Broader community	H	C	1	L	Communication of key management measures and outcomes to key stakeholders	L
Accessibility	Project construction and operations	Impacts to access to services and facilities including waste services and telecommunications	C & O	Local community (Kentucky, Kentucky South, Wollun) Local Government Broader community	M	C	1	L	Engagement with local council and service providing	L
	Project construction	Cumulative impacts on community services as a result of construction workforce in the region	C	Local community (Kentucky, Kentucky South, Wollun) Local Government Service providers and local businesses Broader community	M	C	3	M	Develop Accommodation, Employment and Procurement Strategy (as part of the Local Participation Plan) in consultation with local stakeholders ahead of construction	L

Social impact theme	Project aspect	Social impact description	Duration[2]	Extent/affected parties	Stakeholder Perceived significance[3]	Significance rating[4]			Social mitigations/ enhancement measures	Residual significance
						L	M	S		
Health and wellbeing	Presence of the Project	Perceived effects of the Project development causing stress, anxiety, and health effects on local residents.	C & O	Neighbour landholders Local community (Kentucky, Kentucky South, Wollun)	H	C	2	M	Ongoing engagement with local community	L
		Impacts to physical health as the result of Project impacts (i.e. EMF)	O	Neighbour landholders Local community (Kentucky, Kentucky South, Wollun)	M	D	1	L		L
Culture	Project construction and operations	Impacts on Aboriginal cultural heritage	C&O	Aboriginal community	M	D	2	L	Ongoing engagement with Aboriginal Stakeholders	L

6.12.2.3 Social Impact Management Planning

To minimise potential negative social impacts and enhance social benefits for the community, there have been a number of Project design changes and a range of management measures development for the Project, these include:

- Separating the Thunderbolt Energy Hub into two stages and only progressing with Stage 1 as part of this current development application.
- Designing the Project to seek to avoid and minimise impacts on environmental values and the surrounding community where practicable. Multiple design changes have been made to reduce impacts including through consideration of the findings of preliminary environmental studies and stakeholder feedback.
- Neoen has sought to enter into agreements with the most affected near neighbours to the Project including commitments to appropriate mitigation and management measures. Agreements are in place with the most affected nearby landowners. These agreements are in addition to the agreements in place with the host landholders and collectively ensure the effective mitigation and management of the impacts of the Project on the most effected nearest neighbours
- A range of social mitigation and management measures outlined in detail in the SIA (refer to **Appendix 7**), including:
    - The Community Relations Plan (CRP) will be updated to include all community engagement measures to manage and enhance social impacts throughout each stage of the Project.
    - A Community Benefit Sharing Program, including Neighbour Benefit Program which is designed to ensure that near neighbours receive a monetary benefit from the Project and a Community Benefits Fund to provide benefits to the broader local community.
    - A Local Participation Plan which will include an Accommodation, Employment and Procurement Strategy.

The SIA concludes that collectively these measures will provide a robust social impact management and mitigation plan for the Project that aims to enhance the positive social impacts and mitigate the potential negative impacts.

6.13 Cumulative Impact Assessment

As discussed in **Section 2.4**, there are a total of 34 renewable Energy Projects within or in the vicinity of the REZ (extending up to approximately 165km from the Project Area) and two Battery Energy Storage System (BESS) projects. Of the 34 renewable energy projects, 3 are operational, 4 are under construction and 12 are approved. Twelve projects are at various stages of the assessment process and 3 projects are in planning (scoping report yet to be submitted). Of the 12 Projects currently under assessment, 4 are wind farm developments and 8 solar farm developments.

The *Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects* (DPIE, 2021) requires consideration a project together with the impacts of other relevant future and existing projects in order to determine the potential cumulative impact. The CIA guidelines indicates the following future projects should be considered in the cumulative impact assessment:

- changes to existing projects (expansion, modification, closure)

- approved projects (approved but construction has not commenced)
- projects under assessment (application for the project has been exhibited and is currently under assessment)
- related development (development that is required for the project but subject to separate assessment).

