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Environmental & Social Consultants

ARK ENERGY

Richmond Valley Solar Farm

Environmental Impact Statement

Exhibition Revised Final

June 2024

Richmond Valley Solar Farm

Environmental Impact Statement

Exhibition Revised Final

Prepared by Umwelt (Australia) Pty Ltd
on behalf of
Richmond Valley Solar Farm & BESS Pty Ltd

Project Director:	Malinda Facey
Project Manager	Jessica Henderson-Wilson
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This report was prepared using Umwelt's
ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Disclaimer

Document Status

Rev. No.	Reviewer Name	Review Date	Approved for Issue Name	Approved for Issue Date
Exhibition Final	Jessica Henderson-Wilson	16 May 2024	Malinda Facey	16 May 2024
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Executive Summary

Richmond Valley Solar Farm (the Project) is a solar farm project which will provide a reliable and affordable source of renewable energy and help reduce greenhouse gas emissions associated with energy generation.

Richmond Valley Solar & BESS Pty Ltd (ABN 43 672 993 869) is a wholly owned special purpose vehicle of Ark Energy Projects Pty Ltd and is the Proponent of the Project. Richmond Valley Solar & BESS Pty Ltd will herein be referred to as Ark Energy.

The Project is located in the Northern Rivers region of New South Wales (NSW), approximately 7 kilometres (km) east of the town of Rappville in the Richmond Valley Local Government Area (LGA). The Project has gone through a comprehensive design process that considered community and stakeholder feedback as well as the findings of environmental and social studies. This process aims to maximise positive social, economic and environmental outcomes while minimising any negative impacts.

The Project will have a capacity of up to 500 megawatts (MW) of DC solar electricity generation with a Battery Energy Storage System (BESS) of approximately 2,200 MW hours (MWh) capacity. The Project includes the installation, operation and decommissioning of the solar farm.

The Project will also include:

- supporting infrastructure
- inverters to convert DC to AC electricity
- a substation
- switching substation
- transmission line to the nearby Transgrid transmission network
- temporary construction facilities
- operations and maintenance (O&M) facility
- internal roads, civil works, fencing and other required electrical infrastructure
- road upgrades are encompassed as part of the Project including works at Summerland Way / Main Camp Rd intersection and the sealing of sections of Avenue Rd.

The Project layout is provided in **Figure E.2** and additional details of the proposed development for which approval is sought, is summarised in **Table E.1**.

The Project Area is 1,475 ha situated entirely within the Richmond Valley LGA across 10 lots (refer to **Figure E.1**).

Within the Project Area a maximum Development Footprint of 803 ha is proposed and a road upgrade Development Footprint of 11 ha which runs through the Project Area, shown in **Figure E.2**. The Project Area comprises 10 cadastral lots owned by 2 landowners. The layout of the solar panels and associated infrastructure would be entirely contained within the Development Footprint.

Table E.1 Project Summary

Project Element	Summary of the Project
Project Address	420 Avenue Road, Myrtle Creek NSW
Project Area	1,475 ha across 10 lots owned by 2 landowners
Development Footprint	803 ha
Solar Array Footprint	Approximately 542 ha subject to detailed design
Solar Panels	Up to 730,000 bifacial solar panels on ground-mounted single axis tracking framework
Substation	Approximately 1.6 ha
Switching Substation	Approximately 1.3 ha
Battery Storage	Approximately 5 ha
Electrical Reticulation	Construction of a two km double circuit 330 kV transmission line including 11 transmission towers at 55 m in height within a 60 m transmission corridor in the north-western portion of the Project Area.
Project Access	The Project has three proposed access points off Avenue Road. Major solar components would be delivered via heavy and OSOM vehicles from the Port of Brisbane, via Motorway/Highway, Summerland Way, Main Camp Road, Avenue Road and access into the Project Area.
Internal Roads	Approximately 52 km of compacted access roads of approximately 4 m in width would be constructed throughout the Development Footprint.
Perimeter Fencing and security	Perimeter security fencing around the Development Footprint to a height of approximately 2.1 m plus CCTV at each entrance and the substations.
APZ	Asset Protection Zones between project infrastructure and vegetation will be maintained to a minimum of 10 m and up to 100 m around critical infrastructure such as the BESS and substations.
Biodiversity Corridor	A 30 m biodiversity corridor will be planted beyond the northern extent of the Development Footprint on the eastern side of Avenue Road. The corridor will create connection between existing vegetation in Ellangowan State Forest and Bungawalbin State Forest.
Workforce	Construction: Approximately 327 FTE workers at the construction 'Peak'. Operation: Approximately 10–15 FTE.
Construction Hours	• 7:00 am to 6:00 pm – Monday to Friday • 8:00 am to 1:00 pm – Saturday • Sunday and Public Holidays – no works to be completed.
Operational Hours	24/7
Construction Period	Up to 24 months
Operational Period	Up to 30 years
Estimated Development Cost	$1.2 billion

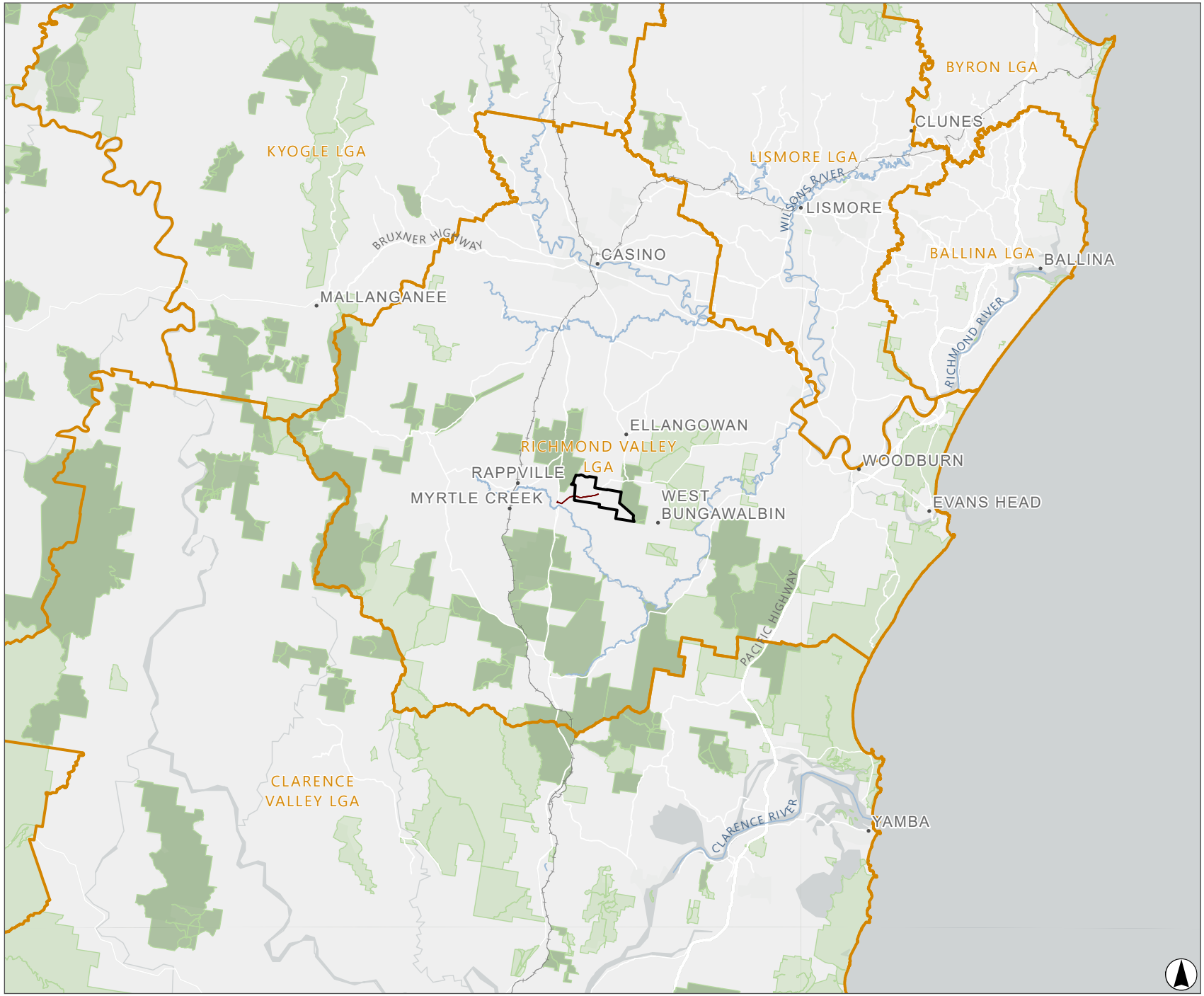


FIGURE E.1

Project Locality Map

Legend

- Project Area
- Road Upgrade Area
- Local Government Area
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- Railway

0 10 20

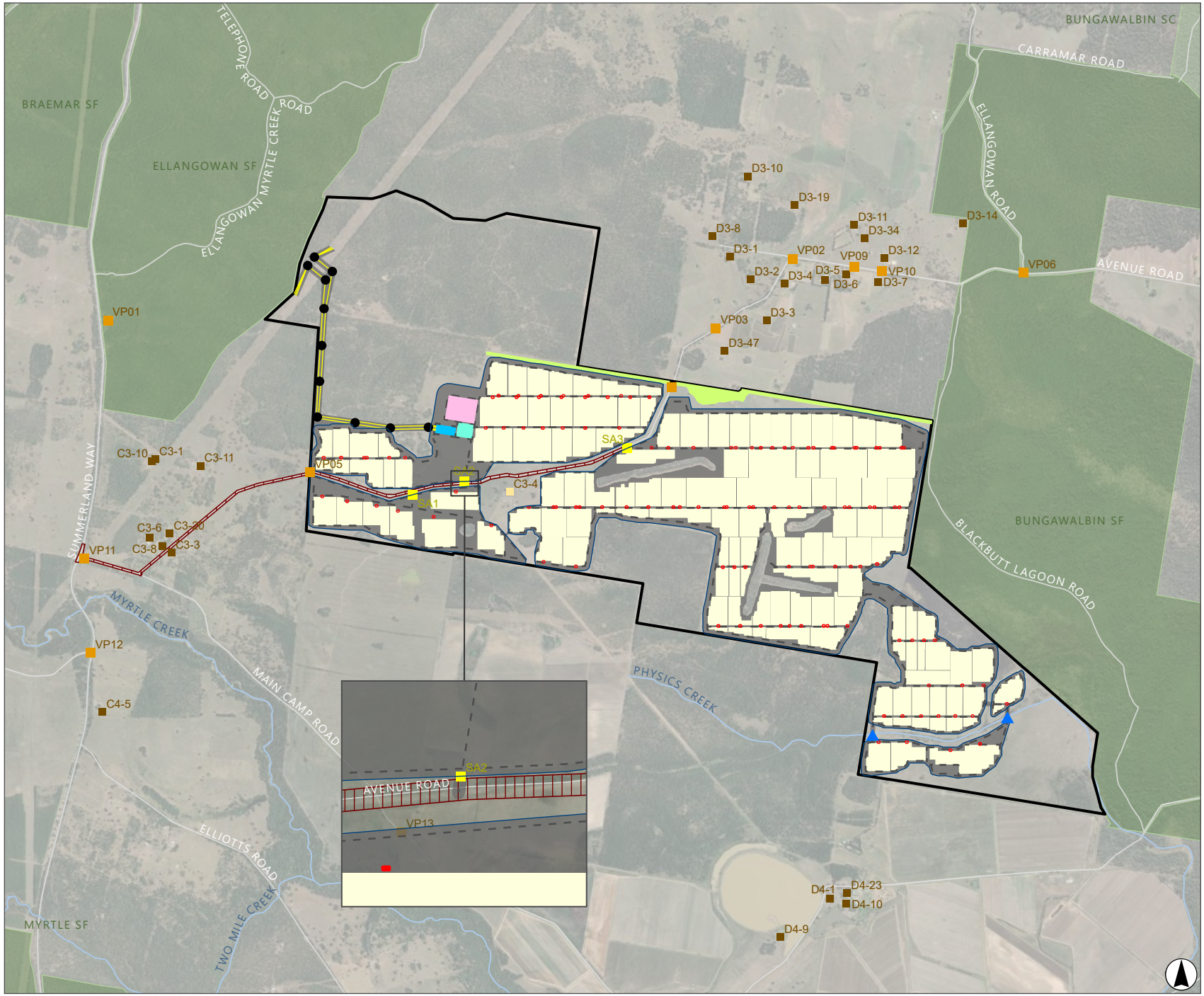
Kilometers

Scale 1:600,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

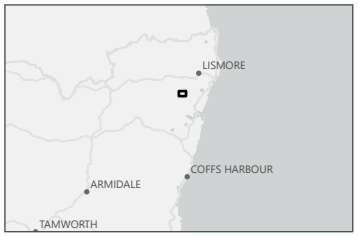
FIGURE E.2

Project Layout



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Transmission Poles
- Associated Receptor
- Private Receptors
- Public Receptors
- Access Points
- Watercourse Crossings
- Transmission Lines
- Access Tracks
- Security Fence
- Biodiversity Corridor
- Substation
- Switching Subsation
- BESS
- Inverters
- Solar Array Blocks
- NPWS Reserve
- State Forest
- Roads
- Watercourse



0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

Environmental Approval Process

The Project requires approval under both NSW and Commonwealth environmental and planning legislation.

Under NSW planning legislation, the Project is a State Significant Development (SSD) and it requires approval under Part 4 of the Environmental Planning & Assessment Act.

The Project also requires assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) due to the potential for significant environmental impacts on matters of national environmental significance (MNES).

An Environmental Impact Statement (EIS) has been prepared to outline the Project, its impacts (positive and negative), how these impacts are proposed to be mitigated, managed and offset, as well as its benefits.

Alternatives and Design Changes

During the planning and design phases, Ark Energy looked at alternative locations, technologies and layouts with consideration of environmental, cultural, economic and social constraints and opportunities.

This included an assessment of a 'do nothing option' (not developing the Project) however this would not deliver the identified benefits or meet NSW commitments to the energy transition and as such was not the preferred option.

Alternative locations were looked at and the Project location was identified as it has:

- Proximity to suitable transmission infrastructure and road network.
- A mostly cleared disturbed landscape with lower biodiversity values and soil capability.
- High potential for solar generation.

Alternative layouts and additional features were developed to avoid and minimise environmental and social impacts this included:

- Reduction of the Development Footprint.
- Relocation or removal of solar arrays to avoid flood prone land and areas of high biodiversity value.
- Relocation of key infrastructure to increase asset protection zones and distances from vegetation.
- Selection of the transmission corridor option with lower environmental impacts in particular biodiversity.
- Public road upgrades to facilitate safe movement of vehicles.
- Inclusion of a 30 m biodiversity corridor on the northern boundary of the Project Area.

Assessment of Environmental and Social Impacts

The 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 impact assessments completed for the Project are provided in **Table E.2**. To avoid and minimise identified impacts the Project design was amended, then, mitigation measures were proposed as to manage any residual impacts. Cumulative impacts have also been assessed.

Table E.2 Summary of Environmental and Social Impact Assessments

Aspect	Overview of Key Findings

Social Amenity	• A Social Impact Assessment was prepared supported by community and stakeholder engagement, and identified both positive and negative impacts on local and regional stakeholders.
	• The main positive impacts of the Project include the:
	  ○ Creation of direct and indirect employment and income opportunities, especially during the construction phase, which may benefit the local and regional economy and reduce unemployment, should local workers be sourced as a priority.
	  ○ Contribution to NSW renewable energy targets and the reduction of greenhouse gas emissions, which will enhance environmental sustainability and the reputation of the region as a leader in clean energy production.
	  ○ Provision of community benefits and initiatives, such as scholarships, grants, sponsorships, and partnerships, which will support the social and economic development and well-being of the local communities and organisations.
	  ○ Improvement of local infrastructure and services, such as roads, telecommunications, and emergency response, to increase the accessibility, connectivity, and safety of the area.
	• The main negative impacts include the potential:
	  ○ Loss or degradation of agricultural land, biodiversity, and cultural heritage, which may affect the land use, landscape, and amenity values of the area and the identity and attachment of local communities and Indigenous groups.
	  ○ Visual, noise, dust, traffic, and electromagnetic interference impacts, which may cause nuisance, disturbance, and health and wellbeing issues for nearby residents and more sensitive/vulnerable stakeholders, including children and the elderly.
	  ○ Social and demographic changes, such as population influx, workforce accommodation, and social cohesion, which may create pressures and challenges for housing, service provision and facilities in the area and affect community character and dynamics.
	  ○ Economic and employment impacts, such as competition, displacement, and skills gap, which may affect the existing and future businesses and industries in the region and the availability and quality of the local labour force.
	• Mitigation and Management measures proposed include but are not limited to:
	  ○ an Accommodation, Employment and Procurement Strategy
	  ○ ongoing implementation of the Community and Stakeholder Engagement Plan
	  ○ implementation of a Community Benefit Fund.

Aspect	Overview of Key Findings

Bushfire	A Bushfire Threat Assessment was prepared and assessed the bushfire risk posed by the Project and to the Project.
	• The Project Area has a known and documented history of bushfires and the Project Area is located on bushfire prone land.
	• The Development Footprint will include an Asset Protection Zone (APZ) ranging from 10m to 100m around the perimeter and the area within the Development Footprint will be managed like an APZ. This reduces the risks associated with operation of infrastructure include the BESS and substations greatly.
	• Construction activities such as hot works and vegetation clearing represent potential sources of ignition from the Project Area to surrounding vegetation.
	• The remote location of the site presents an additional risk factor due to increased emergency response times in the event of an incident.
	• An uncontrolled bushfire poses a risk to the Project, related infrastructure and electrical infrastructure supplied to the local community but through the design considerations and development and implementation of management measures it is considered hazards associated with the Project and its influence on bushfire can be managed.
	• Mitigation and Management measures proposed include but are not limited to:
	  ○ A Fire Safety Study.
	  ○ Design in accordance with relevant guidelines and standards.
	  ○ Maintenance of the Development Footprint to the standard of Inner Protection Area in accordance with Planning for Bushfire Protection.
	  ○ An Emergency Response Plan.
	  ○ Restriction on hot works in accordance with *Rural Fires Act 1997*.
	  ○ Dedicated and appropriate water supply for bushfire protection.

Water Resources	• An assessment of the water resources was undertaken and identified the surface water and ground water constraints in the Project Area and the water requirements of the Project. • The majority of the watercourses in the Project Area are first and second order streams with the exception of Physics Creek, a third and fourth order stream. • Water quality impacts could occur when soils are disturbed due to vegetation removal, excavation works and stockpiling of materials due to the low volumes of water required it is anticipated that the Project would not have a negative impact on water supply in the region. • The Project will have negligible interaction with groundwater based on the extent of ground disturbance and depth of disturbance. • Land within the far south-eastern portion of the Project Area has a number of surface and ground water constraints and has generally been avoided.

Aspect	Overview of Key Findings

	• Mitigation and management measures include but are not limited to:
	  ○ A Construction Soil and Water Management Plan.
	  ○ Design and construction of waterway crossings in accordance with relevant guidelines and standards.

Flooding	• A Flood Impact Assessment was prepared and identified the risk of flood to the Project and from the Project.
	• In the Preliminary Design, the Operations and Maintenance (O&M) facility and staff car park were located in the 1 in a 100 year flood zone and we subsequently relocated.
	• The potential for the greatest impacts on flood behaviour come from the proposed perimeter fencing which falls within the 1% AEP flow path.
	• The most severe blockage scenario from perimeter fencing causes localised impacts (afflux) immediately upstream of the perimeter fence with severity of the afflux linked to the rarity of the flood event.
	• The majority of works are outside of the flood extent and/or do not change the existing topography within the flood conveyance areas of the Project Area.
	• Mitigation and Management measures include but are not limited to:
	  ○ An Emergency Response Plan.
	  ○ Design in accordance with relevant guidelines and standards.
	  ○ Clearing of debris from fence lines as required.

Hazards and Risks	• A Preliminary Hazard Assessment was prepared for the project alongside assessment of electromagnetic fields(EMF). The assessment did not identify hazards from the Project that posed a risk from the Project to nearby receivers or the workforce.
	• EMF levels produced by the Project will comply with the relevant international and Australian standards for generation of and exposure to EMF.
	• A risk analysis assessment was undertaken and determined that an explosion event at the BESS does not pose a significant off-site risk the worst-case scenario of a toxic gas release resulting from a Lithium Ion Battery thermal runaway at the BESS is not considered likely to extend to the nearest off-site dwelling.
	• The highest potential for a contamination event to occur within the Development Footprint is during the construction phase. There is minimal potential that construction activities including potential hazardous materials spills will interact with groundwater.
	• Mitigation and management measures include but are not limited to:
	  ○ A Final Hazard Analysis.
	  ○ An Emergency Response Plan.

Aspect	Overview of Key Findings
	○ A Spill and Contamination Response Plan. ○ Design and operation in accordance with relevant standards and guidelines.
Visual Amenity	• A Landscape and Visual Impact Assessment was undertaken in accordance with the relevant guidelines and identified low and moderate impacts which could be minimised through mitigation. • An assessment was undertaken for 12 public viewpoints within 2.5 km and 36 private receptors within 4 km. Of these, in accordance with the guidelines, 27 private receptors and seven public receptors were identified for detailed assessment. • Photomontages prepared for the Project determined a visual impact rating of 'low' for all private receptors, as existing vegetation is effective in minimising any views of the Project Area. • Two (VP04 and VP05) public receptors were classified with an initial 'moderate' visual impact and photomontages determined a final impact rating of 'low' for both receptors. • Due to the topography and elevation of the Project Area, the LVIA determined that associated Project infrastructure is unlikely to alter the existing visual landscape of the Project Area outside of its immediate vicinity. • There would be limited to no impact on the existing night landscape resulting from the Project's night lighting of ancillary structures. • Management and mitigation measures include but are not limited to: ○ A 30 m biodiversity corridor on the north-east boundary of the Project Area to further reduce visual impacts. ○ Management of lighting during construction to reduce night-lighting impacts.
Glint and Glare	• A glint and glare assessment was prepared to determine the potential for glint and glare to impact upon public and private receptors. • Four receptors were assessed as being potentially impacted by yellow glare. The impact was rated as a 'low' glare as they would experience under 10 hr/year of glare. • Two road public receptors were assessed as having potential yellow glare: Main Camp Road and Avenue Road. Main Camp Road was assessed as having a 'low' glare impact rating as it would experience under 10 hr/year of glare from PV Array 15. Avenue Road was assessed as having a 'high' glare impact rating as it would experience over 30 hr/year of glare. • Mitigation of glare can be done through operational control of the movement of arrays. A range of scenarios were modelled and scenario 6 was found to be the most effective in eliminating the potential for 'yellow' flare impacts on Avenue Road, resulting in the decrease in hour/year of yellow glare on Avenue Road to zero. • Management and mitigation measures include but are not limited to: ○ Operational control of the PV arrays to minimise glint and glare impacts for users of Avenue Road.

Aspect	Overview of Key Findings

Traffic and Transport	• A Traffic and Transport Impact Assessment was prepared to identify impacts to the road network to be used for the Project including any upgrades required to facilitate safe movement of vehicles.
	• Summerland Way, Main Camp Road and Avenue Road will accommodate all light and heavy vehicle movements associated with the Project. The existing configurations of these roads are considered adequate to accommodate forecast traffic movements.
	• Additional traffic associated with the Project will have an insignificant impact on the operation of these roads.
	• The Project's key intersections are Summerland Way/ Main Camp Road and Main Camp Road/Avenue Road. The intersection of Main Camp Road/Avenue Road are considered to have adequate sight distances in both directions to/from Avenue Road at the intersection and to accommodate forecast traffic movements.
	• However, the existing sight lines to/from the intersection from the south were found to be slightly restricted.
	• The relatively small number of Over Size Over Mass (OSOM) movements associated with the Project will not have a significant ongoing impact on the operation or capacity of the roads forming the proposed transport routes for the Project.
	• Management and mitigation measures include but are not limited to:
	  ○ Preparation of a Traffic Management Plan.
	  ○ Upgrade works to the relevant sections of Main Camp Road and Avenue Road.
	  ○ Upgrade the Summerland Way/Main Camp Road intersection to provide for a rural basic left (BAL) and rural short channelised right (CHRs) treatment.

Biodiversity	• A Biodiversity Development Assessment Report was undertaken for the Project in accordance with the Biodiversity Assessment Method (BAM) which found some impacts on biodiversity which can be managed through mitigation.
	• The Project Area includes 137.56 ha of native vegetation and is representative of four plant community types (PCTs), two threatened ecological communities (TECs).
	• 42 scattered/paddock trees were identified and 12 threatened fauna species (either recorded during targeted surveys or assumed present).
	• The following direct impacts will occur as a result of the Project:
	  ○ Removal of 21.7 ha of remnant vegetation.
	  ○ Removal of up to 21.7 ha of individual threatened species habitat.
	  ○ Removal of 1.32 ha of planted native vegetation in addition.
	  ○ Removal of 28 scattered paddock trees.
	  ○ Removal of 21 hollow-bearing trees.

Aspect	Overview of Key Findings

	• Two species; Little Bent-winged Bat and Large Bent-winged Bat were found to meet one or more of these principles relating to a serious and irreversible impact (SAII) and were recorded within the Subject Land. However, no breeding habitat for these species were found to occur within the Subject Land or surrounding locality. Therefore, the Project will not result in impacts on breeding habitat.
	• No potential impacts on Matters of National Environmental Significance (MNES) are anticipated from the Project.
	• Management and mitigation measures include but are not limited to:
	  ○ Offset of impacts in accordance with the BAM.
	  ○ A Biodiversity Management Plan.
	  ○ A biodiversity corridor on the northern boundary of the Project Area.

Aboriginal Cultural Heritage	• An Aboriginal Cultural Heritage Assessment was undertaken for the Project and identified a direct impact on Aboriginal cultural heritage which can be managed through mitigation.
	• A search of the Aboriginal Heritage Information Management System (AHIMS) found that there are no AHIMS sites present.
	• One Aboriginal site was identified during the field survey located on the edge of a vehicle track in eastern edge of the Project Area consisting of a single artefact: a Fine Grained Silicious (FGS) flake which would be impacted by the Project.
	• Management and mitigation measures include but are not limited to:
	  ○ Collection of Aboriginal site by a qualified archaeologist(s) and RAP representatives.
	  ○ An Aboriginal Cultural Heritage Management Plan.

Historic Heritage	• A Historic Heritage Impact Assessment was undertaken for the Project and found that no impacts will occur on historic heritage. • No listed or non-listed heritage items or areas of historical archaeological potential are located within the Project Area. • The Project would change the setting and views across the Project Area and reduce inherent landscape characteristics of the broader landscape, however, predominant areas of change are located away from form nearby local and state listed heritage items. • Minor visual impacts on local heritage item 'Main Camp Homestead and Surrounds' (located 800 m south of the Project Area) would occur but would not impact the overall significance of the heritage item as views of the Project would be screened by existing vegetation. • Management and mitigation measures include but are not limited to: ○ An unexpected finds protocol.

Aspect	Overview of Key Findings

Soils, Land Use and Agriculture	• A Soil, Land Use and Agriculture Impact Assessment was undertaken and determined that impacts to soils are expected to be minimal and impacts to the regional agricultural industry are unlikely to occur.
	• The Project involves using approximately 790 ha of agricultural land with permanent reduction of approximately 4 ha due to the permanent switching substation.
	• The Project will not affect agricultural productivity outside the Development Footprint and will have a negligible impact on local and regional agricultural support services.
	• Impacts to soils as a result of direct disturbance is anticipated to be minimal and temporary.
	• Due to the minor surface works across the Development Footprint, the Project will have minor impacts to Land and Soil Capability.
	• A Land Use Compatibility and Risk Assessment was undertaken which identified potential 45 risk items although 36 were considered minor once mitigation measures and controls were implemented. There are no high risk potential conflicts, however moderate potential for land use conflicts were identified and can be managed effectively through mitigation and management measures.
	• Mitigation and Management measures proposed include but are not limited to:
	  ○ An Erosion and Sediment Control Plan (ESCP).
	  ○ An OEMP will be developed in consultation with DPI Agriculture.
	  ○ A biosecurity management plan.

Economic	• An Economic Impact Assessment was undertaken and demonstrated that Project will have a positive impact on investment in regional businesses including accommodation suppliers and businesses that support the construction industry as well increasing in local employment opportunities. • The Project will involve approximately $1.2 billion in investment, of which approximately $180 million will be retained within the regional economy. • A target of 20% local workforce will be in place during the construction phase of the Project. • The Project has the potential to provide sufficient renewable energy to support the annual electricity needs of the equivalent of approximately 181,000 NSW households. • The Project will generate employment in the region, creating a total of 390 FTE employment opportunities (150 FTE direct and 240 FTE indirect) during the construction phase with around 40 FTE employment opportunities (13 FTE direct and 40 FTE indirect) during the operational phase. • During the peak construction period, the accommodation requirement of the Project are likely to be met by existing accommodation.

Aspect	Overview of Key Findings

	• Mitigation and Management measures proposed include but are not limited to:
	  ○ An Accommodation, Employment and Procurement Strategy.
	  ○ A Community Benefit Fund.

Noise and Vibration	• A Noise and Vibration Impact Assessment was undertaken to assess the potential noise and vibration impacts associated with the Project. There would be instances where predicted noise levels may exceed the nominated noise limits and reasonable and feasible general noise controls are proposed to mitigate such impacts.
	• Construction noise may impact some non-associated receivers however no receivers will be 'highly noise affected' (i.e. exposed to noise levels greater than 75 dB(A)).
	• Road traffic noise may impact two receivers along Avenue Road during the early morning (6 am–7 am).
	• Due to large distances between the Development Footprint and sensitive receivers' vibration impacts from construction activities are anticipated to be negligible.
	• Mitigation and Management measures proposed include but are not limited to:
	  ○ A Noise and Vibration Management Plan.
	  ○ Notification to receivers prior to commencement of works.
	  ○ Verification monitoring of noise and/or vibration levels.

Waste Management	• An assessment of waste was undertaken to assess the potential risks associated with waste management of the Project. Waste streams are within the capacity of local waste management facilities and for potential exceedances, additional services will be consulted to avoid negative impacts on local waste services. • The majority of Project waste would be generated during the construction and decommissioning stage with minor quantities of waste to be generated by the day-to-day operation of the Project. • Suitable facilities for the management of waste have been identified within the EIS. • Mitigation and Management measures proposed include but are not limited to: ○ A Waste management Plan will be prepared including a detailed breakdown of the waste types and quantities in accordance with relevant legislation and guidelines.

Cumulative Impacts

The impact assessments also considered the cumulative impacts associated with other development and projects within the surrounding area.

The Project is located outside of the five REZs identified in NSW. This will likely result in fewer renewable energy projects within the region. As a result the cumulative impacts associated with projects in this regional will be less than comparable solar projects within REZs.

The cumulative impact assessment focussed on the potential combined impacts of the proposed Richmond Valley Solar Farm, Summerville Solar Farm and Myrtle Creek Solar Farm due to their close proximity to each other.

Each of these renewable energy projects is at different stages of the environmental and planning approval process so assessment has been informed by information as currently available. The key aspects with the potential to have cumulative impacts across the three projects include:

- Social and Economic
- Traffic and Transport
- Visual and Amenity
- Noise and Vibration
- Biodiversity
- Waste.

Where possible these potential cumulative impacts have been avoided through design and minimised through the mitigation and management measures identified in each of the impact assessments.

Consultation

A stakeholder identification process was undertaken for the Project to support the planning and delivery of community and stakeholder consultation to inform the Social Impact Assessment (SIA) and the EIS. This process has also considered the interconnectivity of stakeholders with the proposed Summerville Solar Farm and Myrtle Creek Solar Farm, with some stakeholders having a mutual interest in all projects. Issues raised during the engagement process have been recorded and have informed investigations undertaken as part of the SIA, EIS and the ongoing development of the Project.

Ark Energy has undertaken a program of community and stakeholder engagement which has included:

- A Project website and Project email address.
- An online survey.
- Direct contact with host landholders followed by individual landholder briefings and ongoing contact.
- Formal briefings with relevant government agencies.

- Formal briefings with key stakeholders including community, industry, and environmental groups or organisations, as well as traditional owners.
- Online and telephone surveys with local businesses and service providers
- Consultation with interested Aboriginal Parties
- An online information session in March 2023
- Two drop-in sessions (September 2023 and February 2024).
- One structured online information session in March 2023 to provide Project information and preliminary results of technical studies, and an opportunity for members of the community to pose questions to the Project team and provide feedback.
- Two drop-in sessions (6/09/2023 & 12/04/2024) to provide feedback regarding the technical assessments of the Project, as well as articulate the proposed mitigation and enhancement measures under consideration to minimise negative and enhance positive impacts of the Project.

Consultation will continue following the submission of the EIS, which will include public exhibition of the EIS for a minimum of 28 days. Ark Energy will undertake a range of direct stakeholder engagement activities on an ongoing basis. Subject to approval of the Project, Ark Energy will maintain communication activities in the lead up to, and during construction and operation.

Table E.3 presents a summary of the social impacts evaluated through the stakeholder engagement process and the proposed management and enhancement strategies.

Table E.3 Key Social Impacts

Category	Identified Social Impacts	Response/Outcomes/Management Measures
Community **Way of Life** **Surroundings**	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	• Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/concerns on a case-by-case basis. • CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. • Focus on place-based community benefits.
Surroundings **Way of Life**	Changes in visual amenity and enjoyment of the natural environment given perceived industrialisation of the landscape	• Commitment to a 30-metre biodiversity corridor along the northern boundary of the Project. • Consider vegetation screening or landscaping mechanisms on Project site or neighbour sites (in direct consultation), that do not heighten anxiety regarding fire risk.
Surroundings **Way of Life**	Reduced social amenity due to potential noise during construction and operation	• Noise and Vibration Management Plan to be prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. • Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. • Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.
Surroundings	Changes to interaction with, and enjoyment of, valued environmental assets adjacent to the Project Area used for recreational activities e.g. Bungawalbin National Park and Ellangowan State Forests.	• Project design does not inhibit access to recreation activities taking place in the National Park or State Forest. • Development of a Construction Environmental Management Plan to identify any controls to be implemented during the construction phase to minimise impacts to users of these environmental assets. • Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project.
Surroundings	Degradation of assets with environmental value, including flora and fauna	• Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. • Development of a Biodiversity Offset Strategy.

Category	Identified Social Impacts	Response/Outcomes/Management Measures
		• Limit any clearing to that stated in the Construction Environmental Management Plan. • Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. • Further develop, communicate and implement Decommissioning Framework.
Surroundings	Inadequacy of physical infrastructure in the local area to facilitate management of the waste created from the solar farm during operations and in the decommissioning phase.	• Engagement with Richmond Valley Council to determine capacity of infrastructure to accept construction waste and engagement with relevant waste management service providers to identify appropriate waste management solutions.

Community
Way of Life
Accessibility
	Increased demand for housing/accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	• Develop an Accommodation, Employment and Procurement Strategy that includes consideration of:
		  ○ Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing.
		  ○ Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing.
		  ○ Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.

Way of Life **Accessibility**	Incoming construction workforce causing increased pressure local health care and facilities.	• Include health promotion initiatives as part of a Workplace Health and Safety Plan for the site, and collaboratively develop health related KPIs suitable for the likely workforce profile (e.g. smoking cessation, cholesterol). • Commit to encouraging the use of Ballina LGA (for GP presentations) and the Lismore Base hospital (for ED presentations).
Decision making systems	Increased distrust/ outrage given the perceived lack of distributive equity in Project benefits (Project developers Vs community; Landholders Vs Neighbours/ Broader community/Region)	• Develop and implement the Ark Energy Community Benefit Fund (CBF) with Richmond Valley Council reflective of the community needs and aspiration and aligned to the NSW Government Draft Benefit Sharing Guideline. • If other funds are to be disbursed or investments made in key areas such as training and education, a clear governance structure should be developed and communicated with benefit directed towards those most likely impacted by the Project.

Category	Identified Social Impacts	Response/Outcomes/Management Measures
Community	Reduced community cohesion due to differing attitudes and feelings towards renewable energy development in the local community and region.	• Continue to implement and iterate the Project CSEP, with accessible opportunities that promote respectful dialogue and co-create knowledge and awareness about the Project.
Surroundings, **Way of Life** **Health and Wellbeing**	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	• Communicate Environmental Management Plans, decommissioning framework and commitments. • Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.
Surroundings, **Way of Life** **Health and Wellbeing**	Reduced levels of personal and public safety due to fire risk given proximity to natural features such as state forests/farmlands and past fires reported on site.	• Develop, implement and communicate the Bushfire Emergency Management and Evacuation Plan for the construction and operational phase of the Project. • Continue to implement and iterate the Project CSEP to incorporate messaging and mechanisms regarding fire management, highlighting where local insight has been incorporated.
Decision-making	Heightened levels of community outrage associated with perceived inability to inform the Project's planning and decision-making processes.	• Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights. • Continue to provide direct access to technical experts and the Project Manager to provide timely responses to any information requests in formats that are accessible to multiple stakeholder types.
Health and wellbeing	Anxiety/ Stress associated with the introduction of the Project into an environment with reduced adaptive capacity following a series of natural disasters in the area.	• Consider prioritising the support of preventative mental health programs in the region as part of the Community Benefit Fund. • Train the construction and operational workforce in basic mental health first aid techniques, such as the Rural Adversity Mental Health Program Support Skills.
Health and wellbeing	Anxiety/ Stress associated with the uncertainty of the assessment process, construction, and decommissioning.	• Continued utilisation of the CSEP through the Project life as well as increase frequency of Project updates for all stakeholders at key Project milestones, prioritising personal and face-to-face consultation. • Continue proactive personal engagement with community members and proximal landholders, with the Project Manager.

Category	Identified Social Impacts	Response/Outcomes/Management Measures
Culture	Limited consultation with the Bundjalung peoples in regards to intangible values connected to, or surrounding, the Project Area could result in: 1. Cultural values not considered in decision making. Potential damage to Country. 2. Lack of acceptance of the Project. 3. Lack of acceptance of the Project.	• Develop an Aboriginal Cultural Heritage Management Plan (ACHMP) in consultation with Heritage NSW and RAPs. Consider intangible assets/ cultural value mapping as part of this process.
Accessibility Surroundings	Reduced public safety due to further deterioration of local roads (roads previously impacted by flooding and heavy haulage for recovery efforts) and increased volume of traffic.	• Enhancement of Summerland Way along Main Camp Road and Avenue Road. • Develop and implement the Construction Traffic Management Plan, including signage and workforce shuttles from key residential locations (aligned to the Accommodation, Employment and Procurement Strategy).
Accessibility Surroundings	Reduced levels of personal and public safety due to flooding risk and potential impacts to roads, proximal property and fauna.	• Implement Flood Impact Management Plan to consider flood immunity requirements for the access roads, height of the solar panels and location of infrastructure. • Develop and communicate detailed planning transport routes with public safety considerations and information disclosure, notifying residents, considering any sensitive user groups.
Livelihood Surroundings	Reduction in land values due to proximity to solar farm.	• Further engagement and ongoing open, transparent, and accessible communication with host and proximal landholders, and broader community. • Continued implementation of Host landholder and neighbour agreements.
Surroundings	Disruption to the agricultural productivity values ($).	• Continued implementation of Host landholder agreements. • Consideration of dual land use options including agrisolar.
Livelihoods	Increased public liability insurance premiums for neighbouring landholders reducing livelihood.	• Continue to monitor regional, national and international developments in regard to insurance premiums and commit to transparent communication with neighbouring landholders.
Livelihoods	Enhancement of local economy and livelihoods due to construction workforce influx and Project activity.	• Develop an Accommodation, Employment and Procurement Strategy that includes mechanisms to support local businesses to be competitive and sustainably service a constructive workforce over the proposed 2-year period.

Category	Identified Social Impacts	Response/Outcomes/Management Measures
Community **Health and Wellbeing**	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	• Alongside Richmond Valley Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest.
Decision making **Livelihoods**	Enhanced capacity to participate in decision making through knowledge sharing about the technology employed as part of the Project and contribution to climate change efforts, in an accessible and inclusive format.	• Further engagement and ongoing open, transparent, and accessible communication with host and proximal landholders, and provision of clear communication regarding design amendments/ updates. • Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights.
Livelihoods **Community**	Local employment opportunities during construction.	• Develop and implement an Accommodation, Employment and Procurement Strategy, that focuses on an anticipated target of 20% local employment and an ambitious target of 40% local employment.
Livelihoods **Community**	Ability to enhance human and economic capital through skill development and training opportunities.	• Develop an Accommodation, Employment and Procurement Strategy to provide opportunities for local training, skills and development to occur across scalable pathways (i.e. mix of apprenticeships, certificate and degree qualifications, short courses) both onsite and at key training centres such as Lismore and Casino. • Consider prioritising scholarships for local community members to participate in apprenticeships, training and education as part of the Community Benefit Fund, with a focus on encouraging participation of underrepresented groups.
Environment	Intergenerational equity given emphasis on RE production and reduction in carbon emissions.	• Construction of the Project.

Project Justification and Need

The development of renewable energy generation aligns with both Commonwealth and NSW commitments to increase renewable energy generation and reduce carbon emissions across NSW and Australia.

The Project will contribute to the implementation of the NSW Electricity Strategy. The location of the Project including the design, technology, layout and size of the Project has been developed through consideration of a number of alternatives. The Project has sought to maximise benefits for the locality and region in the long term, whilst minimising impacts to the environment and to cultural heritage.

The Project is considered to be justified and in the public interest because:

- It is suitably located in a region with ideal climatic and physical conditions for large-scale solar energy generation.
- Contains suitable terrain and topography to support large-scale solar energy infrastructure.
- The Project Area has access to existing transmission line infrastructure that has available capacity to transport the electricity to the grid. This minimises the need for construction works and disturbance associated with additional infrastructure (i.e. new transmission lines) often required to connect large-scale renewable energy projects to the electricity market.
- It would not result in significant negative biophysical, social or cultural impacts although would present significant positive economic outcomes.
- It has the potential to create employment opportunities and benefits to the local and regional economy.
- The principles of ESD including the precautionary principle, intergenerational equity, conservation of biological diversity and valuation, pricing and incentive mechanisms have been integrated into the design and assessment of the Project. These principles guide development to ensure that future generations live in an environment that is of the same or improved quality than the one that is inherited.

Conclusion

Ark Energy has applied an iterative approach through the development of this EIS responding to environmental, social, economic and cultural heritage constraints and community concerns through refinement of the layout and the overall Project approach. Ark Energy has been responsive to feedback from community and government stakeholders, which has led to several stages of refinements to further avoid impact as a result of the Project.

Through the implementation of best practice and the identified mitigation measures, the potential impacts associated with the Project can be appropriately avoided or managed, which will also address community concerns and associated social impacts identified during the engagement process. Given the net benefit and commitment from Ark Energy to appropriately manage the potential environmental and social impacts associated with the Project, it is considered the Project would result in a net benefit to the region and broader NSW community.

Abbreviations

Term	Abbreviation
ABS	Australian Bureau of Statistics
ABL	Assessment Background Level
ACHA	Aboriginal Cultural Heritage Assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AHIMS	Aboriginal Heritage Information Management Systems
AOBV	Areas of Outstanding Biodiversity Value
APZ	Asset Protection Zone
ASD	Approach site distance
ASS	Acid Sulphate Soils
AS2436-2010	AS2436-2010 (2016) Guide to Noise Control on Construction, Demolition and Maintenance Sites
Associated dwelling	A dwelling owned by an associated landholder
Associated landholder	A landholder who has reached an agreement with Ark Energy in relation to the Project but will not host PV panels on their land
AUR	Auxiliary right turn treatment
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
Ark Energy	Ark Energy Projects Pty Ltd
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW Biodiversity Conservation Regulation 2017
BCD	Biodiversity and Conservation Division
BCS	NSW Biodiversity Conservation and Science
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BFMC	Bushfire Management Committee
Bi-Dir	Bi-directional
BMP	Biodiversity Management Plan
BOM	Bureau of Meteorology
BOS	Biodiversity Offset Scheme
BPL	Bushfire Prone Land
BSAL	Biophysical Strategic Agricultural Land
CBF	Community Benefit Fund

Term	Abbreviation
CCC	Community Consultative Committee
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CLM Act	NSW *Contaminated Land Management Act 1997*
CNVG	Construction Noise and Vibration Guideline (Transport for NSW, 2023)
COA	Constraints and Opportunities Assessment (Biosis, 2023)
Crown Land Act	NSW *Crown Land Management Act 2016*
CSEP	Communications and Stakeholder Engagement Plan
CSWMP	Construction Soil and Water Management Plan
dB(A)	A-weighted noise or sound power level in decibels
DBYD	Dial before you dig
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DoIW	Directory of Important Wetlands
DPE	NSW Department of Planning and Environment [former]
DPHI	NSW Department of Planning, Housing and Infrastructure[current]
DPI	Department of Primary Industries
DPIE	NSW Department of Planning and Environment [former]
EEAP	NSW Energy Efficiency Action Plan
EEC	Endangered Ecological Community
EDC	Estimated Development Cost
EIA	Economic Impact Assessment
EIS	Environmental Impact Statement
EL	Exploration Licence
ELF	Extremely Low Frequency
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EnergyCo NSW	Energy Corporation of NSW
EPA	Environmental Protection Agency
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Cth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ERP	Emergency Response Plan
ESD	Ecologically Sustainable Development
FBI	Fire Behaviour Index
FGS	Fine Grained Silicious
FIA	Flood Impact Assessment

Term	Abbreviation
FTE	Full Time Employee
GDE	Groundwater Dependant Ecosystem
GGA	Glint and Glare Assessment
GHG	Greenhouse Gas
GIS	Geographic Information System
GW	Gigawatts
ha	Hectares
Heritage Act	NSW *Heritage Act 1977*
HF	Hydrogen Floride
Host dwelling	A dwelling owned by a host landholder
Host landholder	A landholder who will (subject to finalisation of an agreement with Ark) host PV panels on their land, also referred to as 'involved' landholders
HHIIA	Historical Heritage Impact Assessment
IAIA	International Association for Impact Assessment
IBRA	Interim Regionalisation of Australia (subregions)
ICOMOS	International Council for Monuments and Sites
ICNG	Interim Construction Noise Guideline (NSW Department of Environment and Climate Change, 2009)
IPA	Inner protection Area
kV	Kilovolt
LALC	Local Aboriginal Land Council
LCZ	Landscape Character Zone
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
LLS Act	NSW *Local Land Services Amendment Act 2016*
LOS	Level of Service
LSAT	Landscape Scale Bushfire Assessment Tool
LSC	Land and Soil Capability
LTESA	Long-Term Energy Service Agreement
LUCRA	Land Use Compatibility and Risk Assessment
LVIA	Landscape and Visual Impact Assessment
MNES	Matter of National Environmental Significance
MP	Member of Parliament
MW	Megawatt
MWh	Megawatt Hour

Term	Abbreviation
NCA	Noise Catchment Area
NCRP	North Coast Regional Plan 2041
NDC	Nationally Determined Contributions
NEM	National Electricity Market
Non-associated dwelling	A dwelling owned by a non-associated landholder
Non-associated landholder	A landholder who has not reached an agreement with Ark Energy in relation to the Project, also referred to as 'non-involved' landholders
NPfI	Noise Policy for Industry (NSW EPA, 2017)
NSW	New South Wales
NSW EPA	NSW Environment Protection Authority
NTSCORP	Native Title Service Provider
NVIA	Noise and Vibration Impact Assessment
NVR	Native Vegetation Regulatory (mapping)
OECD	Organisation for Economic Cooperation and Development
OEMP	Operational Environmental Management Plan
OSOM	Over Size Over Mass (vehicle)
PA	Planning Agreement
PAD	Potential Archaeological Deposit
PANL	Project Amenity Noise Level
PBC	Prescribed body corporate
PCT	Plant Community Type
PHA	Preliminary Hazards Analysis
PINTL	Project Intrusiveness Noise level
PMF	Probable Maximum Flood
PN	Period notification
PNF	Private Native Forestry
PNTL	Project Noise Trigger Levels
POEO Act	NSW *Protection of the Environment Operations Act 1997*
PV	Photovoltaic
RAP	Registered Aboriginal Party
RBL	Rating Background Level
REAP	Registered Environmental Assessment Practitioner
REZ	Renewable Energy Zone
RFS	NSW Rural Fire Service
RNP	NSW Road Noise Policy (Department of Environment, Climate Change and Water, 2011)

Term	Abbreviation
RNTBC	Bandjalang Aboriginal Corporation prescribed body corporate (PBC) Registered native title body corporate
Roads Act	NSW *Roads Act 1993*
RVC	Richmond Valley Council
RVCLSPS	Richmond Valley Council Local Strategic Planning Statement 'Behind 20-20 Vision'
SAT	Spot Assessment Technique
SAII	Serious and Irreversible impacts
SEARs	Secretary's Environmental Assessment Requirements
SHI	Stage Heritage Inventory
SHR	State Heritage Register
SIA	Social Impact Assessment
SIC	Significant Impact Criteria
SISR	Social Impact Scoping Report
SISD	Safe intersection sight distance
SLAIA	Soil, Land Use and Agricultural Impact Assessment
SN	Specific Notification
SSAL	State Significant Agricultural land
SSD	State Significant Development
SWLs	Sound power levels
SWS	Static Water Supply
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
The British Standard	British Standard BS7385 (1993) Part 2 Evaluation and measurement of vibration in buildings
The Burra Charter	The Australia ICOMOS Charter for Places of Cultural Significance 2013
The Code of Practice	Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (2010)
The Consultation Requirements	Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010)
The German Standard	German Institute for Standardisation DIN 4150-3:1999-02 Structural vibration – Effects of vibration on structures (DIN4150)
The Guide	Austroads Guide to Road Design
The Guidelines	Large-Scale Solar Energy Guideline (DPE, 2022)
The Technical Supplement	Landscape and Visual Impact Assessment (DPE, 2022)
The MNES Report	Matters of National Environmental Significance report (Biosis, 2023)
The Vibration Guideline	Assessing Vibration: A Technical Guideline (Department of Environment and Conservation, 2006)

Term	Abbreviation
TMP	Traffic Management Plan
TOBAN	Total Fire Ban
TTIA	Traffic and Transport Impact Assessment
Umwelt	Umwelt (Australia) Pty Ltd
V	Verification monitoring
VMP	Vegetation Management Plan
VPH	Vehicles per hour
WM Act	NSW *Water Management Act 2000*
WRIA	Water Resources Impact Assessment
WSP	Water Sharing Plan

Key Terms

Term	Definition
Ancillary Infrastructure	All infrastructure necessary for the construction and operation of the solar farm and battery storage, including but not limited to: substations, switching substations, permanent offices, underground cabling between arrays and the site substation, overhead electricity transmission lines, communication cables (includes control cables and earthing), water storage tanks, hardstands and internal roads.
APZ	A fuel-reduced area surrounding a built asset or structure which provides a buffer zone between a bushfire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out. The size of the required APZ varies with slope, vegetation and FFDI.
BESS	The entire battery system comprising of battery containers and power conversion systems (inverters). The BESS has a power capacity of 275 MW and an energy storage capacity of up to 2,200 MWh over eight hours., housed in a series of outdoor containers, aggregated in one central location adjacent to the substation infrastructure (including the switching substation).
Development Consent	State significant development consent to carry out the Project granted by the consent authority under the NSW *Environmental Planning and Assessment Act 1979*.
Development Footprint	The extent of ground disturbance including earthworks associated with permanent infrastructure, temporary facilities and road upgrades within the Project Area.
Internal Roads	Approximately 52 km of connected roads within the Project Area which will facilitate the movement of light and heavy vehicle movements during the construction, operational and decommissioning phase of the Project. All internal roads will be rehabilitated unless otherwise specified by landholders.
OSOM	Over size, over mass vehicle; vehicle configuration which requires a permit from the National Heavy Vehicle Regulator.
Permanent Infrastructure	Infrastructure that will remain on the Project Area during the operational phase of the Project, including photovoltaic panels, battery storage and ancillary infrastructure.
Project	The Richmond Valley Solar Farm described in **Section 3.0** of this EIS.
Project Area	The total area investigated during various specialist studies and the broader property the Development Footprint will be located on. The land required for the Project as detailed in shown in **Figure 1.2**. The Project Area covers approximately 1,475ha and includes the solar farm site, the BESS development area and ancillary infrastructure.
Road Upgrades	External road upgrades proposed to the external road network including: • Summerland Way / Main Camp Road intersection. • Main Camp Road / Avenue Rd intersection. • Main Camp Road between Summerland Way and Avenue Road. • Avenue Road between Main Camp Road and the Projects most eastern access point (SA3). • Three access points to the Project Area from Avenue Road (SA1, SA2 and SA3 as detailed in **Section 3.3.5**).