In accordance with the CIA guidelines a scoping summary was undertaken to identify the potential for cumulative impacts to occur as a result of the Project (refer to **Appendix 20**). Given the relevant distance between the Projects, impacts associated with the operations phase will be limited with the majority of the potential impacts associated with the construction phase (particularly traffic and social/economic impacts). In some instances, sufficient detail relating to the projects is not currently available to inform a detailed assessment. The projects identified as requiring further assessment are outlined in **Table 6.37**.

Table 6.37 Cumulative Impact Summary

Project	Detail	Potential Cumulative Impact
Wind Projects		
Doughboy Wind Farm	88.5 km northeast of Project Area - under assessment - Prepare EIS Approval and construction timing unknown however potential for construction and decommissioning timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic
Rangoon Wind Farm (North and South)	93.9 km North of Project Area - under assessment - Prepare EIS Approval and construction timing unknown however potential for construction and decommissioning timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic
Winterbourne Wind Farm	38 km east of Project Area - under assessment (prepare EIS) Approval and construction timing unknown however potential for construction timeframes to overlap Operational impacts (visual and noise) unlikely due to separation distance	Traffic (construction and decommissioning phase) Social/Economic
Solar Projects		
New England Solar Farm	28 km NE of the Project Area construction timeframe 36 months, to be built in stages, potential for construction timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic
Oxley Solar Farm	50 km northeast of Project Area - under Assessment - EIS Exhibited Approval and construction timing unknown however potential for construction timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic

Project	Detail	Potential Cumulative Impact
Salisbury Solar Farm	32 km northeast of Project Area - nder Assessment - Prepare EIS Approval and construction timing unknown however potential for construction timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic
Tilbuster Solar Farm	55 km northeast of the Project Area - under assessment - EIS Exhibited Approval and construction timing unknown however potential for construction timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic
Thunderbolt Energy Hub – Solar Farm	Under Assessment - Prepare EIS Extent and design of solar farm yet to be confirmed. Approval and construction timing unknown however construction unlikely to overlap with the Project Operational impacts to be addressed as part of detailed design of solar farm and detailed cumulative assessment undertaken when preparing relevant EIS	Traffic (construction and decommissioning phase) Social/Economic Operations phase: Visual, noise, biodiversity, Aboriginal/historic heritage, aviation, risk, waste
Other		
Armidale Battery Energy Storage System	45.54 km Northeast of Project Area - under assessment - Prepare EIS Approval and construction timing unknown however potential for construction timeframes to overlap Negligible overlapping impacts during operations due to separation distance	Traffic (construction and decommissioning phase) Social/Economic,

With the exception of the Thunderbolt Energy Hub Solar Farm which is a Neoen development that is currently being subject to further consultation and design work as per Stage 2 of the wind farm, the potential cumulative impacts associated with the Project are expected to be limited to the construction phase of the Project associated with:

- Traffic Impacts – associated with general construction traffic impacts in the locality due to movements to/from the Project Area and OSOM vehicle movements along the proposed traffic routes from Newcastle Port to the Project Area.
- Social/Economic – including demand on services and businesses (supply/demand for products and services).

The CIA scoping summary identifies potential operational cumulative impacts associated with the Thunderbolt Solar Farm - prepare EIS phase. However, as noted above, the detailed design, extent and timing of the solar farm is yet to be confirmed. Neoen will consider operational impacts when preparing the detailed design of the Thunderbolt Solar Farm and a detailed cumulative assessment will be undertaken when preparing the relevant EIS.

6.13.1 Cumulative Impact Summary

Potential cumulative impacts associated with the Project have been addressed in the relevant specialist assessments and the relevant key findings are summarised in this EIS. Detailed cumulative assessment has been undertaken where potential for impact has been identified through the cumulative scoping assessment (refer to **Appendix 20**) relevant to the Project. As discussed in **Section 2.4**, and above this assessment has focused on particular identified projects and relevant impacts, this includes the potential traffic and social/economic impacts, the cumulative impacts are discussed in **Sections 6.2** and **6.12**, with the results summaries in the following sections.

6.13.1.1 Traffic

As discussed in **Section 6.5.3.6**, the majority of the other relevant projects in the region are not considered likely to contribute to cumulative traffic impacts. This is because the identified projects would not lead to an increase in traffic volumes on the section of the New England Highway relevant to the Project (due to location) or the timing of the associated construction and decommissioning phase is expected to be prior to or following that of the Project.

To assess the cumulative impact a sensitivity analysis was undertaken, applying a 20% increase in the background traffic volumes of the relevant section of the New England Highway for the road link and intersection impacts associated with the Project. This increase is considered conservative and given the uncertainty relating to construction timing for other renewable energy projects, sufficient to account for any likely increase in traffic due to potential concurrent transport movements within the region. The results of the cumulative traffic impact assessment (construction and operations phase) indicates that the road network capacity along the relevant section of the New England Highway is sufficient to cater for this cumulative traffic volume, and the proposed configuration of the Project Area Intersection is also expected to operate satisfactorily.

In regard to the haulage of the large OSOM turbine components associated with the other identified projects, it is expected that all movements will originate from the Port of Newcastle and follow a similar route to that identified for the Project, via the New England Highway. It is assumed that a coordinated approach to OSOM movements can be undertaken through consultation with TfNSW and will be required to be undertaken under permit to manage associated cumulative impacts.

It is noted that these impacts are temporary and it is expected that restrictions and management measures will likely be implemented so that movements from one project site only will occur at any time, to minimise the impacts on the operation of the road links forming part of the identified transport routes. As such, the additional traffic past the Project Area from the identified projects to the north of the Project Area is anticipated to be limited to turbine transport volumes from one wind farm only at any one time (approximately 20 vpd).

6.13.1.2 Social and Economic Cumulative Impact

As discussed in **Section 6.12.1**, the region has significant capacity in terms of construction-related workers (13,850 workers) and construction-related businesses (1,930 businesses), including some located in the immediate region to service multiple concurrent infrastructure projects. Regionally, there is also sufficient accommodation to support the workforce for multiple projects (1,890 rooms and cabins) and occupation rates indicate that suitable accommodation is available, however, it is noted that at times of events or buys periods accommodation can be less available and measures to manage cumulative impacts are appropriate.

During the consultation process infrastructure and service capacity, housing and accommodation provision for the construction workforce was noted as a concern by the community. Local accommodation providers surveyed to inform the SIA, indicated limited accommodation in towns nearest the Project Area to meet current demand. Additionally, local accommodation providers that participated in the survey felt occupancy rates are usually steady, however in recent years has been disrupted due to COVID-19 restrictions.

As a result, it is unlikely that the construction workforce would be solely housed in small rural towns such as Kentucky and Bendemeer, and instead would access accommodation options in the major regional centres of Armidale and Tamworth, as both towns offer a range of housing/accommodation and other community services. However, given the presence of a small number of accommodation providers in townships nearest to the Project, with some having plans to expand their services and increase the number of rooms available, the SIA recommends that employment and projected population change associated with the workforce influx should be managed in consultation with local government and local service providers to facilitate early responses to accommodation and township infrastructure as required and to maximise benefits for local businesses/service providers.

Whilst the construction workforce for the Project would be temporary in nature and would be unlikely to utilise services such as education, the workforce is still likely to access a range of housing and accommodation, health, hospitality, and recreational services in local towns, and therefore, would have the potential to impact on service capacity locally. However, the SIA indicates impacts to local services and facilities would generally be low overall except for accommodation services. Whilst there will be a temporary impact to accommodation services during the construction phase, the SIA indicates that there will be sufficient accommodation capacity in the region to service the Project and assessed the cumulative impact as having medium social risk, this will be managed through the implementation of a workforce, procurement and accommodation strategy.

However, it should also be noted that improved investment certainty, stimulated by the New England REZ, will provide confidence to industry and business suppliers to the renewable sector that a sustainable pipeline of major projects exists allowing them to invest and expand operations to meet increasing demand for their services. Increased demand certainty may also entice new entrants into the sector, further increasing industry and business capacity.

In consideration of the likelihood of the construction phase of other projects in the region overlapping with the construction phase of the Project and the economic capacity of the region, the Economic Assessment and SIA considers that the potential cumulative impacts associated with the Project will be manageable.