Term	Definition
Substations	Infrastructure required to collect the internal electrical reticulation to increase the voltage for transmission to connect to the grid, and the infrastructure to physically connect to the grid (i.e. switching substation).
Temporary Facilities	Temporary facilities used for the construction, repowering and/or decommissioning of the Project, including but not limited to temporary site offices, amenities, and compounds, rock crushing facilities, concrete or asphalt batching plants, stockpiles and materials storage compounds, temporary field laydown areas, minor 'work front' construction access roads and temporary meteorological masts.
Temporary Field Laydown Areas	Areas that components may be placed on the ground in preparation for moving or relocating around the Project Area. These areas will not require earthworks and are located within the Development Footprint. They will occur within the Project Area.

EIS Declaration

Project Details

Project Name	Application Number	Address of the land in respect of which the development application is made
Richmond Valley Solar Farm	SSD-4102024	225–420 Avenue Road, Myrtle Creek

Applicant Details

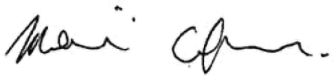
Required Information	Details
Applicant Name	Richmond Valley Solar & BESS Pty Ltd a SPV of Ark Energy Projects Pty Ltd
Applicant Address	Level 2, 275 George Street, Sydney, New South Wales, 2000, Australia

Details of Person by Whom this EIS was Prepared

Name	Address	Professional Qualifications
Jessica Henderson-Wilson	145 Ann Street, Brisbane, QLD	BSc/BA, Masters Environmental Management, CEnvP

Declaration by Registered Environmental Assessment Practitioner

Required Information	Details
Name	Malinda Facey
Registration Number	R80048
Organisation registered with	Environment Institute of Australia and New Zealand
Declaration	The undersigned declares that this EIS: • has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021; • contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; • does not contain information that is false or misleading; • addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project; • identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; • has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement; • contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development;

Required Information	Details
	• contains a consolidated description of the project in a single chapter of the EIS; • contains an accurate summary of the findings of any community engagement; and • contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.
Signature	
Date	11 June 2024

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Appendix No. Appendix Title

1.0 Introduction

Richmond Valley Solar & BESS Pty Ltd proposes to develop the Richmond Valley Solar Farm (the Project) in the Northern Rivers region of New South Wales (NSW), approximately seven kilometres (km) to the east of the town of Rappville in the Richmond Valley Local Government Area (LGA).

The Project includes up to 500 megawatts (MW) of DC solar electricity generation with a Battery Energy Storage System (BESS) of approximately 2,200 MW hours (MWh) capacity. The Project will also include supporting infrastructure, inverters to convert DC to AC electricity, a substation, switching substation and transmission lines to the nearby Transgrid transmission network.

The Project location and regional context is presented in **Figure 1.1**.

1.1 Background

The Project Area is located approximately seven km to the east of the town of Rappville, 25 km south of Casino and 26 km to the west of Woodburn within the Northern Rivers region of NSW. Ellangowan State Forest is located to the north-west of the Project Area and vegetation connecting to Bungawalbin State Forest borders the eastern boundary of the Project Area (refer to **Figure 1.1**). The Project Area is located on freehold land, which is currently used for cattle grazing and forestry.

The Project Area comprises two freehold properties that span across ten cadastral lots, covering an area of approximately 1,475 hectares (ha). The Development Footprint of the solar farm and associated infrastructure occupies approximately 803 ha and the Development Footprint for the road upgrade occupies approximately 11 ha, refer to **Figure 1.2**. The Project Area is approximately 95 km north-east of the New England Renewable Energy Zone (REZ) however it is not related to the REZ, nor is it dependent on the REZ infrastructure. This Project benefits from utilising the existing 330 kV Transgrid powerlines within the north-western extent of the Project Area, allowing connection to the national electricity market (NEM). A new two km overhead 330 kilovolt (kV) transmission line is proposed to connect the Project to the 330 kV transmission line located north-west of the proposed switching substation.

The Project will have access from Avenue Road via Main Camp Road and Summerland Way, located south-west of the Project Area (refer to **Figure 1.1**). Road upgrades will be required to facilitate the transportation of vehicles during the construction and decommissioning phases of the Project.

The Project will support State and Commonwealth targets for establishing renewable energy generation within NSW and Australia, reducing greenhouse gas emissions, and provide economic and social benefits to the regional community. Further information relating to the Project's contributions to Commonwealth, State and local targets can be found in **Section 2.0**.

The Project is expected to generate a peak of up to 327 Full Time Equivalent (FTE) direct jobs during construction and approximately 10–15 FTE direct jobs during the operation and ongoing maintenance of the Project. The Project is anticipated to have a construction duration of 18–24 months, an operational lifespan of 30 years and approximately 18–24 months to allow for completion of decommissioning works.

The Project is a State Significant Development (SSD) under *State Environmental Planning Policy (Planning Systems) 2021* (NSW) (Planning Systems SEPP) as the Project is a development for the purposes of electricity generating works and the estimated development cost (EDC) of the Project is over $30 million. A development Application (DA) for the Project is required to be submitted under Part 4.12(8) of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and in accordance with Part 8, Division 5 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

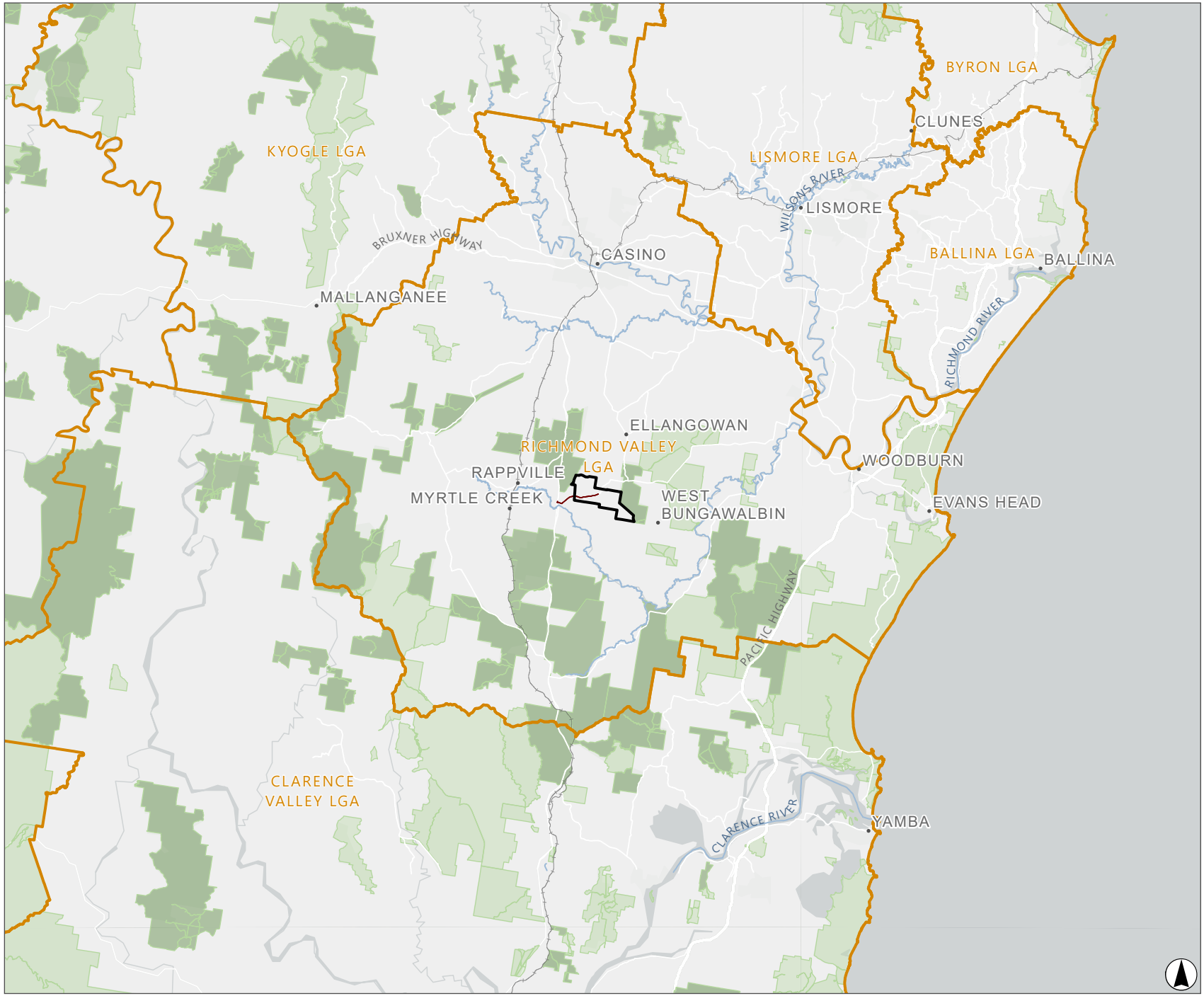
On 23 November 2023, a delegate for the Commonwealth Minister for the Environment determined that the Project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) due to the potential for significant environmental impacts on matters of national environmental significance (MNES). Therefore, the Project will require assessment and approval under the EPBC Act. The delegate specifically found that the Project has the potential to have significant effects on listed threatened species and communities.

The delegate also made the decision for the Project to be assessed under the Assessment Bilateral Agreement between the Commonwealth and NSW Governments. This agreement allows the NSW State Government to conduct a single environmental assessment process for matters of both State and Commonwealth importance, including the above MNES.

This Environmental Impact Statement (EIS) has been prepared in line with the State Significant Development Guidelines – Preparing an Environmental Impact Statement (DPE, 2022a), the Large-Scale Solar Energy (LSSE) Guidelines (DPE, 2022) and Cumulative Impact Assessment Guidelines (DPE, 2022b) and assesses the potential impacts associated with the Project in accordance with the Secretary's Environmental Assessment Requirements (SEARs), issued on 21 September 2022 and Supplementary SEARs issued on 4 March 2024.

FIGURE 1.1

Location and Regional Setting



Legend

- Project Area
- Road Upgrade Area
- Local Government Area
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- Railway

0 10 20

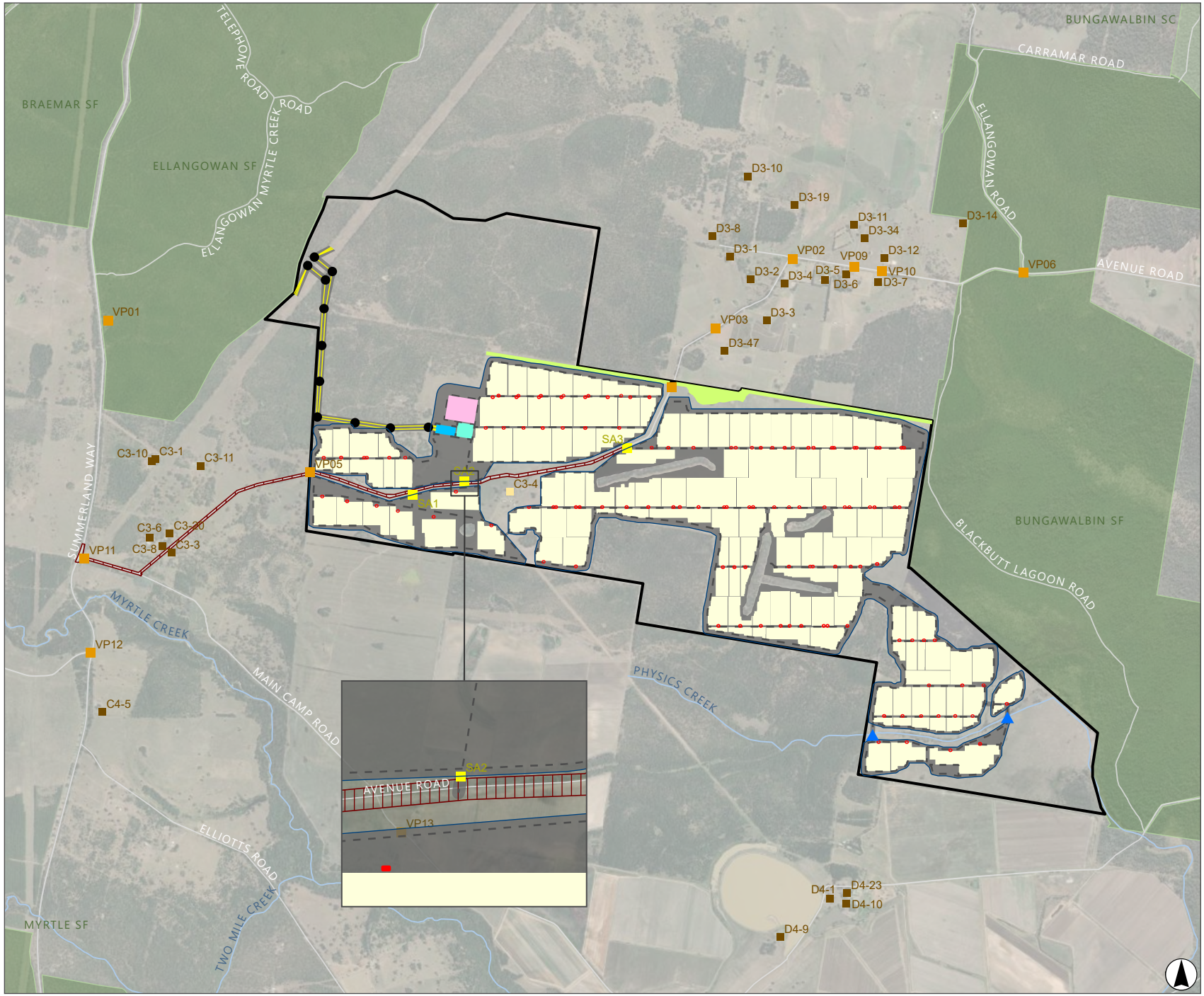
Kilometers

Scale 1:600,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

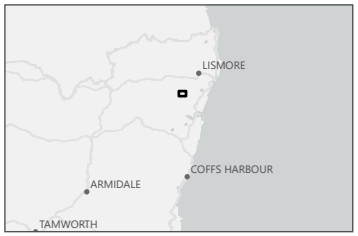
FIGURE 1.2

Richmond Valley Solar Farm



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Transmission Poles
- Associated Receptor
- Private Receptors
- Public Receptors
- Access Points
- Watercourse Crossings
- Transmission Lines
- Access Tracks
- Security Fence
- Biodiversity Corridor
- Substation
- Switching Subsation
- BESS
- Inverters
- Solar Array Blocks
- NPWS Reserve
- State Forest
- Roads
- Watercourse



0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

1.2 Proponent

The Proponent for the Project is Richmond Valley Solar & BESS Pty Ltd (ABN 43 672 993 869), a wholly owned special purpose vehicle of Ark Energy Projects Pty Ltd (Ark Energy). Richmond Valley Solar & BESS Pty Ltd will herein be referred to as Ark Energy throughout the EIS and within specialist reports appended to the EIS.

Ark Energy Projects Pty Ltd was established in 2021 through the acquisition of Australian wind and solar developer Epuron and owns a growing portfolio of wind and solar energy projects in Queensland, New South Wales and Tasmania.

Ark Energy Projects Pty Ltd is an Australian subsidiary of Korea Zinc Co Ltd (Korea Zinc), the world's largest producer of zinc, lead and silver. The head office is located at Level 2, 275 George Street, Sydney and has approximately 60 employees. Through its subsidiary, Sun Metals Corporation Pty Ltd, Korea Zinc has operated the Townsville Zinc refinery, which is the largest private employer in Townsville and has made a significant contribution to the regional economy of North Queensland for more than two decades.
As shown by Korea Zinc's Sun Metals Refinery in Townsville, Korea Zinc's companies deliver strong regional economic investment which is planned to be continued through a portfolio of renewable energy projects across Australia.

Ark Energy Projects Pty Ltd is driven by the overarching goal of advancing decarbonization in the energy sector. As a part of the Korea Zinc group, a pioneering member of the RE100 initiative, the company is dedicated to achieving 100% reliance on renewable energy for its global operations by 2050. By establishing a solar farm, Ark Energy aims to contribute significantly to the broader mission of decarbonising the energy supply, aligning with the global imperative to transition towards sustainable electricity sources.

Ark Energy Projects Pty Ltd is the Proponent of 19 renewable energy projects across Australia which are at various phases of the development process from construction through to energy generation. Ark Energy Projects Pty Ltd is committed to achieve positive outcomes for the communities and environment that its Projects are developed within. To achieve this, Ark Energy Projects Pty Ltd is committed to building strong relationships with key stakeholders and local communities as well as integrate consideration of environmental constraints into the Project design.

1.3 Project Overview

The Project involves the construction, operation and decommissioning of up to 500 MW of DC solar generation, a BESS with a power capacity of 275 MW and an energy storage capacity of up to 2,200 MWh over eight hours and a transmission line to connect the Project from the substation to the NEM. The Project will include various associated infrastructure including inverters to convert DC to AC electricity, a substation and switching substation, temporary construction facilities, operations and maintenance (O&M) facility, internal roads, civil works and other required electrical infrastructure.

The Project Area, illustrated in **Figure 1.2**, is an irregular shape associated with lot arrangement, existing land uses and property boundaries. The Project covers an area of approximately 1,475 ha and the solar farm and associated infrastructure is proposed to have a Development Footprint of approximately 803 ha and the road upgrade Development Footprint is proposed to be approximately 11 ha.

Key components of the Project would include, but not be limited to:

- Up to 730,000 bifacial photovoltaic (PV) modules (solar panels) in an east-west single-axis tracking arrangement with a maximum height of four metres (m) above ground level at maximum tilt.
- A BESS with an approximate 275 MW power and 2,200 MWh storage capacity, housed in a series of outdoor containers, aggregated in one central location adjacent to the substation and switching substation.
- Up to 118 inverter stations to convert the DC solar panel electricity to AC electricity.
- One onsite 330 kV switching substation and 330 kV/33 kV substation for the BESS and solar farm, with underground electrical conduits and cabling.
- Approximately two km of new transmission line connecting to the Transgrid Lismore – Coffs Harbour 330 kV transmission line (line 89) from the proposed 330 kV switching substation and a 330 kV / 33 kV substation.
- Underground electrical cable reticulation between solar arrays and infrastructure within the Project Area to transport power from the solar arrays to the onsite substation.
- Office and an O&M facility with parking for the operations team.
- Three access points from Avenue Road (SA1, SA2 and SA3) via Main Camp Road and Summerland Way (see **Figure 1.2**).
- Internal roads to allow for Project maintenance and emergency response.
- Road upgrades including at the Summerland Way / Main Camp Road intersection and sealing of sections of Avenue Road from Main Camp Road to the north most Project access point (SA3).
- A biodiversity corridor to improve habitat connectivity and reduce amenity impacts.
- Drainage line crossings (where required) to manage existing surface water flows (to be determined during further design development).
- Vegetation clearance associated with establishment of infrastructure.
- Perimeter security fencing around the Development Footprint, crossing gates, water tanks and/or dams, and internal access points around the Project.

Additionally, during the construction of the Project, temporary laydown areas will be established to support the safe and efficient establishment of the facility. Temporary laydown areas will be located within the Development Footprint area detailed further in **Section 3.4**.

The Project is expected to operate for 30 years. After the initial 30-year operating period, the solar farm would either be decommissioned, removing all infrastructure except the transmission lines and substations and returning the Project Area to its existing land capability, or repurposed with new PV equipment subject to technical feasibility and planning consent.

The Project Area does not have any existing or proposed covenants or restrictions that would impact the proposed development. Additionally, all development associated with the Project, including the switchyard and transmission infrastructure is subject to this development application.

1.4 Structure of this Report

This report has the following sections:

- **Section 1.0** introduces the Project, the Proponent, provides an outline of the structure of the report, summarises the impact avoidance and mitigation strategies undertaken during the Project design phase and defines the objectives of the Project.
- **Section 2.0** outlines the strategic context for the Project, including the justification for the Project, a summary of the state and regional planning context, an overview of the locality in which the Project is situated, a description of the Project related agreements and benefit sharing and an overview of the Project alternatives.
- **Section 3.0** contains a description of the Project.
- **Section 4.0** summarises the relevant State and Commonwealth statutory context applicable to the approval process for the Project.
- **Section 5.0** describes the stakeholder and community engagement program for the Project and identifies the environmental and social matters identified during consultation for the EIS.
- **Section 6.0** contains the assessment of environmental and social matters relevant to the Project as well as a summary of the proposed mitigation and management measures.
- **Section 7.0** provides a justification and conclusion.
- **Section 8.0** contains the references.

The EIS contains a number of appendices that provide detailed technical assessments of the key environmental and social issues related to the Project (see **Table 1.1**). The key outcomes of these studies are summarised in **Section 6.0**.

Table 1.1 Overview of Appendices to the EIS

Appendix	Content
Appendix 1	SEARs Table and Checklist
Appendix 2	Detailed Maps and Plans
Appendix 3	Statutory Compliance Table
Appendix 4	Community Engagement Table
Appendix 5	Schedule of Land and Landholder Consent
Appendix 6	Mitigation Measures Table
Appendix 7	Social Impact Assessment
Appendix 8	Bushfire Threat Assessment
Appendix 9	Water Resource Impact Assessment
Appendix 10	Preliminary Hazards Analysis

Appendix	Content
Appendix 11	Landscape Character and Visual Impact Assessment
Appendix 12	Glint and Glare Assessment
Appendix 13	Traffic and Transport Impact Assessment
Appendix 14	Biodiversity Development Assessment Report
Appendix 15	Aboriginal Cultural Heritage Assessment Report
Appendix 16	Historic Heritage Assessment
Appendix 17	Land, Soil and Agriculture Assessment
Appendix 18	Economic Impact Assessment
Appendix 19	Noise and Vibration Impact Assessment
Appendix 20	Cumulative Impact Assessment

1.5 Impact Avoidance and Mitigation

This EIS has adopted a comprehensive risk-based approach to understand the existing environment within the Project Area and surrounding environments, to identify and assess the economic, environmental, and social impacts of the Project and to develop mitigation measures to avoid, minimise and manage those potential impacts.

Impact assessments were undertaken for the Project in the form of 12 technical studies. The findings of these studies have been outlined in **Section 6.0.**

Where possible, changes to the Project design were chosen as the primary course of action to avoid and minimise impact and/or the need for mitigation. The Project has been continuously refined over time as preliminary findings were made available through the technical studies and where modification to the Project's design were found to assist in the mitigation of potential impacts from the Project.

Refinements to the Project's design (as detailed in **Section 2.8.4**) have sought to:

- Adjust the extent of the Development Footprint to maximise the degree to which the Project utilises previously cleared land, thus reducing the requirement to clear additional vegetation and/or impact habitat for flora and fauna species.
- Avoid impacts on biodiversity values through the decision to utilise the western transmission corridor option. The northern transmission line option located along the eastern and northern boundary of Lot 32 DP 755607 was removed from the Development Footprint to avoid impact upon 15.48 ha of threatened ecological community (TEC). The western transmission corridor option was chosen, with a reduced development corridor to avoid additional clearing of native vegetation.
- A 30 m biodiversity corridor is proposed to maximise habitat connectivity along the northern boundary of the Project. This connectivity corridor was developed with consideration of biodiversity, bushfire and visual amenity and in consultation with NSW Biodiversity, Conservation and Science (BCS) Division, Forestry Corporation and the community. The corridor will increase fauna access between remnant vegetation from Ellangowan State Forest and Bungawalbin State Forest and provide a physical amenity barrier between the Project and receivers to the north of the Project Area.

- Increase the distance between the solar arrays and other Project infrastructure to nearby vegetation through the implementation of Asset Protection Zones (APZ's) to minimise potential of bushfire risk. The APZ has been increased to 100 m around the northern and western sides of the BESS, which will mean the BESS will be located outside of bushfire prone land (BPL).
- Improve the safety and functions of key road links for construction vehicles and the community by upgrading local and state roads used for the project as per **Section 3.3.6.5**.
- Minimise infrastructure and assets within flood prone land across the Development Footprint. Infrastructure including the solar arrays have avoided a large part of the south-eastern portion of the site and low lying areas and waterways.

Where further changes in the Project design were not feasible to avoid or minimise potential impacts, mitigation measures were adopted to reduce and manage any potential impacts. Where necessary, proposed mitigation measures for the Project have been developed in each of the technical studies and are outlined in their respective sub-sections in **Section 6.0.**

1.6 Project Objectives

The objectives of the Project and how these will be achieved are outlined in **Table 1.2**.

Table 1.2 Objectives of the Richmond Valley Solar Farm

Objective	How the Project will achieve this objective
Contribute to the local, regional and NSW economies with a particular focus on maximising the economic benefits for the Northern Rivers region.	A significant proportion of the Projects cost will be invested in the Northern Rivers region, see **Section 6.5** for further detail. Landowner payments, operational wage stimulus and community fund payments will provide further economic benefits to the Northern Rivers region during the construction and operational phases. Employment generation creating approximately 327 direct jobs during the peak of the construction phase with up to 10–15 direct jobs during the operational phase.
Support long-term productive relationships with the local community, Traditional Owners, regulators, and industry.	Stakeholder engagement activities have been undertaken to consult with the community, Registered Aboriginal Parties (RAPs), government agencies and industry to capture feedback to assist in developing the Project. The consultation has provided stakeholders throughout the local community with the opportunity to build a relationship with Ark Energy. The feedback received to date has been included within this EIS.
Contribute to the secure energy transition associated with the closure of the remaining coal fire power stations in NSW by supplying electricity to the NEM.	The selected Project Area has favourable solar irradiation and will deliver clean, reliable, and affordable energy. The proposed 8-hour capacity BESS will enhance the energy stability of the NEM during periods of low electricity supply.
Positively contribute to State and Commonwealth renewable energy goals.	The Project is well aligned with the objectives of the current Commonwealth and State commitments to combat climate change and to provide affordable renewable energy to the community and businesses.
Reduce carbon emissions associated with the energy consumption of the Korea Zinc group.	The Project will generate up to 500 MW of electricity to the NEM to support the Korea Zinc group and third parties reduce reliance on fossil fuel-based electricity resources.

2.0 Strategic Context

2.1 Strategic Justification

The progression of solar energy initiatives aligns with the concurrent objectives outlined by both the Commonwealth and NSW governments, aiming to augment renewable energy production and reduce carbon emissions within the economies of NSW and Australia.

The NSW Government is actively seeking investment in renewable energy generation as part of its strategic initiatives to facilitate a systematic shift from coal fired energy production. The goal is to reduce the emissions associated with the electricity generation sector (Energy Corporation, 2024). This efficient transition is essential for delivering electricity across NSW at a cost-effective rate to consumers.

The decommissioning of the State's five coal-fired power stations began in 2023, ahead of the initially projected timeline. There are currently four remaining coal-fired power stations in NSW including Bayswater, Eraring, Mount Piper and Vales Point power stations after the closure of the Liddell Power Station in April 2023. Eraring is proposed to be closed in 2025. These closures are driven by the objectives to reduce greenhouse gas emissions (GHGs) by government and communities, the increasing energy efficiency of renewable energy as well as increasing plant and equipment maintenance resulting in a reduction in the financial and social incentives for coal power stations across NSW (AEMO, 2022).

Various government strategies, plans and policies such as the NSW Transmission Infrastructure Strategy (DPIE, 2018) and NSW Electricity Infrastructure Roadmap (NSW Government, 2023), identify the importance of renewable energy technology in providing an effective and economical way to deliver affordable, clean energy to NSW energy consumers.

Australia's electricity generation is the largest source of emissions accounting for a third of emissions for the year ending June 2023 (DCCEEW, 2023). Emissions from this sector peaked in 2009 and for the year ending December 2022 have declined by 28.3% since this high. Between June 2022 and June 2023, the continuous replacement of fossil fuel-based power sources with renewable energy led to a 3.5% reduction in emissions from electricity from the previous year. Specifically, fugitive emissions from coal generation witnessed a decline of 4.1% compared to the previous year, while the generation from renewable sources saw a significant increase of 17% (DCCEEW, 2023). The share of renewables such as wind and solar in Australia's energy mix is planned to continue to increase over the coming years.

NSW has a strong pipeline of renewable energy projects which have the potential to contribute to achieving the current transition targets. However, significant investment is required from the private sector to achieve sufficient renewable energy supply to support NSW's transition to renewable energy and the retirement of the existing fossil fuel generated supply.

The Project aligns with local and regional strategic strategies to deliver diversification in local economies, yield supplementary income for associated landowners, develop employment opportunities across both construction and operational phases, contribute to regional investment, offer indirect employment to local service providers throughout the Project's lifecycle, and offer benefits upon the local community through the execution of a community benefit fund (or similar). Furthermore, the Project prioritises the preservation of areas with high environmental value, a focal point of the local strategic framework for development across the region. Richmond Valley Council (Council) advises that developers pursue a relationship with the communities and stakeholders they are operating within. Ark Energy have sought such relationships throughout the design process to align the Project with community priorities and local strategic plans.

2.2 Commonwealth Renewable Energy Policy

2.2.1 United Nations Paris Climate Change Agreement

Australia has made commitments alongside 193 Parties under the United Nations Paris Climate Change Agreement (The Paris Agreement) which seeks 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 were 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.

Among various sectors, electricity generation is the largest contributor to greenhouse gas emissions in Australia, accounting for 33.3% of emissions in the year to December 2022 (DCCEEW, 2022).

Australia, in its commitment to the Paris Agreement, signed the agreement on 22 April 2016. The nation pledged to reduce greenhouse gas emissions by 26–28% below 2005 levels by 2030. While there is ongoing debate about Australia's progress in meeting its Nationally Determined Contribution (NDC), some authorities recommend a more ambitious target of 40–60% below 2000 levels by 2030. In response to these obligations, Australia has implemented policies targeting emissions from energy use, industrial processes, agriculture, land-use, land-use change and forestry, and waste.

In alignment with its commitments under the Paris Agreement, the Australian government has identified renewable energy projects as a key method to mitigating greenhouse gas emissions. The Project, a generator of renewable-sourced electricity, would support this commitment, aligning with both national goals and broader international emission reduction objectives.

To reinforce its efforts in reducing greenhouse gas emissions, Australia implemented the Renewable Energy Target (RET) in 2009. This initiative aimed to encourage electricity generation from renewable resources. The RET has proven successful, with the current target of 33,000 gigawatt-hours (GWh) being achieved ahead of schedule in September 2019. Under the scheme, liable commercial entities are required to source a certain percentage of their electricity from renewable sources. Although the target was met in 2019, the scheme will continue to require high energy users to meet their energy obligations until the scheme ends in 2030. By aligning national policies with international accords and actively promoting renewable energy, Australia is actively contributing to the collective efforts to limit global temperature increases and phase out reliance on fossil fuels.

The Project, as a generator of renewable electricity, aims to support Australia's commitment under the Agreement.

2.2.2 Commonwealth Renewable Energy Target Scheme

The Commonwealth Renewable Energy Target (RET) Scheme has legislated objectives that include encouraging additional electricity generation from renewable sources, reducing greenhouse gas emissions in the electricity sector, and ensuring the use of ecologically sustainable renewable energy sources. The RET operates by creating a market for renewable energy certificates, which promotes investment in the renewable energy sector.

The RET provides the opportunity to both major power stations and owners of smaller systems to generate certificates for each megawatt hour of power they produce. These certificates come in two types: large-scale generation certificates and small-scale technology certificates. Electricity retailers, responsible for supplying power to households and businesses, purchase these certificates and present them to the Clean Energy Regulator. As a result, a market is established, offering financial incentives to both large-scale renewable energy power stations and owners of small-scale renewable energy systems.

The RET aimed to achieve a large-scale renewable generation of 33,000 GWh in 2020, accounting for approximately 23.5% of Australia's total electricity generation at the time. This target was met in January of 2021 and will remain at 33,000 GWh until 2030.

The Project will enable Ark Energy to participate in the scheme as an electricity provider, capable of generating certificates and participating in the RET. As a provider, the Proponent may sell these certificates to viable entities.

2.3 NSW Renewable Energy Policy

2.3.1 Net Zero Plan Stage 1: 2020–2030

The Net Zero Plan Stage 1: 2020–2030 establishes the NSW Government's delivery plan toward its objective of achieving net zero emissions by 2050. The Plan represents the overarching strategy to mitigate emissions and address the impacts of climate change.

The Plan outlines how the NSW Government will grow the economy while delivering a reduction in carbon emissions of 35% compared to 2005 levels. The Plan estimates that it will attract investments of $11.6 billion (with two thirds going to regional Australia) and supporting over 2400 employment opportunities (DPIE, 2020). The Project supports Priority 1 of the Plan: "Drive uptake of proven emissions reduction technologies". To achieve this objective, the NSW government aimed to reduce barriers to approval and to advance the approval of suitable projects across the state. The Project would represent another step toward building the states portfolio of low emissions technology.

The Project also aligns with Priority 3 of the plan which is to "Invest in the next wave of emissions reduction innovation". Under the NSW Electricity Infrastructure Roadmap's incentive scheme, the NSW Government and AEMO Services awarded Ark Energy a Long-Term Energy Service Agreement (LTESA). Further information about this agreement is detailed in **Section 2.3.4**. The incentive scheme provides access to innovative technology and paves the way for additional investment in similar and future technologies across the state's electricity sector.

2.3.2 NSW Climate Change Policy Framework

The NSW Climate Change Policy Framework (OEH, 2016) aims to enhance the economic, social, and environmental well-being of New South Wales in the face of a changing climate and evolving national and international policies on climate change. The framework aligns with the global Paris Agreement targets and sets ambitious long-term goals, including achieving net-zero emissions by 2050 and building greater resilience to climate change in NSW.

To implement the framework, various strategies are employed, focusing on both emission reduction and adaptation. These strategies include the development of an advanced energy action plan, a new energy efficiency plan, and a climate change adaptation action plan.

The Project will contribute to the goals established in the NSW Climate Change Policy Framework by building increased security into the regional electricity network. The framework has a focus on resilience for communities and economies in the face of a changing climate and the Project will offer this resilience through network stability.

2.3.3 NSW Electricity Strategy

The NSW Electricity Strategy outlines the NSW Government's vision for an electricity future that is dependable, cost-effective, and sustainable (DPIE, 2019). Its implementation is anticipated to lead to a $40 annual reduction in electricity bills, attract $8 billion in private investments and generate a minimum of 1,200 employment opportunities.

To achieve these goals, the strategy is supported by three key initiatives overseen by the NSW Government. Firstly, the government will facilitate the market to ensure the delivery of reliable electricity at the most affordable rates, while also prioritising environmental protection. Secondly, an Energy Security Target will be established to guarantee that the State possesses sufficient power generation capacity to handle unforeseen generator failures during high-demand periods like heatwaves. Lastly, the NSW Government will ensure it possesses the necessary authority to address any potential electricity emergencies.

The strategy acknowledges that wind and solar energy are the most cost-effective options for new electricity production. Utilising energy storage systems like batteries enables consistent electricity supply, even during periods of low sun and wind. Additionally, these renewable sources present the most economical solution for replacing phased-out power stations.

The Project will contribute to the NSW Electricity Strategy by offering an additional source of renewable energy to the NEM and reduce electricity prices by bolstering the regions energy supply. The proposed BESS will contribute to the security of the network during unforeseen generation failures or surges in demand by offering power beyond the capacity of renewable energy sources at that time.

2.3.4 NSW Electricity Infrastructure Roadmap

The NSW Electricity Infrastructure Roadmap represents the strategic vision of the NSW Government to transform the electricity sector and capitalise on emerging renewable energy technologies (DPIE, 2020). The plan aims to bring increased investment in regional communities, build more dynamic and resilient economies and enhanced quality of life for all NSW citizens by offering a guideline for achieving secure and reliable energy infrastructure. The roadmap outlines five foundational pillars to build a modern electricity system.

Firstly, the roadmap emphasises driving investment in regional NSW, recognising these regions as the economic and energy powerhouse of the state. It underscores the importance of supporting stable, long-term energy storage through the delivery of energy storage infrastructure. The roadmap aims to empower new and revitalized industries by harnessing opportunities for industry with cheap, reliable, and low-emission electricity.

Secondly, the roadmap adopts a proactive approach to new generation, transmission, long-duration storage and firming technology, thereby laying the groundwork for a modern electricity system. By aligning with global trends, it positions NSW industries competitively, with electricity prices forecasted to be among the lowest 10 per cent of the Organisation for Economic Cooperation and Development (OECD).
This initiative is expected to benefit businesses of all scales, saving the average small business an estimated $430 annually and contributing to an estimated $130 annual savings for the average household electricity bill.

The NSW Electricity Infrastructure Roadmap is a pivotal plan that sets the state apart as a global leader in delivering the necessary electricity infrastructure to support a growing, modern economy. It is positioned as a coordinated framework, with the goal of making electricity generation in the state low cost, clean, and supported by 24-hour power sources. The roadmap's success relies on creating the right investment settings for the private sector to compete and deliver the required infrastructure at the lowest cost.

Under the NSW Electricity Infrastructure Roadmap's incentive scheme, the NSW Government has awarded Ark Energy a Long Duration Storage (LDS) Long Term Energy Service Agreement (LTESA) for the battery portion of this Project. The BESS will be capable of providing a power capacity of up to 275 MW and energy storage of up to 2,200 MWh over eight hours.

2.3.5 Network Infrastructure Strategy

The NSW Network Infrastructure Strategy is a plan aimed at enhancing network infrastructure in NSW with a primary focus on supporting renewable energy projects in the state's five REZs (EnergyCo, 2023). Although the Project will not fall within one of the states REZs, other aspects of the strategy relate to the infrastructure and energy contribution the Project offers. For example, the Project will utilise existing capacity in the network without relying on additional infrastructure to be built. This option requires less environmental impact than if additional infrastructure was required and is a cost effective method for building regional renewable energy capacity.

The strategy proposes network infrastructure options with a total capacity of 14 GW to be implemented by 2033, with further options considered for the future. The strategy considers scenarios such as a central power system development, transmission delays in large projects, and an accelerated coal exit by 2030 with strong electrification. Principles agreed upon with stakeholders through the strategies development process including affordability, reliability, and community support. The plan explores emerging technologies and future scenarios, emphasising a 20-year development pathway for NSW's electricity infrastructure.

Implementation involves the categorisation of projects based on their urgency, with a focus on adding between 14 GW and 24 GW of network capacity over the next two decades. Overall, the strategy represents about 5% of wholesale electricity costs over the next 20 years, through energy generation, storage, and firming infrastructure for the benefit of electricity consumers and the community.

The Project aligns with the strategies principles developed through stakeholder consultation. It will contribute to affordable energy generated and provided to the NEM that will increase the networks security and reliability. The inclusion of a high-capacity BESS provides further firming technology to the sector and advances the strategies objective of exploring emerging technology.

2.3.6 NSW Large-Scale Solar Energy Guideline

In 2022, the DPE released The NSW Large Scale Solar Energy Guideline which aimed to provide the community, industry and regulators with guidance on the site selection process, landscape and visual impacts and agricultural land use conflicts assessment framework. Additional objectives of the guideline are to support sustainable solar development, provide clear guidance for the assessment of environmental impacts and to promote best practice community and stakeholder engagement practices.

Updates to the guideline have since been drafted to reflect the key policy changes under the draft Energy Policy Framework. The updates aim to the align the guidelines with the draft Wind Energy Guideline which will consider requests to declare solar energy development as Critical State Significant Infrastructure if it includes a significant energy storage system. The draft changes also aim to improve site selection processes, provide a calculator for estimating decommissioning costs, encourages applicants to pay $850 per megawatt per annum in benefit sharing and improve the assessment of land and visual impacts associated with solar projects.

2.4 Regional and Local Renewable Energy Context

2.4.1 North Coast Regional Plan 2041

The North Coast Regional Plan 2041 (NCRP) is the NSW Government's 20-year strategic land use planning framework for the region (DPE, 2022c). The NCRP provides a framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions at all levels of government and industry across the region.

The plan aims to protect and enhance the region's assets and plan for a sustainable future. The plan was adopted in December 2022 and aims to address changes seen and expected across the LGA including population growth in the regional centres, an aging population, new industrial opportunities and an increasing tension between farmland and urbanisation.

Three overarching goals underpin the 20 objectives of the NCRP outlined below. The objectives which relate to the Project are detailed under each goal:

- Liveable, sustainable and resilient:
    - Objective 3: protect regional biodiversity and areas of high environmental value.
    - Objective 4: understand, celebrate and integrate Aboriginal culture.
    - Objective 7: promote renewable energy opportunities.
    - Objective 8: sustainably manage the productivity of our natural resources.
- Productive and connected:
    - Objective 14: deliver new industries of the future.
- Growth, change and opportunity:
    - Objective 18: plan for sustainable communities.

The North Coast is experiencing a robust and thriving economy, with a strong focus on healthcare and social assistance to cater to the needs of the region's aging population. However, there are other sectors such as education and training, construction, tourism, creative industries, retail, and agriculture that are also growing rapidly and are expected to create more job opportunities.

To promote the development of renewable energy, the North Coast Regional Plan (NCRP) has implemented Objective 7, which aims to bolster the renewable energy sector across the region. This strategy not only supports the emergence of new industries (Objective 14), but also safeguards agricultural practices and ensures the well-being of communities and their cultural heritage (Objective 18). Moreover, the plan strives to contribute to the state's net zero emissions target by 2050, capitalising on advancements in technology and sustainable management of natural resources throughout the region (Objective 8). The preservation of areas with high environmental value is an objective of both the Project and the NCRP (Objective 3), along with the integration of local indigenous communities' knowledge and experiences (Objective 4).

The Project is considered to be consistent with the vision and values of the NCRP, particularly in relation to the expansion of renewable industries. In particular, the NCRP recognises the opportunities that renewable energy offers to the local workforce and communities, while supporting the state's transition to an electricity grid primarily serviced by renewable energy generation.

2.4.2 Northern Rivers Region – Renewable Energy Blueprint for the Northern Rivers

The Northern Rivers Joint Organisation (NRJO), comprising Richmond Valley Council and six neighbouring councils in the Northern Rivers Region, was established to address regional priorities such as advancing sustainable energy, water, and waste management (DPIE, 2019). The Blueprint underscores the region's commitment to embracing renewable energy sources.

> *"The Northern Rivers has been at the forefront of renewable energy uptake in Australia. It is home to Australia's first community-owned renewable energy retailer, NSW's largest bioenergy generation plants, Australia's first solar garden, Australia's first ever council-operated and community-owned solar farm, and the region has among the highest levels of rooftop solar in the country."*

The plan seeks to develop renewable energy through council governance practices and a range of community strategic plans across the Northern Rivers LGA's. The Blueprint encourages renewable energy developers to actively pursue social approval, engage effectively with communities, and seeks for the NSW Government to commit to simplifying planning processes for SSDs. It also emphasises the importance of collaborative efforts with developers.

The Project supports the region's commitment to advancing sustainable energy and exemplifies the collaborative spirit emphasised in the Blueprint by actively seeking social approval and engaging with communities. In doing so, the Project strengthens the Northern Rivers' position as a leader in renewable energy development.

2.4.3 Richmond Valley Council's Local Strategic Planning Statement

The Richmond Valley Council Local Strategic Planning Statement, titled "Beyond 20-20 Vision" (RVCLSPS) was adopted by Council on 19 May 2020 and outlines the town planning priorities and strategic direction for the Richmond Valley Local Government Area (LGA) (Richmond Valley Council, 2020). The statement aims to address planning and development issues for a sustainable and vibrant future. It considers the unique attributes and community values of the local area, taking into account various state, regional, and local plans, policies, and strategies. The statement is influenced by the NCRP and Council's Community Strategic Plan.

The Richmond Valley LGA is located in the North Coast region of New South Wales and is one of 12 LGAs in the area. Richmond Valley LGA is situated at the southern edge of the Far North Coast subregion and shares boundaries with Clarence Valley Council, Kyogle Council, Lismore City Council, and Ballina Shire Council.

Planning themes and priorities of the RVCLSPS establish the commitments of the council to ensuring the region remains a vibrant and sustainable place to visit and live.

The planning priorities outlined within the RVCLSPS are detailed below:

- Our Community (connecting people and places):
    - Planning Priority 1: Have well planned and designed space to grow.
    - Planning Priority 2: Align development, growth and infrastructure.
    - Planning Priority 3: Improve the delivery of planning services.
- Our Environment (looking after our environment):
    - Planning Priority 4: Look after our environment.
    - Planning Priority 5: Create resilient communities.
- Our Economy (growing our economy):
    - Planning Priority 7: Protect productive agriculture land & significant resources.
    - Planning Priority 8: Diversify the range of services and employment options.

Planning Priority 5 details the environmental considerations that endanger the region's economic, ecological and social wellbeing. Under Planning Priority 5, the council's environmental charter aims to build on the principles of sustainability and regenerative initiatives through a variety of practices including the; uptake of new and alternate technology opportunities such as renewable energy options, where they are shown to be economically viable into the future and compatible with this charter.

The Project aligns with Planning Priority 5 as it embraces the objective to utilise new technological opportunities to harness renewable resources whilst reducing environmental impacts. By generating solar electricity, the Project contributes to the region's sustainability goals and reduces reliance on energy generated by fossil fuels.

Planning Priority 8 addresses the need for the council to diversify the services and employment options within the LGA. Construction work represents approximately 8% of employment which is the 7th largest category of work within the LGA. The construction phase of the Project represents an opportunity to expand this category for the duration of the construction period and will facilitate further economic stimuli for supporting industries.

The overarching intent of Planning Priority 4, 5, 7 and 8 have all been addressed through the considered design of the Project to avoid and minimise impacts.

2.5 Environmental and Social Context

2.5.1 Local and Regional Community

As outlined in **Section 1.0**, the Project is located approximately seven km east of Rappville, situated within the Richmond Valley LGA in the Northern Rivers region of NSW. The nearest population centres to the Project Area are Casino, approximately 25 km north or Woodburn, located approximately 26 km east (see **Figure 1.1**). Rappville is a small residential area with a population of 142 (as at the 2021 census) (ABS, 2021) and offers various facilities such as a post office, public school and public house.

Casino has a population of 10, 930 (as at the 2021 census) (ABS, 2021) and is a strong agricultural centre for the region with a strong focus on beef, dairy, timber and broad acre cropping. Casino is advantageously positioned as a regional centre for freight transport north into South-East Queensland, south towards Sydney & Newcastle, and west towards the New England Tablelands.

Historical land uses throughout the Richmond Valley LGA and the Northern Rivers more broadly, began with extensive logging before a productive and widespread dairy industry took hold in the 1970's. The location of Richmond Valley, along key transport infrastructure and its proximity to regional centres, has provided the regions agricultural industry access to important trading hubs.

The Project is located across 10 cadastral lots (**Figure 2.1**) owned by two landholders who have provided consent for the Project (**Appendix 5**). There are 27 non-associated sensitive receivers located primarily to the north, south and west of the Project Area generally located along Avenue Road, Ellangowan Road, Myall Creek Road, Elliots Road and Main Camp Road. Road upgrades proposed are located on local road and state roads spanning 5.1 km from Summerland Way, west of the Project Area to the third Project access point (SA3) along Avenue Rd.

The Project Area has been subject to logging, plantation forest operations, livestock grazing and occasional cultivation for pasture improvement. The current land use within the Project Area is livestock grazing on pasture and fodder crops. The Project Area is zoned as Rural Use 1 (RU1) – Primary Production under the Richmond Valley Local Environmental Plan 2012 (LEP) (Richmond Valley Council, 2012), see **Figure 2.2**.

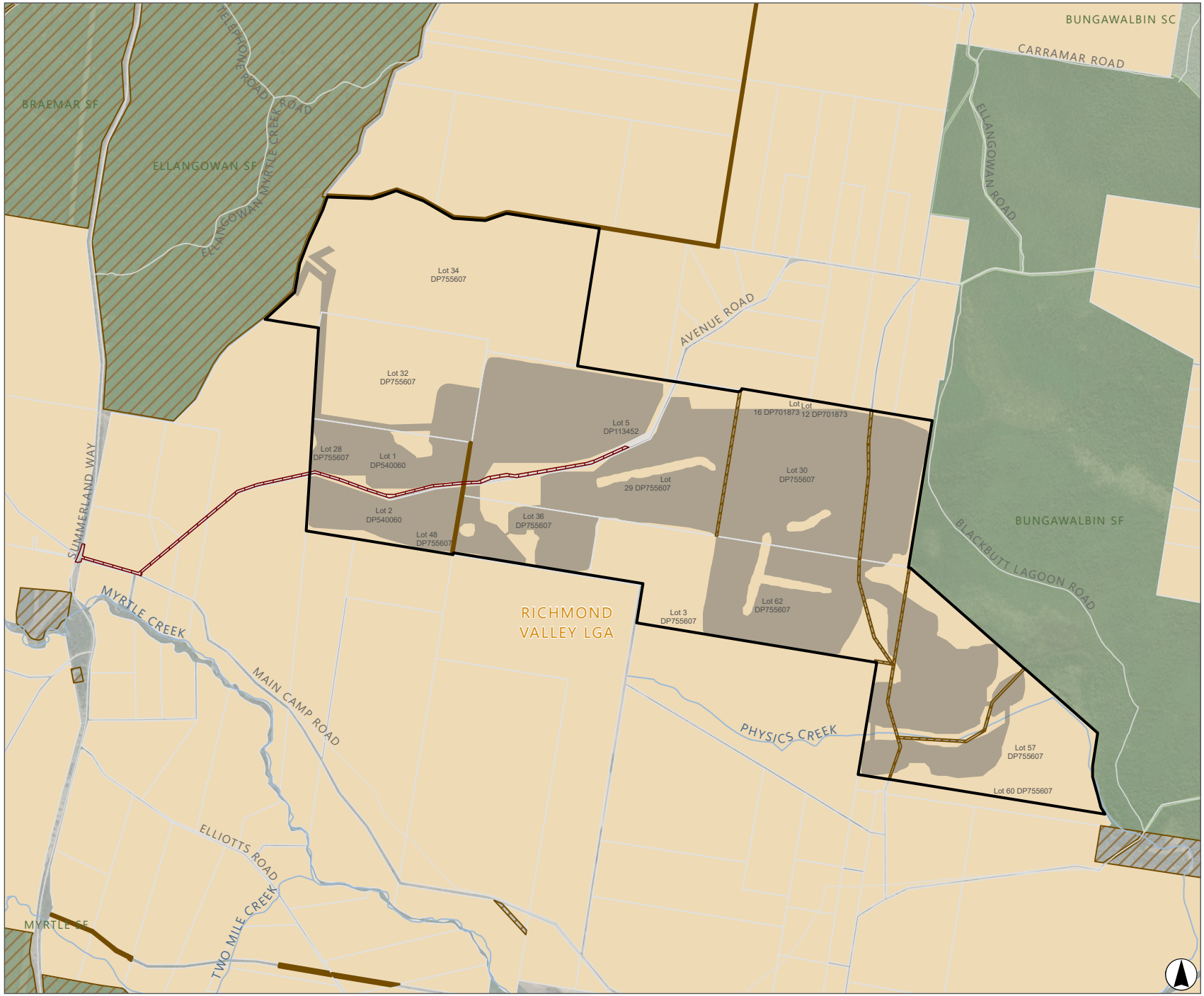
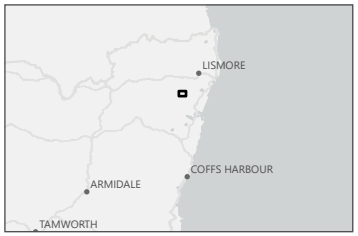


FIGURE 2.1

Land Ownership

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Freehold Land
- Crown Land
- Crown Enclosure Permit
- NPWS Reserve
- State Forest
- Roads
- Watercourse



0 1 2

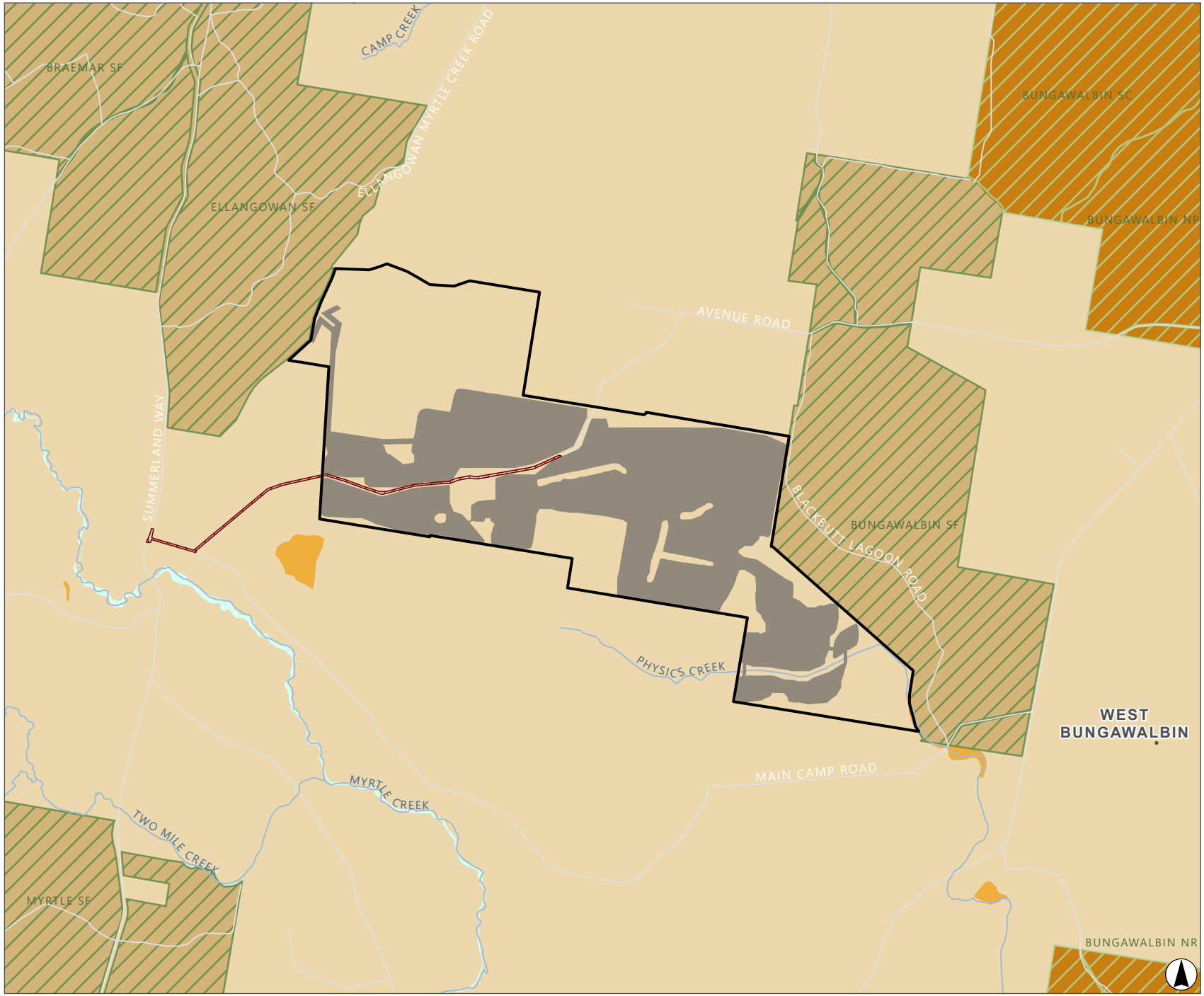
Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

FIGURE 2.2

Land Use and Zoning



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- NPWS Reserve
- State Forest
- Watercourse
- Roads

EPI Land Zoning

- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation and Environmental Management
- RU1 - Primary Production
- RU3 - Forestry
- W1 - Natural Waterways

0 1 2

Kilometers

Scale 1:60,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

2.5.2 Natural and Built Features

2.5.2.1 Natural Features

The Project Area is located in the Northern Rivers region situated between the Tasman Sea to the east and the Great Dividing Range to the west. The region is defined by fertile valleys, carved by the Clarence, Richmond and Tweed Rivers. The Project Area is located in the Richmond Valley LGA which is adjacent to the Lismore LGA to the north-east, the Clarence Valley LGA to the south and Kyogle LGA to the north-west.

The Project is located in the NSW North Coast climate zone with an annual average rainfall of approximately 1056 mm between 1995 and 2023 (Bureau of Meteorology, 2024). Summer rainfall has been moderately reliable, with a 170 mm difference from year to year. Autumn rainfall is generally less reliable, and winter rainfall has not been consistent. Richmond Valley was severely impacted by fire in 2019 which burnt approximately 140,000 ha of land within the LGA. There were two significant fires in the region including Busbys Flat Road Fire and Myall Creek Road Fire which together, destroyed 62 homes within the LGA. Flooding has also occurred in the region including floods in 2008, 2009, 2017 and a significant flood event in February/March 2022. During the 2022 flooding, 1,200 homes were inundated or severely damaged in the Richmond Valley LGA, with 427 being classified as uninhabitable after the event (Richmond Valley Council, 2022).

The closest weather station is at Casino Airport, 25 km north, and records an annual average rainfall of 1,062.9 mm, with the highest rainfall historically occurring in February and lowest in July. The region experiences an annual average maximum temperature of 26.2°C and a minimum of 13.3°C. January has the highest average maximum temperature (30.6°C), while June and July have the lowest (20.8°C).

The Richmond River catchment, where the Project Area is located, encompasses diverse landscapes including rainforests, agricultural valleys, and coastal estuaries. It spans over 7,000 km^2, extending from the Border Ranges in the north to the Richmond Range in the west and south. The upland ranges and the plateau north of Lismore are predominantly forested, while the lower coastal plains are cleared for agriculture. Elevations vary from over 1,000 m in the Border Ranges to near sea level on the coastal floodplain.

The Project is primarily situated in a rural area with Ellangowan State Forest located to the north-west of the Project Area and is adjacent to vegetation connecting to Bungawalbin State Forest to the east. There are scattered rural residential properties to the north, south and west and livestock grazing, plantation forests or native forestry to the south and west. Myrtle State Forest is located approximately 8 km southwest.

The minimum elevation in the southeastern part of the Project Area is approximately 24.4 m Australian Height Datum (AHD), while it increases to 70 m on elevated regions in the west (**Figure 2.3**). The Project Area includes several small water bodies and 1st and 2nd order Strahler streams. A 3rd order Strahler stream intersects the northern part of the Project Area, extending east before flowing south-east towards Physics Creek. A 4th order Strahler stream, identified as Physics Creek and marked as a sensitive watercourse, intersects the southeastern corner of the Project Area and flows into the Richmond River catchment.

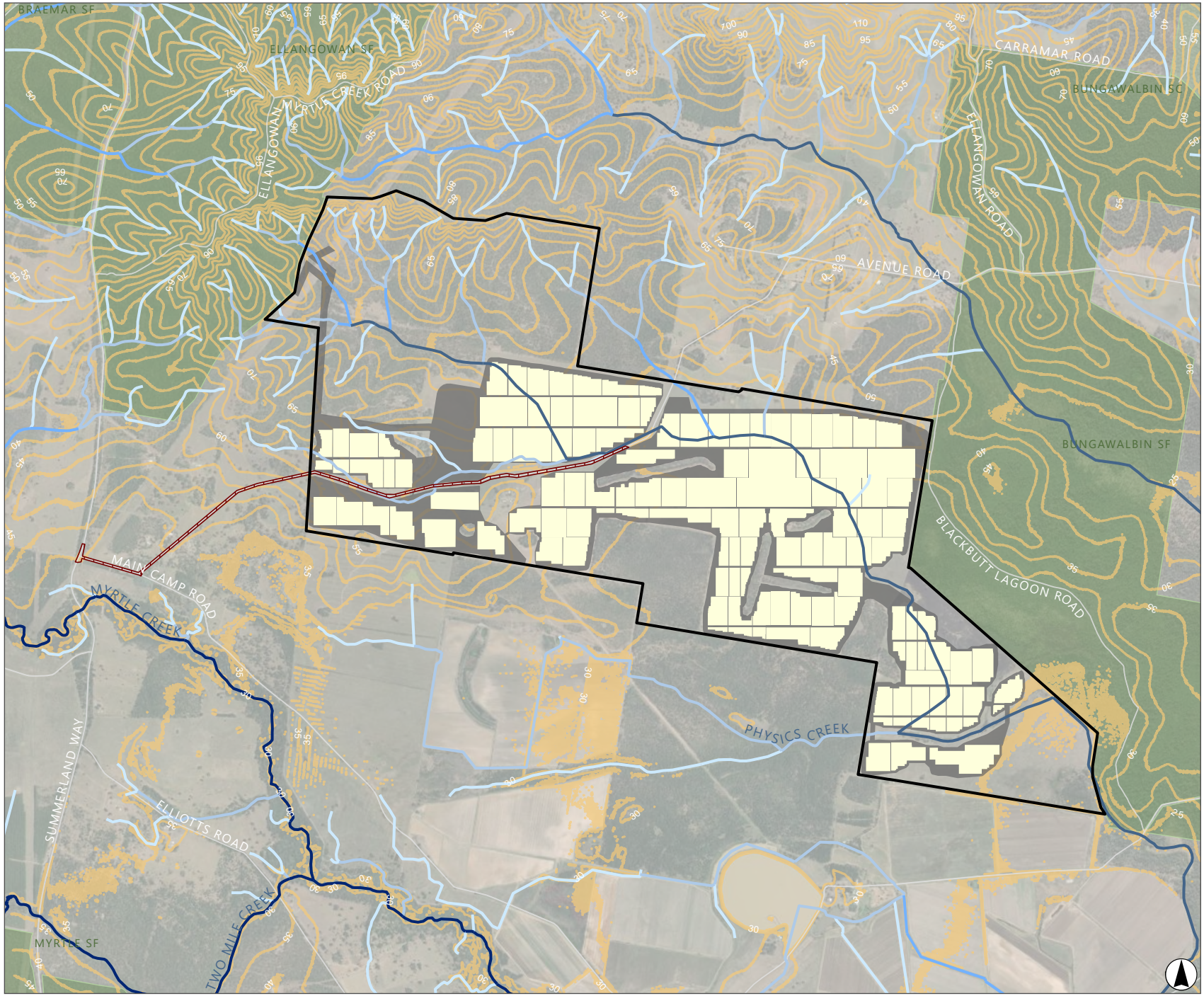
2.5.2.2 Built Features

An existing 330 kV transmission line is located within the Project Area and approximately 1.6 km north-west of the proposed substation. The transmission line runs north-south from Coffs Harbour through Grafton and north beyond Lismore.

The Project Area is bisected by Avenue Road, which connects with Summerland Way to the west via Main Camp Road and with Myall Creek Road to the east. Summerland Way stretches from Grafton (65 km south of the Project) to the Mount Lindesay Highway in southern Queensland (approximately 89 km north-west). The state road is an alternate north-south route to the Pacific Highway which runs along the east coast and is located 25 km east of the Project Area.

FIGURE 2.3

Topography and Drainage

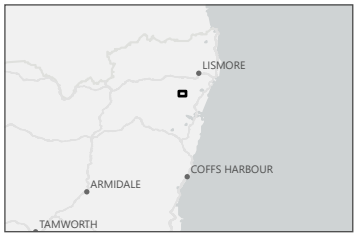


Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Solar Array Blocks
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- Contours (5m intervals)

Strahler Stream Order (as mapped)

- 1
- 2
- 3
- 4
- 5+



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Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

2.5.3 Key Hazards and Risks

The iterative design process and various technical assessments conducted for this EIS have aided in shaping the Project's design to reduce, as much as feasible, potential risks, impacts and hazards through avoidance and mitigation measures (refer **Section 1.5**). However, given the nature of the Project, comprising a solar farm with a BESS and associated infrastructure, certain risks, impacts or hazards may persist despite avoidance through design, management, or mitigation efforts.

The Project Area:

- has not been identified as containing contaminated land
- is not located within land considered to be prone to mine subsidence
- is not located within a coastal zone.

As detailed in **Section 6.5**, portions of the Development Footprint are subject to flood inundation. Flood depths are generally in the order of 1–2 m in the 1% AEP and 0.2% AEP event in the south-eastern portion of the Project Area which incorporates some low-lying wetland areas adjacent to Physics Creek. The Project has been designed to accommodate flood risk as detailed in **Appendix 9**.

The Project Area is also located within a bushfire prone area. Although the Project Area has been subject to extensive clearing it contains remnant patches of vegetation connected to Ellangowan State Forest to the north-west and vegetation connecting to Bungawalbin State Forest to the east which may provide fuel loads and present fire spreading risks refer to **Section 6.4**. Key Project components have been designed in light of the vegetation classification to minimise the risk of bushfire impacting the Project and originating from the Project, see **Table 2.1**.

A consideration of land use conflict between the Project and adjacent land uses has informed the design process. Design measures have reduced the potential for land use conflict and there are no identified high risk activities associated with the Project that will infringe upon the rights or impact the values or amenity of adjacent landholders. Relevant risks and hazards, as well as the associated management and mitigation measures, have been considered and are described in detail in **Section 6.5.4**. Relevant hazards and potentially hazardous Project components have been addressed in accordance with the SEARs, including:

- Electromagnetic Fields (EMFs).
- Hazardous Materials.
- BESS.
- Electrical infrastructure including the transmission line.

Where a hazard or risk was unable to be avoided entirely, all reasonable and feasible management and mitigation measures are proposed as detailed in **Appendix 10**.

2.6 Cumulative Impacts

The *Large-Scale Solar Energy Guideline* (DPE, 2022) and the *Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects* (DPIE, 2022b) require the consideration of a project together with the impacts of other relevant future and existing projects in order to determine the potential cumulative impacts.
A detailed assessment of potential cumulative impacts has been conducted for the Project in **Appendix 20**. The Project is located outside of the NSW REZs and as such will have considerably less cumulative impacts associated with it than comparable solar projects within these zones. The nearest REZ is the New England REZ, located 95 km south-east of the Project Area.

Each impact was assessed for its potential to contribute to cumulative impacts alongside nearby development. In particular, traffic, noise, social, visual, biodiversity and waste impacts were assessed in detail throughout **Section 6.0** with an overview of these key cumulative impacts in **Section 6.18**.

2.7 Project Related Agreements and Benefits Sharing

Through the Project design and stakeholder engagement process, Ark Energy has proposed and developed several Project related agreements.

2.7.1 Host Landholder Agreements

Host landholder agreements are in place for long term leases of farmland with the two owners of the 10 cadastral lots that make up the Project Area, see **Figure 2.1**. Landholder consent is provided in **Appendix 5**. Upon completion of the Project, each property will be rehabilitated in line with the specific terms of the agreements and conditions of consent.

These agreements include annual payments to landholders to host the solar farm and BESS infrastructure on their properties. These payments are confidential between Ark Energy and host landowners and address the Project related impacts on these land holdings and residence.

The impacts of the Project on these host landholders whilst noted in the technical assessments as relevant, are addressed by the agreements in place.

2.7.2 Neighbour Agreements – Impact

No neighbour agreements are required to manage or mitigate impacts associated with the Project.

2.7.3 Neighbour Agreements – Benefit Sharing

Ark Energy has offered agreements to 10 properties neighbouring the project. The proposed payments have been calculted based on proximity and the likelihood of experiencing the effects of the Project more acutely. These agreements will be in the form of a benefit sharing agreement.

2.7.4 Community Benefit Fund

A Community Benefit Fund (CBF) with a value of $850/MW of solar electricity generation installed/year paid over the lifetime of the project will be implemented. Ark Energy is open to exploring sponsorship opportunities as a component of the CBF throughout the remainder of the development process. The CBF is likely to be administered by Council in the form of their Section 7.12 Contributions Plan aimed at improving and building local facilities such as parks, community facilities, roads and drainage. Ark Energy is currently negotiating with Council on the structure of the contributions plan.

2.8 Alternatives

2.8.1 'Do Nothing' Option

The Project Area is currently used for livestock grazing and limited fodder cropping. The 'do nothing option' would allow for the continued use of the Project Area solely for agricultural purposes. The 'do nothing option' would also imply that the Project is not developed and would therefore forego the Project's identified benefits, namely:

- The provision of up to 500 MW of renewable energy supply to assist in reaching State and Commonwealth renewable energy targets.
- Contribution to the achievement of the transition towards cleaner electricity generation and a reduction in greenhouse gas emissions.
- Increased energy security and supply into the NEM.
- Significant social and economic benefits created through capital investment and provision of direct and indirect employment opportunities during the construction, operation and decommissioning phases of the Project.
- The 'do nothing option' would avoid the environmental and social impacts associated with the construction, operation, and decommissioning of the Project, such as biodiversity impacts, construction noise, traffic and dust, social amenity impacts and visual impacts. However, these impacts are manageable through the implementation of the management and mitigation measures outlined throughout **Section 6.0** and would not result in a significant impact to the environment and local communities.
- The 'do nothing option' also risks a smooth transition away from coal-based generation sources in the future as generators such as Eraring and Bayswater reduce their output and close over the coming years. The Project will inject large quantities of renewable energy into the NEM within the timeframe of these large generators downscaling and closures, further alleviating the stability of the power system.
- Considering the benefits of the Project, the 'do nothing option' is not considered to be a preferred option.

2.8.2 Alternative Locations

Throughout the site selection and design process, alternative locations were considered based on proximity to the NSW electricity grid (existing and proposed) and the solar generation potential of the region. Alternatives were excluded for various reasons including inconsistency with the strategic planning context set by the NSW Government, costs and potential environmental impacts. The proposed Project Area was shown to be more suitable than alternatives considered as it provides the optimal combination of:

- Availability of land of a suitable scale for a viable commercial-scale solar farm project.
- Proximity to the 330 kV transmission line.
- The Project Area is predominantly cleared for agricultural purposes with low biodiversity value, providing ample area for the installation of the Project.
- The Project will not impact land that has a high soil capability for agricultural purposes (see **Section 6.14**).
- Compatible land use zoning both on the Project Area and adjacent land holdings.
- Access to the major transport network namely Summerland Way.
- Reduced environmental constraints with potential environmental impacts that can be managed with appropriate mitigation and management.
- Agreements with host landholders.

The alternative locations are further from a REZ, closer to existing dwellings and were considered likely to result in fragmentation of existing agricultural operations and greater environmental impacts.

2.8.3 Alternative Technologies

Alternative Project layouts based on different solar farm designs and technology with a proven track record of large-scale implementation, have been investigated including:

- Fixed versus tracking options for PV module mounting: A single axis tracking system was chosen for the Project as it allows for more efficient electricity generation than fixed tilt options, leading to more efficient land use. Tracking systems also have a lower visual impact as they minimise glare from the sun, which can occur when the sun is at low angles in the sky and the PV modules are not facing the sun.
- Mono-facial versus bifacial PV modules: Bifacial PV modules were selected for the Project as they allow for more efficient electricity generation than traditional single-sided PV modules, leading to more efficient land use. The distance between the rows of modules is also larger for bifacial modules, which helps to minimise environmental and visual impacts of the Project.
- High efficiency solar panels were selected to minimise the Development Footprint while maintaining the minimum Project capacity required to connect to the onsite transmission line and deliver a commercially viable Project.

- Prior to the LTESA granted under the NSW Electricity Infrastructure Roadmap's incentive scheme, Ark Energy intended to host a smaller BESS. This BESS would not have been capable of providing the energy security that is now accessible under the agreement. The original BESS design would offer 2 hours of storage capacity that could be provided to the NEM during times of low supply. The final BESS design offers an 8-hour storage capacity, which provides increased output capacity for periods of low UV and high energy demands. Unlike the original design, the upgraded BESS under the LTESA is equipped to provide enhanced energy security and reliability to meet the evolving demands of the electricity grid.

2.8.4 Alternative Project Layouts

During the early design phases of the development, Ark Energy considered the environmental, cultural and social constraints of the locality to minimise the potential impacts of the Project. Stakeholder consultation indicated that design refinements identified through specialist studies aligned with concerns raised about the Project. These alternative Project Layouts have been designed to avoid and minimise environmental and social impacts throughout the EIS process and to address engineering requirements to fulfil the objectives of the Project.

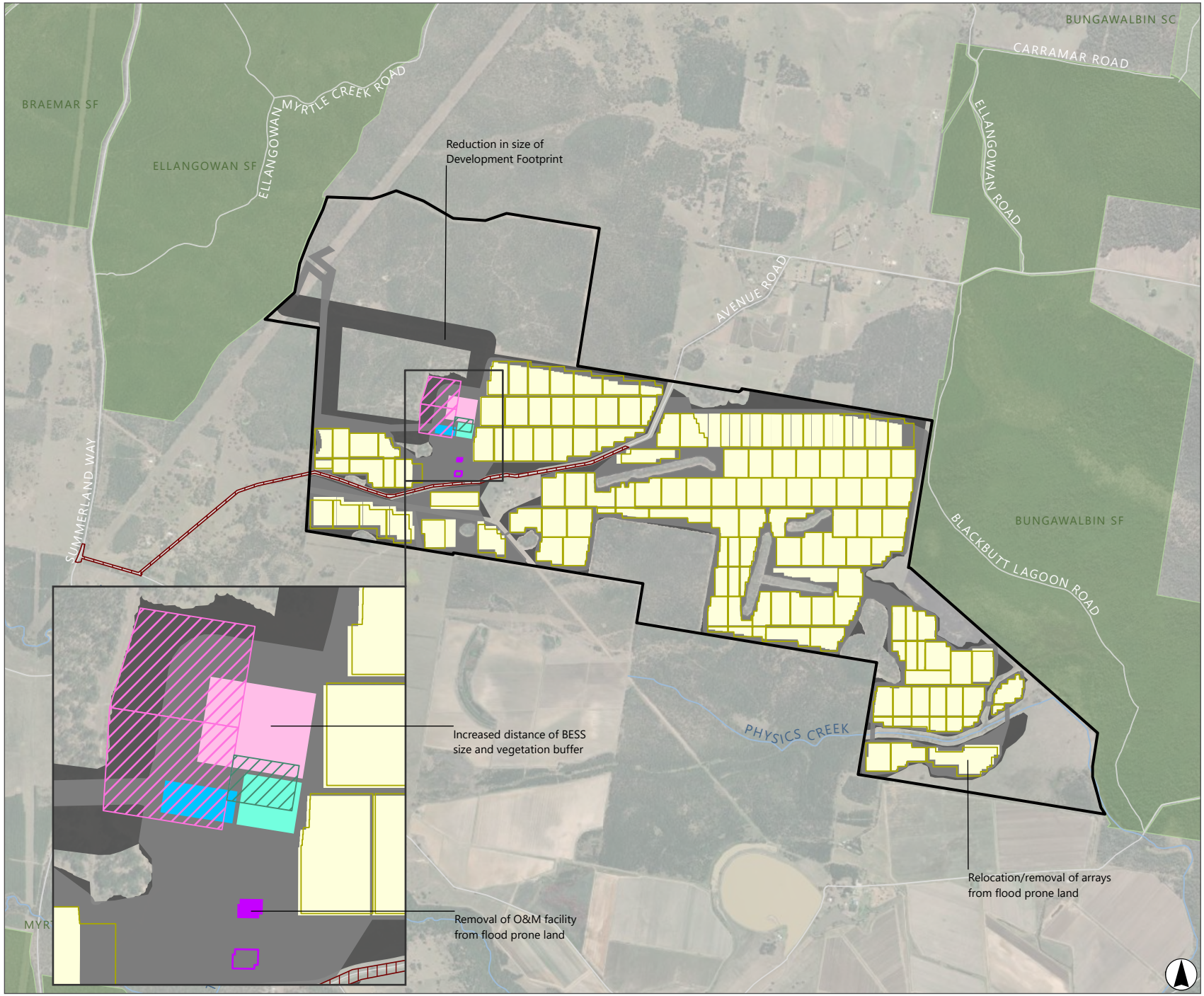
The design refinements that have been incorporated into the Project since the scoping phase are detailed below in **Table 2.1**.

Changes to the Development Footprint and internal Project layout has been an iterative process in response to consultation and advice from technical specialists. Key design refinements are depicted in **Figure 2.4** and include:

- Reduction of the Development Footprint to address environmental constraints including relocation or removal of solar arrays to avoid flood prone land and areas of high biodiversity value.
- Relocation of key infrastructure to minimise impacts including the O&M facility to avoid flood prone land and the BESS to the east to create a 100 m buffer to vegetation.
- Selection of the transmission corridor option with lower environmental impacts in particular biodiversity.
- Public road upgrades to facilitate safe movement of vehicles.
- Increased width of APZ surrounding the solar arrays (11–25 m) and the BESS (100 m on northern and western boundaries).
- Inclusion of a 30 m biodiversity corridor on the northern boundary of the Project Area.

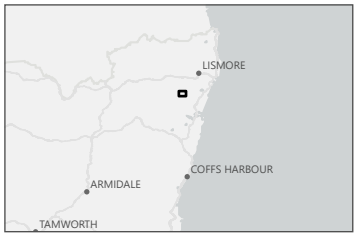
FIGURE 2.4

Summary of the Key Design Refinements



Legend

- Project Area
- Development Footprint (Final Design)
- Development Footprint (Preliminary Design)
- Road Upgrade Area
- Substation (Final Design)
- Substation (Preliminary Design)
- Switching Subsation (Final Design)
- O&M Facility (Final Design)
- O&M Facility (Preliminary Design)
- BESS (Final Design)
- BESS (Preliminary Design)
- Solar Array Blocks (Final Design)
- Solar Array Blocks (Preliminary Design)
- NPWS Reserve
- State Forest
- Roads
- Watercourse



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Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

Table 2.1 Design Refinements

Project Component	Scoping Phase (July 2022)	Revision A (September 2023)	Revision B (November 2023)	Final Design (March 2024)	Key Changes Since Scoping
Project Area	1132 ha	Approximately 1,475 ha	No Change	No Change	• Increased by 343.3 ha.
Solar Farm Development Footprint	955 ha	880 ha	Approximately 803 ha	No Change	• Reduced by 152.2 ha.
Road Upgrade Development Footprint	Not included during Scoping Phase	10.6 ha	17.4 ha	11.0 ha	• Addition of 11.0 ha.
Solar Array Layout	Up to 500 MW capacity, location undefined. Arrays to be situated on mostly cleared land with a height of 5 m.	Up to 500 MW capacity located with 10 m APZ to vegetation and reduced number of solar arrays located in flood prone land.	No Change	Up to 500 MW capacity located with between 10 m and 100 m APZ to vegetation. A panel height of 4 m.	• No change to the solar farm capacity. • Increased APZ on average. • Reduction of solar arrays within flood prone land. • Reduced height of panels.
Grid Connection	A single transmission corridor along the northern boundary of Lot 32 DP755607 and Lot 34 DP755607.	Two transmission options along the eastern/northern boundary of Lot 34 DP755607 and along the southern and western boundary of Lot 34 DP755607. Transmission line corridor 190 m wide.	Single transmission line along the southern and western boundary of Lot 34 DP755607. Transmission line corridor 60 m wide.	No Change	• Refinement of transmission corridor to a single option. • Reduction in corridor width by 130 m.
BESS	Potential 500 MW BESS. Confirmation of BESS to be decided later in the design and if built would be located adjacent to the substation in Lot 29 DP755607.	A 275 MW and 2,200 MWh capacity covering a 14 ha area within Lot 32 DP 755607. BESS located directly adjacent to vegetation.	No Change	A 275 MW and 2,200 MWh capacity covering a 5 ha area within Lot 32 DP 755607.	• Increase BESS MWh capacity from 2 hours to 8 hours. • Reduction in BESS Development Footprint since Revision A by 9 ha. • Relocating BESS to the eastern side of Lot 32 DP 755607.

Project Component	Scoping Phase (July 2022)	Revision A (September 2023)	Revision B (November 2023)	Final Design (March 2024)	Key Changes Since Scoping
Substation / Switching Substation	Located in the north-western corner of Lot 29 DP755607	Located in the south-eastern corner of Lot 32 DP 755607. Substation 1.4 ha and switching substation 2.0 ha.		Located along the southern boundary of Lot 32 DP 755607. Substation approximately 1.6 ha and switching substation 1.3 ha.	• Moved closer to the final transmission corridor. • Increase substation area by 0.2 ha and decrease switching substation by 0.7 ha.
Road Upgrades	Not proposed. Two vehicle access points defined off Avenue Rd.	In line with **Section 3.3.6.5**. Differences include the road upgrades extend to the northern boundary of the Project Area along Avenue Rd, road upgrades encroach on the road shoulder and no accommodation for bus layby / set down area.	No Change	Road and intersection upgrades at Summerland Way / Main Camp Rd in line with **Section 3.3.6.5**. Road sealing from Main Camp Road / Avenue Road to extend to the SA3 along Avenue Road, inclusion of bus layby / set down area.	• Sealing of parts of Avenue Road and Main Camp Road and upgrades at Summerland Way / Main Camp Road intersection. • Additional Project access at Lot 2 DP 540060 • Reduction of impact to the shoulder of Avenue Road and Main Camp Road and 700 m less road upgrade from the northern site boundary to SA3. • Accommodation for bus lay down area outside of swept path at the Main Camp Road / Summerland Way intersection.
APZ	APZ to comply with the minimum 10 m distance between vegetation and Project infrastructure.	APZ to comply with the minimum 10 m distance between vegetation and Project infrastructure. Increased APZ at arrays to meet the bushfire attach level (BAL) 29 standard.	APZ distance of 50 m at critical infrastructure such as the BESS and substation. Increased APZ at arrays to ensure that the vast majority of arrays meet the BAL 19 standard.	APZ distance of 100 m at critical infrastructure such as the BESS and substation. Increased APZ at arrays to ensure that the vast majority of arrays meet the BAL 19 standard. See **Section 6.4.3**.	• Increase distance APZ distance from the substation / BESS to vegetation by 90 m. • Increase the vast majority of perimeter arrays from the BAL 29 zone to BAL 19 zone.

Project Component	Scoping Phase (July 2022)	Revision A (September 2023)	Revision B (November 2023)	Final Design (March 2024)	Key Changes Since Scoping
Security Fence	Details yet to be confirmed		Security fence surrounding the Development Footprint. Setback to provide space for internal access tracks surrounding the PV modules.	No Change	• Additional distance between critical infrastructure and the security fence by up to 100 m.
Biodiversity Corridor	No corridor in Project design	No corridor in Project design.	A 20 m wide biodiversity corridor along the northern boundary of Lot 29 DP 755607 and Lot 30 DP 755607 to connect Ellangowan State Forest and Bungawalbin State Forest vegetation.	A 30 m wide biodiversity corridor along the northern boundary of Lot 29 DP 755607 and Lot 30 DP 755607 to connect Ellangowan State Forest and Bungawalbin State Forest vegetation.	• Addition of a 30 m wide biodiversity corridor along the northern boundary of Lot 29 DP 755607 and Lot 30 DP 755607.

3.0 Project Description

This section describes the layout, location, and function of all infrastructure to be constructed and operated as part of the Project. It includes descriptions of the Project's construction, operation and decommissioning phases, along with the necessary services and utilities needed to execute and sustain the Project. Additionally, this section provides information regarding the timing of each phase of the Project.

3.1 Project Overview

A summary of the Project, listing details of the proposed development for which approval is sought, is summarised in **Table 3.1**.

Table 3.1 Project Summary

Project Element	Summary of the Project
Project Application Number	SSD-41020R244
Project Description	The Project involves the construction, operation and decommissioning of up to 500 megawatts (MW) of solar DC PV generation, inverters, BESS with a power capacity of 275 megawatts and an energy storage capacity of up to 2,200-megawatt hour (MWh) over eight hours and approximately 2 km of transmission line to connect the Project from the switching substation to the NEM. The Project will include various associated facilities and infrastructure including, temporary construction facilities, O&M facility, internal roads, civil works, fencing and other required electrical infrastructure.
Project Address	420 Avenue Road, Myrtle Creek NSW
Project Area	Approximately 1,475ha
Solar Farm and Associated Infrastructure Development Footprint	Approximately 803 ha
Road Upgrade Development Footprint	Approximately 11 ha
Solar Array Footprint	Approximately 542 ha subject to detailed design
Schedule of Land	The Project is located across 10 cadastral lots owned by two different landholders, with the Schedule of Lands included in **Appendix 5**.
Solar Panels	Up to 730,000 bifacial solar panels on ground-mounted single axis tracking framework. Row spacing: 5.4 m Tracker Height: 2.5 m Maximum Panel Height (at full tilt): 4 m. Model panel dimensions: 2384 mm x 1303 mm Tracking angle: +/- 60 degrees Ground Coverage Ratio: 44.15%
PV Inverter Stations	118

Project Element	Summary of the Project
Substation	Dimensions: 135 m x 120 m (Approximately 1.6 ha) Voltage step up: 33 kV / 330 kV
Switching Substation	Dimensions: 170 m x 75 m (Approximately 1.3 ha)
Battery Storage	Centralised 275 MW / 2,200 MWh BESS situated on elevated ground adjacent to the substation. Dimensions: 201 m x 250 m (Approximately 5ha)
Electrical Reticulatiorn	Construction of a two km double circuit 330 kV transmission line including 11 transmission towers at 55 m in height within a 60 m transmission corridor in the north-western portion of the Project Area. Power conversion located alongside PV modules consisting of approximately 118 inverters. Cabling between solar arrays, inverters and the onsite substation will via a network of underground cables (up to one m deep and one m wide).
Temporary Construction Facilities	Main construction facilities to include office amenities, parking (approximately 0.4ha), storage, a control room and data, water and electrical reticulation. Laydown areas suitable for storing plant material and equipment, solar arrays and cable drums, and areas to support waste management activities.
Permanent Operational Facilities	This would include the system control building, switch room and storage facilities (Approximately 0.2ha) and car parking.
Project Access	The Project has three proposed access points off Avenue Road. The main access point (SA2) would be the central access point approximately three km from the intersection of Avenue Road and Main Camp Road. The two secondary access points (SA1 and SA3) will be on the southern side of Avenue Road. Major solar components would be delivered via heavy and OSOM vehicles from the Port of Brisbane, via Motorway/Highway, Summerland Way, Main Camp Road, Avenue Road and access into the Project Area via SA2 on the northern side of Avenue Road. Light vehicle access would be facilitated off Avenue Road.
Internal Roads	Approximately 52 km of compacted access roads of approximately 4 m in width would be constructed throughout the Development Footprint. Existing internal roads will be used where available although existing roads will be developed to accommodate vehicle movement across the Project Area. A sealed main access road will be 6 m wide leading to the substation and parking area.
Perimeter Fencing and security	Perimeter security fencing around the Development Footprint to a height of approximately 2.1 m plus CCTV at each entrance and the substations.
APZ	Protection zones between Project infrastructure and vegetation will be maintained to a minimum of 10 m and up to 100 m around critical infrastructure such as the BESS and substations.
Biodiversity Corridor	A 30 m biodiversity corridor will be planted beyond the northern extent of the Development Footprint on the eastern side of Avenue Road. The corridor will create connection between existing vegetation in Ellangowan State Forest and Bungawalbin State Forest.
Workforce	Approximately 327 FTE workers at the construction 'Peak'. Operation: Approximately 10–15 FTE.

Project Element	Summary of the Project
Construction Hours	• 7:00 am to 6:00 pm – Monday to Friday. • 8:00 am to 1:00 pm – Saturday. • Sunday and Public Holidays – no works to be completed.
Operational Hours	24/7
Construction Period	Up to 24 months
Operational Period	Up to 30 years
EDC	$1.2 billion.

3.2 Project Area

The Project Area is 1,475 ha situated entirely within the Richmond Valley LGA (refer to **Figure 1.1**). Within the Project Area a maximum Development Footprint of 803 ha is proposed and a Road Upgrade Area of 11 ha which runs through the Project Area, shown in **Figure 3.1**. The Project Area comprises 10 cadastral lots, which are listed in **Table 3.2**. These cadastre lots are owned by two landowners. The layout of the solar panels and associated infrastructure would be entirely contained within the Development Footprint.

Table 3.2 Cadastral Lots Intersecting with the Study Area

Lot	Deposited Plan
29	755607
30	755607
32	755607
34	755607
36	755607
57	755607
62	755607
1	540060
2	540060
5	113452

There are some areas of Crown roads / paper roads within the Project Area and works proposed in these areas may require a section 5.21 licence to authorise the use or occupation of these areas. The Project Area includes land designated as Crown Roads. Ark Energy has undertaken ongoing consultation with Crown Lands to enable the provision of landowners consent. Ark Energy, will seek to formally acquire Crown Land parcels (crown roads) within the Project Area to facilitate the construction and operation of the Project.

The Project also includes the construction of a double circuit transmission line to facilitate connection from the Solar Farm substation to the existing 330 kV Transgrid transmission lines to the north-west of the Project Area. The proposed transmission line corridor is approximately 60 m in width and has a distance of 2.1 km.

Road upgrades are proposed to enable safe movement of vehicles associated with the Project during the construction, operation and decommissioning phases including OSOM movements. Project related road upgrades are proposed at the intersection of Summerland Way/Main Camp Road as well as sealing of Avenue Road from the Main Camp Road intersection and continuing through Avenue Road to SA3 (see **Figure 3.1**).

The Project Area is zoned as RU1 Primary Production under the Richmond Valley LEP and bordered by land zoned as RU3 Forestry, with the Ellangowan State Forest to the north-west and Bungawalbin State Forest in the east. The Project Area is also in proximity to land zoned as C1 National Parks and Nature Reserves comprising the Bungawalbin State Conservation Area and Bungawalbin National Park to the north-east. Approximately 1076 ha, or 73% of the Project Area is comprised of Category 1-exempt land.

Land uses within the Project Area include livestock grazing, private native plantation, forestry and areas of environmental conservation as well as rural residential purposes. The disturbance regimes associated with the existing and historical land uses have led to some parts of the Project Area containing remnant native vegetation, particularly along the edges of the Project Area and within Lot 34 DP 755607, Lot 32 DP 755607and the western portion of Lot 62 DP755607.

The Project Area is generally flat with some undulation towards the western side of the Project Area. The general gradient of the Project Area slopes from west to east with an elevation of 70.0 AHD along the western boundary and 24.4 m AHD on the southern boundary of the Project Area.

The Project has been designed through a comprehensive process that incorporated specialist impact assessment and community and stakeholder feedback to maximise positive social, economic and environmental outcomes while avoiding and minimising impacts.

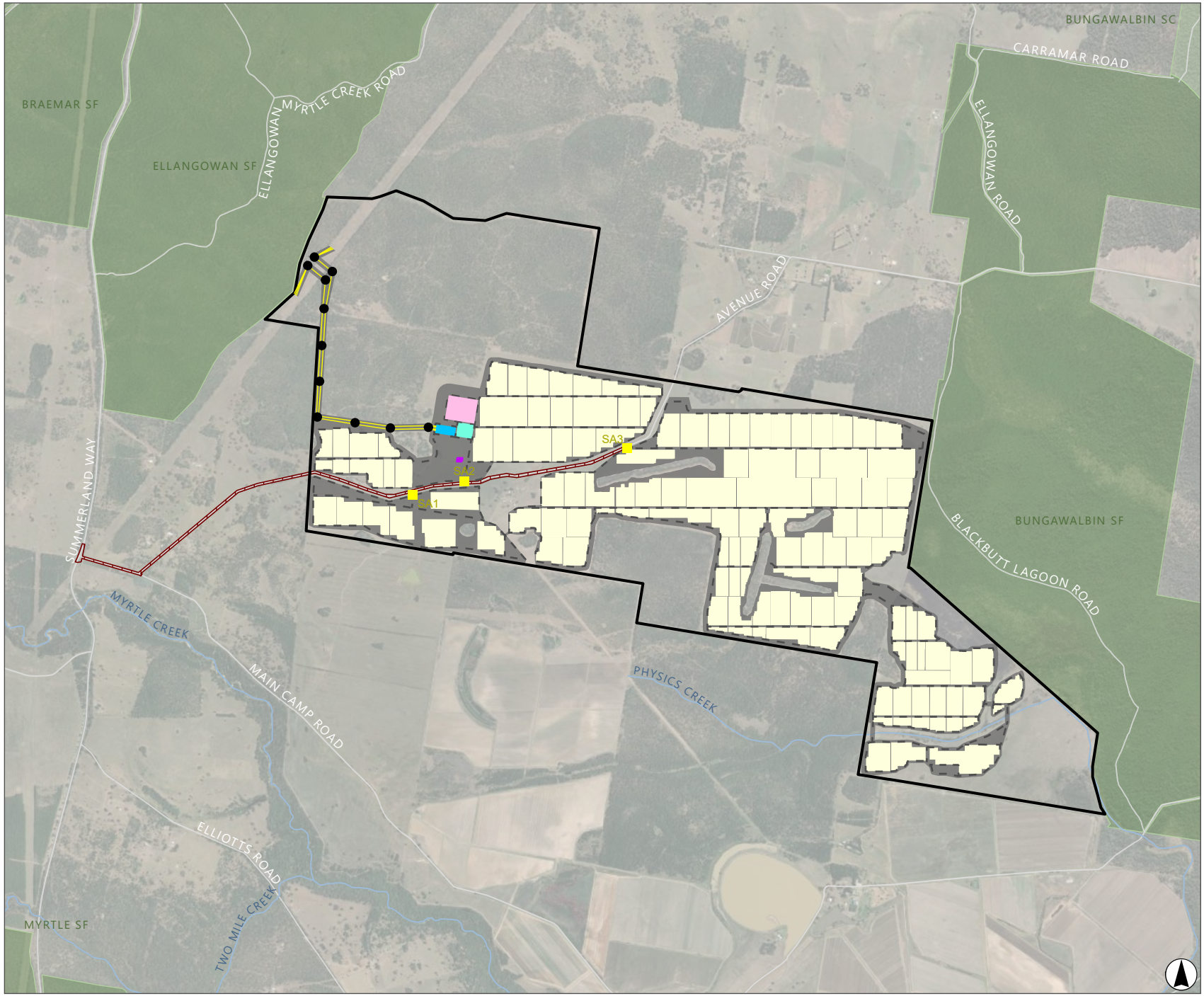
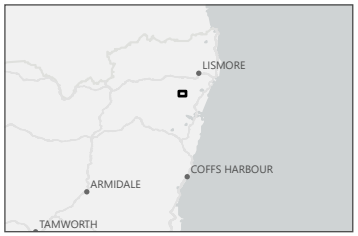


FIGURE 3.1

Project Layout

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Transmission Poles
- Access Points
- Transmission Lines
- Access Tracks
- Substation
- Switching Subsation
- O&M Facility
- BESS
- Solar Array Blocks
- NPWS Reserve
- State Forest
- Roads
- Watercourse



0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

3.3 Project Layout and Design

3.3.1 Temporary Construction Facilities and Activities

To facilitate construction of the Project, a range of temporary buildings and facilities will be required within the Project Area. These temporary construction facilities are described in the following subsections.