Neoen acknowledges that the cumulative social impacts of development on local communities within the region, particularly impacts associated with the influx of construction workers, subsequent impacts on local community services, as well as impacts associated with construction related activities, will remain a key challenge for all developers, and other key stakeholders (Government, local businesses and service providers, community groups and landholders/residents). Such impacts will require proactive engagement and effective collaboration, to ensure appropriate social and environmental impact management, and the enhancement and augmentation of benefits for local communities.

Neoen has committed to the development and implementation of a workforce, procurement and accommodation strategy identified by the EIA and SIA, which will assist in the management of the Project only and cumulative social and economic impacts. These strategies will be developed in the lead up to the construction phase of the Project to reflect and respond to actual regional demand conditions at that time, especially in relation to concurrent projects principally being serviced out of Tamworth and Armidale.

7.0 Justification for the Project

This section provides a conclusion to the EIS. It includes 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.

7.1 Environmental, Social and Economic Impacts

As discussed in **Section 3.3**, the Project has been designed using an iterative approach. The conceptual layout of the WTGs, electrical reticulation infrastructure, Project Area access, internal access roads and other supporting infrastructure has been subject to ongoing refinement with the aim of minimising associated environmental impact.

The approach of separating the Thunderbolt Energy Hub into two stages is a direct response by Neoen to feedback received from the landholders, neighbours, local community groups and local community leaders. Stage 2 is closer to Kentucky village, adds more turbines on another side of some non-involved dwellings, and will generally be move visible. The Stage 1 layout (this Project) has been designed in a way to minimise impacts where possible. Importantly, the residual visual impacts at all non-associated dwellings have been assessed in the Visual Impact Assessment to be low or negligible, whilst noting that WTGs will be a visible feature of the landscape. While Neoen intends on progressing with Stage 2 in the future as part of a separate assessment, Neoen elected to develop Stage 1 first to demonstrate its professionalism, build trust in the community and demonstrate its contribution both socially and economically.

The development of this Project as Stage 1 is intended by Neoeo to allow the community to learn about wind farms in their community and the benefits that they can provide economically and socially and build a relationship with Neoen as a long-term owner-operator, prior to future stages being assessed.

Additionally, in response to strongest concerns from nearby neighbours, Neoen has committed to a best-practice revenue-sharing model whereby non-involved neighbours within 3.5 km will receive ongoing payments based on the number and distance of turbines adjacent to a dwelling.

As outlined in **Section 6.0**, the potential environmental and social impacts associated with the Project can be appropriately managed through the implementation of appropriate management, mitigation and monitoring measures. A consolidated list of the proposed management and mitigation measures is provided as **Appendix 5**.

7.2 Justification for the Project

As discussed in **Section 2.1**, the Project is a direct response to the NSW Government's commitment to transition to renewable electricity generation. The Project Area is strategically located within the New England REZ, with ready connection to the existing transmission infrastructure and in an area with identified high wind renewable energy source potential. The Project will contribute to the implementation of the NSW Electricity Strategy, which seeks to establish a reliable, affordable and sustainable electricity future for NSW.

Overall, the Project will involve approximately $373 million in investment and have the capacity to supply sufficient clean energy to power the equivalent of approximately 118,000 homes per annum, which represents approximately 2.7 times of the total annual residential requirements of the Region (Armidale, Tamworth, Uralla and Walcha LGAs - 43,300 dwellings).

The Project will generate significant employment in the region, generating a total of 495 FTE positions (direct and indirect) over the 18–24-month construction period. Once operational, a total of 20 FTE jobs (direct and indirect) will be generated by the Project. Employment generated by the Project within the region surrounding the Project Area (direct and indirect) is estimated at approximately 210 FTE jobs during the construction phase and approximately 9 FTE jobs during the operational phase.

The Project will provide significant participation opportunities for businesses and workers (subject to skills and available resources). Additionally, the Project will support increased/new revenues for accommodation providers and private homeowners over the construction phase, particularly in off-peak seasons and there is sufficient accommodation capacity in the region to support the Project. The 55 FTE construction workers expected to relocate to the Study Area are expected to inject approximately $2.7 million in new spending into the economy during the construction phase, supporting approximately 18 FTE jobs in the service sector across the region over this period.