All temporary use sites that are not required for the ongoing operation of the Project will be rehabilitated once they are no longer required. The sites will either be rehabilitated to pre disturbance conditions as guided by the Construction Environmental Management Plan (CEMP) or will form part of the eventual Development Footprint for solar arrays.

3.3.1.1 Site Offices and Compounds

Temporary staff amenities would be designed to service the number of workers at the peak of construction period, and include:

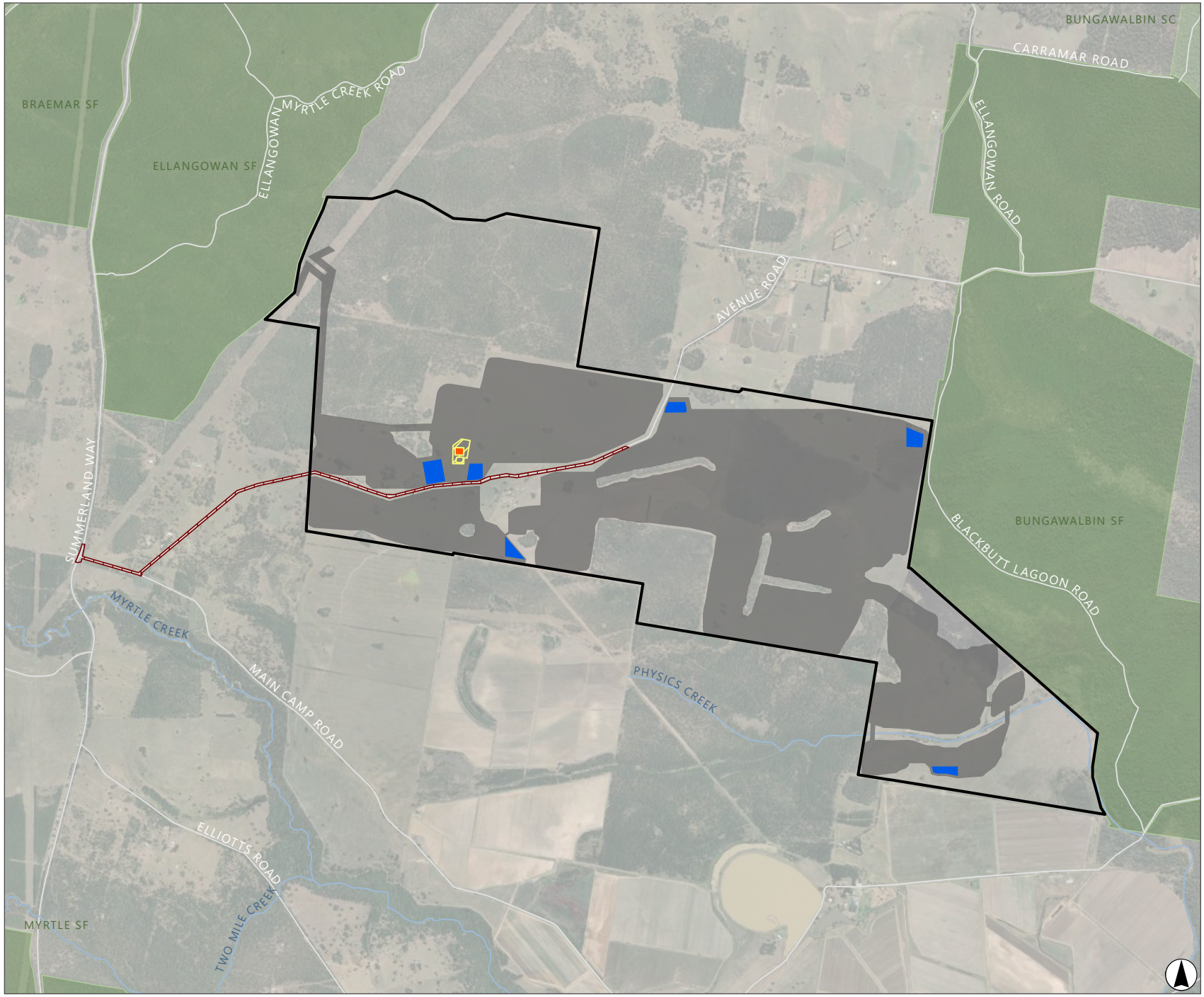
- Car parking.
- Staff offices.
- Control room.
- Lunchroom and first aid room.
- Toilet and shower facilities.
- Water tanks.
- Covered walkways.
- Covered storage area.
- Associated data, water, and electrical reticulation.

Arrangements will be made for power and communications connections to the site offices during the construction period. During construction, sewage and waste will be transported offsite. This arrangement will be managed through a waste plan and sewage plan developed in consultation with Council.

Temporary construction compounds will be typical of that used at construction sites; noting they will not include accommodation facilities. Indicative locations for construction compounds have been identified in **Figure 3.2**. The final locations will be determined in accordance with the development consent conditions and will be within the Development Footprint.

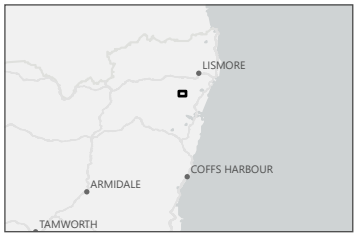
FIGURE 3.2

Indicative Concept for Solar Farm Temporary Construction Site Offices and Compounds



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Staff Car Park
- Temporary Site Facility
- Temporary Laydown Areas
- NPWS Reserve
- State Forest
- Roads
- Watercourse



0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

3.3.1.2 Stockpiles and Temporary Laydown Areas

Stockpiling of materials will be undertaken to maximise construction efficiencies and minimise waste being exported from the Project Area. Stockpiles will be established across the Project Area with six indicative locations identified alongside internal roads, compounds and laydown areas for the duration of construction.

Six temporary laydown areas will be distributed across the Project Area to minimise the transportation of materials and machinery during construction. Fuel and any other chemicals stored in laydown areas will be stored in appropriately designed, bunded storage facilities and trucked to plant in the field. If additional locations are required during the construction phase they would be contained to within the Development Footprint.

3.3.2 Solar Panels

The Project would involve the installation of up to 730,000 PV modules across the Project Area providing up to 500 MW of generation capacity. The panels would be arranged in a series of rows positioned to maximise the solar resources available. The solar panels would be installed through pile driving on ground-mounted single axis tracking frames, in rows configured in a north-south direction. The panels would move through the day from the east to the west, tracking the movement of the sun throughout the day.
The tracking system is estimated to have a tracking range of 120 degrees, or +/- 60 degrees from the horizontal position.

The standard PV modules will be 2.5 m off the ground in full tilt and have a tracker height of 4 m.
Panel dimensions will be 2384 mm by 1303 mm with a surface area of approximately 3.1 m^2 per PV modules. PV modules are designed for maximum light absorptivity and constructed of solar glass with anti-reflective surface treatment. The distance between each row will be 5.4 m. The tracking system will have a maximum tracking angle 60 degrees and the total ground cover ratio within the solar array blocks is 44%.

Photo 3.1 Example of an existing solar farm, the Sun Metals Solar Farm (Ark Energy, 2023)

Photo 3.2 Example of typical single axis tracking system (Ark Energy, 2023)

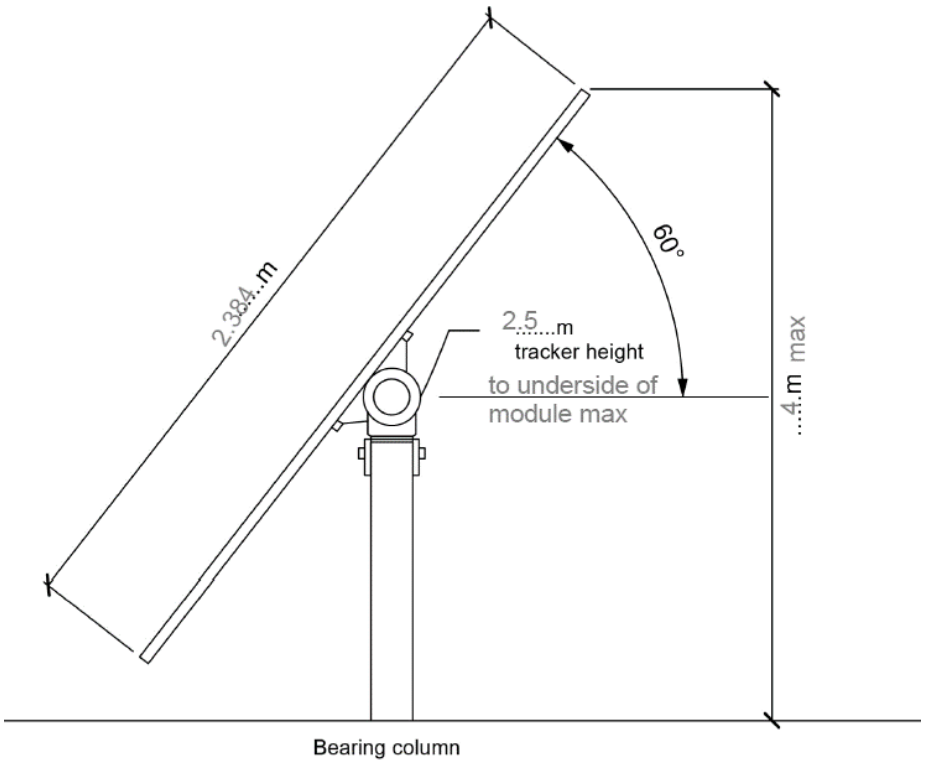


Figure 3.3 Proposed Panel Dimensions[1] (Ark Energy, 2024)

3.3.3 Battery Storage

The Project would include a BESS with a capacity of up to 275 MW and an energy storage capacity of up to 2,200 MWh over 8 hours. The BESS is proposed to comprise of a lithium-iron phosphate battery system, to be housed in a series of outdoor containers, aggregated in one central location. The BESS would be located adjacent to the substation in the western extent of the Development Footprint. Fencing will be erected surrounding the BESS facility and will be at least 2.1 m high. A concept render for the proposed BESS is provided in **Photo 3.3**. This render is an indicative design and is open to changes during the final design phases of the Project.

[1] Diagram not to scale.

Photo 3.3 Indicative Render of the Proposed BESS facility (Ark Energy, 2023)

3.3.4 Operations and Maintenance Facility

A permanent operation monitoring and maintenance facility would be constructed to support the ongoing operation of the solar farm. The facility would be located between the BESS, substation and construction compound. The O&M facility would be used on an ongoing basis to support maintenance and repair activities. This would include storage space, a communication and control room, male, female and disabled toilets, kitchen facilities, cribbing facilities and office space suitable for four people. The facility would have a footprint of approximately 0.2 ha.

3.3.5 Site Access, Internal Roads and Parking

Three access points will be provided along both the northern and southern sides of Avenue Road. The main entrance to the Project Area will be via Avenue Road, providing staff and construction vehicles access to the staff parking, O&M facility, laydown areas, substation and BESS.

Major solar components would be delivered via heavy and OSOM vehicles from the Port of Brisbane, via Motorway/Highway, Summerland Way, Main Camp Road, Avenue Road and access into the Project Area via existing property access off Avenue Road. Light vehicles and the majority of the construction workforce will use the local road network from Summerland Way accessing the main access point via Main Camp Road and Avenue Road.

Approximately 52 km of internal roads are proposed across the Project Area for the construction, operation, and decommissioning of the Project. Internal roads have been planned to follow existing farm tracks where practicable, with new roads to be constructed where necessary (see **Figure 3.4**). The internal road network will be unsealed and approximately 4 m wide to accommodate construction and operational traffic movements throughout the Project Area. The internal road network has been designed to generally follow the perimeter of the solar array blocks.

Construction parking would be available for 100 FTE workers which would be scaled back once the Project is operational. It is noted that the majority of the workforce would travel to site in shuttle buses. During peak construction, the car park will be 0.4 ha as detailed in **Figure 3.2**.

FIGURE 3.4

External Road Upgrades

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Access Points
- State Forest
- Roads
- Watercourse

0 500 1,000

Metres

Scale 1:25,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

3.3.6 Ancillary Infrastructure

3.3.6.1 Onsite Electrical Reticulation and Substation

The Project would include a substation connected to electrical infrastructure via a network of underground cables which are buried in trenches (up to 1 m deep and 1 m wide). The solar PV modules will be connected together via a direct current (DC) collection system consisting of cables mounted on the module support structure. The electricity generated by the Project would be directed via these cables to the inverters and transformers which will be located in an array within the footprint to convert the DC to AC. The inverters change the DC electricity into AC, so that it is in a usable form to be transported across the grid. **Photo 3.4** illustrates the type of inverters to be distributed throughout the Development Footprint. Transformers would be required to step up voltage to the solar farm reticulation voltage, medium voltage switchgear and communication and ancillary equipment. The final number of inverters required are dependant on the final designs, however it is estimated that 118 inverters would be required.

The onsite substation will be located in Lot 32 DP 755607 (refer to **Figure 3.1**). The substation would include a range of electrical equipment to manage and control the supply of electricity and a lightning rod of up to 30 m in height. The substation would include an elevated busbar, switch room, lightning protection system, circuit breakers, disconnectors, current transformers and voltage transformers. The footprint of the substation is approximately 1.6 ha. The substation will be enclosed securely and will consist of a transformer to increase voltage from 33 kV to 330 kV. The 330 kV switching substation is the point of connection for the solar farm and BESS and provides facilities for Transgrid to operate and maintain the switching station independently along with proper control and protection systems. The switching substation will have a loop-in-loop-out arrangement and will be designed to Transgrid's design specifications. A connection from the switching substation to the nearby Transgrid powerlines will be made via overhead high voltage cables as detailed below.

Photo 3.4 Example of a Proposed Inverter (Ark Energy, 2024)

Photo 3.5 Example of the Proposed 330 kV Substation (Ark Energy, 2024)

3.3.6.2 Electrical Network and Transmission Lines

The Project would use the existing 330 kV Transgrid transmission network located 1.6 km to the north-west of the proposed substation. The transmission line that will connect the Project to the Transgrid transmission line would be owned by Transgrid and would require a 330 kV transmission line built from the switching substation to the existing network. The proposed transmission line corridor is approximately 60 m in in width and would travel from the switching substation to the existing Transgrid transmission network for a distance of approximately 2 km. Minor tracts of partially cleared forest will be impacted by the transmission corridor although this vegetation has been historically disturbed. See **Photo 3.6** for an example of the proposed transmission line and an example of a proposed transmission tower.
The proposed transmission line connection route traverses a pre-existing partially cleared corridor along the western boundary of Lot 32 DP755607 which is zoned RU1 – Primary Production. The 11 new transmission towers will be 55 m high.

Photo 3.6 Example of the Proposed 330 kV Transmission Line and a Proposed Tower (Ark Energy 2023)

3.3.6.3 Signage

Traffic signage will be installed in compliance with the Construction Traffic Management Plan (CTMP), relevant regulations and in accordance with any permits obtained for traffic management.

Signage will be erected at critical locations from the outset of construction, directing all vehicles associated with the construction to the O&M facility. Additional signage would be located at or near entry points, providing information about the Project, the companies involved and essential safety information and telephone numbers.

Consultation with Council and Transport for NSW (TfNSW) will be initiated to determine final signage locations.

Appropriate signage will be installed to guide construction-related traffic and ensure pedestrian safety. Both temporary and permanent signage will be strategically placed for optimal visibility, providing operators with essential information on speed restrictions, warnings, and other critical traffic details without obstructing their line of vision. The signage will be constructed from durable materials to withstand various weather conditions and maintain visibility.

Signage beyond the Project Area, such as on local roads, will adhere to AS 1742.3;2009 Manual Uniform Traffic Control Devices and receive approval from the relevant road authority.

3.3.6.4 Security and Fencing

Within the Development Footprint, PV modules and associated Project infrastructure would be enclosed by security fencing (no security fencing is proposed around the Project Area boundary), approximately 2.1 m high, subject to final design. The security fencing would involve casting concrete footings for posts and installing fencing mesh and barbed wire. Fencing will restrict public access to the Development Footprint and is required under Australian Standard (AS) 1725.2010 Parts 1–5. CCTV cameras would also be provided around the onsite substations, and at all entrances to the Project Area.

3.3.6.5 External Road Upgrades

External road upgrades (see **Figure 3.4**) are required to facilitate the movement of machinery, equipment and personnel during the construction, operation and decommissioning of the Project. External road upgrades are proposed including:

- Summerland Way / Main Camp Road intersection will be upgraded to provide a BAL treatment on the northern approach and to reconfigure a CHR into the existing AUR treatment at the intersection.
- The northbound and southbound departures of the Summerland Way / Main Camp Road intersection are proposed to be widened to provide bus layby / set down areas clear of the adjacent vehicle movements at the intersection if required.
- Main Camp Road / Avenue Rd intersection to provide minor widening and sealing works.
- Upgrades to Main Camp Road and Avenue Road to provide a 6 m sealed pavement on a 7 m formation, as agreed with Council). These upgrades will occur from the intersection of Summerland Way / Main Camp Road to the Projects most eastern access point (SA3) on Avenue Road.

- Appropriate signage will be installed on the north and southbound approach to the Summerland Way intersection with the Main Camp Road to advise the presence of the Project Area access and the potential for turning heavy vehicles to/from the side road.
- Construction of the three identified access points to the Project Area on Avenue Road (SA1, SA2 and SA3) generally in accordance with the site access arrangement for articulated vehicles.
- It is noted that temporary works may be required to facilitate OSOM movements, but these are contained to existing disturbed road environs. Further information is provided in **Appendix 13**.

3.4 Construction

3.4.1 Site Preparation and Earthworks

The first steps of construction within the Development Footprint would include:

- Ongoing geotechnical investigations to confirm the ground conditions.
- Appropriate weed suppression methods will be used during the initial stages of construction.
- Vegetation removal (further information provided below).
- Construction of internal roads for access from the local road network and car parking.
- Installation of temporary construction fencing around work areas and boundary fencing.
- Establishment of temporary construction compounds, Project facilities and laydown areas for construction materials and equipment.
- Preliminary earthworks and installation of environmental controls including erosion and sediment control structures. Earthworks will be most significant at the location of the proposed BESS, substation and switching substation.
- Identification and establishment of no-go zones around sensitive biodiversity and heritage features as required.

3.4.2 Construction Activities

The construction and commissioning phase of the Project is anticipated to involve the following:

- Installation of steel posts and framing system to support the solar panels, which would be driven or screwed into the ground to a depth of approximately 1.5 to 3 m depending on geotechnical conditions.
- Installation of PV modules.
- Installation of permanent fencing and security.
- Preparation of foundations for the permanent buildings, BESS and on-site substation.
- Installation of underground cabling (trenching and installation of power conversion stations).

- Construction of O&M facility.
- Construction of the onsite substation and associated grid connection infrastructure.
- Removal of temporary construction facilities.

3.4.3 Vegetation

Vegetation removal will be required throughout the Development Footprint to enable installation of solar arrays, ancillary infrastructure, internal roads and the transmission corridor. This includes removal of single standing trees and exotic pasture within the Development Footprint. Areas of vegetation that have been assessed as moderate to high biodiversity value have been avoided and will not be disturbed by works in the Development Footprint.

Minor vegetation trimming and/or clearing will be required on the eastern side of Summerland Way to ensure the ongoing compliance of the Safe Intersection Site Distance (SISD) in line with Austroads standards. Ark Energy are continuing to consult with Council regarding this work, to determine if this area can form part of their current roadside maintenance operations.

A biodiversity corridor is proposed along the northern boundary of the Development Footprint. See **Figure 3.1** for further details. The 30 m wide biodiversity corridor will have a dual purpose of providing a continual connection between Bungawalbin State Forest and Ellangowan State Forest as well as providing visual screening to adjacent neighbours to the north of the Project Area. Further information regarding the biodiversity corridor can be found in **Section 6.11** and **Section 3.4.3**.

3.4.4 Construction Workforce

The Project would generate up to 327 jobs during the peak months of the construction period. Onsite workforce numbers would vary month to month, depending on the intensity of the proposed works at the time. The workforce would include licensed electrical trade personnel, mechanical and electrical trade assistants, machinery operators, riggers and labourers.

Ark Energy anticipates hiring a minimum of 20% local labour for construction, and will prioritise the sourcing of local sub-contractors and suppliers. It is envisaged that the majority of the local workforce would be residing in towns within one hour's drive from the site (i.e. Myrtle Creek, Rappville, Ellangowan, West Bungawalbin, Casino, Lismore and Grafton). This is also the likely accommodation locations for non-local labour required for the Project.

3.4.5 Vehicle Movements

During the construction period, personnel would access the Project Area via the main access point on Avenue Road. Personnel are anticipated to travel from nearby population centres including Casino and Grafton. Further information about the distribution of local employment is provided in **Section 6.3**.

Major solar components would be delivered to the Port of Brisbane and transported to the Project Area by truck via Motorway/Highway, Summerland Way, Main Camp Road, Avenue Road and access the Project via the central access point off Avenue Road. Further information regarding the heavy vehicle transport route can be found in **Figure 3.5**.

Estimated peak daily vehicle movements during construction are detailed below in **Table 3.3**.

Table 3.3 Construction Vehicle Movements to/from the Project Area (daily)

Vehicle	Construction
Light	66 movements
Heavy	106 movements

During Project decommissioning, the Project generated peak daily traffic movements will be similar to those generated during the construction phase. During Project operations, the Project will generate minimal vehicle movements.

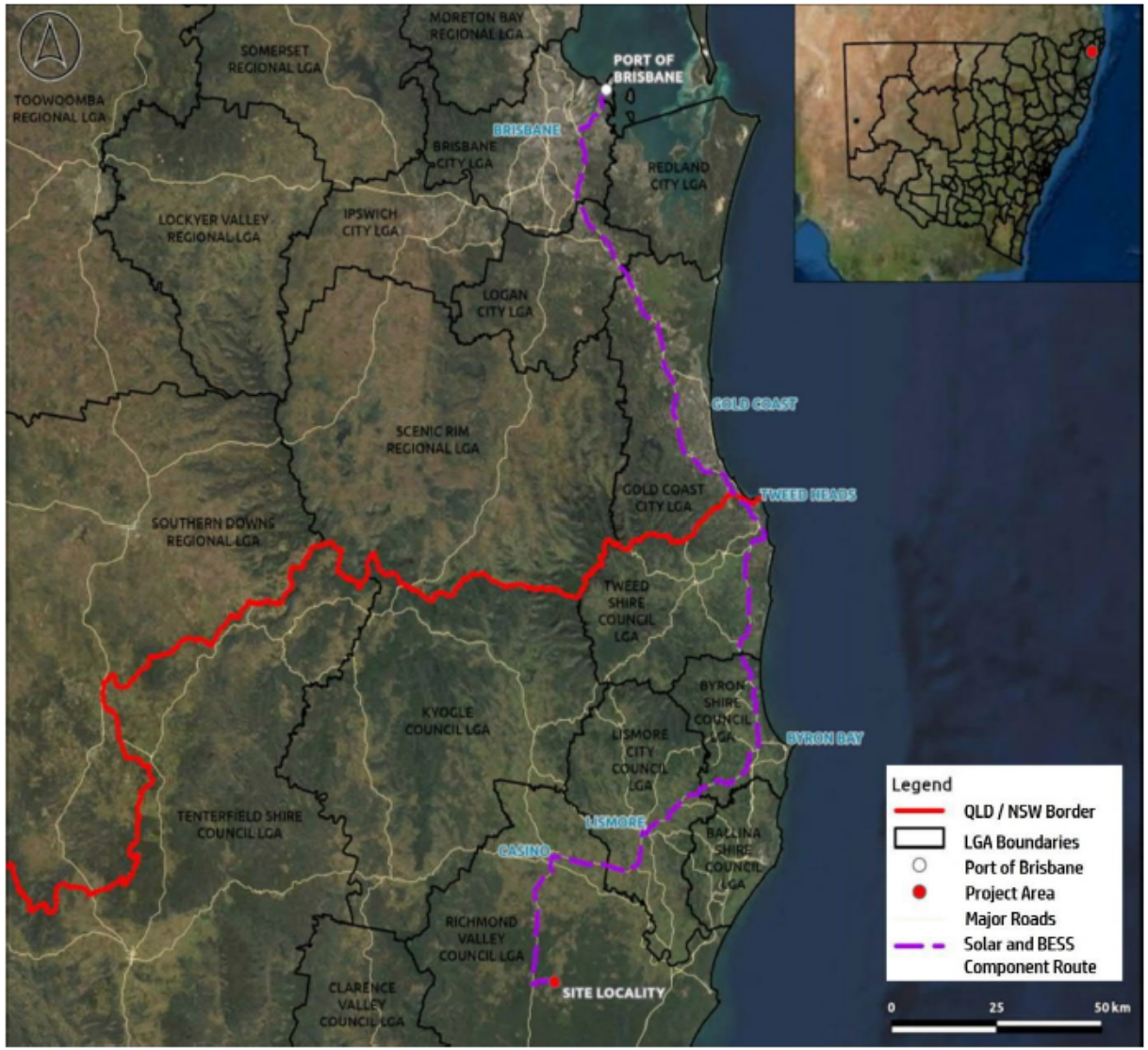


Figure 3.5 Heavy Vehicle Transport Route

3.4.6 Subdivision

The land on which the switching substation is constructed will require a subdivision of Lot 32 DP 755607 as this is the typical requirement of Transgrid, the likely owner/operator of the cut-in section of the switching substation.

All land surrounding Lot 32 DP 755607 is zoned RU1 Primary Production under the Richmond Valley LEP, with associated minimum lot sizes of 100 ha. The subdivision of this lot for the substation may result in a lot size that is less than the minimum lot size under the Richmond Valley LEP. Notwithstanding, in accordance with the provisions of Section 4.38 of the EP&A Act, the proposed subdivision will be permissible subject to the approval of the Minister for Planning or their delegate.

Once the final location of the switching substation is determined, the proposed subdivision will be the subject of ongoing discussion with Council, DPHI and the host landholders. The Project's layout including the Lot and DP of each holding is provided in **Figure 2.2**.

3.5 Operations and Maintenance

Once fully operational, activities will include the following:

- Routine visual inspections, general maintenance and cleaning operations of the solar panels and substation, as required.
- Vegetation management including potential use of seeding or armouring (i.e. jute mesh) to avoid erosion.
- 24-hour security response.
- Replacement of equipment and infrastructure, as required.
- Pest and vermin control.

Agricultural activities to run concurrent to the Project are under review with sheep grazing currently not advised as suitable at this location. Sheep grazing was initially discussed during the design and assessment phase of the Project as an opportunity to maintain agricultural uses, manage the grass length beneath and between the solar arrays and provide diversification of revenue to the Project. Through consultation with the existing landholders and NSW DPI Ag, it was determined that the local climate is not optimal for many sheep breeds including merino, the most common livestock used for agrisolar across NSW. Alternate options will be considered post approval under advice from government agencies and landholders.

During the operational phase of the Project, it is anticipated that between 10 and 15 FTE personnel would be required. Traffic movements would consist primarily of light vehicles for routine operations and maintenance.

3.5.1 Environmental Management

Ark Energy would develop and implement an Environmental Management Strategy (EMS) post approval as part of the Project to provide the strategic framework for environmental management. The EMS would:

- Incorporate a CEMP, Operational Environmental Management Plan (OEMP) and Decommissioning and Rehabilitation Environmental Management Plan (DREMP), including all required sub-plans, protocols, management, and mitigation measures proposed in this EIS.
- Identify all relevant statutory approvals.
- Establish roles, responsibilities, authority and accountability of all key personnel involved in the environmental management of the Project.

3.6 Decommissioning

The Project is expected to operate for 30 years. After the initial operating period, the solar farm would either be decommissioned, removing all infrastructure, and returning the Project Area to its original condition or the Project will be upgraded (pending any additional approval requirements).

Decommissioning would involve the mobilisation of a workforce and additional temporary facilities, and the subsequent removal of equipment and infrastructure. All infrastructure will be removed during decommissioning except for the transmission lines and substation unless stated otherwise in the development consent conditions. At this time, it is expected that significant movements of light vehicles and trucks for transporting waste would occur. The decommissioning phase would be expected to last less than 24 months.

3.7 Services and Utility Supply

3.7.1 Water

The Project would require a water supply during the construction, operation and decommissioning phases. Total anticipated water demands are approximately 246 ML of non-potable and 7 ML of potable for the construction and decommissioning periods (equivalent to 130 ML per annum) and 109 ML for the operational period (equivalent to 3.6 ML per annum).

During construction, water would primarily be used for the establishment of hard-stand areas and dust suppression. Water for construction would be sourced from commercial suppliers in the region (via water trucks). Farm dams within the Development Footprint will be removed and the water will be used for earthworks during the site preparation phase of construction. Water sources would be determined prior to the commencement of construction in consultation with suppliers and landholders. Town water supplies will be generally avoided for use in construction but may be used where appropriate and available.

During operations, it is expected that approximately 109 ML of water would be required for ongoing maintenance activities such as panel cleaning, O&M facilities and amenities within the Development Footprint. Panel cleaning is expected to require 3.6 ML per year noting washing of the panels would not require any detergent or cleaning agents.

3.7.2 Electricity

Access to electricity during operational activities would be via a dedicated low voltage feeder from the substation, battery backup is provided for essential services at the O&M Facility. During construction electricity access would be via the local distribution network or alternatively a diesel generator when required.

Electricity requirements during operation would include lighting at ancillary infrastructure (office, workshop, amenities, and parking), power for internal office facilities and appliances, and onsite security systems. Electricity generated by the solar farm would be used for most activities during operations via a dedicated low voltage feeder from the substation, except for maintenance of the inverters during the night which would involve a small amount of auxiliary load being supplied from the grid.

3.7.3 Sewer

There is no sewer access in the Project Area. Therefore, construction amenity facilities would be pumped out via tanker and delivered to the nearest sewage treatment facility, or as agreed with Council during construction.

A septic system would be installed for the operational amenities and function of the O&M facility. This would be constructed and managed in accordance with the relevant council requirements.

3.8 Timing

The Project will be implemented in four general phases. Pre-construction minor works will facilitate land clearing and road upgrades as described in **Section 3.3.6.5**, landscaping and construction of the Project will take place as detailed in **Section 3.4** and operations will involve ongoing maintenance, monitoring, and performance optimisation as outlined in **Section 3.5**. Decommissioning of the Project will take place as detailed in **Section 3.6**.

Table 3.4 details the estimated start date and duration of the four Project phases.

Table 3.4 Projected Timing and Duration of Each Phase of the Project

Phase	Approximate Commencement	Approximate Duration
Pre-construction minor works	Q4 2025	6 months
Construction	TBC	Up to 24 Months
Operation	TBC	30 years
Decommissioning	TBC	Up to 24 months

3.8.1 Hours

3.8.1.1 Construction Hours

Construction activities for the Project will be limited to 7 am–6 pm Monday–Friday and Saturday 8 am–1 pm. Construction activities will not take place on Sunday or public holidays unless unexpected risks to the Project and personnel are required to be resolved during these days.

3.8.1.2 Hours of Operation

The Project would operate continuously, 24/7 with a mix of remote and onsite monitoring and maintenance activities.

Associated works by onsite staff would be undertaken during the standard working hours of:

- Monday to Friday: 7 am–6 pm.
- Saturday: 8 am–1 pm.

No activities would occur on Sundays or public holidays, however, in cases of emergencies, major asset inspection or maintenance programs may be undertaken outside standard hours. Council and surrounding landholders would be notified of any works outside standard work hours that may be expected to cause noise exceedance.

4.0 Statutory Context

This section provides an overview of the statutory context for the Project and discusses the application of key legislation and planning provisions to the Project. The Project requires approval under both NSW and Commonwealth environmental and planning legislation.

4.1 Commonwealth

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary environmental and planning regulatory instrument relevant to the Project at the Commonwealth level. Under the EPBC Act, approval from the Commonwealth Minister for the Environment and Water is required for any action that may have a significant impact on Matters of National Environmental Significance (MNES). If an 'activity' is likely to have a significant impact on a MNES then it may be a 'controlled action' and require approval from the Commonwealth Minister for the Environment and Water. To obtain approval from the Minister, a proposed action must be referred to the Minister via the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). The purpose of a referral is to enable the Minister to decide whether the proposed action will need assessment and approval under the EPBC Act.

The Project will be assessed under the Bilateral Agreement made under section 45 of the EPBC Act between the Commonwealth of Australia and NSW.

Further details regarding the Commonwealth statutory context are provided in **Table 4.1** and **Appendix 5**.

4.2 NSW

The NSW EP&A Act is the primary instrument which regulates the environmental impact assessment and approval process for development in NSW.

The Project will be assessed under Part 4 of the EP&A Act.

Further details regarding NSW statutory context are provided in **Table 4.1** and **Appendix 5**.

4.3 Summary of Requirements

The key statutory provisions applying to the Project with respect to environmental assessment and planning approval at Commonwealth, State and local level, as well as the roles that these play in the Project's assessment and determination are outlined in **Table 4.1**. This also serves as a summary of legislative compliance requirements relevant to the Project in accordance with the DPIE EIS Guideline (DPE, 2022a).

In addition, details on the relevant statutory requirements for the Project and where these have been addressed in the EIS are provided in **Appendix 5**.

Table 4.1 Statutory Requirements Summary

Category	Comment
Power to Grant Approval – *Environmental Planning and Assessment Act 1979* (EP&A Act) and *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP)	The Project will require development consent under Part 4 of the EP&A Act. Section 4.36 of the EP&A Act provides for the declaration of a project as State Significant Development (SSD). Under the EP&A Act, the declaration of a project as SSD can be made by meeting the requirements of a SEPP or by the Minister for Planning and Public Spaces. Clause 20 of Schedule 1 of the Planning Systems SEPP prescribes that development for the purpose of 'electricity generating works' that has a capital investment value of more than $30 million is SSD. The Project has an EDC of greater than $30 million. Therefore, the Project is declared as SSD and the development application for the Project will be subject to the requirements of Division 4.7 of the EP&A Act. The development application will be lodged with the Planning Secretary of the DPHI. The Minister for Planning and Public Spaces is the consent authority for SSD projects. Section 4.5(a) of the EP&A Act also provides that the Independent Planning Commission (IPC) is the consent authority for SSD where it is declared to be the consent authority under an Environmental Planning Instrument (EPI). The Minister for Planning and Public Spaces has issued a general delegation of the consent authority function for SSD projects to the IPC in instances where 50 or more public objections are received on the application, where the applicant has made a reportable political donations disclosure and/or where the local Council objects to the Project. Section 4.15 of the EP&A Act describes the matters for consideration in assessing SSD, which includes the provisions of relevant environmental planning instruments (EPIs), proposed instruments that have been the subject of public consultation, development control plans, planning agreements and statutory regulations. The assessment of SSD must also consider the likely impacts of the development, suitability of the site, any submissions received and the public interest.
Permissibility – *Richmond Valley LEP 2012*	The Project is located within the Richmond Valley LGA and wholly located within land zoned as RU1 Primary Production as illustrated in **Figure 2.2**. Electricity generating works are not permitted in this zone however Clause 2.36(1)(b) of the Transport and Infrastructure SEPP states that development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Under Clause 2.7(1) of the Transport and Infrastructure SEPP, the provisions prevail where there are inconsistencies with any other EPIs, including LEPs. Consideration of the LEP zoning provisions applying to the land are discussed in **Appendix 5**. Subdivision of land is proposed for the switching substation and is discussed in **Section 3.4.6**.
Permissibility – *State Environmental Planning Policy (Transport and Infrastructure) 2021*	Due to the operation of Clause 2.36(1)(b) of the Transport and Infrastructure SEPP the Project is permissible with development consent. **Appendix 5** provides further consideration of other relevant EPIs and how these have been considered in this EIS.

Category	Comment
Consistent Approvals – Section 138, *Roads Act 1993* (NSW) (Roads Act) and Section 4.42 of the EP&A Act	Consent is required under section 138 of the Roads Act for works or structures that disturb the surface of a public road or connect a road to a classified road. However, section 4.42(f) of the EP&A Act applies to SSD projects and requires that consent must not be refused and is to be substantially consistent with the consent if the works are necessary for carrying out an approved project. The Project will require upgrades to an intersection on Summerland Way, which is a state road, hence a permit under section 138 of the Roads Act will be required.
Commonwealth Approvals – *Environment Protection and Biodiversity Conservation Act 1999*	Under the EPBC Act, a referral is required to be submitted to DCCEEW for any 'action' that is considered likely to have a significant impact on any Matter of National Environmental Significance (MNES). A referral was submitted to DCCEEW on 5 September 2023. The controlling provisions were listed threatened species and communities. On 21 November 2023, the Project was determined to be a Controlled Action requiring approval under the EPBC Act from the Commonwealth Minister for the Environment and Water. The Project will be assessed under the Assessment Bilateral Agreement currently in place between the NSW and Commonwealth Governments, which allows assessment processes under the EP&A Act for certain developments, including SSD, to form the assessment for the EPBC Act to avoid duplication. Supplementary SEARs in relation to MNES identified in the Commonwealth Minister's 'controlled action' decision were issued by the DPHI on 04 March 2024. A copy of the supplementary SEARs and where these have been addressed in the EIS is included in **Appendix 1** of this EIS. A decision whether to approve the Project for the purposes of the EPBC Act will be made, based on this assessment documentation, by the Commonwealth Minister for the Environment and Water or their authorised delegate.
Native Title Act 1993	Searches of the National Native Title Register, the Register of Native Title Claims, and Native Title Applications Registration Decisions and Determinations found that no Native Title Claims cover the Project Area.
Heavy Vehicle National Law	Approvals are required for the transport of equipment and infrastructure by OSOM vehicles. The requirements for such OSOM transport have been assessed via a route analysis study as part of the EIS (see **Section 6.10.3**).
NSW Conveyancing Act 1919	Ark Energy is planning long-term leases (in excess of five years) of parts of existing lots for the solar arrays, the BESS and the substation. The leasing of a site for the purposes of a solar farm is considered a lease of "premises" in accordance with the NSW *Conveyancing Act 1919*. Transgrid (the Network Service Provider), requires subdivision and transfer of ownership of the land that will host the project switchyard.

Category	Comment
Other State Approvals – Approvals that are not required	Section 4.41 of the EP&A Act specifies authorisations which are not required for approved SSD. Those are listed below: • *Fisheries Management Act 1994* – a permit under section 201, 205 or 219. • *Heritage Act 1977* – an approval under Part 4, or an excavation permit under section 139. • *National Parks and Wildlife Act 1974* – an Aboriginal heritage impact permit under section 90. • *Rural Fires Act 1997* – a bushfire safety authority under section 100B. • *Water Management Act 2000* (WM Act)– a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91.
Other State Approvals – Approvals that must be applied consistently	Section 4.42 of the EP&A Act requires that several approvals, if required for a SSD, cannot be refused if a development consent is granted and must be substantially consistent with the terms of any development consent granted for the development. Of particular relevance to the Project, these include: • *Protection of the Environment Operations Act 1997* – an Environment Protection Licence under chapter 3. • *Roads Act 1993* – a consent under section 138 for work within a public road. Refer to **Appendix 5** for a summary of all relevant NSW statutory requirements for the Project and where these have been addressed in the EIS.
Pre-Conditions to Exercising the Power to Grant Consent – *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 completed for the Project as discussed in **Section 6.11**. Consultation with the NSW Biodiversity, Conservation and Science (BCS) Division has also been undertaken during the preparation of the EIS, as further discussed in **Section 5.7**.
Mandatory Matters for Consideration	Section 4.15 of the EP&A Act describes the matters for consideration in assessing SSD, which includes the provisions of relevant environmental planning instruments, proposed instruments that have been the subject of public consultation, development control plans, planning agreements and statutory regulations. The assessment of SSD must also consider the likely impacts of the development, suitability of the site, and submissions received and the public interest. All relevant matters are addressed in the EIS based on the outcomes of environmental assessments undertaken (refer to **Section 6.0**). Mandatory matters for consideration have been addressed in detail in **Appendix 3**.

5.0 Engagement

5.1 Overview

Ark Energy appreciates the importance of engaging, listening to and involving community members and other local stakeholders throughout the project's development, and ensuring that local priorities and concerns are considered. Ark Energy's approach to consultation has been carried out in accordance with the International Association for Public Participation's (IAP2) Core Values (IAP2, 2024). Engagement has been conducted in compliance with the principles and requirements of the Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2022) and the requirements of the Project's SEARs as outlined in **Appendix 1**.

Ark Energy is also signatory to the Clean Energy Council's Best Practice Charter for Renewable Energy Projects (Clean Energy Council, 2021), a voluntary commitment to engage respectfully with communities, be sensitive to environmental and cultural values, and make a positive contribution to the regions in which they operate.

Ark Energy, and formerly Epuron, prepared a Community and Stakeholder Engagement Plan (CSEP) in accordance with the above principles which has been, and will continue to be, used to guide community and stakeholder engagement throughout the project lifecycle (Ark Energy, 2024).

5.2 Community and Stakeholder Engagement Plan (CSEP)

The CSEP outlines the approach, strategy, objectives, methods and techniques for implementation of Ark Energy's community and stakeholder engagement. Ark Energy developed the CSEP in accordance with the Social Impact Assessment Guideline (DPIE, 2023) Appendix A – Community engagement. Upon completion of the CSEP, Umwelt reviewed and provided guidance to ensure the plans alignment with stakeholder requirements and to ensure the plan was developed in accordance with the appropriate NSW guidelines and policy.

In addition to community stakeholders, ongoing consultation has been undertaken with Councils 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, throughout the life of the Project.

Ark Energy has focused on providing opportunities for interested community members and stakeholders to participate, and maximising opportunities for the local community to benefit from the project in meaningful ways. This is demonstrated through the use of a variety of engagement methods undertaken during the EIS and the progression of discussions with community and Council regarding a Community Benefit Fund. Benefits of the Project include local employment opportunities (**Section 6.3.4**), increased business for downstream service providers (**Section 6.15.3**) upgrades to the local road network (**Section 6.10.3**) and increased firefighting capability on site for early intervention in the event of a fire (**Section 6.4**). Ark Energy, and former proponent Epuron, commenced consultation with landholders in August 2021.

The goals for the community consultation were guided by the IAP2 Core Values for Public Participation. Ark Energy's goals for community engagement alongside the associated IAP2 level of participation are detailed below in **Table 5.1**. Additional context detailing how these goals apply to the engagement undertaken by Ark Energy is Provided in **Section 5.4.1**.

Table 5.1 Goals for Community Participation Informed by the IAP2 Federation's Levels of Engagement

IAP2 Level of Participation	Ark Anergy Goal for Community Participation
Inform	Ensuring the community members are well informed and kept up to date on project status and developments.
Consult	Obtaining feedback and providing opportunities for community members to communicate their views, concerns and aspirations for the project.
Involve	Addressing any community member's issues or concerns promptly.
Collaborate	Working to avoid and minimise the impacts and maximise the benefits of the project for the local community.

5.3 Scoping Phase Engagement

To inform the scoping phase of the Social Impact Assessment (SIA) and the development of the Scoping Report, engagement was undertaken in 2021–2022 by the former proponent Epuron. This engagement sought to identify the concerns of near neighbours and key stakeholders surrounding the Project Area and is described further in the Scoping Report.

5.4 Stakeholder Identification

As part of the development of the CSEP, Ark Energy undertook a stakeholder identification process which involved identifying stakeholders with an interest in the Project, or those that may be directly and/or indirectly affected. This included potentially vulnerable or marginalised groups.

Additional stakeholders were identified for consideration upon review of the CSEP and during the SIA and EIS engagement process.

Key stakeholder groups consulted or engaged during the SIA are outlined in **Figure 5.1**, with further detail provided in **Section 5.4.1**. Engagement with NSW Government agencies was also undertaken in the development of the EIS and is summarised in **Section 5.7**.

Figure 5.1 Key Stakeholder Groups

Source: (Umwelt, 2024).

5.4.1 Engagement Mechanisms

Consultation activities across the scoping and EIS phases were developed to address the IAP2 Core Values for Public Participation. These are detailed in **Table 5.2**.

Table 5.2 Ark Energy Engagement Objectives and Alignment with IAP2

IAP2 Objective for Public Participation	Outcome of Engagement
Inform	Inform various stakeholders on the Project and planning process.
Consult	Consult with community to understand the perceived impacts and social impacts of the proposed Project.
Involve	Involve expert perspective from government agencies into the project design and technical assessments.
Collaborate	Collaborate with stakeholders on potential management measures to address social and environmental impacts. Key findings from technical studies, as detailed in **Section 6.0**, were communicated to the various stakeholders.

A range of mechanisms used were designed to provide information through a range of outreach tools or to engage stakeholders and involve participants in the EIS and project design process. Feedback received from the community was used in the Project design to inform features such as the APZ surrounding Project infrastructure, road design and upgrades and the biodiversity corridor detailed in **Section 2.8**, **Section 3.3.6.5** and **Section 3.4.3** respectively.

These mechanisms are listed below.

Mechanisms designed to inform: Project website, printed project newsletters, posters, information sheets, email updates, personalised letter box drops, local media release.

Mechanisms designed to engage: Project briefings, individual meetings/ interviews, community information sessions, online survey, phone survey, feedback survey, site visits.

A detailed explanation of the consultation mechanisms conducted during the scoping phase and SIA/EIS phase of the Project is provided in the SIA, **Appendix 7**.

Key stakeholder groups that were consulted or engaged during the EIS phases are summarised in **Table 5.3**. The outcome of consultation with these stakeholders is detailed further in **Appendix 4**.

Table 5.3 Engagement – EIS Phase

Stakeholder Group	Information Provision	Engagement Mechanism	Interaction Count
Aboriginal stakeholders and Traditional Owners	• Project Website.	• Project briefings. • Site visits.	20
Local Government	• Project Website.	• Project briefings.	3
State Government	• Project Website.	• Project briefings.	14
Commonwealth Government	• Project Website.	• Project briefings.	1
Neighbouring landholders / residents	• Project Website. • Printed project newsletters. • Project email updates. • Personalised letter box drops.	• Individual meetings/ Interviews. • Community information sessions. • Online survey.	101
Community and special interest groups	• Project Website. • Printed project newsletters. • Project email updates. • Local media release.	• Individual meetings/ Interviews. • Community information sessions. • Online survey.	115
Local businesses and service providers (health, emergency, education, local business)	• Project Website.	• Individual meetings/ Interviews.	16
Accommodation service providers	• N/A	• Phone Survey.	101

Stakeholder Group	Information Provision	Engagement Mechanism	Interaction Count
Broader community	• Project posters. • Project Website. • Printed project newsletters. • Project posters. • Project information sheets. • Project email updates. • Local media release. • Local media release.	• Community information sessions (6/09/23 & 12/04/2024) and one online information session (7/03/22). • Online survey. • Feedback Survey.	1,040

5.5 Aboriginal Community Engagement

Aboriginal community consultation was undertaken with the Project's Registered Aboriginal Parties (RAPs) as part of the Aboriginal Cultural Heritage Assessment (ACHA).