Neoen has refined the Project based on feedback received from relevant stakeholders through the scoping and EIS phases. Neoen has considered a range of alternatives in planning the Project and in determining the concept layout included in this EIS. The preliminary WTG layout and infrastructure design was subject to a number of iterations during consultation with the landowners, neighbours and community members and initial environmental investigation during the feasibility and scoping phases of the Project in order to minimise environmental impact and maximise energy production.

As detailed in **Section 6.0** appropriate mitigation and management measures will be implemented by Neoen in order to reduce any associated environmental and social impacts.

7.2.1 Suitability of the Site

The Project Area is strategically located within the REZ with ready connection to the existing transmission infrastructure and in an area with identified high wind renewable energy source potential.

The New England Highway extends along the southeast boundary of the Project Area providing direct access to the site from Tamworth to the south and Armidale to the north (regional service centres) and the Port of Newcastle. The New England Highway has sufficient operating capacity to support the Project. No local roads in the vicinity of the Project Area will be used to access the Project Area.

The Project Area largely comprises areas that have previously been disturbed and/or historically cleared associated with the agricultural land use. The Project will provide for a compatible land use and support the ongoing agricultural use of the Project Area. The conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise impact to identified biodiversity and Aboriginal cultural heritage values.

The Project Area also provides for sufficient separation distances to non-associated dwellings to minimise noise impacts associated with the construction and operation of the Project. Key factors which form a part of the existing landscape character surrounding the Project Area include large areas of vegetation, undulating topography, roadside vegetation and riparian vegetation associated with creek lines which will assist in reducing the potential for viewing the proposed infrastructure and reduce the associated visual impact.

7.3 Ecologically Sustainable Development

An objective of the EP&A Act is to encourage ecologically sustainable development (ESD) within NSW. This section provides an assessment of the Project in relation to the principles of ESD.

To justify the Project with regard to the principles of ESD, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The principles of ESD encompass the following:

- the precautionary principle
- inter-generational equity
- conservation of biological diversity
- valuation and pricing of resources.

Essentially, ESD requires that current and future generations should live in an environment that is of the same or improved quality than the one that is inherited.

7.3.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> *'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.*

In order to achieve a level of scientific certainty in relation to the potential impacts associated with the Project, this EIS has undertaken an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures have been conducted and are comprehensively documented in this EIS.

The preparation of this EIS has involved a detailed analysis of the existing environment (refer to **Sections 2.0** and **6.0**), and the use of desktop analysis, site specific survey and monitoring and scientific modelling (where relevant) to assess and determine potential impacts as a result of the Project.

The decision-making process for the design/refinement, impact assessment and development of management and mitigation measures has been transparent in the following respects.

Government authorities, landholders potentially affected by the Project, the local community, the Aboriginal community and other stakeholders have been consulted during EIS preparation (refer to **Section 5.0** and **Appendix 7**). This has enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures. This process also provided for community feedback to inform the refinement of the Project (particularly splitting the Project into two stages and only progressing the first stage as part of this current development application).

The community has been engaged throughout the development and assessment of the Project through a range of mechanisms including face to face meetings (both in person and online), community newsletters, virtual information sessions (during covid restrictions) (refer to **Section 5.0** and **Appendix 7**), which provided stakeholders with both information and the opportunity to provide feedback in relation to the Project.

The EIS has been undertaken on the basis of the best available scientific information about the Project Area and has been informed by site specific survey, monitoring, modelling and environmental and social assessment.

Due to the nature of the Project, specific project details will be subject to the detailed design phase 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 and/or sensitivity analysis has been undertaken to assess a range of potential impact scenarios. Extensive management and mitigation measures will be implemented, including monitoring programs to measure predicted against actual impacts of the Project (refer to **Appendix 5**).

Neoen will prepare and implement a CEMP and OEMP, which will implement best practice management and will incorporate all identified mitigation and management measures identified in this EIS. Additionally, the Project will be subject to an independent auditing and verification process consistent with relevant requirements for SSD projects.