This consultation aided in the identification and assessment of the significance of Aboriginal objects and/or places present within the ACHA Study Area and provided insight to help inform mitigation and management measures. The ACHA was heavily guided by the idea that Aboriginal people are the primary determinants of what is defined as the 'cultural significance' of their heritage.

A detailed summary of this consultation can be found in **Section 6.12.2.2**. A full documentation of the consultation process can be found in Appendix A of the ACHA (see **Appendix 15**).

5.6 Infrastructure/Service Provider Consultation

Ark Energy undertook consultation with infrastructure and service providers during preparation of the EIS. An overview of the consultation is provided in **Table 5.4**. Additional service provider consultation has been scheduled prior to construction to ensure that the Project will not impede or interact with their services. Such providers will include but not be limited to Telstra and Optus.

Table 5.4 Infrastructure/Service Provider Engagement undertaken during the preparation of the EIS

Agency	Date	Format, Outcomes and Actions	Section addressed within the EIS
Essential Energy	10 October 2023	Email regarding potential relocation of low voltage powerlines on site, Essential Energy advised of approach required for development near infrastructure and relocation of lines, if required.	**Section 3.3.6.2**
Transgrid	8 June 2023	Connection enquiry accepted by Transgrid	**Section 3.3.6.2**
Transgrid	19 July 2023	Received connection enquiry response from Transgrid	**Section 3.3.6.2**
Transgrid	March 2024	Commencement meeting for grid connection	**Section 3.3.6.2**
Transgrid	March 2024	Connection process agreement in progress	**Section 3.3.6.2**

5.7 Agency Consultation

Ark Energy has undertaken ongoing engagement with local, State and Commonwealth government representatives throughout the planning and environmental assessment process for the Project. A summary of ongoing government consultation undertaken is provided in **Table 5.5** below.

Table 5.5 Summary of Agency Engagement during the Preparation of the EIS

Agency	Date	Engagement Type and Purpose	Outcomes and Actions	Section addressed within the EIS
NSW Forestry Corporation (FCNSW)	4 April 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
NSW Forestry Corporation (FCNSW)	10 April 2023	Meeting – Project Introduction	Commitment to consult again prior to the EIS submission.	See below
NSW Forestry Corporation (FCNSW)	5 October 2023	Meeting – Project Update	It was determined that the fire risk was the priority for NSW Forestry Corp and that buffers and battery APZ would be reviewed at a later stage.	**Section 6.4.4**
NSW Forestry Corporation (FCNSW)	4 March 2024	Email – Project Update	FCNSW accepted the offer of additional consultation, scheduled for 13 March 2024.	N/A
NSW Forestry Corporation (FCNSW)	13 March 2024	Meeting – Project Update	FCNSW noted the primary bushfire risk as originating from the north-west where larger APZs are noted around the BESS. FCNSW noted that they have a nursery that may be used to provide vegetation for the biodiversity corridor. Commitment by Ark Energy to contact Local Bushfire Committee in development of post approval management plans. Commitment by Ark Energy to contact FCNSW in development of post approval management plans.	**Section 6.4**
NSW Department of Agriculture	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
NSW Department of Agriculture	14 July 2023	Meeting – Project Introduction	Due to flooding constraints, land suitability and landholder guidance, it was agreed in consultation with the Department that Agrisolar using sheep would not be appropriate for the Project. It was confirmed that the cumulative impacts for the agricultural industry should be included in the assessment of impacts.	**Section 6.14**
DPI Fisheries	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
DPI Fisheries	23 July 2023	Meeting – Project Introduction	DPI Fisheries requested the inclusion of recommendations for appropriate design of the waterway crossing for Physics Creek.	**Appendix 2**

Agency	Date	Engagement Type and Purpose	Outcomes and Actions	Section addressed within the EIS
Fire and Rescue NSW	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
Fire and Rescue NSW	23 July 2023	Meeting – Project Introduction	Increased attention on the installation and operation of the BESS was advised by FRNSW. A Fire Safety Study is to be requested as a condition of consent if approved.	**Section 6.4**
Fire and Rescue NSW	4 March 2024	Email – Project Update	FRNSW advised that no additional consultation is required.	N/A
NSW Biodiversity, Conservation and Science Division	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
NSW Biodiversity, Conservation and Science Division	24 July 2023	Meeting – Project Introduction	NSW BCS noted the value of conserving isolated patches in the centre of the array footprint as well as providing connectivity. It was advised that continued consultation occur.	**Section 3.4.3**
NSW Biodiversity, Conservation and Science Division	5 December 2023	Site Visit	A site visit was conducted with representatives from Ark, Biosis, and NSW BCS.	N/A
NSW Biodiversity, Conservation and Science Division	4 March 2024	Email – Project Update	NSW BCS accepted the offer of additional consultation, scheduled for 18 March 2024.	N/A
NSW Biodiversity, Conservation and Science Division	18 March 2024	Meeting – Project Update	Meeting to discuss key Project design changes and assessment findings since the site visit in December 2023.	N/A
Richmond Valley Council	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
Richmond Valley Council	25 July 2023	Meeting – Project Introduction	Information sharing between Council and Ark Energy was considered essential to the EIS and development process. Attention to the Northern Rivers requirements documents was noted to inform road upgrades. The entry point required additional investigation as it was determined to be State wide standard and not suitable for OSOM vehicles.	See below **Section 6.10** **Appendix 2** **Section 6.11** **Section 6.3.4**

Agency	Date	Engagement Type and Purpose	Outcomes and Actions	Section addressed within the EIS
			A request to investigate habitat connectivity via a biodiversity corridor was made by council. Accommodation concerns regarding cumulative impacts of nearby developments to be further investigated. Offsetting priorities were determined to be kept local and on site if possible. Further consultation required with Council to organise the Community Benefit Fund (CBF) which may consider the rehabilitation requirements and inclusion of CBF framework.	**Section 6.11.4.1** **Section 2.7.3**
Richmond Valley Council	19 January 2024	Email – Road Upgrade Specifications	Determined Council's position and requirements for the road upgrade.	**Section 6.10**
Richmond Valley Council	6 February 2024	Meeting – Presentation to Councillors	Provided overview of project to Councillors and clarifications on project details.	N/A
Richmond Valley Council	7 February 2024	Meeting – Community Benefits Sharing	Council expressed their interest in using a Section 7.12 contributions plan as the mechanism for the benefits sharing for the project.	**Section 2.7.3**
Richmond Valley Council	4 April 2024	Email – Landowner Consent	Council provided their consent to an EIS being submitted that proposes works upon Council owned and controlled roads.	**Section 3.2**
Crown Land	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
Crown Land	3 August 2023	Meeting – Project Introduction	Crown Land to investigate acquisition of their assets with licensing arrangements to be confirmed.	**Section 3.2**
Crown Land	26 October 2023	Email – Landowners consent	Landowners consent application form submitted to Crown Lands.	**Section 3.2**
Crown Land	9 February 2024	Email – Landowners consent	Crown Lands acknowledged the receipt of the landowners consent application.	**Section 3.2**
Crown Land	9 April 2024	Email – Landowners consent	Ark contacted Crown Lands enquiring about the progress of the request.	**Section 3.2**
Crown Land	10 April 2024	Email – Landowners consent	Crown Lands advised that someone from the Grafton Land and Asset Management Office will be in contact directly to discuss.	**Section 3.2**

Agency	Date	Engagement Type and Purpose	Outcomes and Actions	Section addressed within the EIS
Transport for NSW	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
Transport for NSW	23 August 2023	Meeting – Project Introduction	TfNSW recommended a collaborative approach with organisations such as RFS, emergency services and council.	See **Table 5.5**
Transport for NSW	4 March 2024	Email – Project Update	TfNSW accepted the offer of additional consultation, scheduled for 12 March 2024.	N/A
Transport for NSW	12 March 2024	Meeting – Project Update	TfNSW advised that height clearances will need to be checked and if beam vs platform construction will be suitable. TfNSW process for upgrading bus stops is via Local Traffic Committee. Discussion on assessment of Safe Intersection Site Distance (SISD) within the EIS. Option to share concept designs with TfNSW prior to EIS submission.	**Section 6.10.3**
NSW Rural Fire Service	6 July 2023	Email – invitation to consult on the Project	Confirmed interest in participating in agency consultation.	N/A
NSW Rural Fire Service	4 September 2023	Meeting – Project Introduction	Consideration of need for potential workers camp and requirement to consult further if required. Consideration of recent bushfires to be a focus and integrated into reporting.	**Section 6.3.4** **Section 6.4**
NSW Rural Fire Service	4 March 2024	Email – Project Update	No additional consultation required.	N/A
NSW Department of Planning, Housing and Infrastructure	6 March 2024	Lodgement Preparation Meeting	Discussion about the lodgement process and updates on key aspects of the Project. DPHI to follow up with Crown Land re land owners consent.	**Section 3.2**

5.8 Community Consultation

Ark Energy has undertaken ongoing engagement with host landholders, neighbouring landholders and the broader community throughout the planning and environmental assessment process for the Project.
A summary of community views identified during consultation is provided in **Section 5.8.1** and a summary of outcomes is provided in **Section 5.8.2** below.

5.8.1 Community Views

Quantitative and qualitative data gathered during the scoping and EIS phase engagement activities were analysed to identify potential social impacts associated with the Project, as perceived by affected parties, and to conduct an initial assessment of these impacts. The Social Scoping Worksheet (DPIE, 2021) served as a tool for decision-making, helping to assess the social impacts and demonstrate how issues identified during scoping influenced the assessment level for each impact. As per the SIA Guideline and **Figure 5.2**, social impacts can be categorised into various groups, potentially affecting people's lifestyles, communities, accessibility, culture, health, environment, livelihoods, and decision-making processes.

Figure 5.2 DPE Social Impact Categories

Source: (DPE, 2023) ©Umwelt, 2023.

A range of assessment mechanisms were used to identify anticipated changes to the current social baseline for the community due to the Project. The results of these assessments are provided in **Section 6.3.4**.
To guide the SIA and inform the EIS on the community views, surveys were conducted. They survey was completed by 27 registered survey respondents, predominantly located in the vicinity of the Project Area.

When asked to consider negative impacts associated with the Project, respondents rated a number of prompted impacts illustrated in **Figure 5.3**. Stakeholders were concerned about alterations to landscape and visual amenity, decline in air quality affecting health and wellbeing during construction, heightened traffic during construction leading to disruption to road users, with nearly two-thirds (63%) of participants considering these impacts extremely significant. Amplified noise to households during construction activities was of less concern with more than half (56%) of participants rating this impact as extremely significant. The survey comprised prompted responses and as such did not cover all concerns of the community with additional views discussed during unstructured discussions, as detailed below.

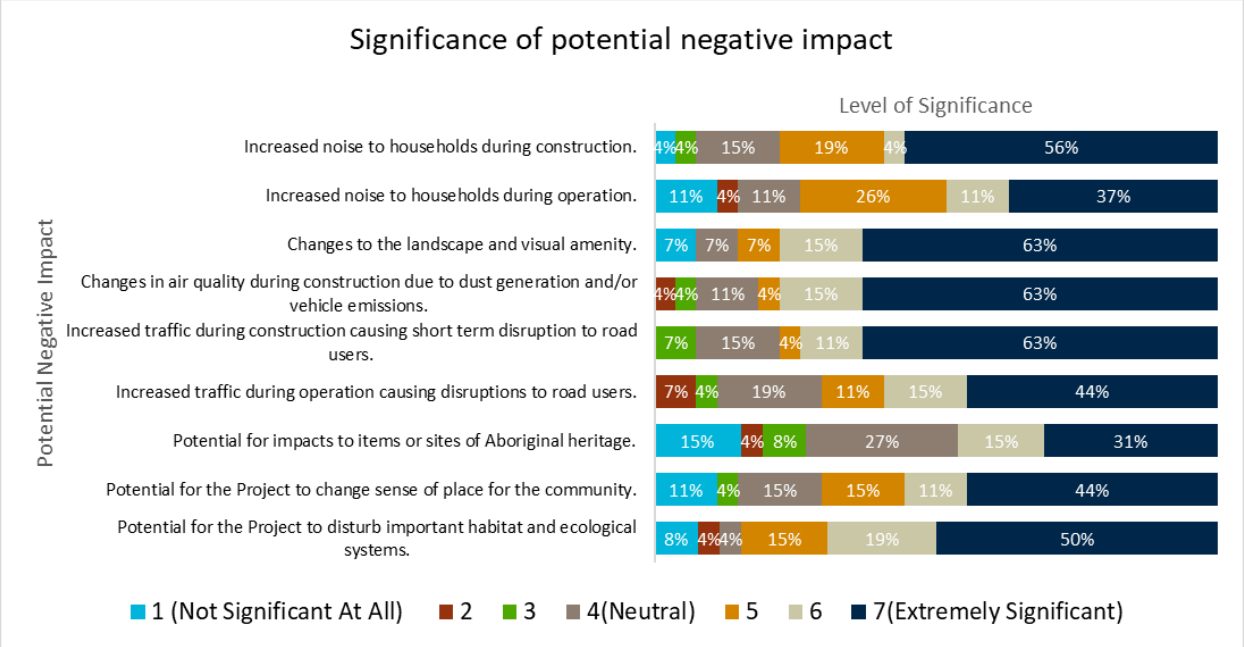


Figure 5.3 Percentage of survey respondents rating significance[2] of potential negative impacts of the Project (prompted)

Source: (Umwelt, 2024).

Figure 5.4 emphasises perceived positive impacts linked to the Project. Approximately 22% and 24% of respondents respectively rated contribution to renewable energy resources and reduction in power prices in the locality as extremely significant positive benefits of the Project. Additionally, increased employment opportunities during the construction and operation phase, the economic boost for the locality during construction, and contribution to renewable energy resources were highlighted as significant by approximately a third of those consulted, with a rating of 6 or 7 on the significance scale.

[2] Significance Rating: 1–3= 'Not Significant', 5–7= 'Significant'.

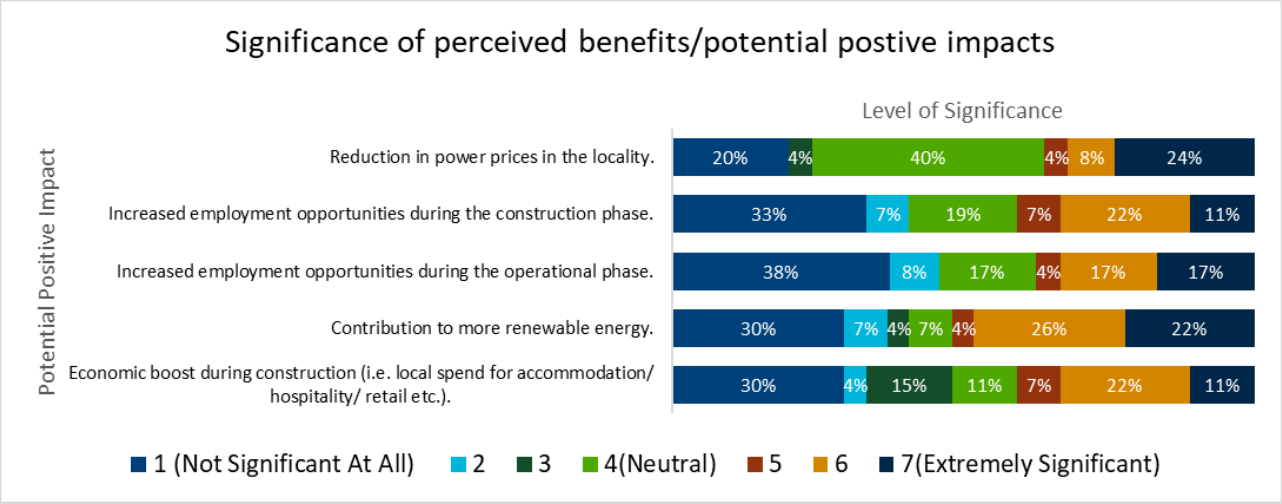


Figure 5.4 Percentage of survey respondents rating significance[3] of potential positive impacts of the Project (prompted)

Source: (Umwelt, 2024).

Beyond the surveys, additional community views were also identified through email and telephone correspondence and meetings with near neighbours, community members and stakeholders as well as community information sessions.

During community engagement, various concerns were expressed by community members and stakeholders regarding perceived increased fire risk associated with the Project. These concerns encompassed the proximity of the Project Area to state forests, the establishment of appropriate APZs and setbacks, and the potential fire risk posed by the presence of a large-scale BESS.

Flood management and safety emerged as another significant topic during stakeholder engagement, with concerns regarding the Project Areas susceptibility to flooding. Notably, these concerns regarding flood impacts had been previously voiced during scoping consultations by neighbouring landholders.

Stakeholders also voiced concerns regarding the impact of heavy vehicle traffic associated with the Project on current road conditions and safety. This issue was initially highlighted during the scoping phase consultation as a major concern for neighbouring landholders and participants at the online community information session. The increase in traffic was also perceived to potentially cause short-term disruptions to residents and commuters.

5.8.2 Summary of Community Consultation outcomes

A summary of consultation with key community groups and the outcomes is provided in **Table 5.6.**

[3] Significance Rating: 1–3= 'Not Significant', 5–7= 'Significant'.

Table 5.6 Summary of Community Consultation and Outcomes

Stakeholder Group	Consultation Summary	Key Outcomes
Host Landholders	Ongoing consultation regarding design of the solar farm and host landholder agreements.	Host landholder agreements have been established as outlined in **Section 2.7.1.**
Community including: • **Neighbouring landholders/resident.** • **Community and special interest groups.** • **Broader Community.**	Key issues raised by community during consultation included issues related to impacts associated with: • Bushfire. • Flooding. • Landscape and visual amenity. • Property Values. • Health. • Ecology. • Roads. • Traffic and Transport. • Project lifespan and decommissioning. Further information is detailed in **Section 6.3.4.** Additionally, community identified potential positive impacts associated with • Net zero. • Employment opportunities. • Benefit sharing. • Road upgrades. • Participation in the process.	Ark Energy provided additional opportunities for consultation including via online surveys, a second community information session and direct contact. This included sharing the preliminary findings of key impact assessments and proposed mitigation measures. Issues raised by the community were considered during the design refinement process including the following design changes: • Increase in APZ for the Project. • Increase in the APZ for the BESS and Substation. • Sealing of Avenue Road. • Inclusion of a biodiversity corridor. These are detailed further in **Section 2.8.4** and **Appendix 4**. Mitigation measures were also developed with consideration of community feedback including: • Commitment to a Community Benefit Fund as detailed in **Section 2.7.4**. • Engagement with residents to discuss issues and neighbour agreements – benefit sharing. This is detailed further in **Section 2.7.3**. • Development of post-approval management plans in consultation with key stakeholders and communication of commitments. • Continued implementation of the Community and Stakeholder Engagement Plan (CSEP). • Continued proactive engagement with community by Project Manager. • Develop an Accommodation, Employment and Procurement strategy to maximise local benefits.
Local businesses and industry groups	Key issues raised included: • Accommodation availability in Lismore. • Mechanisms to support local business service the workforce. • Enhancing outcomes for local communities.	Mitigation measures were developed with consideration of local business and industry feedback including: • Engagement during development of an Accommodation, Employment and Procurement Strategy.

A full analysis of community concerns is provided in **Appendix 4** and **Section 6.3**.

5.9 Ongoing Engagement

Throughout the assessment, construction, operation and decommissioning phases of the Project, Ark Energy will continue to engage with community stakeholders according to the Engagement Guidelines (DPIE, 2022). Stakeholders will include all relevant groups and individuals outlined in **Section 5.4**, plus any additional stakeholders identified during the development process with an interest in the Project.

Engagement activities will include:

- Regular updates to the Project website.
- Distribution of information sheets, fact sheets and/or FAQs to the local community.
- Face-to-face meetings and Project briefings.
- Regular community surveys.
- Operation of a community enquiry line/complaints line and the provision of timely responses to feedback, enquiries and complaints by Ark Energy.

Community and stakeholder concerns and appropriate mitigation and management measures are addressed in further detail in **Section 6.3**.

6.0 Assessment and Mitigation of Impacts

This section provides a description of the key environmental, social, and economic impacts associated with the Project and presents a detailed summary of the results from the specialist assessments. Furthermore, it describes the proposed measures to be implemented as part of the Project to manage and minimise these impacts.

6.1 Key Environmental Impacts and Community Issues

The key environmental, social, and economic impacts associated with the Project requiring detailed investigation as part of the EIS were identified through consideration of:

- The strategic, environmental and social context for the locality (refer to **Section 1.0** and **Section 2.0**).
- Project SEARs dated 21 September 2022, Supplementary SEARs issued on 4 March 2024 and supporting Agency advice (refer to **Appendix 1**).
- The preliminary risk assessment of potential environmental and social impacts associated with the Project as prepared for the Scoping Report (refer to **Section 6.2**).
- Specialist studies completed as part of the preparation of the EIS (refer to **Section 6.3** to **Section 6.17**).
- The community and stakeholder issues associated with the Project (based on the SIA and agency consultation) and where they are addressed in the EIS are provided in **Appendix 4**.

6.2 Preliminary Risk Assessment

A review of the relevant environmental, social and economic matters was conducted as part of the Scoping Report prepared for the Project (Premise, 2022), which identified issues to be assessed as part of the EIS and the level of assessment required.

The preliminary environmental, social and economic assessment identified a range of issues that required detailed assessment as part of the EIS. Based on the preliminary assessment, the potential issues included:

1. Social impacts – preliminary investigations concluded that the Project has the potential to result in both positive and negative social impacts (refer to **Section 6.3**).
2. Bushfire – preliminary investigations determined that portions of the Project Area are mapped as Category 1 BPL and historic bushfire events have occurred in the region. Potential risks associated with the BESS and construction activities were also identified (refer to **Section 6.4**).
3. Water – preliminary investigations identified groundwater impacts to be unlikely and Physics Creek was identified as containing biodiversity value (refer to **Section 6.5**).
4. Flooding – it was identified that flooding occurs in the region and has the potential to impact the Project Area (refer to **Section 6.6**).
5. Hazards – preliminary investigations identified that EMF and lithium batteries were risks associated with the Project (refer to **Section 6.7**).

6. Visual amenity – preliminary investigations identified the potential for the Project to change the visual amenity of nearby residents and road users as a potential impact (refer to **Section 6.8**).

7. Glint and Glare - preliminary investigations determined that glare and reflectivity had the potential to be risks associated with the Project (refer to **Section 6.9**).

8. Traffic impacts – preliminary investigations determined that traffic impacts, primarily associated with the construction phase, including OSOM vehicles would result from the Project (refer to **Section 6.10**).

9. Biodiversity – preliminary investigations identified that the Project has the potential to impact threatened and endangered species (refer to **Section 6.11**).

10. Aboriginal Heritage – preliminary investigations determined that impacts to Aboriginal heritage would result if heritage items were identified within the Project Area (refer to **Section 6.12**).

11. Historic Heritage - preliminary investigations determined that impacts to European heritage would result if heritage items were identified within the Project Area (refer to **Section 6.13**).

12. Soils and Agricultural Land use – preliminary investigations identified potential impacts to surrounding land uses and agricultural operations within the Project Area (refer to **Section 6.14**).

13. Economic Impacts - preliminary investigations determined that the Project would result in both positive and negative economic impacts for the local and regional community and business sector (refer to **Section 6.15**).

14. Noise amenity – preliminary investigations identified that impacts associated with noise amenity would generally be limited to the construction and decommissioning phases (refer to **Section 6.16**).

15. Waste – preliminary investigations indicated that the construction and decommissioning phases would generate large quantities of waste requiring management (refer to **Section 6.17**).

16. Air Quality – preliminary investigations identified that impacts arising from dust generation and vehicle emissions would occur primarily during construction and decommissioning of the Project (refer to **Section 6.14**).

17. Cumulative impacts – preliminary investigations determined that the construction and operation of the Project have the potential to result in cumulative impacts associated with nearby developments (refer to **Appendix 20**).

6.3 Social

An SIA (see **Appendix 7**) was undertaken by Umwelt (2024) to assess potential social impacts associated with the Project. This section outlines the key findings of the SIA, the potential social constraints and opportunities and where required, mitigation and management measures.

The SIA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with several guidelines including:

- DPE's Large-Scale Solar Energy Guideline (2022).
- NSW Government's Social Impact Assessment Guidelines for State Significant Projects (SIA Guidelines) (2023).
- Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2022).

Engagement undertaken to support the EIS and the SIA is summarised in **Section 5.0** of this report as well as outcomes of this engagement in the following sections and within the SIA report contained in **Appendix 18**.

6.3.1 Existing Environment

The Project's 'area of social influence' (or SIA study area) comprises of the Richmond Valley LGA (as host LGA), Lismore LGA, Ballina LGA and Clarence Valley LGA. The area of social influence is illustrated in **Figure 6.2** and is defined as the area considered to be impacted by a Project, based on a range of direct and indirect, tangible and intangible impacts (DPE, 2023). Rural towns within a 30-minute drive of the Project Area within the area of social influence include Myrtle Creek, Rappville, Ellangowan and West Bungawalbin. Regional centres within the three LGA's listed above that were included comprise Casino, Grafton and Lismore.

The SIA also considered the communities affected by the 2019/20 bushfires and 2022 floods as these communities may be more vulnerable to change due to the prolonged impact of these events. The economic impact of these floods was estimated to exceed $250 million across 2021/22 to 2022/23 financial years (Sea & Star Advisory, 2022). Across the Richmond Valley LGA, 53.4% of total land was impacted by the 2019–2020 bushfires with existing recovery and resilience plans via Northern Rivers Resilience Initiative valued at more than $150 million (Richmond Valley Council, 2020).

In order to assess the potential impacts of the Project upon the area of social influence a social baseline was established through a detailed review of available data including Australian Bureau of Statistics (ABS), Commonwealth Scientific and Industrial Research Organisation and local and regional news publications. This includes reference to data associated with the Statistical Area 1 which the Project is related to. A Statistical Area 1 is a geographic area assigned by ABS.

The social baseline identifies a range of factors which are detailed in **Appendix 7** including:

- The median age in the area directly surrounding the Statistical Area 1 (ABS) is 57 years, higher than NSW's 39 years.
- Year 12 attainment is lower in Statistical Area 1 (ABS see **Figure 6.2**), offset by higher certificate attainment and job types.
- Population growth: Minimal or declining in LGAs, slight increase in Ballina, Richmond Valley, Clarence Valley; Lismore expected to decline due to housing and job shortages.
- Top employment sectors: Agriculture, construction, and manufacturing.

- Economic contribution: Construction ($6.109 billion), manufacturing ($5.081 billion) in Northern Rivers Region which includes the LGA's of Ballina, Byron, Clarence Valley, Kyogle, Lismore, Richmond Valley and Tweed.
- Employment in construction: At least 7.5% of working-age population in each LGA.
- Major local employers: Meat processing (12.7%), primary education (7.9%), beef cattle farming (6.3%).
- Volunteering: High levels in Rappville and Ellangowan, average in Statistical Area 1 (as defined in the SIA).
- Housing demand: Increased due to 2022 floods, with 1,200 homes inundated.
- Rental stress: Higher than NSW average, with significant variation across LGAs.
- Located within Casino Boolangle Local Aboriginal Land Council (LALC).

6.3.2 Methodology

A key component of the SIA is the process of gaining an understanding from a local community and business perspective on the issues, values and uses associated with the area of social influence. More specifically the process aids in the identification of issues of concern and potential opportunities associated with the Project. These matters are then further assessed to predict any significant social impacts in relation to the Project which may require mitigation or enhancement. As illustrated in **Figure 6.1**, and consistent with the SIA guidelines, the SIA process involved a scoping, impact assessment, a prediction and reporting phase.

Consultation with key stakeholders was initiated in the Scoping Phase and was proceeded by an expansion of stakeholder consultation and defining of the social locality during the impact assessment and prediction phase. Further details regarding the SIA methodology are provided in **Appendix 7**.

01

SCOPING

- Prepare a community and stakeholder engagement strategy that outlines recommended and requested engagement activities, materials and proposed responsibilities.
- Identify the extent of the Project's social locality, which includes the specific geographies and communities relevant to the SIA, which are unique to the Project and its potential impacts.
- Develop a social baseline of the locality in which the Project is located to understand the current social environment and the communities, groups and individuals potentially affected by a project. This profile is created using both primary and secondary data and is essential for identifying and predicting social impacts.
- Engage key stakeholders to validate social baseline and inform initial prediction and evaluation of likely social impacts.

02

IMPACT ASSESSMENT AND PREDICTION

- Work collaboratively with the Project team to ensure that relevant stakeholders (individuals and groups) are aware of the Project and have been provided with an opportunity to provide input.
- Undertake specific SIA engagement to identify key social impacts from the perspectives of those likely to be most affected/interested in the project, particularly any vulnerable or marginalised groups.
- Undertake an assessment of the social impact(s) of each project activity, providing an evidence base for impact significance through review of relevant literature and other technical studies.
- Identify mitigation and/or enhancement measures in collaboration with impacted stakeholders to reduce negative impacts and enhance social/community benefits and outcomes.
- Determine social impact rankings/significance with consideration of likelihood and magnitude dimensions – extent, duration, severity or scale, intensity or importance and level of stakeholder concern/interest - combining stakeholder and expert perceptions of risk and impact.

03

SOCIAL IMPACT MANAGEMENT AND REPORTING

- Identify relevant/ appropriate management and enhancement measures, utilising stakeholder input identified as part of the impact assessment and prediction phase.
- Ensure key stakeholders and communities are aware of the outcomes of key technical studies, including the SIA, and how significant impacts are to be managed and enhanced; including any residual impacts post management.
- Develop a Social Impact Management Framework and Plan that outlines how social impacts associated with the Project will be managed and monitored throughout the development lifecycle.
- Prepare the SIA to DPHI requirements.

Figure 6.1 SIA Program Phases

Source: ©Umwelt, 2023.

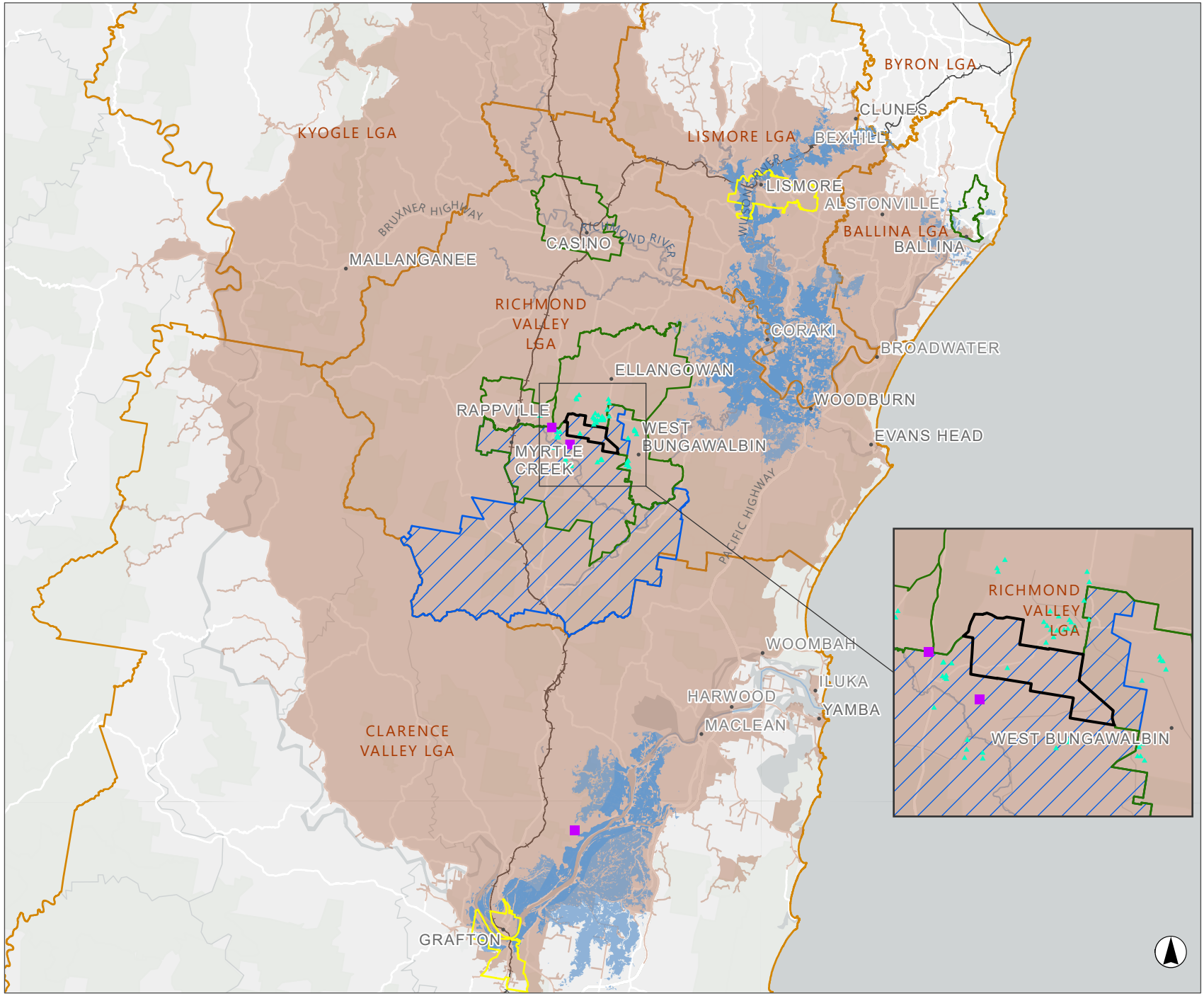


FIGURE 6.2

Social Locality

Legend

- Project Boundary
- Nearby Residents
- Towns
- Nearby SSD Projects (Solar)
- Areas within a 60-minute drive
- Local Government Area
- SA1 as defined in the SIA
- Urban Centres and Localities Boundary
- Suburb and Localities Boundary
- Flood Extent March-April 2022
- Roads
- Watercourse
- Railway

Scale 1:700,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) **Data source:** NSW DFSI (2023)

Engagement that was undertaken by Ark Energy and Umwelt identified community concerns and constraints as well as opportunities. These were then considered during the project design to refine the development, whilst including mitigation and management measures to minimise potential impacts.

Throughout the development of the Project various stakeholders have been engaged, to understand their views and opinion on the Project. A summary of the stakeholders contacted throughout the SIA phase is provided in **Table 6.1**.

Table 6.1 Stakeholders Consulted During the SIA

Stakeholder Group	Contact Attempts made to Stakeholder Groups	Number Participants Engaged
Aboriginal stakeholders and Traditional Owners	20	5
Local Government	3	2
Community and Special Interest Groups	15	2
Local Business and Service providers (health, emergency, education, local business)	16	4
Accommodation Service Providers	31	10
Neighboring landholders / residents	101	34
Broader community	1,040	92

6.3.3 Consultation and Site Visit

As outlined in **Section 5.0**, Umwelt supported Ark Energy to undertake a range of consultation and engagement activities during the EIS phase. A summary is provided below:

- Attendance at two community information sessions in September 2023 and February 2024.
- Facilitating a community survey.
- Interviewing accommodation service providers and local businesses.
- Consultation with local tourism service providers.
- Collaboration with government agencies.
- Interviews with local community members.
- Support in the development of community information posters.

6.3.4 Assessment of Social Impacts

Issues raised during the engagement process have been recorded and have informed investigations undertaken as part of the EIS, SIA and the ongoing design and development of the Project. This analysis of both quantitative and qualitative data gathered during the scoping and EIS phases was used to identify potential social impacts of the Project as perceived by affected parties. This analysis also allowed for an initial assessment of these social impacts.

Through the stakeholder identification and engagement process outlined in **Table 5.3** and described in detail in **Appendix 7**, themes emerged regarding the key issues for various stakeholders.

The impact on the local and regional economy were commonly cited as positive outcomes the Project would offer, particularly during the construction phase. The construction of the Project was perceived by the community as offering employment opportunities, income and skills development to the region. Conversely, proximal landholders identified the negative impacts of the Project on the visual amenity, landscape character, rural lifestyle, and heritage values of the area. Of particular concern was the perceived risk of bushfires and flooding near the Project Area given community experiences during the 2019/20 bushfires and 2022 floods across the region.

Increased pressure on housing and accommodation due to the incoming construction workforce was also raised, particularly in key locations where community members remain displaced after the 2022 floods within both the Richmond Valley LGA and Lismore LGA.

A range of positive and negative cumulative impacts were raised given the potential for development of two additional solar farms in the local area. It is noted that these perceived impacts align with the general sentiment of the community regarding the Project. Positive perceptions of potential cumulative impacts included opportunities for local employment, training and procurement, with perceived negative impacts relating to impacts on way of life, health and wellbeing, livelihoods, surroundings and accessibility.

It should be noted that the residual social risk ratings represent the risk post implementation of mitigation measures, with proposed mitigation and enhancement strategies outlined at **Section 6.3.5**. included to address any residual social impacts.

It is also important to note that unlike in the context of other technical studies undertaken as a part of the EIS, there are no thresholds in the social space, with the identification of possible consequences largely made qualitatively. This qualitative approach is informed by the socio-economic baseline data, outcomes of relevant literature and research studies and experiences with other projects, outcomes of consultation and findings of technical studies; with a conservative approach taken in assigning ratings.

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 level of concern (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.

In line with the SIA Guideline, the frequency that the risk was raised during stakeholder consultation and the likelihood that the risk would occur, based on a review of the technical studies, was used to determine an overall significance 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, bushfire, flood impact assessment etc.). The residual social risk ratings represent the risk post implementation of mitigation measures with the majority of residual social impacts rated low.

Table 6.3 presents a summary of the social impact evaluation with the justification and proposed management and enhancement strategies. As shown in **Table 6.2**, the colour blue has been used to represent the significance rating of impacts, while the symbol + has been used to indicate positive impacts. Community-generated strategies and opportunities are denoted with the abbreviation (CG).

Table 6.2 Significance Rating Legend

Significance Rating	Blue
Very High	**VH**
High	**H**
Medium	**M**
Low	**L**

Source: (Umwelt, 2024).

Table 6.3 Evaluation of Social Impacts

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Host landholders	C	L	**L**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**L**
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Host landholders	O	L	**L**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**L**
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Neighbouring landholders	C	H	**H**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**M**
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Neighbouring landholders	O	H	**H**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**M**
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Broader Community	C	M	**L**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/ concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**L**
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Users of environmental assets such as Bungawalbin National Park and/ or Ellangowan State Forest	C	L	**L**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/ concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**L**
Community Way of Life Surroundings	Project construction and operations	Disruption to sense of place due to changes in community values associated with the ecological, aesthetic, amenity attributes and function of the landscape.	Users of environmental assets such as Bungawalbin National Park and/ or Ellangowan State Forest	O	L	**L**	Host landholder agreements include obligation to remove above ground infrastructure Neighbour agreements addressing personal issues/concerns on a case-by-case basis (CG). CSEP to acknowledge the stages of psychological response to place change in Project messaging and mechanisms. Focus on place-based community benefits (CG).	**L**

[4] Duration (C: Construction, O: Operation, D: Decommissioning)
[5] Level of Stakeholder Concern (L: Low, M: Medium, H: High, VH: Very High)
[6] Significance rating (L: Low, M: Medium, H: High, VH: Very High).