7.3.2 Intergenerational Equity

The EP&A Regulation defines the principal of intergenerational equity as:

> *'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.'*

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

As discussed in **Section 2.0**, NSW is currently in a transition to increased renewable electricity generation which will replace the existing coal-fired power stations which are scheduled to retire between 2022 and 2043. A target of 8 GW of renewable energy generation has been assigned to the New England REZ and a key objective of the Project is to contribute to this goal through providing a source of affordable, reliable power to NSW consumers whilst also assisting in reducing greenhouse gas emissions.

Any residual environmental impacts will be addressed through the implementation of a CEMP and OEMP, to apply best practice management incorporating all identified mitigation and management measures identified in this EIS.

7.3.3 Conservation and Biological Diversity

The EP&A Regulation identifies that the principle of conservation of biological diversity and ecological integrity should be a fundamental consideration in the decision making process. The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them. All environmental components, ecosystems and habitat values potentially affected by the Project are described in this EIS (refer **Section 6.4** and **Appendix 11**) and measures to ameliorate any negative impacts are outlined in **Appendix 5**.

A large part of the Project Area comprises areas that have previously been disturbed and/or historically cleared associated with the agricultural land use. The conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise impact to identified biodiversity. Following the application of avoidance and mitigation measures, the BAM assessment has identified the biodiversity credit requirement to offset the impacts of the residual impacts of the Project and the required management and mitigation measures to be implemented, including the Bird and Bat Adaptive Management Plan while will provide for the ongoing adaptive management of impacts on key species. The principle of Conservation of Biological Diversity is considered to be satisfied.

7.3.4 Valuation and Pricing of Resources

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle has been defined in the EP&A Regulation as:

> *'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 will provide cleaner reliable electricity generation, assisting with meeting current load demand while reducing greenhouse gas emissions and the impacts of climate change.

Potential for air quality impacts will be predominately related to the construction phase of the Project. Appropriate air quality management measures will be incorporated into the CEMP and OEMP to manage offsite air quality.

In relation to noise, during standard construction hours there will potentially be noise levels of greater than 45 dB(A) for some activities at six non-associated residences when activity is occurring in the vicinity. However, the predicted noise levels are significantly less than 75 dB(A) which the NVA indicates is the point where there may be strong community reaction to noise. The only activity triggering this exceedance is road upgrades and access track construction. As this is linear work, the exceedance will be temporary as construction continues along the length of the road or access track.

No exceedance of relevant noise criteria for the operation phase is predicted at any non-associated dwelling. The CEMP and OEMP will also include relevant noise management, mitigation and monitoring measures.

The relevant erosion and sediment control measures outlined in **Section 6.9.7** will be incorporated into the CEMP, developed in accordance with relevant legislation and guidelines to control and manage potential impacts to surface water.

Appropriate and best-practice waste management will be implemented as part of the Project in accordance with the following legislation and guidelines.

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.

7.4 Conclusion

As outlined in **Section 7.3**, the Project is consistent with the principles of ecologically sustainable development. The Project will provide long-term, strategic benefits to the State of NSW, including:

- renewable energy supply to assist with fulfilling the current obligations under State and Federal renewable energy targets
- providing for cleaner reliable electricity generation, assisting with meeting current load demand while reducing greenhouse gas emissions and the impacts of climate change
- The Project will also provide direct financial benefits to the regional and local community, including:
    - capital investment of approximately $373 million
    - a total of 495 full time positions (direct and indirect) during the 18-24 month construction phase and 20 full time positions (direct and indirect) during operations
    - providing regional investment in the NSW renewable energy sector of $56 million (including wage stimulus) as a result of the construction phase
    - ongoing economic stimulus during the operation phase of approximately $99.0 million over 30 years (2021 dollars, CPI adjusted),
    - Neighbour Benefit payments, operational wage stimulus, Community Benefit Fund payments and increased Council land tax returns from the Project Area. It is considered this economic stimulus will also assist with supporting the ongoing agricultural land use within the Region.
- Neoen has applied an iterative approach through the development of this EIS responding to both environmental constraints and community concern through refinement of the layout and the overall Project approach. Through the implementation of best practice management, the potential environmental impacts associated with the Project can be appropriately managed, which will also address the community concerns and associated social impacts identified during the stakeholder engagement process. Given the net benefit and commitment from Neoen to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to the region and broader NSW community.

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