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Surroundings Way of Life	Project construction and operations	Changes in visual amenity and enjoyment of the natural environment given perceived industrialisation of the landscape.	Host Landholders	C & O	L	**L**	Commitment to a 30-metre biodiversity corridor along the northern boundary of the Project. Consider vegetation screening or landscaping mechanisms on Project site or neighbour sites (in direct consultation), that do not heighten anxiety regarding fire risk (CG).	**L**
Surroundings Way of Life	Project construction and operations	Changes in visual amenity and enjoyment of the natural environment given perceived industrialisation of the landscape.	Neighbouring landholders (7 moderate receptors from LVIA)	C & O	H	**M**	Commitment to a 30-metre biodiversity corridor along the northern boundary of the Project. Consider vegetation screening or landscaping mechanisms on Project site or neighbour sites (in direct consultation), that do not heighten anxiety regarding fire risk (CG).	**L**
Surroundings Way of Life	Project construction and operations	Changes in visual amenity and enjoyment of the natural environment given perceived industrialisation of the landscape.	Broader community	C & O	L	**L**	Commitment to a 30-metre biodiversity corridor along the northern boundary of the Project. Consider vegetation screening or landscaping mechanisms on Project site or neighbour sites (in direct consultation), that do not heighten anxiety regarding fire risk (CG).	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Host Landholders	C	L	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Host Landholders	O	L	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Neighbouring landholders	C	H	**M**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Neighbouring landholders	O	L	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Broader community	C	L	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase.	**L**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
							Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Broader community	O	L	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Users of environmental assets such as Bungawalbin National Park and/ or Ellangowan State Forest	C	M	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life	Project construction and operations	Reduced social amenity due to potential noise during construction and operation.	Users of environmental assets such as Bungawalbin National Park and/ or Ellangowan State Forest	O	L	**L**	Development of a Noise and Vibration Management Plan prepared and implemented as part of the Construction Environmental Management Plan to identify controls to be implemented during the construction phase. Construction and operational management controls to be developed in consultation with key stakeholders, such as neighbouring landholders and managers of National Park & State Forest. Communication of key Ark Energy contacts from the Construction Team for the community to liaise with as required.	**L**
Surroundings Way of Life Accessibility	Project construction and operations	Changes to interaction with, and enjoyment of, valued environmental assets adjacent to the Project Area used for recreational activities e.g. Bungawalbin National Park and Ellangowan State Forests.	Neighbouring landholders	C & O	L	**L**	Project design does not inhibit access to recreation activities taking place in the National Park or State Forest (CG). Development of a Construction Environmental Management Plan to identify any controls to be implemented during the construction phase to minimise impacts to users of these environmental assets. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project.	**L**
Surroundings Way of Life Accessibility	Project construction and operations	Changes to interaction with, and enjoyment of, valued environmental assets adjacent to the Project Area used for recreational activities e.g. Bungawalbin National Park and Ellangowan State Forests.	Broader community	C & O	L	**L**	Project design does not inhibit access to recreation activities taking place in the National Park or State Forest (CG). Development of a Construction Environmental Management Plan to identify any controls to be implemented during the construction phase to minimise impacts to users of these environmental assets. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project.	**L**
Surroundings Way of Life Accessibility	Project construction and operations	Changes to interaction with, and enjoyment of, valued environmental assets adjacent to the Project Area used for recreational activities e.g. Bungawalbin National Park and Ellangowan State Forests.	Tourist/Visitors/ Users of State Forests	C & O	H	**L**	Project design does not inhibit access to recreation activities taking place in the National Park or State Forest (CG). Development of a Construction Environmental Management Plan to identify any controls to be implemented during the construction phase to minimise impacts to users of these environmental assets.	**L**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
							Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project.	
Surroundings **Way of Life** **Accessibility**	Project construction and operations	Changes to interaction with, and enjoyment of, valued environmental assets adjacent to the Project Area used for recreational activities e.g. Bungawalbin National Park and Ellangowan State Forests.	Special Interest Group (Environmental)	C & O	H	**M**	Project design does not inhibit access to recreation activities taking place in the National Park or State Forest (CG). Development of a Construction Environmental Management Plan to identify any controls to be implemented during the construction phase to minimise impacts to users of these environmental assets. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project.	**L**
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Neighbouring landholders	C	H	**M**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**L**
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Neighbouring landholders	O	M	**L**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**L**
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Broader community	C	M	**L**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**L**
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Broader community	O	L	**L**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**L**
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Special Interest Group (Environmental)	C	H	**M**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**M**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Special Interest Group (Environmental)	O	M	**M**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**L**
Surroundings	Project construction and operations	Degradation of assets with environmental value, including flora and fauna.	Special Interest Group (Environmental)	D	H	**M**	Installation of a vegetation corridor across the norther boundary between Ellangowan State Forest and Bungawalbin National Park/ State Forest. Consider development of a Biodiversity Offset Strategy. Limit any clearing to that stated in the Construction Environmental Management Plan. Ensure key stakeholders such as Landcare are proactively informed about any planned or unplanned changes to environmental assets as a result of the Project. Further develop, communicate and implement Decommissioning Framework.	**M**
Surroundings	Operation and decommissioning	Inadequacy of physical infrastructure in the local area to facilitate management of the waste created from the solar farm during operations and in the decommissioning phase.	Local Government	O & D	L	**H**	Engagement with Council to determine capacity of infrastructure to accept construction waste and engagement with relevant waste management service providers to identify appropriate waste management solutions.	**L**
Community **Way of Life** **Accessibility**	Project construction – peak construction workforce influx (260)	Increased demand for housing/ accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	Local accommodation service providers	C	H	**H**	Develop an Accommodation, Employment and Procurement Strategy that includes consideration of: Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing (CG). Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing (CG). Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.	**M**
Community **Way of Life** **Accessibility**	Project construction – peak construction workforce influx (260)	Increased demand for housing/ accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	Homelessness service providers	C	H	**H**	Develop an Accommodation, Employment and Procurement Strategy that includes consideration of: Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing (CG). Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing (CG). Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.	**M**
Community **Way of Life** **Accessibility**	Project construction – peak construction workforce influx (260)	Increased demand for housing/ accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	Homeless/At risk of homelessness	C	H	**H**	Develop an Accommodation, Employment and Procurement Strategy that includes consideration of: Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing (CG). Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing (CG). Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.	**M**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Community **Way of Life** **Accessibility**	Project construction – peak construction workforce influx (260)	Increased demand for housing/ accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	Tourists/ Visitors	C	M	**M**	Develop an Accommodation, Employment and Procurement Strategy that includes consideration of: Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing (CG). Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing (CG). Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.	**L**
Community **Way of Life** **Accessibility**	Project construction – peak construction workforce influx (260)	Increased demand for housing/ accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	Other key workers (construction workforce following 2022 flooding)	C	M	**M**	Develop an Accommodation, Employment and Procurement Strategy that includes consideration of: Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing (CG). Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing (CG). Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.	**L**
Community **Way of Life** **Accessibility**	Project construction – peak construction workforce influx (260)	Increased demand for housing/ accommodation due to construction workforce influx into the region, affecting accessibility, availability and affordability for other sectors and community members (particularly in key locations where community members remain displaced after the 2022 floods in Richmond Valley LGA and Lismore).	Broader community	C&O	L	**L**	Develop an Accommodation, Employment and Procurement Strategy that includes consideration of: Engagement and joint planning with key stakeholders such as housing and homelessness support service providers and accommodation providers to limit impact on local access to affordable housing (CG). Exploring flexible housing options utilising existing temporary housing stock, in the form of fixed or modular housing (CG). Commit to avoiding Lismore as a housing location for an incoming workforce to ensure housing and reconstruction efforts in this locality are not further constrained.	**L**
Way of Life **Accessibility**	Project construction – peak construction workforce influx (260)	Incoming construction workforce causing increased pressure local health care and facilities.	Health care providers	C	M	**M**	Include health promotion initiatives as part of a Workplace Health and Safety Plan for the site, and collaboratively develop health related KPIs suitable for the likely workforce profile (e.g. smoking cessation, cholesterol). Commit to encouraging the use of Ballina LGA (for GP presentations) and the Lismore Base hospital (for ED presentations).	**L**
Decision making systems	Project planning, approval, construction and operations	Increased distrust/ outrage given the perceived lack of distributive equity in Project benefits (Project developers Vs community; Landholders Vs Neighbours/ Broader community/Region).	Host Landholder	C&O	L	**L**	Develop and implement the Ark Energy Community Benefit Fund (CBF) with Council reflective of the community needs and aspiration and aligned to the NSW Government Draft Benefit Sharing Guideline. If other funds are to be disbursed or investments made in key areas such as training and education, a clear governance structure should be developed and communicated with benefit directed towards those most likely impacted by the Project.	**L**
Decision making systems	Project planning, approval, construction and operations	Increased distrust/ outrage given the perceived lack of distributive equity in Project benefits (Project developers Vs community; Landholders Vs Neighbours/ Broader community/Region).	Neighbouring landholders	C&O	H	**M**	Develop and implement the Ark Energy Community Benefit Fund (CBF) with Council reflective of the community needs and aspiration and aligned to the NSW Government Draft Benefit Sharing Guideline. If other funds are to be disbursed or investments made in key areas such as training and education, a clear governance structure should be developed and communicated with benefit directed towards those most likely impacted by the Project.	**M**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Decision making systems	Project planning, approval, construction and operations	Increased distrust/ outrage given the perceived lack of distributive equity in Project benefits (Project developers Vs community; Landholders Vs Neighbours/ Broader community/Region).	Special Interest Groups	O	M	**M**	Develop and implement the Ark Energy Community Benefit Fund (CBF) with Council reflective of the community needs and aspiration and aligned to the NSW Government Draft Benefit Sharing Guideline. If other funds are to be disbursed or investments made in key areas such as training and education, a clear governance structure should be developed and communicated with benefit directed towards those most likely impacted by the Project.	**L**
Decision making systems	Project planning, approval, construction and operations	Increased distrust/ outrage given the perceived lack of distributive equity in Project benefits (Project developers Vs community; Landholders Vs Neighbours/ Broader community/Region).	Broader community	O	L	**L**	Develop and implement the Ark Energy Community Benefit Fund (CBF) with Council reflective of the community needs and aspiration and aligned to the NSW Government Draft Benefit Sharing Guideline. If other funds are to be disbursed or investments made in key areas such as training and education, a clear governance structure should be developed and communicated with benefit directed towards those most likely impacted by the Project.	**L**
Community	Project planning, approval, construction and operations	Reduced community cohesion due to differing attitudes and feelings towards renewable energy development in the local community and region.	Host landholders	C&O	L	**L**	Continue to implement and iterate the Project CSEP, with accessible opportunities that promote respectful dialogue and co-create knowledge and awareness about the Project (CG).	**L**
Community	Project planning, approval, construction and operations	Reduced community cohesion due to differing attitudes and feelings towards renewable energy development in the local community and region.	Neighbouring landholders	C&O	H	**M**	Continue to implement and iterate the Project CSEP, with accessible opportunities that promote respectful dialogue and co-create knowledge and awareness about the Project (CG).	**M**
Community	Project planning, approval, construction and operations	Reduced community cohesion due to differing attitudes and feelings towards renewable energy development in the local community and region.	Broader community	C&O	M	**L**	Continue to implement and iterate the Project CSEP, with accessible opportunities that promote respectful dialogue and co-create knowledge and awareness about the Project (CG).	**L**
Community	Project planning, approval, construction and operations	Reduced community cohesion due to differing attitudes and feelings towards renewable energy development in the local community and region.	Special Interest Groups	C&O	M	**M**	Continue to implement and iterate the Project CSEP, with accessible opportunities that promote respectful dialogue and co-create knowledge and awareness about the Project (CG).	**M**
Community	Project planning, approval, construction and operations	Reduced community cohesion due to differing attitudes and feelings towards renewable energy development in the local community and region.	Local Government	C&O	M	**M**	Continue to implement and iterate the Project CSEP, with accessible opportunities that promote respectful dialogue and co-create knowledge and awareness about the Project (CG).	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Host landholders	C, O	L	**L**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Host landholders	D	H	**M**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Neighbouring landholders	C, O	H	**M**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Neighbouring landholders	D	H	**M**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Broader community	C, O & D	M	**L**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Special Interest Groups (Environment)	C, O	H	**M**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Special Interest Groups (Environment)	D	H	**M**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Local Health District	C, O & D	L	**L**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Construction and Operation	Reduced physical health and wellbeing due to potential for project components to leach chemicals into the ground/ ground water and generate radiation causing cancer and these effects being compounded by proximity to other solar farms.	Traditional Owners	C, O & D	M	**M**	Communicate Environmental Management Plans, decommissioning framework and commitments (CG). Procurement of infrastructure components from reputable, ethical sources to reduce risk of any physical health impacts during installation or decommissioning.	**L**
Surroundings, Way of Life Health and Wellbeing	Operation	Reduced levels of personal and public safety due to fire risk given proximity to natural features such as state forests/farmlands and past fires reported on site.	Host Landholders	C & O	M	**M**	Develop, implement and communicate the Bushfire Emergency Management and Evacuation Plan for the construction and operational phase of the Project (CG). Continue to implement and iterate the Project CSEP to incorporate messaging and mechanisms regarding fire management, highlighting where local insight has been incorporated.	**M**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Surroundings, Way of Life Health and Wellbeing	Operation	Reduced levels of personal and public safety due to fire risk given proximity to natural features such as state forests/farmlands and past fires reported on site.	Neighbouring Landholders	C & O	H	**M**	Develop, implement and communicate the Bushfire Emergency Management and Evacuation Plan for the construction and operational phase of the Project (CG). Continue to implement and iterate the Project CSEP to incorporate messaging and mechanisms regarding fire management, highlighting where local insight has been incorporated.	**M**
Surroundings, Way of Life Health and Wellbeing	Operation	Reduced levels of personal and public safety due to fire risk given proximity to natural features such as state forests/farmlands and past fires reported on site.	Broader community	C & O	H	**M**	Develop, implement and communicate the Bushfire Emergency Management and Evacuation Plan for the construction and operational phase of the Project (CG). Continue to implement and iterate the Project CSEP to incorporate messaging and mechanisms regarding fire management, highlighting where local insight has been incorporated.	**M**
Surroundings, Way of Life Health and Wellbeing	Operation	Reduced levels of personal and public safety due to fire risk given proximity to natural features such as state forests/farmlands and past fires reported on site.	Special Interest Group (Environmental)	C & O	H	**M**	Develop, implement and communicate the Bushfire Emergency Management and Evacuation Plan for the construction and operational phase of the Project (CG). Continue to implement and iterate the Project CSEP to incorporate messaging and mechanisms regarding fire management, highlighting where local insight has been incorporated.	**M**
Decision-making	Project planning	Heightened levels of community outrage associated with perceived inability to inform the Project's planning and decision-making processes (C).	Neighbouring landholders	P,C	H	**M**	Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights. Continue to provide direct access to technical experts and the Project Manager to provide timely responses to any information requests in formats that are accessible to multiple stakeholder types.	**M**
Decision-making	Project planning	Heightened levels of community outrage associated with perceived inability to inform the Project's planning and decision-making processes (C).	Broader community	P,C	L	**L**	Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights. Continue to provide direct access to technical experts and the Project Manager to provide timely responses to any information requests in formats that are accessible to multiple stakeholder types.	**L**
Decision-making	Project planning	Heightened levels of community outrage associated with perceived inability to inform the Project's planning and decision-making processes (C).	Special Interest Groups	P,C	M	**M**	Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights. Continue to provide direct access to technical experts and the Project Manager to provide timely responses to any information requests in formats that are accessible to multiple stakeholder types.	**L**
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the introduction of the Project into an environment with reduced adaptive capacity following a series of natural disasters in the area (C).	Neighbouring landholders	P,C	H	**H**	Consider prioritising the support of preventative mental health programs in the region as part of the Community Benefit Fund. Train the construction and operational workforce in basic mental health first aid techniques, such as the Rural Adversity Mental Health Program Support Skills.	**M**
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the introduction of the Project into an environment with reduced adaptive capacity following a series of natural disasters in the area (C).	Mental Health Service Providers	C	M	**M**	Consider prioritising the support of preventative mental health programs in the region as part of the Community Benefit Fund. Train the construction and operational workforce in basic mental health first aid techniques, such as the Rural Adversity Mental Health Program Support Skills.	**L**
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the introduction of the Project into an environment with reduced adaptive capacity following a series of natural disasters in the area (C).	Special Interest Groups	P,C	M	**M**	Consider prioritising the support of preventative mental health programs in the region as part of the Community Benefit Fund. Train the construction and operational workforce in basic mental health first aid techniques, such as the Rural Adversity Mental Health Program Support Skills.	**L**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the introduction of the Project into an environment with reduced adaptive capacity following a series of natural disasters in the area (C).	Broader Community	C	L	**L**	Consider prioritising the support of preventative mental health programs in the region as part of the Community Benefit Fund. Train the construction and operational workforce in basic mental health first aid techniques, such as the Rural Adversity Mental Health Program Support Skills.	**L**
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the uncertainty of the assessment process, construction, and decommissioning.	Host landholders	P, C & D	L	**L**	Continued utilisation of the CSEP through the Project life as well as increase frequency of Project updates for all stakeholders at key Project milestones, prioritising personal and face-to-face consultation (CG). Continue proactive personal engagement with community members and proximal landholders, with the Project Manager (CG).	**L**
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the uncertainty of the assessment process, construction, and decommissioning.	Neighbouring landholders	P, C & D	H	**M**	Continued utilisation of the CSEP through the Project life as well as increase frequency of Project updates for all stakeholders at key Project milestones, prioritising personal and face-to-face consultation (CG). Continue proactive personal engagement with community members and proximal landholders, with the Project Manager (CG).	**M**
Health and wellbeing	Project planning, construction	Anxiety/ Stress associated with the uncertainty of the assessment process, construction, and decommissioning.	Broader community	P, C &D	L	**L**	Continued utilisation of the CSEP through the Project life as well as increase frequency of Project updates for all stakeholders at key Project milestones, prioritising personal and face-to-face consultation (CG). Continue proactive personal engagement with community members and proximal landholders, with the Project Manager (CG).	**L**
Culture	Project planning, construction and operations	Limited consultation with the Bundjalung peoples in regards to intangible values connected to, or surrounding, the Project Area could result in: • Cultural values not considered in decision making. • Potential damage to Country. • Lack of acceptance of the Project.	Traditional Owners	P,C,O & D	L	**M**	Develop an Aboriginal Cultural Heritage Management Plan (ACHMP) in consultation with Heritage NSW and RAPs. Consider intangible assets/ cultural value mapping as part of this process.	**L**
Culture	Project planning, construction and operations	Limited consultation with the Bundjalung peoples in regards to intangible values connected to, or surrounding, the Project Area could result in: 1. Cultural values not considered in decision making. 2. Potential damage to Country. 3. Lack of acceptance of the Project.	Aboriginal community	P,C,O & D	L	**L**	Develop an Aboriginal Cultural Heritage Management Plan (ACHMP) in consultation with Heritage NSW and RAPs. Consider intangible assets/ cultural value mapping as part of this process.	**L**
Accessibility Surroundings	Heavy truck movements	Reduced public safety due to further deterioration of local roads (roads previously impacted by flooding and heavy haulage for recovery efforts) and increased volume of traffic.	Road users around Project Area	C	M	**M**	Enhancement of Summerland Way along Main Camp Road and Avenue Road. Develop and implement the Construction Traffic Management Plan, including signage and workforce shuttles from key residential locations (aligned to the Accommodation, Employment and Procurement Strategy).	**L**
Accessibility Surroundings	Heavy truck movements	Reduced public safety due to further deterioration of local roads (roads previously impacted by flooding and heavy haulage for recovery efforts) and increased volume of traffic.	School bus route users on Main Camp Road	C	M	**M**	Enhancement of Summerland Way along Main Camp Road and Avenue Road. Develop and implement the Construction Traffic Management Plan, including signage and workforce shuttles from key residential locations (aligned to the Accommodation, Employment and Procurement Strategy).	**L**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Accessibility Surroundings	Heavy truck movements	Reduced public safety due to further deterioration of local roads (roads previously impacted by flooding and heavy haulage for recovery efforts) and increased volume of traffic.	Local Government	C	M	**H**	Enhancement of Summerland Way along Main Camp Road and Avenue Road. Develop and implement the Construction Traffic Management Plan, including signage and workforce shuttles from key residential locations (aligned to the Accommodation, Employment and Procurement Strategy).	**M**
Accessibility Surroundings	Heavy truck movements	Reduced public safety due to further deterioration of local roads (roads previously impacted by flooding and heavy haulage for recovery efforts) and increased volume of traffic.	State Government	C	M	**M**	Enhancement of Summerland Way along Main Camp Road and Avenue Road. Develop and implement the Construction Traffic Management Plan, including signage and workforce shuttles from key residential locations (aligned to the Accommodation, Employment and Procurement Strategy).	**L**
Accessibility Surroundings	Project planning, construction and operations	Reduced levels of personal and public safety due to flooding risk and potential impacts to roads, proximal property and fauna.	Host Landholders	C, O	L	**L**	Implement Flood Impact Management Plan to consider flood immunity requirements for the access roads, height of the solar panels and location of infrastructure. Develop and communicate detailed planning transport routes with public safety considerations and information disclosure, notifying residents, considering any sensitive user groups.	**L**
Accessibility Surroundings	Project planning, construction and operations	Reduced levels of personal and public safety due to flooding risk and potential impacts to roads, proximal property and fauna.	Neighbouring landholders	C, O	M	**M**	Implement Flood Impact Management Plan to consider flood immunity requirements for the access roads, height of the solar panels and location of infrastructure. Develop and communicate detailed planning transport routes with public safety considerations and information disclosure, notifying residents, considering any sensitive user groups.	**L**
Accessibility Surroundings	Project planning, construction and operations	Reduced levels of personal and public safety due to flooding risk and potential impacts to roads, proximal property and fauna.	Broader community	C, O	L	**L**	Implement Flood Impact Management Plan to consider flood immunity requirements for the access roads, height of the solar panels and location of infrastructure. Develop and communicate detailed planning transport routes with public safety considerations and information disclosure, notifying residents, considering any sensitive user groups.	**L**
Accessibility Surroundings	Project planning, construction and operations	Reduced levels of personal and public safety due to flooding risk and potential impacts to roads, proximal property and fauna.	Special Interest Groups	C, O	L	**M**	Implement Flood Impact Management Plan to consider flood immunity requirements for the access roads, height of the solar panels and location of infrastructure. Develop and communicate detailed planning transport routes with public safety considerations and information disclosure, notifying residents, considering any sensitive user groups.	**L**
Livelihood Surroundings	Project planning, construction and operations	Reduction in land values due to proximity to solar farm.	Neighbouring landholders	P,C,O	H	**M**	Further engagement and ongoing open, transparent, and accessible communication with host and proximal landholders, and broader community. Continued implementation of Host landholder and neighbour agreements.	**L**
Livelihood Surroundings	Project planning, construction and operations	Reduction in land values due to proximity to solar farm.	Real estate agents	P,C,O	L	**L**	Further engagement and ongoing open, transparent, and accessible communication with host and proximal landholders, and broader community. Continued implementation of Host landholder and neighbour agreements.	**L**
Surroundings	Decommissioning	Disruption to the agricultural productivity values ($).	Host landholders	O&C	L	**L**	Continued implementation of Host landholder agreements. Consideration of dual land use options including agrisolar.	**L**
Surroundings	Decommissioning	Disruption to the agricultural productivity values ($).	Host landholders	D	H	**M**	Continued implementation of Host landholder agreements. Consideration of dual land use options including agrisolar.	**L**
Livelihoods	Construction and Operations	Increased public liability insurance premiums for neighbouring landholders reducing livelihood.	Neighbouring landholders	C&O	H	**M**	Continue to monitor regional, national and international developments in regard to insurance premiums and commit to transparent communication with neighbouring landholders (CG).	**L**
Livelihoods+	Construction	Enhancement of local economy and livelihoods due to construction workforce influx and Project activity.	Broader community	C	L	**L +**	Develop an Accommodation, Employment and Procurement Strategy that includes mechanisms to support local businesses to be competitive and sustainably service a constructive workforce over the proposed 2-year period.	**M+**

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Livelihoods+	Construction	Enhancement of local economy and livelihoods due to construction workforce influx and Project activity.	Local businesses and service providers	C	M	**H+**	Develop an Accommodation, Employment and Procurement Strategy that includes mechanisms to support local businesses to be competitive and sustainably service a constructive workforce over the proposed 2-year period.	**H+**
Livelihoods+	Construction	Enhancement of local economy and livelihoods due to construction workforce influx and Project activity.	Local, state and federal government (funding recovery)	C	M	**M+**	Develop an Accommodation, Employment and Procurement Strategy that includes mechanisms to support local businesses to be competitive and sustainably service a constructive workforce over the proposed 2-year period.	**M+**
Livelihoods+	Construction	Enhancement of local economy and livelihoods due to construction workforce influx and Project activity.	Special interest groups	C	M	**M+**	Develop an Accommodation, Employment and Procurement Strategy that includes mechanisms to support local businesses to be competitive and sustainably service a constructive workforce over the proposed 2-year period.	**H+**
Livelihoods+	Construction	Enhancement of local economy and livelihoods due to construction workforce influx and Project activity.	Regional businesses and service providers	C	L	**M+**	Develop an Accommodation, Employment and Procurement Strategy that includes mechanisms to support local businesses to be competitive and sustainably service a constructive workforce over the proposed 2-year period.	**M+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Host landholders	O	H	**H+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**VH+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Neighbouring landholders	O	H	**M+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**M+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Aboriginal Stakeholders	O	M	**M+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**M+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Special interest groups	O	M	**M+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**M+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Broader community	O	L	**L+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**M+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Local businesses and service providers	O	M	**M+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**M+**
Community+ Health and Wellbeing+	Project construction & Operations	Enhanced social outcomes for local and regional communities through targeted community benefit sharing and investment initiatives.	Local Government	O	H	**VH+**	Alongside Council co-design a Community Benefit Fund that enhances opportunities for active decision making and participation in the affected communities of interest (CG).	**VH+**
Decision making+ Livelihoods+	Project planning, approvals, construction and decommissioning	Enhanced capacity to participate in decision making through knowledge sharing about the technology employed as part of the Project and contribution to climate change efforts, in an accessible and inclusive format.	Broader community	P,C,O&D	L	**L+**	Further engagement and ongoing open, transparent, and accessible communication with host and proximal landholders, and provision of clear communication regarding design amendments/ updates. Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights.	**L+**

Social Impact Theme	Project Aspect	Social Impact Description	Extent/ Affected Parties	Duration[4]	Level of Stakeholder Concern[5]	Significance Rating (before mitigation)[6]	Refinements/ Mitigation/ Management Measures	Significance Rating After Mitigation
Decision making+ Livelihoods+	Project planning, approvals, construction and decommissioning	Enhanced capacity to participate in decision making through knowledge sharing about the technology employed as part of the Project and contribution to climate change efforts, in an accessible and inclusive format.	Special Interest Groups	P,C,O&D	H	**M+**	Further engagement and ongoing open, transparent, and accessible communication with host and proximal landholders, and provision of clear communication regarding design amendments/ updates. Continue to implement and iterate the Project CSEP to promote respectful dialogue and co-create knowledge and awareness about the Project, incorporating local perspectives and insights.	**H+**
Livelihoods+ Community+	Construction	Local employment opportunities during construction.	Unemployed with appropriate skills looking for work	C	H	**H+**	Develop and implement an Accommodation, Employment and Procurement Strategy, that focuses on an anticipated target of 20% local employment and an ambitious target of 40% local employment (CG).	**VH+**
Livelihoods+ Community+	Construction	Local employment opportunities during construction.	Traditionally under-represented groups in the RE workforce, for e.g. women, young people, Aboriginal and/ or Torres Strait Islander peoples, people with a disability	C	H	**H+**	Develop and implement an Accommodation, Employment and Procurement Strategy, that focuses on an anticipated target of 20% local employment and an ambitious target of 40% local employment (CG).	**VH+**
Livelihoods+ Community+	Construction	Local employment opportunities during construction.	Currently employed, appropriately skilled professionals in the local area	C	L	**M+**	Develop and implement an Accommodation, Employment and Procurement Strategy, that focuses on an anticipated target of 20% local employment and an ambitious target of 40% local employment (CG).	**M+**
Livelihoods+ Community+	Project planning, construction & operations	Ability to enhance human and economic capital through skill development and training opportunities.	Broader Community	C&O	M	**M+**	Develop an Accommodation, Employment and Procurement Strategy to provide opportunities for local training, skills and development to occur across scalable pathways (i.e. mix of apprenticeships, certificate and degree qualifications, short courses) both onsite and at key training centres such as Lismore and Casino (CG). Consider prioritising scholarships for local community members to participate in apprenticeships, training and education as part of the Community Benefits Fund, with a focus on encouraging participation of underrepresented groups (CG).	**H+**
Livelihoods+ Community+	Project planning, construction & operations	Ability to enhance human and economic capital through skill development and training opportunities.	Unemployed looking for training opportunities	C&O	H	**H+**	Develop an Accommodation, Employment and Procurement Strategy to provide opportunities for local training, skills and development to occur across scalable pathways (i.e. mix of apprenticeships, certificate and degree qualifications, short courses) both onsite and at key training centres such as Lismore and Casino (CG). Consider prioritising scholarships for local community members to participate in apprenticeships, training and education as part of the Community Benefits Fund, with a focus on encouraging participation of underrepresented groups (CG).	H+
Livelihoods+ Community+	Project planning, construction & operations	Ability to enhance human and economic capital through skill development and training opportunities.	Traditionally underrepresented groups in the RE workforce, for e.g. women, young people, Aboriginal and/ or Torres Strait Islander peoples, people with a disability	C&O	H	**M+**	Develop an Accommodation, Employment and Procurement Strategy to provide opportunities for local training, skills and development to occur across scalable pathways (i.e. mix of apprenticeships, certificate and degree qualifications, short courses) both onsite and at key training centres such as Lismore and Casino (CG). Consider prioritising scholarships for local community members to participate in apprenticeships, training and education as part of the Community Benefits Fund, with a focus on encouraging participation of underrepresented groups (CG).	H+
Environment+	Operations	Intergenerational equity given emphasis on RE production and reduction in carbon emissions.	Broader community	O	M	**M+**	Construction of the Project.	**H+**
Environment+	Operations	Intergenerational equity given emphasis on RE production and reduction in carbon emissions.	Population of NSW	O	M	**H+**	Construction of the Project.	**H+**

6.3.5 Social Impact Management

There are a number of elements of the Project, that will provide positive elements to the community, including development of a dual-purpose biodiversity corridor to provide biodiversity connectivity and address visual amenity concerns as well as local road upgrades (that have been detailed previously in **Section 3.4.3** and **Section 3.3.6.5** respectively).

A range of social mitigation and management measures and recommendations are provided in detail in the SIA (refer to **Appendix 7**) and summarised below in **Table 6.4**:

Table 6.4 Social Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
S-01	An Accommodation, Employment and Procurement Strategy (AEPS) will be developed prior to construction that will: • Provide mechanisms to prioritise local employment with a focus on those with the requisite skill types who are currently unemployed. • Provide details regarding existing accommodation providers, including temporary accommodation providers and manufacturers. • Maintain an accommodation register for accommodation providers to register their interest in leasing their accommodation for use by the Project workforce.	Pre construction
S-02	Host Landholder agreements to include reference to decommissioning obligations.	Pre construction
S-03	Any neighbour agreements to address the concerns of the landholder on a case by case basis.	Pre construction
S-04	Continue to apply the CSEP as detailed in Section 5.2 the SIA. The CSEP will: • Include consistent, transparent and proactive information provision and mechanisms for consultation with stakeholders throughout Project development. • Be updated to adapt to the changing needs of the community and engagement intentions across each phase of the Project. • Be updated in partnership with local community stakeholder and economic partners. • Have mechanisms and guidance for providing Project updates at key Project milestones. • Facilitate ongoing communication with host and proximal landholders to provide project updates, feedback and to identify construction access points and enable landholders to effectively plan stock movements and farming activities.	Throughout
S-05	Implement a Community Benefit Fund (CBF) in consultation with RVC. The CBF will have a value of $850/MW installed/year over the lifetime of the project (**Section 2.7.3**).	Throughout
S-06	Continue collaboration with the community, community service providers and other proximal renewable energy developers to understand evolving needs and to ensure coordination in community investment opportunities beyond the CBF.	Throughout
S-07	Prior to communicating with stakeholders, consider consultation fatigue in light of stakeholder communication from nearby renewable energy projects.	Throughout

6.4 Bushfire

A Bushfire Threat Assessment (BTA) (see **Appendix 8**) was undertaken by Blackash Bushfire Consulting (BBC, 2024) to describe the bushfire risks to the Project. This section outlines the key findings of the BTA, the potential bushfire risks of the Project and proposed mitigation and management measures.

The BTA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with:

- DPE's Large-Scale Solar Energy Guideline (2022).
- EP&A Act: Section 10.3 Bushfire Prone Land.
- *Rural Fires Act 1997*.
- NSW Rural Fire Service (RFS) document Planning for Bushfire Protection (PBP).
- Standards for Asset Protection Zones NSW Rural Fire Service (2006).
- ISSC 20 – Guideline for the Management of Activities Within Electricity Easements and Close to Electricity Infrastructure (September 2012).

6.4.1 Existing Environment

The Project Area is located within the Northern Rivers Bushfire Management Committee (BFMC) area. The Project Area and surrounding land is identified as bushfire prone land by the NSW Rural Fire Service (RFS) bushfire prone land mapping as shown in **Figure 6.3**. The topography of the Project Area generally slopes to the south-east towards Physics Creek with ridgelines to the southwest, west, north, and east of the site.

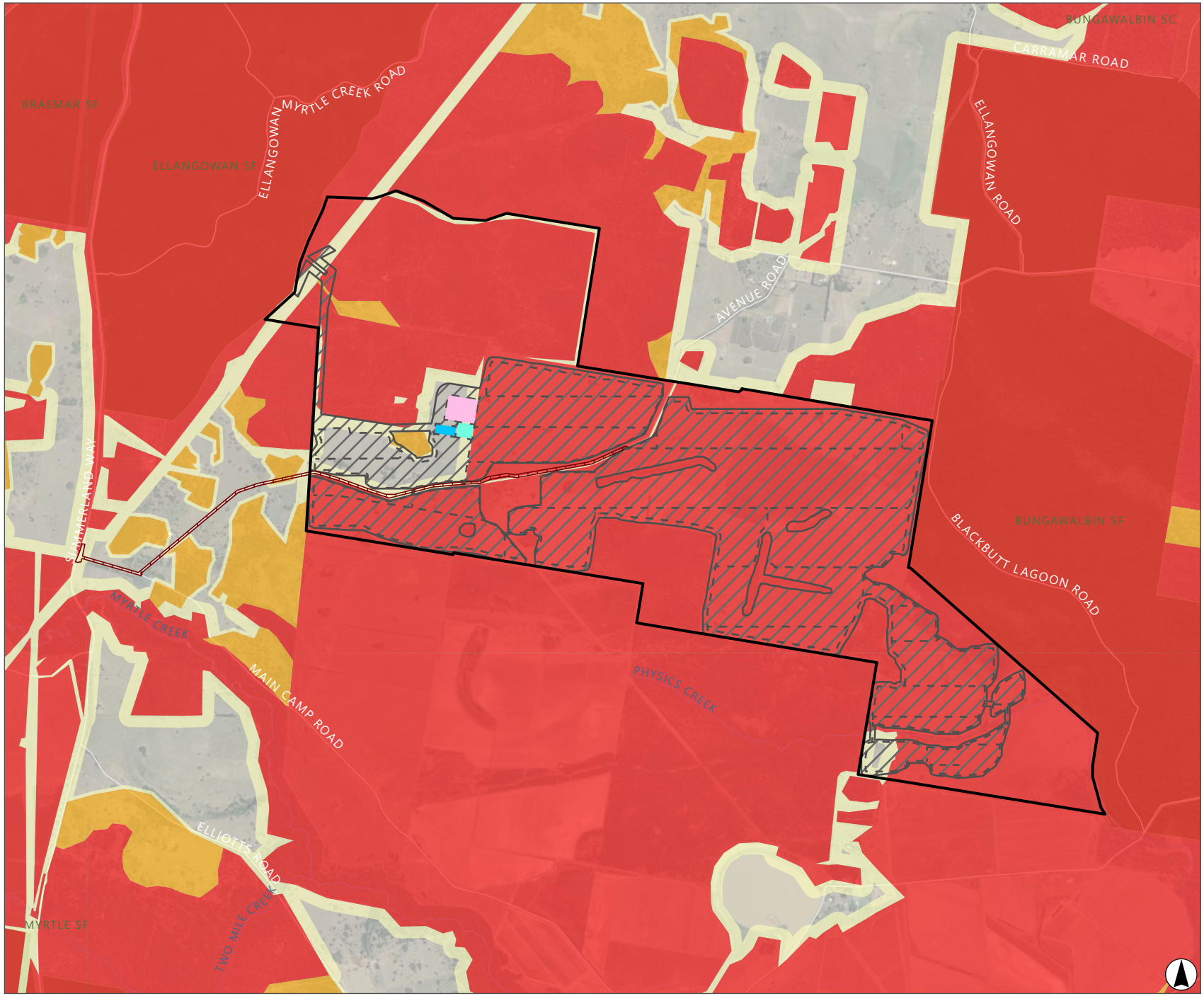


FIGURE 6.3

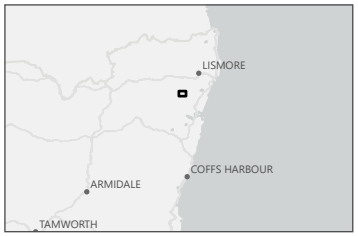
Bush Fire Prone Lands

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Access Tracks
- Substation
- Switching Subsation
- BESS
- NPWS Reserve
- State Forest
- Roads
- Watercourse

NSW Bush Fire Prone Lands

- 0
- 1
- 2



0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

The region and the surrounding locality of the Project Area has a history of bushfires. Drought and prevailing south-west to north-west winds through the winter-spring period have contributed to a pattern of serious bushfires occurring in spring within the Richmond Valley LGA. Typically, the bushfire danger period ends in February due to high rainfall that occurs in the late summer months. Fire seasons are extended when summer rainfall is lower than normal, leading to some fire seasons ending in Autumn.

While the Development Footprint has been highly disturbed by historical land clearing for pastural and agricultural practices dense vegetation is located to the north, west and south comprising Clarence Dry Sclerophyll Forest and low lying regions of the site to the south-east featuring coastal swamp forest with areas of coastal floodplain wetlands (Figure 25 of the BTA).

6.4.1.1 Bushfire History

The Project Area has a documented history of bushfires. The Northern Rivers BFMC area has approximately 120 bushfires per year, of which 7 on average are considered to be major fires (Norther Rvers BFMC, 2021).

The ignition of bushfires across the Northern Rivers BFMC has generally been linked to:

- pre-bushfire danger period burns
- illegal burning off
- arson
- escapes from legal burning off
- lightning.

The most significant bushfires the region has seen in recent years were the Busbys Flat Road Fire and Myall Creek Road Fire in October 2019 which together impacted nearly 48% of the Richmond Valley LGA and destroyed 62 homes within the LGA (Richmond Valley Council, 2020). The Northern Rivers (along with most of NSW) was severely drought affected at the time and subtropical rainforests in the region were also impacted by the fire event.

The RVCLSPS identifies the need to prepare a bushfire recovery Master Plan for Rappville aimed at leveraging government funding to provide key social and community bushfire protection measures and additional bushfire infrastructure.

Recent bushfires and bushfire history of the area have informed the assessment of fire risk associated with the Project.

6.4.2 Methodology

The BTA was prepared in accordance with Planning for PBP 2019 and the SEARs, including an assessment of potential bushfire hazards applicable to the Project Area and the proposed bushfire management for the Project.

The BTA utilised a Landscape Scale Bushfire Assessment Tool (LSAT) to assess the landscape scale potential of bushfire affecting the Project Area. This is a framework detailed within the Victorian Planning Permit Applications Bushfire Management Overlay. The priority of life, safety and the criticality of bushfire emergency management and evacuation planning were emphasised in the assessment of bushfire risk.

Appendix 8 provides a detailed description of the assessment methods undertaken to complete the BTA. An overview of the methodology for the BTA included although was not limited to:

- Desktop review and analysis of publicly available data to determine BPL within the Project Area, existing climatic conditions, vegetation classification within and surrounding the Project Area, the topography of the Project Area and the existing waterways present within and surrounding the Project Area.
- A review of the documented historic fire events that have taken place within and surrounding the Project Area.
- A Landscape Scale Threat Assessment to assess the broader landscape scale potential of bushfire affecting the Project Area.
- An assessment of the bushfire hazard based upon the vegetation formations (bushfire fuels), the topography (effective slope) and the designated fire weather FBI was undertaken to determine the bushfire threat that may affect bushfire behaviour within the Project Area.
- A slope assessment based on topography and vegetation cover to determine the BAL rating within and surrounding the Project Area.
- A BAL assessment was undertaken based upon the Project design and assumption that all vegetation within the Development Footprint will be managed as an APZ, unless specified otherwise.
- Recommendations for appropriate measures to mitigate the impacts of construction, operation and decommissioning on bushfire threat.

6.4.2.1 Site Visit and Consultation

A key component of the assessment methodology for the BTA was consultation with the community and key agencies to identify potential bushfire hazards and assessment expectations of these groups.

Consultation with the local community during Project information sessions was undertaken in September 2023 and February 2024 and identified a number of factors based on lived experience of recent bushfire events for integration into the BTA and for consideration in the mitigation of bushfire risk. The key concerns and perspectives posed by the community during this session included:

- Concern regarding the proximity of the Project Area to Ellangowan State Forest and Bungawalbin State Forest.
- Request for the establishment of appropriate APZ and setbacks from nearby vegetation.
- The potential fire risk posed by the presence of a large-scale BESS.
- Concern that the local RFS did not have the capacity to manage a fire generated by a large-scale BESS.

Additionally, meetings with the NSW RFS (September 2023) and FR NSW (July 2023) were held to integrate their perspectives and experiences into the BTA and Project design. This is further discussed in **Section 5.7**.

A site inspection conducted in February 2024 was undertaken from public viewpoints to confirm and build on the findings of the desktop assessment. These findings were integrated into the BTA and informed the design of the Project and mitigation measures recommended in **Section 6.4.4**.

6.4.3 Impact Assessment

6.4.3.1 Bushfire Risk Posed by the Project

Construction and operational activities carry the inherent risk of on-site ignition, which could lead to fire spreading to vegetation within or adjacent to the Project Area. These risks primarily stem from activities such as hot work, vegetation clearance and management as well as the operation of vehicles on-site. Hot work, defined as tasks involving high temperatures and fire risk work, which encompasses activities with heat or spark generation potential, pose ignition hazards.

The potential impact of bushfire stemming from the Project to nearby vegetation could result in an uncontrolled bushfire impacting nearby dwellings, property, roads and public infrastructure. A key determining factor in assessing the potential for a bushfire to be caused by onsite ignition is the distance from construction and operational activities to unmanaged vegetation. Due to the considerable APZ which places sensitive infrastructure such as the switching substation 50 m from the uncontrolled vegetation and the BESS and substation at least 100 m from uncontrolled vegetation, the risk associated with these assets is greatly reduced when compared to industry requirements.

The single-axis tracking frames of the solar arrays, constructed from heavy-duty steel, are likely to resist fires and prevent the spread of internal electrical sparks beyond the immediate area of the fault. Vegetation underneath the arrays and within the Development Footprint will be managed grassland, meeting the required standards for an APZ.

The substation and switching substation will adhere to industry-standard design, utilising established setback distances and be surrounded by gravel hardstands. Similarly, the BESS will have a setback of 100 m on the northern and western sides closest to existing vegetation, along with non-combustible hardstand areas approximately 20 m wide around the BESS. These hardstand areas and the large APZ distances will facilitate construction and maintenance and provide access for fire suppression in case of electrical faults. This layout significantly reduces the risk of fire spreading into bushland from the BESS or substation and switching substation and offers ample space for firefighting operations.

A biodiversity corridor is proposed along the northern boundary of the Project Area which has been suggested by community members could increase the risk of bushfire due to connectivity and increased fuel loads. The APZ proposed along the northern boundary has been designed with consideration of the additional vegetation added by the biodiversity corridor. The APZ between the biodiversity corridor and Project infrastructure exceeds all guidelines and requirements including PBP.

Through the appropriate design considerations, development and implementation of bushfire management measures and identified hazard safeguards and controls (See **Section 6.4.4**), it is considered that potential hazards associated with the Project and its influence on bushfire, can be appropriately managed.

6.4.3.2 Bushfire Risk Posed to the Project

The threat to the Project, associated infrastructure and workforce as a consequence of a bushfire encroaching onto the site was assessed as part of the BTA. The impact of a bushfire to the Project could include damage to infrastructure and assets, pose a risk to the workforce and or interrupt or pause operation of the Project and subsequently disrupt supply to the NEM.

The LSAT is designed to rate a project on the basis of safety for residential purposes and rates the Project Area as high landscape scale bushfire risk. It should be noted that the land use proposed for the development does not directly align with the use case for the LSAT although this assessment provides a tool in assessing the suitability of the Project Area.

As the Project is located on BPL (**Figure 6.3**) a consideration of the vegetation structure and slope are used to determine the BAL rating which indicates the Projects' potential exposure to ember attack, radiant heat and direct flame contact. The BAL assessment has been completed based on the current design of the Project noting that vegetation within the Development Footprint will be managed as an APZ, except where vegetation has been shown to be retained. More than 90% of infrastructure with the Development Footprint will be more than 100 m from vegetation. The single axis tracking arrays will be constructed with steel and be highly resistant to bushfire attack. Therefore, this infrastructure will be located outside of BPL.

Additionally, the 10% of solar infrastructure that is located less than 100 m from vegetation has been designed to meet the BAL-19 standard, unless there are low risk components which are required within a higher BAL due to Project operational constraints. BAL-19 is considered moderate risk with the main bushfire impact being from embers which are unlikely to be a risk to the solar infrastructure.

The construction of the substation will include gravel hardstand surrounding the perimeter which will act as a fire break in the event of a bushfire impacting the site. Similarly, the BESS has been designed with 100 m setback from the nearest vegetation placing the infrastructure outside of BPL. The conservative design of the APZ and associated BAL have placed sensitive infrastructure such as the BESS, substation, switching substation, transmission line and O&M facility within moderate to low risk bushfire threat zones.

6.4.3.3 Occupational Fire Risk

Bushfire and heat exposure risk associated with the site presents a risk to the construction and operational workforce within the Project Area. High risk activities include vegetation clearing, hot works and conducting work on days with an extreme or greater Fire Behaviour Index (FBI). The remote location of the site presents an additional risk factor due to increased emergency response times in the event of an incident. Such risk to occupational health will be mitigated and considerably reduced through the measures detailed in **Section 6.4.4**.

6.4.3.4 Disruption to Power Supply

An uncontrolled bushfire poses a risk to the Project, related infrastructure and electrical infrastructure supplied to the local community. The fire could damage or destroy essential facilities to such a degree that it could lead to disruptions in power transmission and trigger power failures. Such risk will be mitigated and considerably reduced through the measures detailed in **Section 6.4.4**.

6.4.4 Mitigation Measures

Table 6.5 Bushfire Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase

B-01	Prior to commencing construction, a Fire Safety Study will be developed in consultation with FRNSW. The study will:
	• be consistent with the Department's Hazardous Industry Planning Advisory Paper No. 2 'Fire Safety Study' guideline
	• describe the final design of the battery storage facility
	• include reasonable worst-case bush fire scenario/s to and from the battery storage and the associated bush fire management
	• identify measures to eliminate the expansion of any fire incident including:
	  ○ adequate fire safety systems and appropriate water supply
	  ○ separation and / or compartmentalisation of battery units
	  ○ strategies and incident control measures specific to the battery storage design.
		Pre-construction

B-02	The Project will be designed in accordance with PBP and the Australian Standards for Construction of Buildings in Bushfire Prone Areas (AS3959). The Project will be constructed in accordance with Australian Building standards to ensure electrical equipment is not installed incorrectly resulting in an ignition site. The Development Footprint will be maintained to the standard of an Inner Protection Area (IPA) in accordance with the NSW RFS Standards for APZ and Appendix 4 of PBP.	Pre-construction
B-03	An ERP will be developed prior to the commencement of construction and will contain measures to manage bushfire risk in accordance with the NSW Rural Fire Service Guide to Developing a Bushfire Emergency Management Plan (NSW RFS, 2014). The plan will: • outline the strategies to exclude workers to the effect of potential bushfire attack • eliminating workforce exposure to bushfire threat • Identify management systems to forecast bushfire threat, and • provide the Project will the optimal evacuation route from site.	Pre-construction
B-04	Bush fire emergency management and operations strategies will be contained within the ERP and will be delivered post approval, addressing fire prevention measures, equipment availability, and appropriate emergency planning.	Pre-construction
B-05	In accordance with the *Rural Fires Act 1997* – Section 99, total restriction of hot works on any day declared to be a Total Fire Ban (TOBAN) will be applied to the Project to address the potential impacts associated with onsite ignition. Essential works may be completed during a TOBAN if works are compliant with the Hot Work and Fire Risk Work procedure and any exemption provided by the NSW RFS.	Construction

ID	Mitigation and Management Measure	Phase
B-06	The Development Footprint will be appropriately maintained over the life of the Project and all vegetation maintenance and management will be undertaken in accordance with relevant requirements set out in the proposed Emergency Response Plan.	Operation
B-07	An appropriate dedicated water supply for bushfire protection will be provided. Water supply for the Project would likely be sourced from commercial suppliers in the nearby region (via water trucks), rainwater collected from onsite rainwater tanks (at O&M facility) and farm dams within the Project Area (subject to availability).	Throughout

6.4.4.1 Community Safeguards and Project Resilience

Additional measures have been identified that would benefit the Project and community beyond the legislative requirements. These have been identified in response to consultation with the community and Ark Energy's desire to operate the Project with a conservative approach to bushfire protection.

Additional measures being taken by Ark Energy to increase community safety and provide additional safeguards to Project infrastructure will be further explored in the Fire Safety Study and the bushfire emergency management and operations strategies within the ERP. These plans will be developed post approval under the conditions of consent. Provisionally, these measures could include:

- Opportunities to develop the Project Area as an RFS "Neighbourhood Safer Place" as the nearest alternative options are at Whiporie (23 km to the south) and Casino (36 km to the north).
- Additional access to water may be provided on site that can be accessed by fire fighters for use in managing bushfire both within the Project Area and within surrounding land. The opportunity may benefit the local community as the provision of additional water may be used for non-bushfire related house and shed fires. This opportunity will align the Project with the objectives of the Static Water Supply (SWS) program aimed at providing pre-identified sources of firefighting water for RFS operations.
- The Project will provide the region with additional early bushfire detection systems that will be in place for the benefit of infrastructure protection, workforce safety and the local community asset protection. This will include first response firefighting capability including suitable vehicles, equipment and training for staff during all phases of the Project.
- The PBP 2019 requires a minimum of 10 m APZ which is significantly exceeded across the Project, in particular in the northwest corner of the site which includes the BESS, substations and transmission lines. The BESS will be setback more than 100 m from vegetation which will place the infrastructure in BAL-Low zone. The APZ on the western side of the switching substation will position this infrastructure within BAL 19 and the substation will wholly be located in BAL-Low beyond 100 m from the security fence.

Management and mitigation measures will be implemented to address key bushfire associated with the Project as detailed in **Table 6.5**.

6.5 Water

An assessment of the potential impacts of the Project on surface water supply and groundwater was undertaken by Umwelt.

The assessment of surface and groundwater water impacts was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with:

- DPE's Large-Scale Solar Energy Guideline (2022).
- DPI Guidelines for Controlled Activities on Waterfront Land (2018).
- Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).
- Policy & Guidelines for Fish Habitat Conservation & Management (DPI, 2013).
- Managing Urban Stormwater: Soils & Construction (Landcom, 2004).

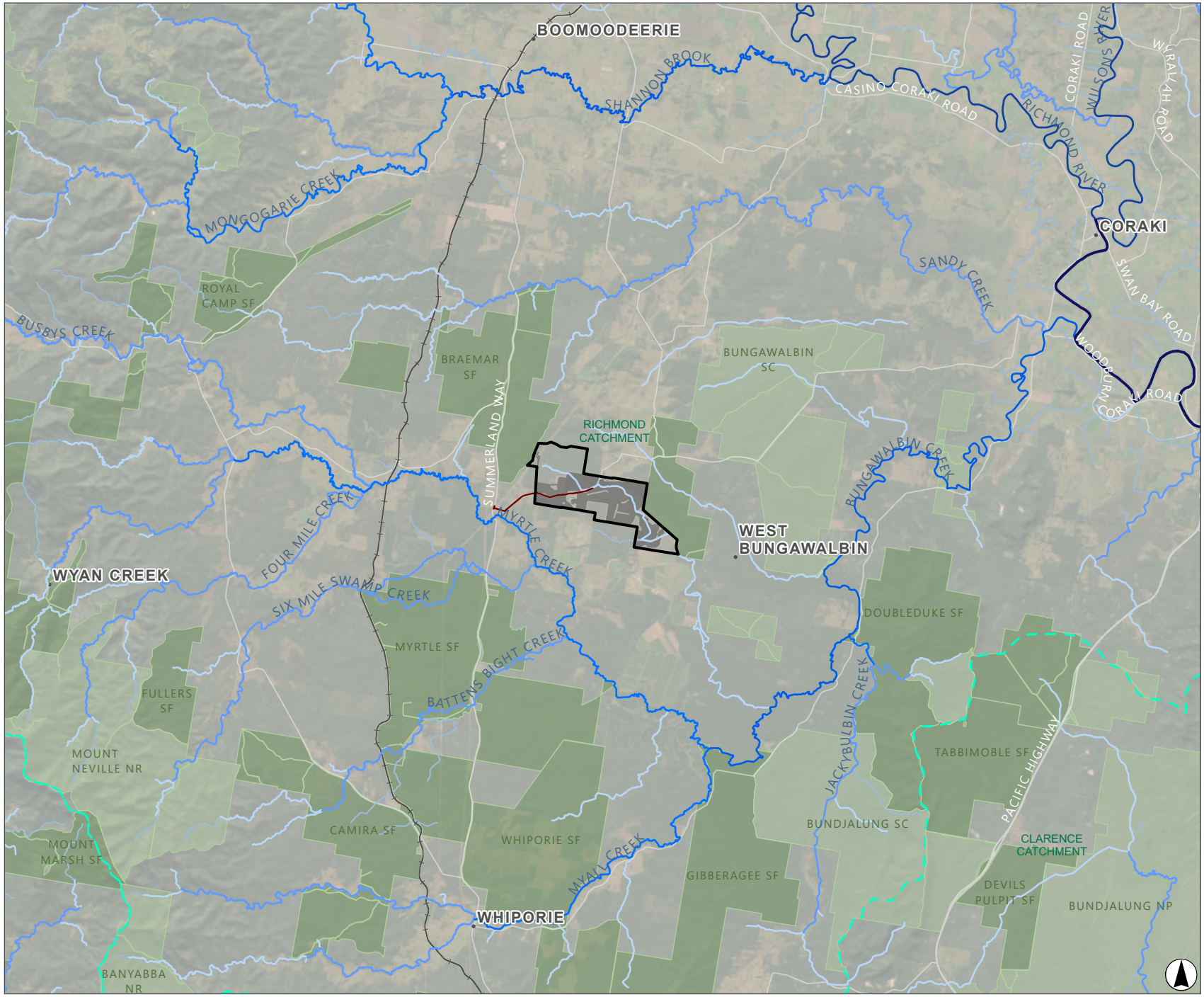
6.5.1 Existing Environment

The Project is located in the Richmond River basin, which includes local catchments of Myrtle Creek and Two Mile Creek to the southeast of the Project Area, and Bungawalbin Creek and Lower Bungawalbin Wetlands to the east.

All watercourses in the Project Area flow to the Richmond River as outlined in **Figure 6.4**. The majority of the hydro lines in the Project Area are 1st and 2nd order Strahler streams, with a mapped 4th order Strahler stream intersecting the northern portion of the Project Area, traversing southeast through the Development Footprint before draining into Physics Creek in the south-eastern portion of the Project Area (**Figure 6.5**).

FIGURE 6.4

Regional Hydrological Context



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- NPWS Reserve
- State Forest
- Water Catchments
- Roads
- Watercourse
- Railway

Strahler Stream Order

- 4
- 5
- 6
- 7
- 8
- 9

0 2.5 5

Kilometers

Scale 1:250,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

Physics Creek is a 3rd order Strahler stream which traverses the lower floodplain area in the south-east of the Project Area and incorporates some low-lying wetland areas. At the confluence of Physics Creek and an unnamed 4th order Strahler stream, Physics Creek is then classified as a 4th order Strahler stream. The total area within the Project Area made up by the various classifications of hydro lines is provided below:

- 1st and 2nd order hydro lines accounts 115.62 ha or 7.84% of the Project Area
- 3rd order hydro lines accounts for 17.0 ha or 1.16% of the Project Area
- 4th order watercourse accounts for 97.84 ha or 6.64% of the Project Area.

These calculations were based upon a predictive model used to identify likely areas for Aboriginal site locations (see **Appendix 15**). This includes stream channels and a 50 m corridor of land adjacent to hydro lines. The identified hydro lines and their corresponding mapped Strahler stream order are provided in **Figure 6.5**.

According to the Richmond Valley LEP (2012), Physics Creek is identified as Key Fish Habitat as well as a portion of land in the northern-western part of the Project Area beyond the proposed Development Footprint.

Groundwater within the Project Area is managed under the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources (DPIE, 2023). A search of publicly available bore data from the Australian Groundwater Explorer (BOM, 2024) on 10 April 2024, identified 15 registered groundwater bores within 2 km of the Project Area. Drill depths for these bores range from 6 m–102 m. Two monitoring bores are drilled to a depth of 6 m and are 63.2 m and 1.0 km from the Project Area as detailed in **Table 6.6**.

Figure 6.5 identifies the location of each groundwater bore within 2 km of the Project Area.

Table 6.6 Groundwater Bore Depth within 2 km of the Project Area

Bore ID	Bore Depth (m)	Drilled Date	Purpose	Distance (approximate) to the Project Area (m)
Private Bore on Lot 48 / DP 755607	80	Unknown	Water Supply	Within Development Footprint
Private Bore on Lot 57 / DP 755607	40	Unknown	Water Supply	Within 200 m of the Development Footprint
GW306605.1.1	102	2010-02-20	Water Supply	571.4
GW073358.1.1	21	1994-02-01	Water Supply	64.3
GW039170.1.1	17	1977-01-05	Water Supply	1966.4
GW300918.1.1	6	1995-09-23	Monitoring	63.2
GW073357.1.1	18	1994-01-25	Water Supply	47.5
GW073356.1.1	29	1994-02-02	Water Supply	878.0
GW300927.1.1	28	1995-09-30	Irrigation	490.8
GW306606.1.1	102	2010-02-22	Water Supply	989.7
GW300925.1.1	25	1995-08-18	Irrigation	1295.4
GW059097.1.1	Unknown	1981-07-01	Irrigation	1172.5
GW300924.1.1	18	1995-08-12	Irrigation	590.9

Bore ID	Bore Depth (m)	Drilled Date	Purpose	Distance (approximate) to the Project Area (m)
GW300911.1.1	11	1995-09-25	Monitoring	765.2
GW300919.1.1	6	1995-09-22	Monitoring	1011.8
GW300926.1.1	29	1995-09-18	Irrigation	831.2
GW300917.1.1	27	1995-09-23	Monitoring	914.6

Ark Energy commissioned CMW (2024) to undertake preliminary geotechnical investigations across the Project Area. Groundwater was encountered during test pit investigation within the south-eastern section of the Project Area at a depth of between 1.6 m and 2.9 m. Additionally, monitoring groundwater boreholes GW300919.1.1 and GW300918.1.1 located 1011.8 m and 63.2 m respectively from the Development Footprint were installed to a depth of 6 m. Additional investigations will be undertaken during detailed design to verify the depth of groundwater and avoid ground disturbance and excavation intercepting groundwater.

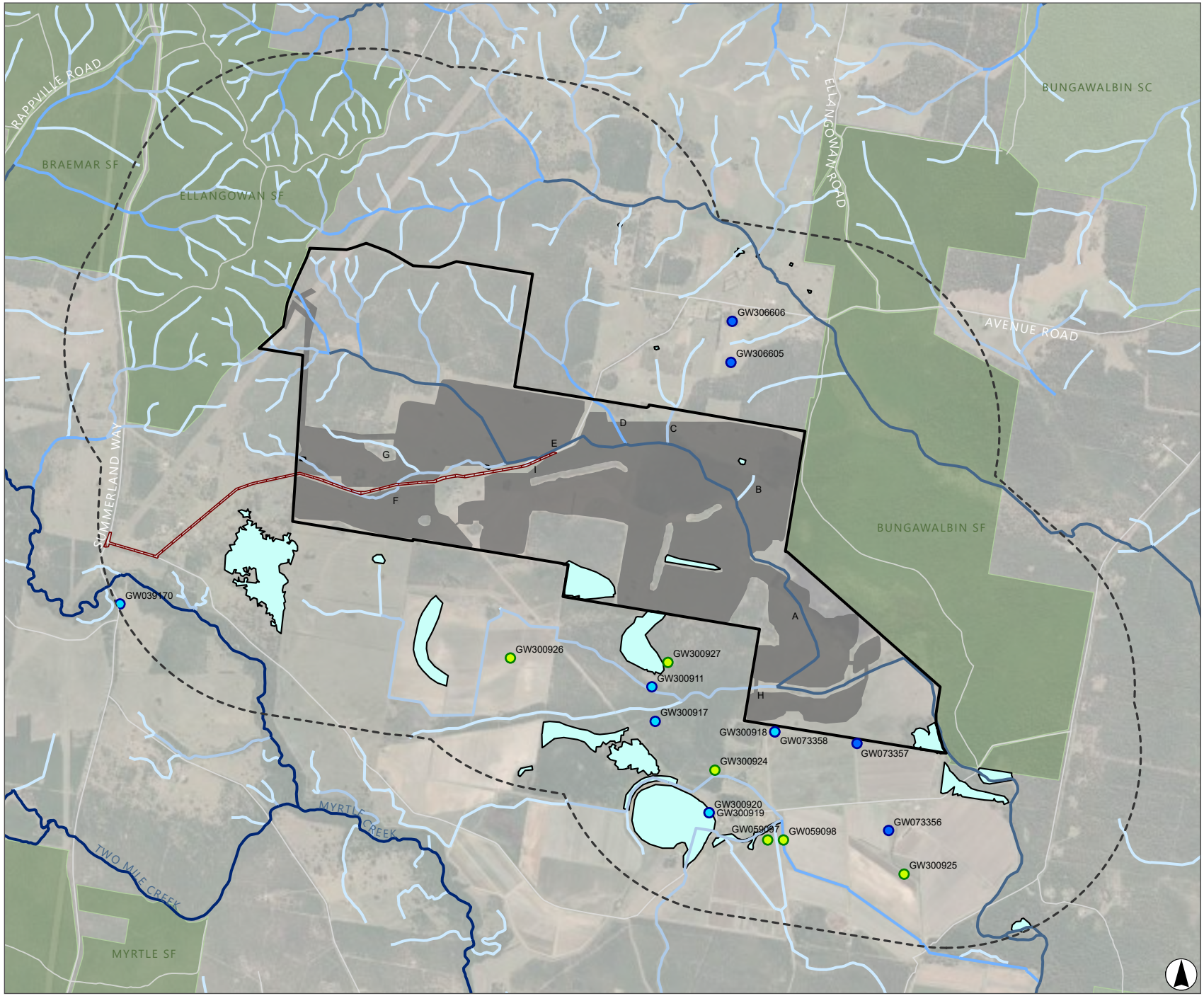


FIGURE 6.5

Local Hydrology and Groundwater

Legend

- Project Area
- 2km Buffer
- Development Footprint
- Road Upgrade Area
- NPWS Reserve
- State Forest
- Wetlands (Richmond Valley LEP)
- Roads
- Watercourse

Bores (including bore ID)

- Water Supply
- Monitoring
- Irrigation

Strahler Stream Order

- 1
- 2
- 3
- 4
- 5+

0 1 2

Kilometers

Scale 1:55,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

The Project Area is not identified as having groundwater vulnerability according to the Richmond Valley LEP (Richmond Valley Council, 2012).

The Project Area does not contain nationally important wetlands although sections of the Lower Bungawalbin Catchment Wetland Complex are located approximately 5.5 km south-east of the Project Area. The Project Area lies approximately 161.6 km to the north-east of the Ramsar wetland Little Llangothlin Nature Reserve.

Land within the south-eastern portion and land within the central portion of the Project Area are defined as wetland within the Richmond Valley LEP (Richmond Valley Council, 2012). Land designated as wetland within the Richmond Valley LEP contains existing remnant vegetation and has been excluded from the Development Footprint as detailed in **Figure 6.5**.

6.5.2 Methodology

The methodology for assessment of potential impacts on surface water quality, waterfront land and groundwater included:

- Desktop review and analysis of existing surface water quality information including identifying the watercourses and hydro lines present within the Project Area.
- Synthesise field observations from various disciplines to provide ground truthing of mapped watercourses.
- A qualitative assessment of the quality and quantity of pollutants that may be introduced during construction and operation of the Project, and the impact that this may have on surface water quality.
- Recommendations for appropriate treatment measures to mitigate the impacts of construction and operation on surface water quality.
- Review existing exclusion zones and design refinements in line with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).
- A desktop study of existing hydrogeological conditions at the Project Area including:
    - Description of aquifers, depth to groundwater, groundwater quality and groundwater flow directions.
    - Existing groundwater users, groundwater dependent ecosystems and groundwater-surface water interaction.
    - Review of relevant previous investigations including a geotechnical assessment was undertaken by CMW Geosciences (CMW) on behalf of Ark Energy (CMW Geosciences, 2024).
    - Review of relevant previous investigations including a geotechnical assessment was undertaken by CMW Geosciences (CMW) on behalf of Ark Energy (CMW Geosciences, 2024).A bore review was undertaken to confirm the location of the bores, depths and use.
    - Assessed any potential dewatering requirements and associated drawdown impacts.

6.5.3 Assessment of impacts

6.5.3.1 Surface Water Quality

Water quality impacts are most likely to be experienced during construction and decommissioning of the Project, when soils would be subject to disturbance due to vegetation removal, excavation works and stockpiling of materials, which can potentially lead to sediments and/or pollutants mobilising in runoff and entering local waterways and hydro lines. The key factor influencing the extent of sediment runoff and stormwater pollution is likely to be weather events. The occurrence of a major storm event at a critical phase of the construction period could potentially result in higher levels of turbid runoff. With the implementation of erosion and sediment control measures (outlined in **Section 6.5.4**) potential construction-related erosion and sedimentation impacts would be appropriately managed and are expected to be minor.

Water quality impacts during the operational phase are expected to be minimal as the day-to-day activities during this phase would be limited to routine maintenance and monitoring. There is potential however for stormwater runoff from impervious surfaces, accidental spills or discharge through the use and storage of chemicals such as fuel as well as the use of herbicides for vegetation control. With the implementation of operational management measures outlined in **Section 6.5.4** water quality impacts are expected to be negligible.

Road upgrades along Avenue Road, Main Camp Road and the intersection of Main Camp Road and Summerland Way are expected to have minimal impacts during construction through the implementation of erosion and sediment control measures. Additionally, road upgrades include the design of appropriate erosion and scour protection reducing potential construction-related erosion and sedimentation impacts to a minimum. These upgrades will include two culverts across a 2nd order Strahler stream identified in **Figure 6.5** along Avenue Road. The potential operational impacts are mitigated through detailed design being undertaken in line with relevant guidelines prior to any works commencing. With the implementation of management measures outlined in **Section 6.5.4** water quality impacts from road upgrades are expected to be minimal.

6.5.3.2 Impact on Stream Stability and Waterfront Land

There are several ephemeral and perennial hydro lines that traverse the Development Footprint as detailed in **Figure 6.5**. Additional investigation of these hydro lines during site inspections undertaken by numerous specialists supporting the EIS and analysis of aerial imagery determined that many of the mapped hydro lines presented in **Figure 6.5** and **Table 6.7** do not have a defined bed or bank. **Table 6.7** details the current hydro lines and their associated Strahler stream order as well as observations made during site inspections and assessment of aerial imagery.

Table 6.7 Ground Truthed Project Hydro Lines

Hydro line	Mapped Strahler stream Order	Ground truthing observations
Physics Creek	3rd and 4th	A perennial stream identified as Key Fish Habitat with a defined bank and bed.
Unnamed tributary of Physics Creek (a) (see Photo 6.1).	4th	No identified bank or bed as determined through aerial mapping and site inspection.
Unnamed tributary of Physics Creek (b)	2nd	No identified bank or bed as determined through aerial mapping and site inspection.
Unnamed tributary of Physics Creek (c)	2nd	No identified bank or bed as determined through aerial mapping and site inspection.
Unnamed tributary of Physics Creek (d)	3rd	No identified bank or bed as determined through aerial mapping and site inspection.
Unnamed tributary of Physics Creek (e)	2nd	No identified bank or bed as determined through aerial mapping and site inspection.
Unnamed tributary of Physics Creek (f)	1st	No identified bank or bed as determined through aerial mapping and site inspection.

Project construction will impact the unnamed tributaries identified in **Table 6.7** however as they do not have a defined channel with bed and banks, these tributaries do not meet the definition of waterfront land for the purposes of the WM Act (2000). The classification of these hydro lines is subject to change and as such, each hydro line will be verified prior to construction as detailed in **Section 6.5.4**.

Physics Creek is identified as a perennial 3rd and 4th order stream which was observed to have defined bed and banks. As such a 40 m exclusion zone from the highest bank has been incorporated into the design of the Development Footprint. Two access tracks are proposed across Physics Creek which will interact with the 3rd and 4th order Strahler Stream. All construction works taking place within the exclusion zone will be completed in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).

Photo 6.1 Unnamed Tributary of Physics Creek (a)

6.5.3.3 Water Supply Impacts

Water for construction would be sourced from commercial suppliers in the region (via water trucks). Farm dams within the Development Footprint will be removed and the water will be used for earthworks during the site preparation phase of construction. Water sources would be determined prior to the commencement of construction in consultation with suppliers and landholders, subject to availability. A water sourcing strategy would be developed to ensure there are no water supply impacts to adjacent landowners or other stakeholders.

As detailed in **Section 3.7.1**, anticipated water demands are 246 ML of non-potable and 7 ML of potable for the construction and decommissioning periods (equivalent to 130 ML per annum) and 109 ML for the operational period (equivalent to 3.6 ML per annum). Due to the low volumes of water required it is anticipated that the Project would not have a negative impact on water supply in the region.

During operations, a minimal water demand would be required for ongoing maintenance activities washing PV panels, amenities, and potable purposes by operational staff as well as for stock. Operational water will be stored on site, separate to water supplies for the purposes of firefighting. Potable water demands for both the construction and operational phases of the Project will be primarily sourced from rainfall stored in on-site water tanks at the O&M facility and augmented by water trucks if required.

6.5.3.4 Groundwater Impacts

It is anticipated that the Project will have negligible interaction with groundwater based on the extent of ground disturbance, depth of post holes for solar arrays and the features of the existing environment including the depth of nearby boreholes. The construction depths required for the Project are:

- Approximately 3 m for the solar arrays.
- Approximately 1 m for the BESS in the western portion of the Development Footprint.
- Approximately 1.5 m for the O&M facility in the western portion of the Development Footprint.

As detailed in **Section 6.5.1**, groundwater was identified at a depth of between 1.6 m and 2.9 m during test pit investigation within the south-eastern section of the Project Area. Additional assessment will be undertaken prior to construction noting any potential interactions with groundwater can be managed through the measures proposed in **Section 6.5.4**. Groundwater is not proposed to be used to supply water to the Project and the depth to groundwater within the Project Area (based on available information) means that groundwater quality impacts are also unlikely. Additionally, given the depth to groundwater within the Project Area, hydrocarbon/chemical spills are unlikely to infiltrate to the groundwater table.

Assessment of the potential for the Subject Land to support GDEs was undertaken using the Australian Government's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM 2019). There are no aquatic Groundwater Dependant Ecosystems (GDEs) within the Project Area although there is high potential terrestrial GDEs identified that are not considered restricted or located within aquifers. Furthermore, land mapped within the far south-eastern portion of the Project Area as high potential GDE has generally been avoided with only 1.2 ha located within the Development Footprint. Two stream crossings are required which will be managed in accordance with the measures proposed in **Section 6.5.4**.

Should the final Project design identify that construction activities will result in the interception of the groundwater, further assessment will be undertaken in accordance with the *NSW Aquifer Interference Policy* (NSW Government, 2012) and appropriate management measures developed to mitigate any potential impacts.

There will be no impacts to groundwater resources, including GDEs and bore users, during operation on the basis that the groundwater table will not be intercepted.

6.5.3.5 Cumulative Water Impacts

Cumulative impacts are considered to be negligible as nearby proposed renewable projects do not present significant additional risk to groundwater, stream stability or surface water quality.

Summerville Solar Farm is located to the western side of Summerland Way on a natural crest which runs north-south. The rise in the landscape separates the local drainage catchment of the Project and Summerville Solar Farm. Myrtle Creek Solar Farm proposed south of the Project and within the same local catchment zone and includes 1st and 2nd order tributaries of Physics Creek.

It is considered that the mitigation and management measures identified for each individual project are sufficient to reduce potential for cumulative surface water or groundwater impacts.

6.5.4 Mitigation and Management Measures

The following mitigation and management measures are recommended to minimise water impacts during construction and/or operation of the Project:

Table 6.8 Water Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
WT-01	Water sources for the construction of the Project will be confirmed during the detailed design phase and in consultation with suppliers and landholders and be subject to availability.	Pre-construction
WT-02	The presence and current conditions of 3rd and 4th order stream waterways within the Project Area will be verified and where feasible, 40 buffers will be applied in accordance with DPI Guidelines for Controlled Activities on Waterfront Land (2018) and Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI, 2003).	Pre-construction

WT-03	A Construction Soil and Water Management Plan (CSWMP) will be included as a part of the CEMP and be prepared to outline measures to manage soil and water impacts associated with the construction works, including contaminated land. The CSWMP will provide:
	• Measures to minimise/manage erosion and sediment transport both within the Development Footprint and offsite including requirements for the preparation of erosion and sediment control plans (ESCP) for all progressive stages of construction, Measures to manage waste including the classification and handling of spoil.
	• Procedures to manage unexpected, contaminated finds.
	• Measures to manage stockpiles including locations, separation of waste types, sediment controls and stabilisation.
	• Measures to manage accidental spills including the requirement to maintain materials such as spill kits.
	• Measures and methods to describe the dewatering procedure in the event that the construction activities interact with the ground water.
	• Establish responsibilities and water requirements.
	• Establish surface water quantity and quality reporting requirements.
	• Controls for receiving waterways may include:
	  ○ Designation of 'no go' zones for construction plant and equipment.
	  ○ Creation of catch/diversion drains and sediment fences at the downstream boundary of construction activities where practicable to support containment of sediment-laden runoff.
	• Erosion and sediment control measures will be implemented and maintained at all work site in accordance with the principles and requirements in Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (NSW Department of Environment, Climate Change and Water 2008b), commonly referred to as the "Blue Book".
		Construction

ID	Mitigation and Management Measure	Phase
WT-04	Box culvert crossings to enable access over Physics Creek will be designed and constructed in compliance with DPI Water Guidelines, including: • 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).	Construction
WT-05	Post-construction, disturbed areas will be stabilised by the establishment and maintenance of a vegetated ground cover consisting of low-growing grasses.	Operation
WT-06	Water sources for the operation of the Project will be confirmed during the detailed design phase and in consultation with suppliers and landholders and be subject to availability.	Operation
WT-07	An OEMP will be developed for the Project to address potentially adverse impacts on the receiving environment surface water quality during the operational phase. This will include the development and appropriate maintenance of suitable ground cover around solar panels, and grassed table drains near access tracks to minimize the potential for erosion and export of sediment. Additional measures for the treatment of stormwater quality are not considered necessary.	Operation

6.6 Flooding

A Flood Impact Assessment (FIA) (2024) (see **Appendix 9**) was undertaken by Arcadis Australia Pacific Pty Limited (Arcadis) to assess potential flood impacts associated with the Project. This section outlines the key flood risks, the key and proposed mitigation and management measures.

The FIA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with DPE's Large-Scale Solar Energy Guideline (2022) and the latest Australian Rainfall and Runoff 2019 Guidelines.

6.6.1 Existing Environment

The Project is located in the Richmond River basin, which includes local catchments of Myrtle Creek and Two Mile Creek to the southeast of the Project Area, and Bungawalbin Creek and Lower Bungawalbin Wetlands to the east.

The majority of the watercourses in the Project Area are first and second order streams with the exception of Physics Creek, a third and fourth order stream, which traverses the lower floodplain area in the south-east of the Project Area and incorporates some low-lying wetland areas. All watercourses in the Project Area eventually flow to the Richmond River as outlined in **Figure 6.4**.

The topography of the Project Area is relatively flat and provides for a broad floodplain with numerous minor flow paths and topographical depressions which are likely to accumulate surface water under local catchment flooding conditions. There is some watercourse connectivity through what appears to be constructed channels, that link a number of the low-lying areas and in-stream storages and depressions.

6.6.2 Methodology

A flood impact assessment was undertaken to define the flood conditions within the Project Area by developing hydrological and hydraulic models using publicly available data. These models were used to simulate design flood behaviour to estimate flood inundation extents, levels, depths and velocities to assess flood risk and flood impacts for the Project and guide the development planning.

6.6.2.1 Data

The FIA has used a range of publicly available data to develop an understanding of the existing environment and as inputs into the models. This has included LiDAR, gauge rainfall and flow data and flood frequency estimates as detailed below.

LiDAR

The Project Area is covered by high-resolution LiDAR datasets obtainable from Geoscience Australia. The western half of the Myrtle Creek and Two Mile Creek catchments are covered by a 2 m resolution LiDAR dataset flown in July 2017 (GA, 2017). The Physics Creek catchment and the eastern half of the Myrtle Creek and Two Mile Creek catchments are covered by a 1 m resolution LiDAR dataset flown in June 2010. This LiDAR was used in developing the models and limitations associated with its use are detailed in **Appendix 9**.

Gauge Data

There are no water level recording stations for Physics Creek, the highest order watercourse within the Project Area. The nearest active gauge location is Myrtle Creek at Rappville (Station No 203030) located at the Summerland Way bridge crossing approximately 2 km west of the Project Area. The Myrtle Creek gauging station was used for this assessment and has rainfall and flow water level records. The rainfall records are continuous over the period from 1994 to present and water level records are continuous over the period from 1979 to present.

There is significant break-out flow upstream of the gauge from Myrtle Creek to the Two Mile Creek catchment to the south and therefore a considerable portion of the flow would bypass the gauge. Given this, it is expected there would be issues with the rating curves developed with consideration of rarer events. Therefore, only lower events were considered for calibration for the current flood assessment for flood frequency analysis.

Flood Frequency

The Bureau of Meteorology's Flood Frequency Analysis for Myrtle Creek at Rappville indicates a consistent flow rate beyond the 4-year return period, suggesting the stream's capacity is exceeded and flooding occurs.

6.6.2.2 Hydrological Model

A RORB software hydrological model was developed to simulate the catchment rainfall-runoff processes in the upper catchments of Myrtle Creek, Two Mile Creek and the catchment of the Project Area. RORB is a general runoff and streamflow routing program used to calculate flood hydrographs from rainfall and other channel inputs. It subtracts losses from rainfall to produce rainfall-excess and routes this through catchment storage to produce the hydrograph.

The hydrological model was split into a network of 41 sub-catchments with cumulative sub catchment areas of Myrtle Creek (392 km^2), Two Mile Creek (132 km^2) and the Project Area (44 km^2) (see **Figure 6.6**). Review of satellite imagery indicates that the contributing rural catchment area does not contain any effective (directly connected) impervious area. The catchments contain small areas of disconnected and distributed impervious area which would not influence the regional runoff characteristics. Therefore, the rural catchments were considered to be 100% pervious.

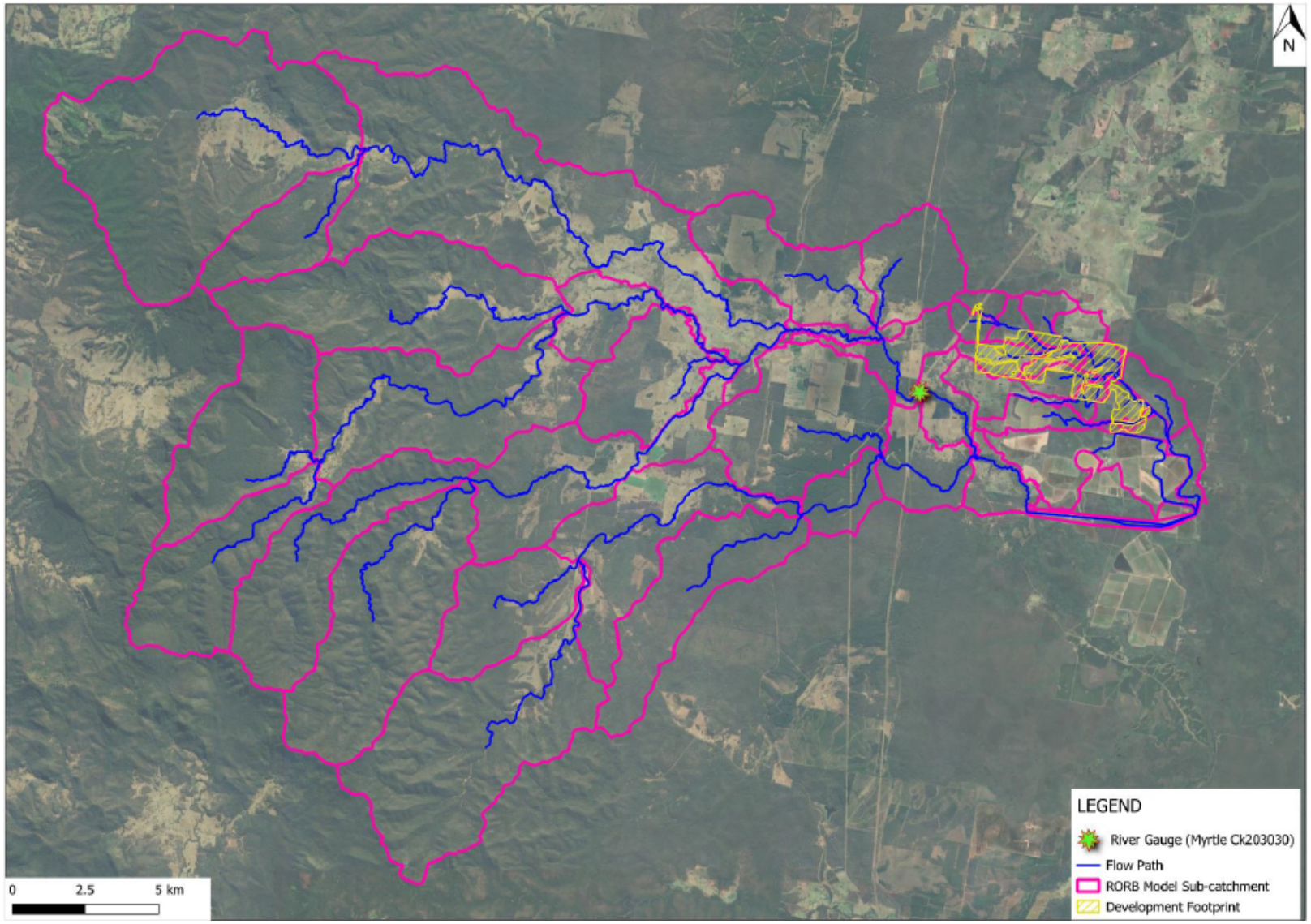


Figure 6.6 RORB Model Sub-Catchments

Further information regarding the development of the hydrological model and the assumptions used is outlined in **Appendix 9**.

6.6.2.3 Hydraulic Model

A two-dimensional (2D) TUFLOW flood model was run for both existing and climate change conditions which utilised the output flow rate from the RORB model.

Modelling was undertaken for 5%, 2%, 1%, 0.5%, 0.2%, 0.1% and 0.05% Annual Exceedance Probability (AEP) events and the Probable Maximum Flood (PMF) as required in the SEARs and to identify the impacts associated with a broad range of rainfall events from highly improbable storms to probable events across the Project life. AEP is a measure of the likelihood a flood level or flow will be equalled or exceeded in any given year. The PMF is the largest flood that could be conceivably expected to occur at a particular location. Climate change modelling was also undertaken using the 1% AEP plus climate change in addition to the SEARs requirement to assess via proxy using the 0.5% and 0.2% AEP year flood events. This broad range of modelling aimed to assess the Project Areas sensitivity to an increase in rainfall intensity of flood-producing rainfall events due to climate change.

Further information regarding the development of the hydraulic model and the assumptions used is outlined in **Appendix 9**.

6.6.2.4 Model Outputs and Assessment

The modelling outputs for the Preliminary Design were used to define flood risk across the Project Area and inform the final design and layout of infrastructure within the Development Footprint. Hazards associated with flood model outputs were classified according to 6 classes of hazards in the Flood Hazard Categorisation (ADR Handbook 7) (see **Figure 6.7**).

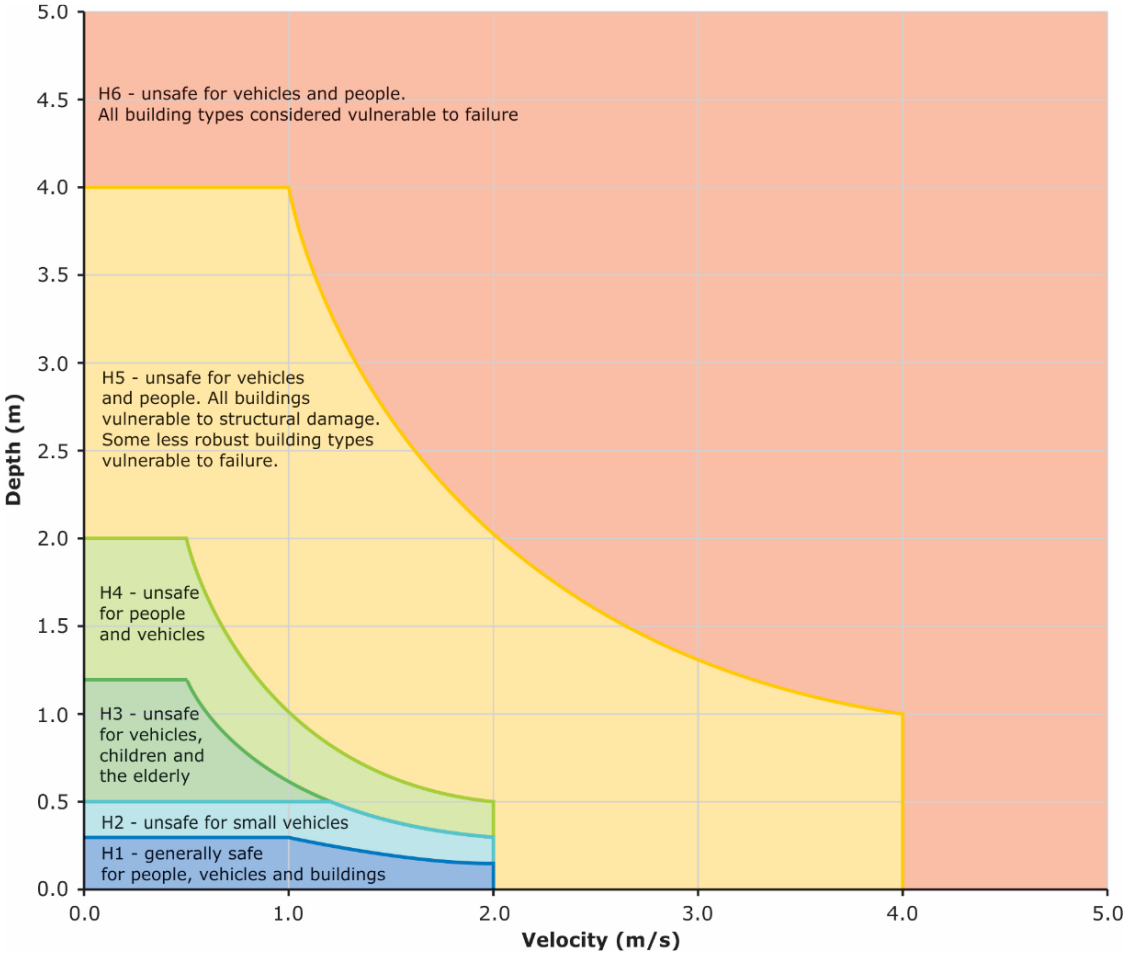


Figure 6.7 Flood Hazard Categorisation (ADR Handbook 7)

Subsequently, the model was run with the Final Design to identify changes to flood extent, levels, depths and velocities as a result of the Project and any required mitigation and management measures. A blockage assessment in accordance with Australian Rainfall and Runoff 2019 methodology was undertaken.
A blockage assessment considered the perimeter fencing surrounding the Development Footprint and identifies the potential for floating, non-floating, and 'urban' debris to change the flood dynamics of the Project.

Further information regarding the methodology is provided in **Appendix 9**.

6.6.2.5 Assumptions and Limitations

The topographical data does not include bathymetry of the creeks. This may have a minor impact on the accuracy of the model due to a loss in conveyance capacity within the waterway, resulting in an increased overbank flow.

A considerable breakout flow was expected between Myrtle Creek and Two Mile Creek as well as floodplain storage, to simulate the flow behaviour of the overland flow paths and waterways producing flood inundation extents, water levels, flow depths and velocities. The 2D hydraulic model extent covers the upstream of the Myrtle Creek and Two Mile Creek junction and the Project Area. The inflow from Myrtle Creek and Two Mile Creek is from the RORB model with the overall outflow for the creek catchment and the rainfall excess (rainfall depths minus loss) hydrographs for each sub-catchment extracted and used as inflows in TUFLOW.

6.6.3 Impact Assessment

6.6.3.1 Preliminary Design – Flood Risk Assessment

Flood risk and hazard was assessed across the Project Area and identified that (see **Figure 6.7**):

- Most of the Project Area is H3 and H4 for the PMF event and H2 and H3 for the 1% AEP event.
- Key infrastructure including the O&M facility, and staff car park were within the flood extent of all modelled events (H1 for Staff Car Park in PMF and H4 for O&M facility in PMF and H1 in the 1% AEP event).
- Avenue Road had varying degrees of hazard including some areas of H5 in the PMF event and H2 in the 1% AEP event.
- The Project Area exhibited varying flood risk but the majority of critical infrastructure was located outside the flood extent.

As a result of the findings of the flood risk assessment against the Preliminary Design the O&M facility and staff car park were relocated. Additional changes between the Preliminary Design and Final Design were also undertaken to address other constraints as identified in **Section 2.8.4**.

6.6.3.2 Final Design – Flood Impact Assessment

A risk assessment of the Final Design relative to the existing flood characteristics indicated that the potential for the greatest impacts on flood behaviour as a result of the Project comes from the proposed perimeter fencing which falls within the 1% AEP flow path.

The majority of the additional works are outside of the flood extent and/or do not change the existing topography within the flood conveyance areas of the Project Area.

The flood modelling conducted with the Final Design for the defined events indicated that the most severe blockage scenario causes localised impacts (afflux) immediately upstream of the chain mess fence with severity of the afflux linked to the rarity of the flood event. For example, the 1 in 20 year AEP (5% AEP) event shows minor afflux (0.01–0.10) along some sections of the upstream side of the perimeter fence line, which results in a reduction in flood level immediately downstream within several of the tributary channels entering the Project Area (see **Figure 6.8**).

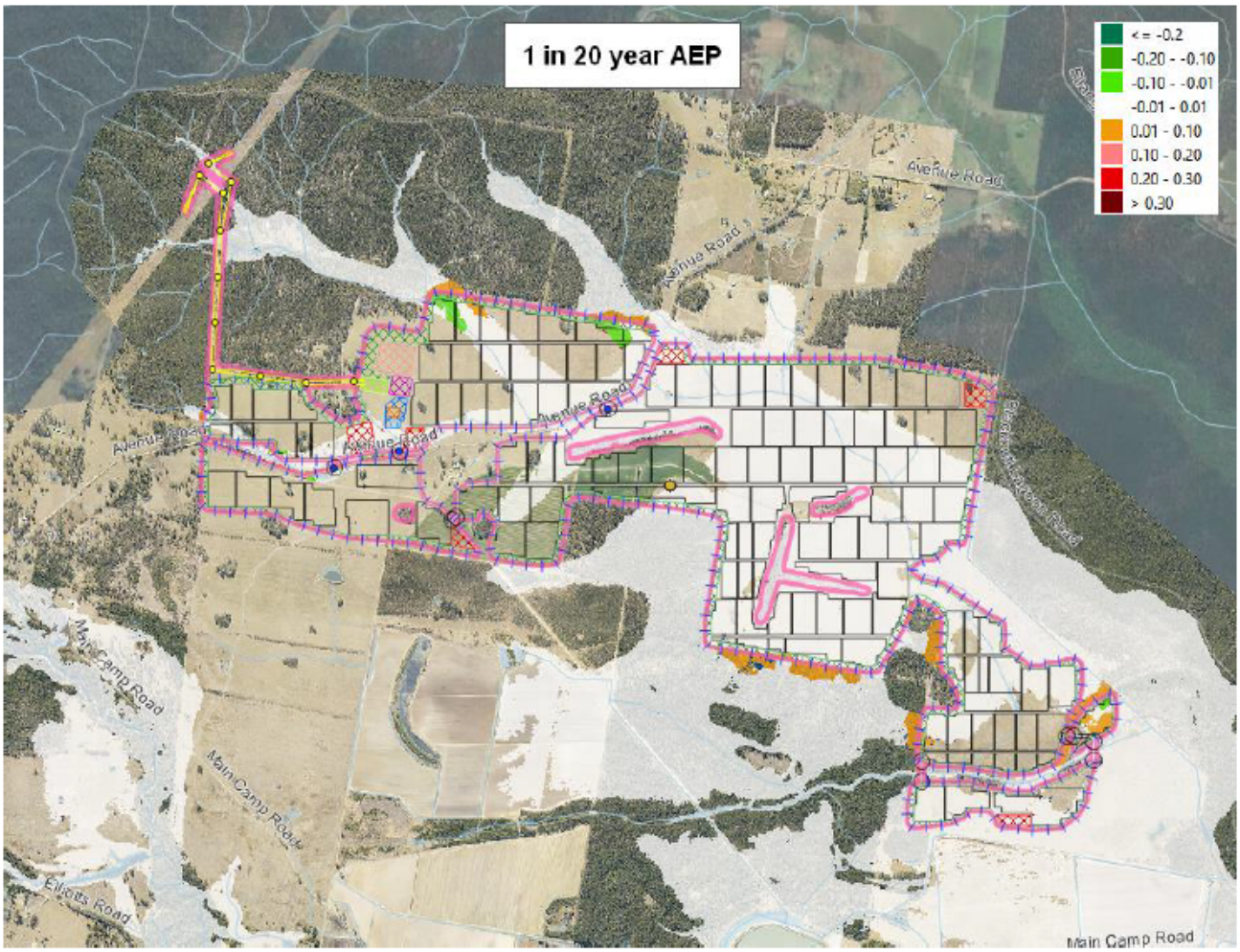


Figure 6.8 5% AEP Afflux Mapping

In rarer events, such as the 0.2% AEP (1 in 500 year AEP) the impact of the perimeter fence is more evident. The potential blockage of the fence structure results in an increase in extent of afflux as well as the area of effect for the flood level reduction, although, all variation remains within ±100 mm. The most notable increase can be seen in the southeast of the Project Area within the open fields where the simulated blockage restricts the free movement of flood water across the Project Area.

The modelled changes in flood level are within ±100 mm. Impacts do extend outside the Project Area although these are typically confined to natural landscapes (densely vegetated areas, waterway channels and open fields). No roads or building structures are impacted and modelled flood impacts do not extend beyond Physics Creek. Impacts generally do not impact Avenue Road however flood levels are observed to increase on Avenue Road at the western access point (SA1).

Hydraulic hazard maps for all events for the Final Design are provided in **Appendix 9**.

The existing flood hazard profile (i.e. the flood profile without the project) – classified with respect to flood depth, velocity and the velocity depth product; ranges across the site from Category H1 to H3. Review of the hydraulic hazard maps with respect to the existing conditions hazard maps indicates that the proposed works do not adversely change the flood risk and hazard profile, as depicted in the side-by-side map for the 1% AEP under the high blockage scenario (SEN_A) (see **Figure 6.9**).

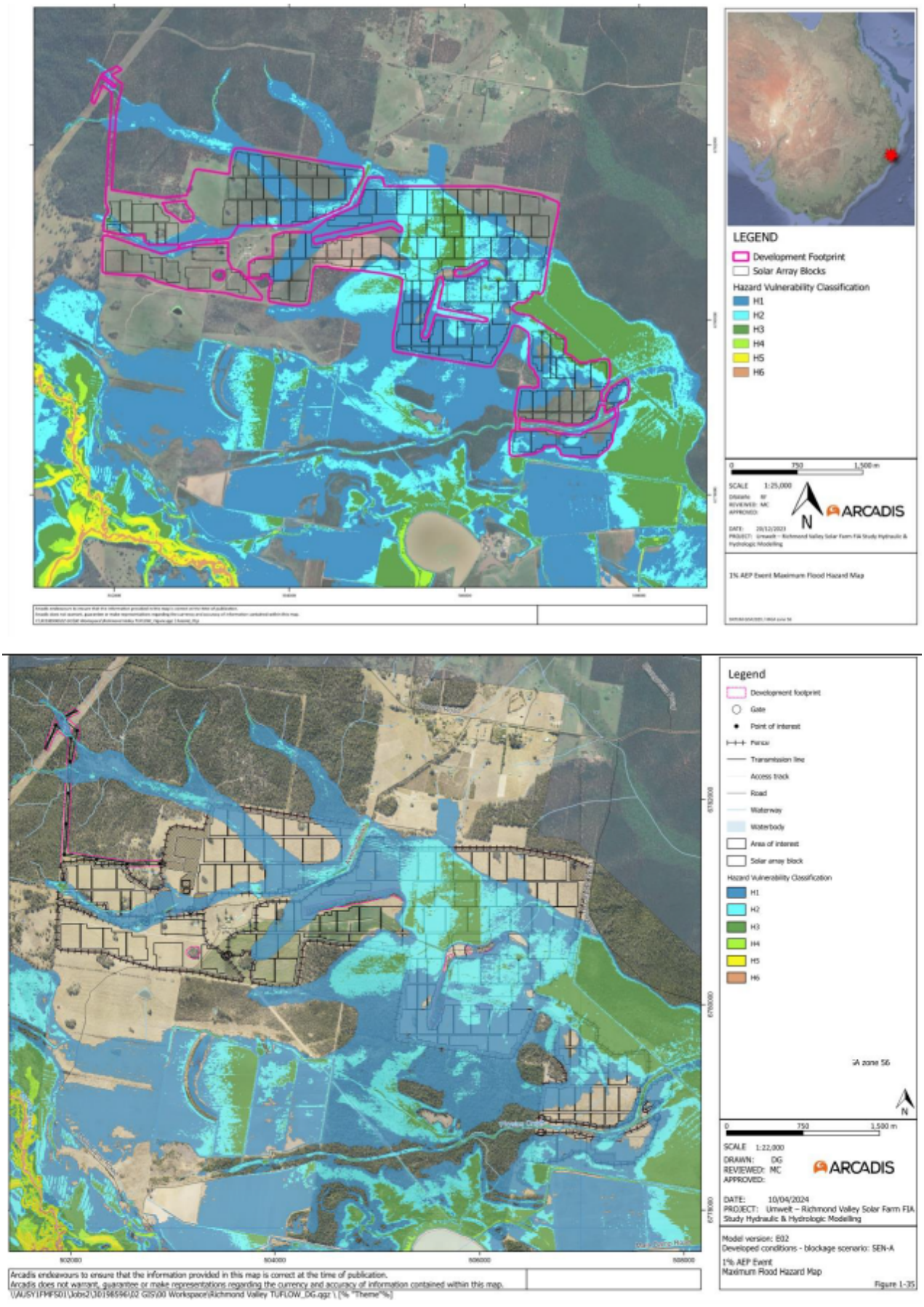


Figure 6.9 1% AEP Hydraulic Hazard – existing (top) vs design (bottom)

Review of the 0.2% (1 in 500 year AEP) shows that the hydraulic profile does not adversely increase within the Project Area, even though afflux above 10 mm is experienced outside of the Project Area in the high blockage potential scenario (SEN_A) (see **Figure 6.10**).

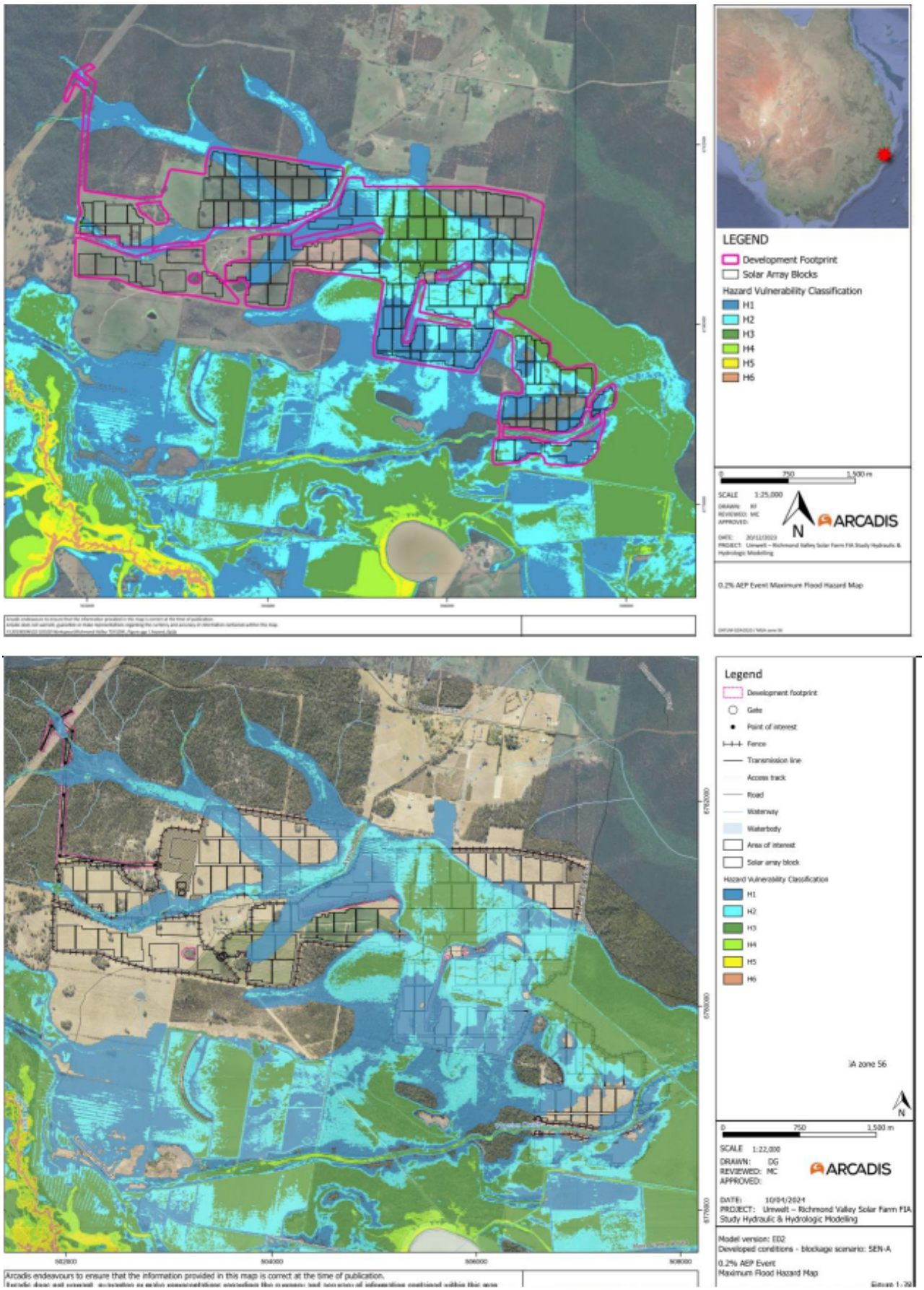


Figure 6.10 0.2% AEP Hydraulic Hazard – existing (top) vs design (bottom)

6.6.4 Mitigation and Management Measures

Ark Energy will implement a range of technical and non-technical risk mitigation and management measures including rigorous design standards and maintenance practices. An overview of the mitigation and management strategies in response to the identified flood hazards associated with the Project and are summarised below.

Table 6.9 Flooding Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
F-01	Solar panels will be designed to provide a minimum of 300 mm freeboard for the lowest edge above the maximum 1% AEP flood level.	Pre-construction
F-02	Solar panel piles will be designed to withstand the 1% AEP flood velocities expected in the Project Area.	Pre-construction
F-03	Further flood investigations will be carried out where required during detailed design to confirm the flood immunity objectives and design criteria for the Project are met including the need for collapsible fencing to limit afflux.	Pre-construction
F-04	An Emergency Response Plan (ERP) will be prepared in consultation with relevant emergency services organisations (i.e., FRNSW, NSW Rural Fire Service (RFS), NSW Ambulance and relevant local emergency management services). The ERP will include a Flood Response Plan (FRP) which will: • detail emergency response procedures including an evacuation plan for site personnel, the associated dwelling and surrounding premises during flood events • identify procedures for safety of personnel during PMF events noting that safe egress from the Project Area will not be possible during these events • identify a safe route between the area of operations and onsite residence to provide staff and/or visitors the ability to 'hunker in place' during extreme flood events.	Pre-construction
F-05	Debris will be cleared from fencing following flood events.	Construction & Operation

6.7 Hazard and Risks

6.7.1 Preliminary Hazards Analysis

A Preliminary Hazard Analysis (PHA) was undertaken by Umwelt (2024) to assess the potential risks associated with hazardous materials and activities associated with Project. This section outlines the key findings of the PHA, the potential hazards associated with the Project and proposed mitigation and management measures.

The PHA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with:

- DPE's Large-Scale Solar Energy Guideline (2022).
- Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning.

- Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (HIPAP 6) (DoP, 2011d).
- Multi-level Risk Assessment (MLRA) (DoP, 2011b).

6.7.1.1 Existing Environment

The Project has residential receivers located primarily to the north, south and west of the Project Area. The nearest residential receiver is within 400 m from the northern boundary of the Project Area and there is one host dwelling located within the Project Area (See **Figure 2.1**).

Land within the Project Area has been subject to extensive clearing associated with historic agricultural land use, with areas of scattered woodland vegetation. Vegetation connecting to Ellangowan State Forest and to Bungawalbin National Park border the Project Area which represent a potential bushfire threat to the site due to high fuel loads (refer to **Section 6.4**). The north-western edge of the Project Area is traversed by an existing 330 kV transmission line.

6.7.1.2 Assessment Methodology

The PHA considered the hazards and risks posed to off-site receivers and involved dwellings associated with the transport, storage and use of hazardous materials for the Project and has been prepared generally in accordance with:

- Resilience and Hazards SEPP.
- Applying SEPP 33: Hazardous and Offensive Development Application Guidelines (NSW Department of Planning, 2011).
- Multi-Level Risk Assessment (NSW Department of Planning, 2011).
- Hazardous Industry Planning and Advisory Paper 4 – Risk Criteria for Land Use Safety Planning (HIPAP 4) (NSW Department of Planning, 2011).
- Hazardous Industry Planning and Advisory Paper 6 – Hazard Analysis (HIPAP 6) (Department of Planning, 2011)
- Manual for Classification of Risks due to Major Accidents in Process and Related Industries (International Atomic Energy Agency, 1996).
- The detailed methodology and calculations used to identify and assess the potential hazards and respective failure scenarios that have the potential for off-site impact is outlined in **Appendix 10** with results detailed in the sections below.

6.7.1.3 Preliminary Risk Screening

The hazardous materials to be stored/used/ for the Project are detailed in **Table 6.10**.

Table 6.10 Storage Quantities of Hazardous Materials

Hazardous Material	Quantity	Classification	Screening Threshold
Lithium-ion batteries (LIBs)	8,800 t[7]	Class 9 miscellaneous dangerous good	N/A
Electrical transformer insulating oil	Approximately 65,000 to 70,000 L (approximately 62.5 t based on an assumed specific gravity of 0.89)	Not classified as a dangerous good under the *Australian Code for the Transport of Dangerous Goods* (National Transport Commission, 2020)	N/A
Liquefied petroleum gas (LPG)	7 t	Class 2.1	10 t in above ground storage
Petrol	4 t	Class 3 PG I	Required to be greater than 4 m from the boundary according to (Applying SEPP 33 Figure 8)
Diesel	13 t	Combustible liquid Class C1	Compliance with AS1940 The Storage and Handling of Flammable and Combustible Liquids

The storage of liquefied petroleum gas (LPG), petrol and diesel by the Project will be in accordance with the relevant Australian Standards. The quantity of LPG stored on the site will be below the assessment threshold of 10 t and the proposed 4 t of petrol storage would need to be greater than 4 m from the property boundary to ensure that *SEPP 33* (DoP, 2011a) is not triggered. The proposed 13 t of diesel storage would not be considered potentially hazardous if placed in a storage area away from flammable materials and within a separate bund.

Neither LIBs nor the transformer insulating oil have a relevant screening threshold in the Resilience and Hazards SEPP. However, with the rapid proliferation of LIBs in portable devices, electric vehicles, energy storage systems and a range of other applications in recent years, the potential hazards associated with LIBs have become evident. It is known that LIBs may present fire, explosion and toxic gas release hazards as a result of manufacturing faults or a range of battery abuse scenarios. Therefore, given the large scale of the Project BESS, the limited global experience with large capacity grid connected LIB BESSs, and to maintain a conservative approach with respect to the assessment of hazards and risk, further assessment was considered appropriate.

Based on the very low frequency of transport LIBs, transformer insulating oil, LPG and petrol to the Project site following the completion of construction, no further assessment of transport risks (e.g., a transport route analysis) is considered necessary.

6.7.1.4 Risk Assessment

The PHA prepared for the Project identified a number of hazard events involving LIBs and electrical transformers with the potential for harmful off-site impacts. The Level 1 qualitative risk analysis determined that an explosion event at the BESS does not pose a significant off-site risk as such incidents are expected to be relatively near field (i.e. less than 100 m). Additionally, the potential offsite thermal radiation impacts were not considered credible due to the construction specifications of the BESS units and the distance to the nearest vegetation and offsite dwelling.

[7] Mass estimated based on 0.25 kWh/kg for a LIB cell from Bravo Diaz et al. (2020) and a total BESS capacity of 2,200 MWh.

It was determined using the Multi-Level Risk Assessment (2011) risk classification and prioritisation process that a Level 2 semi-quantitative risk assessment would be required to demonstrate that the Project can comply with relevant criteria. The hazard event determined to require the Level 2 semi-quantitative risk assessment is the potential release of toxic gas associated with a thermal runaway event in LIB. A semi-quantitative consequence analysis modelled the toxic gas release event of hydrogen fluoride (HF) to determine the minimum required distance that LIB units should be setback from the nearest dwellings to ensure the risk criteria provided in HIPAP 4 are met.

The semi quantitative analysis undertaken estimated that the worst-case scenario of a toxic gas release resulting from a LIB thermal runaway at the BESS is not considered likely to extend to the nearest off-site dwelling. The maximum distance at which an individual exposed to HF emissions from a battery storage facility toxic release event could experience an injury is 57 m. The dwelling nearest to the BESS (Involved Dwelling C3-4) is located approximately 660 m to the south-southeast from the southeast corner of the closest BESS unit.

6.7.1.5 Risk Management and Mitigation

Ark Energy will implement a range of technical and non-technical risk mitigation and management measures including rigorous design standards and maintenance practices. An overview of the mitigation and management strategies in response to the identified hazards associated with the Project are summarised below in **Table 6.11**.

Table 6.11 Hazards Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
H-01	A final hazard analysis (FHA) will be completed for the Project when the Project design has achieved an adequate level of detail (i.e. specific BESS technology has been selected and layout has been confirmed).	Pre-construction
H-02	An Emergency Response Plan (ERP) will be prepared consistent with HIPAP 1 in consultation with relevant emergency services organisations (i.e., FRNSW, NSW Rural Fire Service (RFS), NSW Ambulance and relevant local emergency management services). The ERP will: • detail the management measures to minimise the risk of hazardous events • detail emergency response procedures including an evacuation plan for site personnel, the associated dwelling and surrounding premises. The ERP will be submitted to the NSW RFS and FRNSW for comment prior to finalisation.	Pre-construction
H-03	In accordance with the PHA the BESS purchase, design, configuration, operation and maintenance activities will be in line with required national and international guidelines.	Throughout
H-04	Training will be provided for all personnel responsible for operations, maintenance and emergency response.	Throughout

6.7.2 Electromagnetic Field (EMFs)

An assessment of EMF was undertaken by Umwelt to assess the potential risks associated with electrical infrastructure associated with the Project. This section outlines the key findings of the EMF assessment, the potential EMF hazards associated with the Project and proposed mitigation and management measures.

The assessment of EMF was prepared in accordance with the requirements of the Project's SEARs (see **Appendix 1**) and:

- DPE's Large-Scale Solar Energy Guideline (2022).
- The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published Guidelines for limiting exposure to time-varying electric, magnetic and EMFs (up to 300 GHz).

6.7.2.1 Background and Guidelines

EMF occurs wherever electricity is produced, transmitted or used, and so are found commonly in everyday life. Many of the fundamental components of a solar farm (including power conversion (inverter) units, substations and transmission lines) inherently produce varying levels of EMF emissions.

The solar PV arrays themselves do not emit EMF. EMF are only present once the inverter stations convert the electricity produced into an alternating current (AC). In Australia, electrical devices and infrastructure such as transmission lines and substations, operate at a frequency of 50 Hz which falls within the Extremely Low Frequency (ELF) range of EMF between 0 and 300 Hz.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is the Commonwealth Government's primary authority on radiation protection and nuclear safety. The ARPANSA website notes that "exposure to ELF EMF at high levels can affect the functioning of the nervous system" *but that "most of the research indicates that ELF EMF exposure normally encountered in the environment, including in the vicinity of powerlines, does not pose a risk to human health*". Generally, distances beyond 50 m from a high voltage powerline are not expected to have higher than typical EMF and for substations EMF levels at distances of 5 to 10 m away are no higher than background levels in a typical home.

The ICNIRP published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)* in 1998 (Landstr, 1998). The guidelines were updated in 2010, specific to the low-frequency range of the electromagnetic spectrum, i.e. from 1 Hz to 100 kHz with the objective of establishing guidelines for limiting EMF exposure that would provide protection against known adverse health effects.

To prevent health-related interactions with ELF EMF, ICNIRP recommends limiting exposure so that the threshold at which adverse effects due to interactions between the body and the external EMF is never reached. The reference levels for occupational and general public exposure for EMF at 50 Hz are shown in **Table 6.12**.The guideline adopts more stringent exposure restrictions for the general public compared to occupational exposures, recognising that in many cases the general public are unaware of their exposure to EMF.

Table 6.12 ICNIRP EMF Reference Levels at 50 Hz

Exposure Characteristic	Electric Field Strength kilovolts per metre (kV/m)	Magnetic flux density microteslas (μT)
Occupational	10	1,000
General public	5	200

Source: ICNIRP, 2010.

Human responses to EMFs depend on the field strength, ambient environmental conditions, and individual sensitivity. The strength of EMFs decreases rapidly with increasing distance from operating electrical equipment and can also be reduced by shielding. Trees, tall fences, buildings and most other large structures provide shielding from some electric fields.

6.7.2.2 EMF Sources

EMF would potentially be generated during the construction and operational phases of the Project from a number of EMF sources including inverters, BESS, overhead transmission lines and substation as well as cabling (underground) and collection circuits. Potential EMF produced by these components is discussed further below.

BESS

EMF is considered in the safety design process for any BESS. The EMF associated with a BESS will vary depending on several factors including configuration, capacity and type of housing. When there is no current flowing, there is no EMF generated, meaning that for the BESS, EMFs will only be generated during the charging or discharging cycle. The BESS will be designed in accordance with electrical safety standards and codes AS 3000, UL 9540A, UL 1973, UN 38.3, UN 3536, NFPA 855, NFPA 69, NFPA 72 and as such the general public would be excluded from any exposures from these sources.

The Project will include a higher capacity BESS than equivalent solar projects in NSW. This increased storage capacity does not present an increased EMF risk as the storage of electricity does not generate EMF. The anticipated storage capacity and EMF associated with the BESS would not exceed the ICNIRP occupational exposure reference levels due to the rapid attenuation of EMF with distance.

Solar Arrays and Inverters

A very small amount of EMF would be produced by the DC wiring that will connect the PV modules to the inverters. Research into EMF produced by commercial solar PV electricity-generating facilities in Porterville and San Bernadino, California (Tell et al. 2015), identified that static EMF were very small compared to exposure limits established by ICNIRP. The highest 60-Hz[8] EMF were measured adjacent to transformers and inverters. The EMFs measured complied in every case with ICNIRP occupational exposure limits. In all cases, electric fields were negligible compared to ICNIRP limits. Specific findings were as follows:

- There was no evidence of EMFs created from the PV modules.
- The highest AC and DC EMFs were measured adjacent to the inverter and transformer and both were lower than ICNIRP's occupational exposure limit.

[8] Note that US power supply operates at 60 Hz frequency, compared to 50 Hz in Australia.

- The strength of the EMFs attenuated rapidly with distance (i.e. within 2–3 m the fields dropped to background levels).
- Electric fields were negligible to non-detectable, most likely due to the enclosures provided for the electricity generating equipment.

Overhead Transmission Lines

The EMF from transmission lines varies with configuration, phasing and load, however typical EMFs near high voltage overhead transmission lines are estimated by ARPANSA to be between 1 µT and 20 µT (directly underneath) and 0.2 µT and 5 µT (at the edge of easement). A µT, or microtesla is the unit of measurement for the magnetic field which passes through a given area. The natural magnetic field of the earth varies from approximately 30 µT to 70 µT (Finlay, 2010).

Substation

The substation is the interface between the transmission network and the Project. The highest sources of EMFs associated with a large transmission substation would generally occur at the boundary from the incoming and outgoing transmission lines. Generally, the application of electrical safety standards and codes (e.g. fence, enclosure, distance) will result in exclusion of general public exposures from these sources. The typical measurement of EMF at the boundary from the incoming and outgoing transmission lines reported by ARPANSA is between 1 µT and 8 µT.

Underground cabling networks typically have no EMFs as these are screened by ground cover.

6.7.2.3 Impact Assessment

Numerous components of the Project are potential sources of EMF including the BESS, inverters, overhead transmission line and the substation. The design, selection and procurement of the electrical equipment for the Project would comply with relevant international and Australian standards for generation of and exposure to EMF as detailed in **Section 6.7.2.1**.

The required electrical safety standards and codes (including provision of fencing, enclosures, and physical distance) would be utilised to eliminate EMF exposure to the general public from these sources.

Table 6.13 identifies the distances from potential EMF emitting infrastructure before recorded EMF measurements are anticipated to drop to background levels. These distances are based upon the field studies undertaken at two comparable large scale solar facilities in Porterville and San Bernardino (Tell, Hooper, Sias, Mezei, & Kavet, 2015). Due to the rapid attenuation of EMF from source infrastructure, the buffer distances required before EMF levels return to background levels are minimal. Buffer distances from each infrastructure component has been conservatively determined and is likely an overestimation of the required buffer distances.

Table 6.13 Buffer Distance from EMF Emitting Infrastructure

EMF Source	Buffer Distance	Magnetic flux density microteslas (µT) within Buffer Distance	Receivers within buffer	Compliant with ICNIRP EMF Reference Levels at 50 Hz
BESS	2–3 m	1–8 µT	Project workforce	Yes
Solar Arrays and Inverters	2–3 m	277 µT	Project workforce	Yes
Overhead Transmission Line	No buffer required	1–8 µT	N/A	Yes
Substation	2–3 m	1–8 µT	Project workforce	Yes

Public Access

Access to the Project Area would be restricted to the public via security fencing. Buffer distances (see **Table 6.13**) far exceed the required distances before EMF measurements return to background measurements.

The inverters are considered the highest EMF generating infrastructure on site. The nearest inverter to the publicly accessible Avenue Road is beyond 50 m. The potential EMF associated with the inverters have such a rapid attenuation of EMF that the associated EMF will be negligible beyond 3 m from the inverters. The BESS and substation have been placed more than 350 m from Avenue Road.

Workforce

Staff involved in the construction and decommissioning of the Project would be exposed to minor EMF for the duration of the works. However, the inherently low EMF levels produced by the proposed infrastructure combined with the temporary nature of the construction and decommissioning phases mean that exposure levels will be below the ICNIRP recommendations for occupational exposure.

It is therefore concluded that there will be low to negligible potential for EMF impacts upon human health throughout the construction, operation and decommissioning phases of the Project. With the implementation of management measures outlined in **Section 6.7.2.4**, it is considered that the EMF exposure risk of the Project can be appropriately managed in all phases.

6.7.2.4 Management and Mitigation Measures

The layout of the Project has been designed considering buffer distances between the EMF sources and sensitive receivers, road and State Forest users and the general public. In addition, the design, selection and procurement of electrical equipment for the Project would comply with relevant international and Australian standards for generation of and exposure to EMF.

The following measures will be implemented to manage any EMF risks (see **Table 6.14**):

Table 6.14 EMF Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
EMF-01	All EMF generating infrastructure will be buffered from the boundary of the Project Area beyond industry standards as defined by **Figure 1.2**.	Pre-construction
EMF-02	All Project infrastructure will be designed, installed and maintained in accordance with relevant industry standards.	Pre-construction
EMF-03	All relevant procedures in relation to a high voltage installation will be adhered to throughout the life of the Project	Throughout
EMF-04	Public access will be restricted throughout the life of the Project.	Throughout

6.7.3 Contamination

An assessment of contamination risk was undertaken by Umwelt to assess the potential risks associated with contaminated land and potential contamination sources associated with Project. This section outlines the key findings of the contamination assessment and proposed mitigation and management measures.

The assessment of contamination was prepared in accordance with the requirements of the Project's SEARs and DPE's Large-Scale Solar Energy Guideline (2022).

6.7.3.1 Existing Environment

A review of the NSW Environmental Protection Agency's (EPA) Contaminated Land Record of Notices revealed one site situated in the Richmond Valley LGA, specifically a service station in Casino. The site is located 25 km north of the Project Area and is therefore not considered a potential contamination source. Furthermore, a search of the NSW EPA Notified Contaminated Sites did not detect any contaminated sites in close proximity.

Existing and historical land uses do not indicate a high likelihood of contamination within the Project Area. Agricultural land use has the potential to result in contamination where poor waste management and storage and use of hazardous substances such as pesticides or diesel occurs. This could become evident during the construction phase, particularly during excavation activities. No evidence of waste dumping or contaminating activities were observed during the site visit by Umwelt (7 September 2023).

6.7.3.2 Potential Sources of Contamination

As detailed in **Table 6.10**, hazardous materials including LIB, electrical transformer insulating oil, LPG, petrol and diesel will be stored within the Development Footprint. These materials have the potential to cause a contamination event if not stored or handled in line with the relevant Australian Standards.

6.7.3.3 Impact Assessment

The highest potential for a contamination event to occur within the Development Footprint is during the construction phase. Increased vehicle movements, inappropriate handling of waste, the installation of equipment and the disturbance of soil are all activities that may result in a potential spill or contamination event involving one or more of the hazardous materials detailed in **Section 6.7.3.2**.

It is anticipated that the Project will have negligible interaction with groundwater based on the extent of ground disturbance and the depth of the water table as described in **Section 6.5.1**. The positioning of Project infrastructure beyond flood prone land and onto land with groundwater that is beyond the proposed excavation depth for the O&M facility, BESS, substation and switching substation in the north-western portion of the site will reduce the potential for contamination events at these locations to impact and interact with groundwater. Construction activities in the south-western portion of the Development Footprint that have potential to interact with groundwater are limited to the installation of solar arrays. There is minimal potential that construction activities including potential hazardous materials spills will interact with groundwater. Through mitigation and management measures detailed in **Section 6.7.3.4**, contamination risks to groundwater are considered minor.

Operationally, contamination risks are very low, limited to a low number of onsite vehicle movements and maintenance activities. The potential for hazardous chemicals contained in solar panels to cause a contamination event during use (operations) and under threat of fire, hail and earthquake is very low. Research conducted by the Massachusetts Department of Energy Resources concluded that under normal use, the chemicals used in solar panels are not exposed to the environment and will not mix with water or vapour. Under the external environmental strain of fire, hail or earthquake, it is unlikely that panels will break and cause a contamination event (Eisenson, Elkin, & Sittinger, 2024).

6.7.3.4 Management and Mitigation

Table 6.15 Contamination Impact Management and Mitigation

ID	Mitigation and Management Measure	Phase
C-01	If indications of contaminated soils are detected (such as odour, discoloration, or suspicious debris), the area will be flagged and potentially contaminated soil should be removed and replaced. A stop work procedure will be enacted while soil samples are take and tested identify the contamination type, followed by the formulation and implementation of an appropriate management strategy and engagement with relevant authorities as required.	Construction
C-02	A Spill and Contamination Response Plan would be developed as part of the overall ERP to prevent contaminants affecting adjacent surrounding environments. The plan would include measures to: • Respond to unexpected finds (e.g., pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements. • Requirement to notify the EPA for incidents that cause material harm to the environment (refer s147–153 of the POEO Act). • Manage the storage of any potential contaminants onsite. • Mitigate the effects of soil contamination by fuels or other chemicals including emergency response and the EPA notification procedures. • Ensure that machinery arrives on site in a clean, washed condition, free of fluid leaks. • Prevent contaminants affecting adjacent pastures, dams, water courses and native vegetation. • Monitor and maintain spill equipment. • Induct and train all site staff.	Throughout

6.8 Landscape and Visual

A Landscape and Visual Impact Assessment (LVIA) (see **Appendix 11**) was undertaken by Moir Landscape Architecture Pty Ltd (Moir, 2024) to assess potential landscape and visual impacts associated with the Project. This section outlines potential visual impacts, the key findings of the LVIA and proposed mitigation and management measures.

The LVIA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with:

- DPE's Large-Scale Solar Energy Guideline (2022) (the Guidelines).
- Technical Supplement – Landscape and Visual Impact Assessment (2022) (the Technical Supplement).

6.8.1 Existing environment

The Project Area (see **Figure 6.14**) and immediate surrounds consist of low-lying flats comprising primarily cleared and modified land to support agricultural activities. Remnant patches of native vegetation are present in pockets throughout the Project Area, which is surrounded by several densely vegetated State Forests and National Park and Conservation Areas.

The Project Area is not located in a Renewable Energy Zone (REZ). There are two renewable energy projects located within close proximity to the Project Area: Myrtle Creek Solar Farm (located directly to the south of the Project) and Summerville Solar Farm (located approximately 1.8 km west of the Project Area) (see **Figure 6.14**).

Richmond Valley Council LEP 2012 recognises up to 143 lots with dwelling entitlements or dwelling opportunities within 4 km of the Project Area. A receivers list received from Ark Energy dated 27 June 2023 showed 69 dwellings within 4 km of the Project Area. This list was refined based on feedback from RVC to exclude 17 structures that were determined to be sheds. Therefore, as per the latest data received from Ark Energy dated 27 November 2023, there are 49 structures classified as dwellings within 4 km of the Project Area. For purposes of the LVIA, dwelling entitlements with no visibility of the Project, determined by the LVIA assessment have been excluded from visual impact assessment (see Section 11 of the LVIA). Additionally, one dwelling located within the Project Area is an associated dwelling (C3-4) (see **Figure 6.12**) and was therefore not considered in assessment as part of the LVIA.

6.8.2 Methodology

The methodology for the LVIA is comprised of two key assessments in accordance with the Technical Supplement: A Landscape Character Assessment and a Visual Impact Assessment.

6.8.2.1 Landscape Character Assessment

The landscape character assessment was completed to an extent of 5 km form the Project Area (the LVIA Study Area) to determine how the Project might impact on the character and sense of place of the surrounding landscape.

A baseline investigation was undertaken to establish the existing landscape character of the Study Area and its sensitivity. Landscape Character Zones (LCZ) were then identified across the LVIA Study Area based on common distinguishing visual characteristics. To determine the impact of the Project on the LCZs, the sensitivity of the landscape and the magnitude of the Project were used to produce an overall landscape character impact rating.

6.8.2.2 Visual Impact Assessment

The visual impact assessment comprised of two key stages:

- Preliminary assessment aimed to identify viewpoints in both the public and private domain with dwelling entitlement and determine which required more detailed assessment.
- Detailed assessment:
    - All viewpoints identified in the preliminary assessment were refined and classified into private and public receptors.
    - Visual magnitude was calculated for each private and public receptor by producing a wireframe for each private receptor (See Appendix B.1 of the LVIA) and public receptor (see Appendix B.2 of the LVIA). The visual sensitivity of each receptor was also determined.
    - The overall visual impact for each receptor was then determined by combining the visual sensitivity and magnitude ratings.
    - All receptors were assessed against the specific 'performance objectives' (as outlined in the Technical Supplement) for their specific determined overall visual impact rating which informed required mitigation.
- Furthermore, the LVIA also assessed:
    - The potential impact of Project infrastructure such as the BESS, substation, switching substation, inverters and external road upgrades on the existing visual landscape of the LVIA Study Area.
    - Potential visual impacts of the Project on heritage listed items. A low potential visual impact was determined for all heritage items. A detailed discussion of the assessment and its findings can be found in **Section 6.13.3.7** 'Historic Heritage' of this EIS.
    - Potential night lighting sources impacts associated with the Project and consideration of the DPE's *Dark Sky Planning Guidelines 2023*.

The LVIA also undertook a cumulative impact assessment of nearby renewable energy projects within 8 km of the Project Area and in accordance with the DPE's *Cumulative Impact Assessment Guidelines 2023.*

6.8.2.3 Site Visit

Moir attended the Project Area in August 2023 to assess and identify the existing landscape character of the LVIA Study Area as part of the Preliminary Assessment, undertake ground-truthing works to assess potential visibility from key viewpoints and confirm any existing screening structures. Moir also undertook a photographic survey.

6.8.3 Impact Assessment

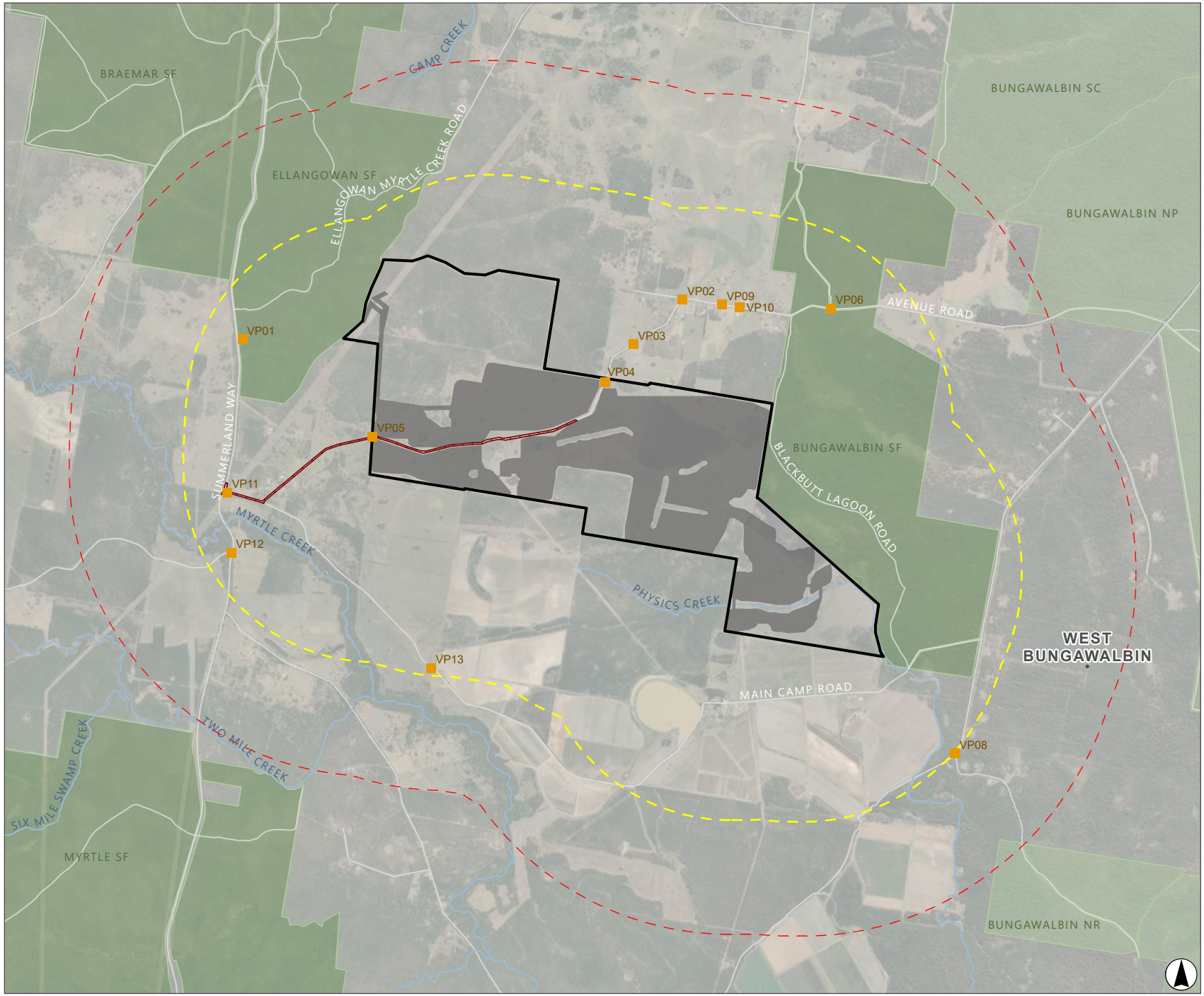
6.8.3.1 Preliminary Assessment

The preliminary assessment identified 12 public viewpoints within 2.5 km of the nearest solar array. A total of 13 representative viewpoints were selected by Moir from a range of publicly accessible locations surrounding the Project Area to represent a broad range of views surrounding the Project, including one viewpoint to represent views from Bungawalbin National Park (VP07) (see **Figure 6.11**). Each viewpoint was photographed in a capacity representative of the central field of vision of the human eye.
These photographs and detailed analysis can be found in Appendix A of the LVIA.

Additionally, the preliminary assessment identified 36 private receptors within 4 km of the nearest solar array (see **Figure 6.12**).

FIGURE 6.11

Preliminary Assessment- Public Viewpoints



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Public Receptors
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- 4 km from the nearest solar array
- 2.5 km from the nearest solar array

0 1 2

Kilometers

Scale 1:70,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

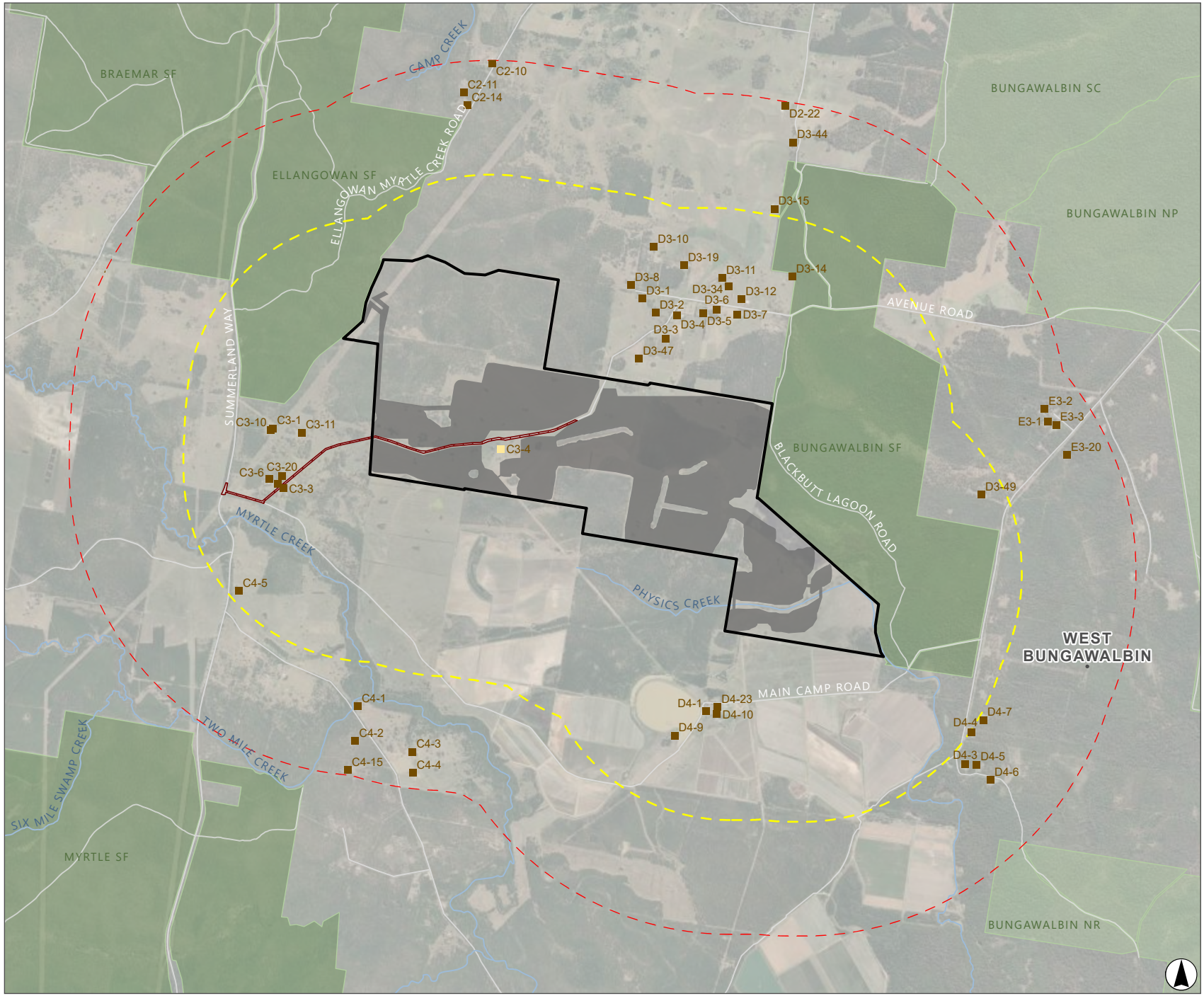


FIGURE 6.12

Preliminary Assessment- Private Viewpoints

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Associated Receptor
- Private Receptor
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- 4 km from the nearest solar array
- 2.5 km from the nearest solar array

0 1 2

Kilometers

Scale 1:70,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

27 private receptors and seven public receptors were identified for detailed assessment following the preliminary assessment (see **Figure 6.14**).

6.8.3.2 Private Receptors

Of the 27 private receptors identified in the preliminary assessment (see **Figure 6.14**), 20 were classified with an initial 'low' visual impact rating. The additional seven private receptors (D3-1, D3-2, D3-3, D3-4, D3-47, D3-5 and D3-8) were classified with an initial 'moderate' visual impact rating.

As required under the Guidelines, to verify these results, photomontages were prepared for these seven private receptors (see Appendix C of the LVIA). Moir was not granted permission to access private receptor D3-47 and, therefore, utilised a representative viewpoint 'VP03' for the photomontage.

Assessment (as required under the Solar Guidelines) of these seven photomontages determined a final overall visual impact rating of **'low'**, as existing vegetation surrounding the viewpoints were determined to be effective in minimising any views of the Project Area. Therefore, no mitigation is required in accordance with the performance objectives.

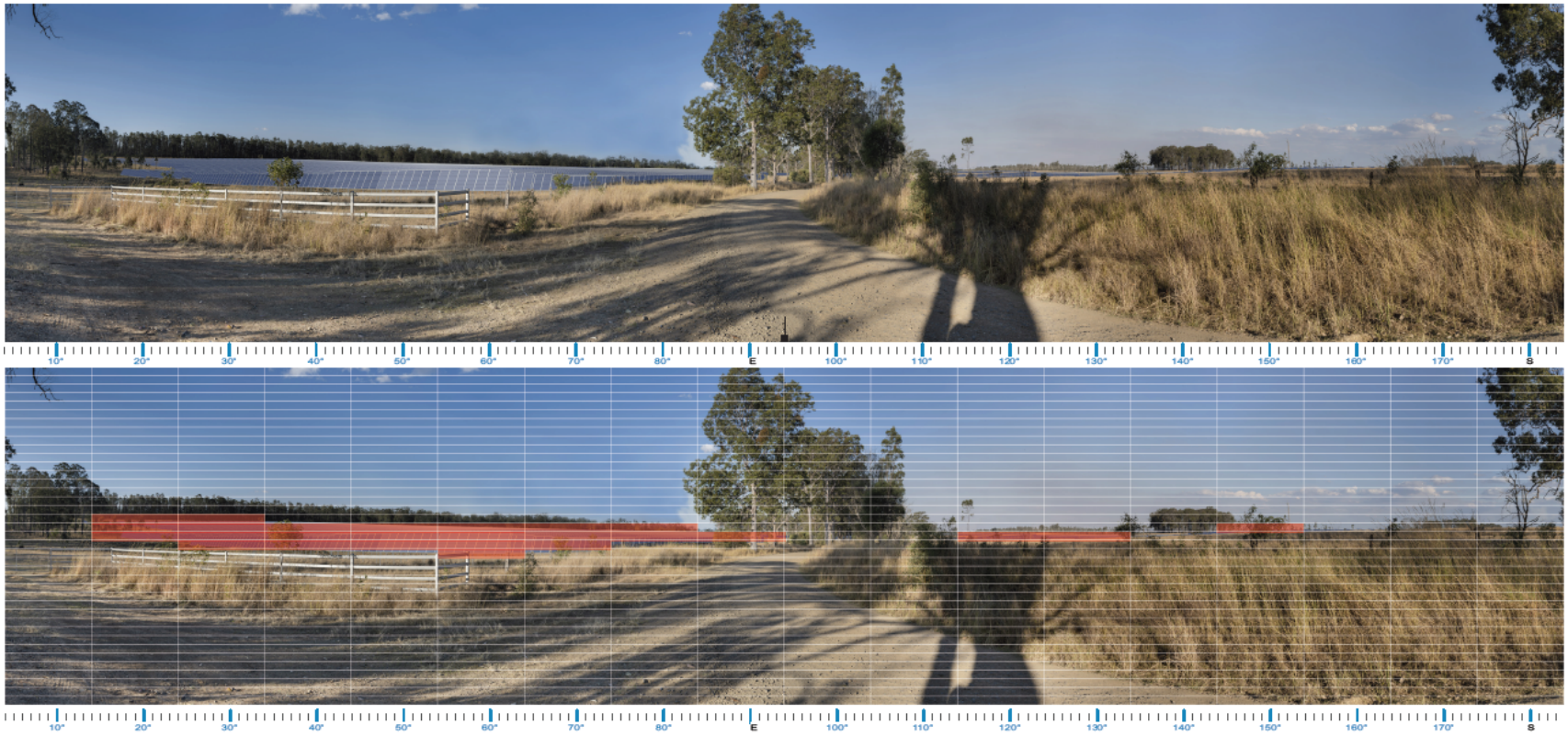
Please see **Table 6.16** for a summary of the final visual magnitude and sensitivity ratings assigned for the seven private receptors which were utilised to determine their final overall visual impact rating.

Table 6.16 Summary of Detailed Assessment of private receptor locations

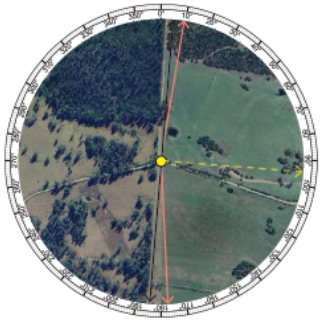
Private Receptor	Visual Magnitude Rating	Visual Sensitivity Rating	Visual Impact Rating
D3-1	Very Low	Moderate	Low
D3-2	Very low	Moderate	Low
D3-3	Very low	Moderate	Low
D3-4	Very Low	Moderate	Low
D3-47	Very Low	Moderate	Low
D3-5	Very Low	Moderate	Low
D3-8	Very Low	Moderate	Low

While the representative viewpoint 'VP03' for private receptor D3-47 was assigned a final overall visual impact rating of 'low', a precautionary approach to develop mitigation has been used (in accordance with the performance objectives) due to its proximity to the Project and surrounding vegetation (see **Figure 6.13**). This recommendation was made based on an analysis of aerial imagery, wireframe analysis and the representative viewpoint which showed that existing vegetation surrounding this viewpoint may not provide sufficient screening of the Project from the dwelling's primary view. A 30 m biodiversity corridor is proposed along the northern boundary of the Project Area (see **Figure 6.15**) which will reduce the visual impact of the Project on D3-47 to an acceptable level (see **Section 6.8.4**).

Photomontage - Sensitivity and Magnitude



PM08 (VP05)								
Coordinates	Distance to development:	Viewpoint Type:	Receptor Sensitivity:	Scenic Quality:	Overall Sensitivity:	Occupied Cells:	Magnitude Rating:	Visual Impact Rating:
29°05'57.98"S 153°01'9.46"E	0.046 km	Public Receptor	Very Low	Low	Very Low	26	High	Low



Occupied cell. A cell is deemed to be unoccupied if the Project does not cover more than approximately 25% of a cell (Technical Supplement, DPE 2022)

Figure 6.13 D3-47/VP03 Photomontage

6.8.3.3 Public Receptors

Of the identified seven public receptors (see **Figure 6.14**), five were classified with an initial 'low' or 'very low' visual impact rating. The additional two public receptors (VP04 and VP05) were classified with an initial 'moderate' visual impact rating after the initial wireframe assessment.

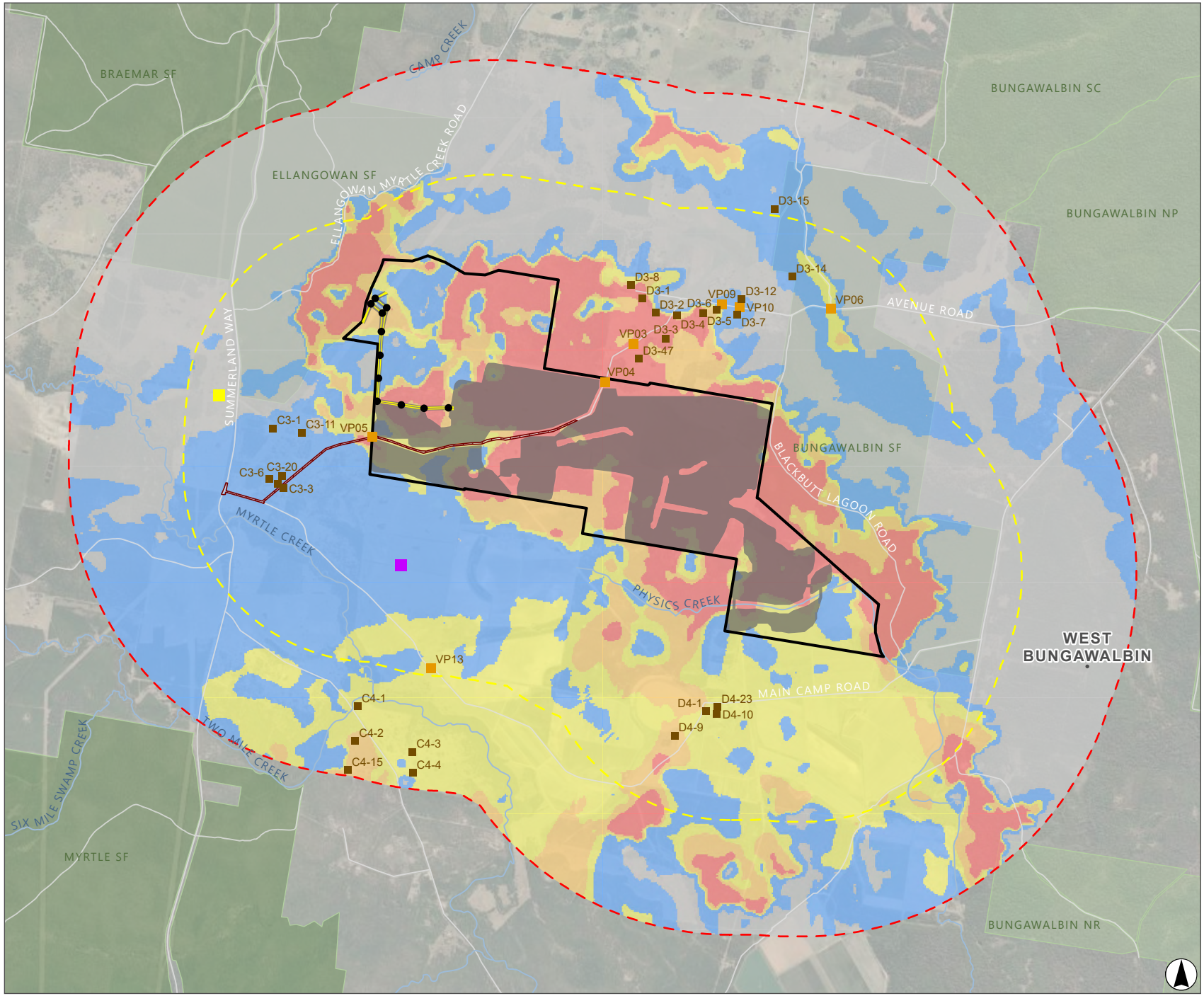
In order to verify these results, photomontages were prepared for these two public receptors (see Appendix C of the LVIA). Assessment of these two photomontages determined a final overall visual impact rating of **'low'** for both receptors. Please see **Table 6.17** for a summary of the final visual magnitude and sensitivity ratings assigned for both public receptors which were utilised to determine their final overall visual impact rating. Therefore, no mitigation is required in accordance with the performance objectives.

Table 6.17 Summary of Detailed Assessment of Public Receptor Locations

Public Receptor	Visual Magnitude Rating	Visual Sensitivity Rating	Visual Impact Rating
VP04	High	Very Low	Low
VP05	High	Very Low	Low

FIGURE 6.14

Viewshed and Receptors



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Transmission Poles
- Transmission Lines
- Public Receptors
- Private Receptor
- Myrtle Creek Solar Farm
- Summerville Solar Farm
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- 4 km from the nearest solar array
- 2.5 km from the nearest solar array

Visibility of Solar Arrays

- 0%
- 1 - 25%
- 25 - 50%
- 50 - 75%
- 75 - 100%

0 1 2

Kilometers

Scale 1:70,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.8.3.4 Visual Impact Consultation

During community consultation sessions held for the Project on 6 and 7 September 2023 and 7 February 2024, the community had an opportunity to voice their perceptions on significant landscape features, defining areas of scenic quality and key public viewpoints of value.

Key concerns raised related to potential visual impacts including reflections from solar impacts and the potential for cumulative impacts on the natural landscape making it less aesthetically pleasing. These concerns were taken into consideration when assessing visual impacts of the Project and developing mitigation measures (see **Section 6.8.4**).

6.8.3.5 Landscape Character

The landscape character assessment identified four LCZs across the LVIA Study Area all of which were found to have low landscape character impact ratings. Therefore, the overall visual impact rating of the Project was determined to be low in accordance with the Guidelines.

6.8.3.6 Associated Project Infrastructure

Due to the topography and elevation of the Project Area, the LVIA determined that associated Project infrastructure (see **Figure 3.1**) is unlikely to alter the existing visual landscape of the Project Area outside of its immediate vicinity. See **Table 6.18** for a more detailed description of the assessment findings for each element of associated Project infrastructure.

Table 6.18 Associated Project Infrastructure Assessment

Project Element	Assessment and Sensitivity Rating
BESS	It is likely that the BESS would be visible when travelling along Avenue Road due to its proximity. However, as Avenue Road is a local road, the sensitivity rating for the BESS is likely to be **very low.**
Site Access and External Road Upgrades	Although upgrades to Avenue Road may increase traffic movements (due to sealing of the road making it more accessible), the sensitivity rating is likely to remain **very low.**
O&M Facility	The appearance of this facility would be similar to the existing farm structures within the landscape therefore the potential visual impacts are likely to be **very low.**
Inverters	The appearance of inverters would be similar to the existing farm structures within the landscape therefore the potential visual impacts are likely to be **very low.**
Substation/Switching Substation	It is likely that the substation would be visible when travelling along Avenue Road due to its proximity. However, as Avenue Road is a local road, the sensitivity rating for the Substations is likely to be **very low.** Additionally, views from surrounding receptors are limited due to a combination of intervening vegetation between the Project and the substations which would likely screen views.

Project Element	Assessment and Sensitivity Rating
Electrical Reticulation and transmission line	Transmission infrastructure is an existing element within the LVIA Study Area and forms part of the visual character of the area. The proposed transmission infrastructure is likely to be higher than those that are currently within the LVIA Study Area. The proposed transmission infrastructure is likely to be visible, though will not dominate the surrounding visual landscape. Therefore, the potential visual impacts are likely to be **very low.**
Fencing	Whilst the fencing is likely to be visible from areas directly adjoining the Project, the proposed fencing is unlikely to contrast with the surrounding landscape. As a result, the visual impacts are likely to be negligible. Therefore, the potential visual impacts from fencing are likely to be **negligible.**

The LVIA has identified design principles to reduce the potential visual impact from the Project and associated infrastructure noting impacts from associated infrastructure are all anticipated to be very low or negligible (see **Section 6.8.4**).

6.8.3.7 Night Lighting

The LVIA concluded it is likely there would be limited to no impact on the existing night landscape resulting from the Project's night lighting of ancillary structures.

The LVIA Study Area is relatively isolated and existing lighting is largely associated with existing dwellings and motor vehicles. The Project would only require the use of night lighting for security lighting to the substation and within the O&M facility and light sources would be limited to low-level lighting for security as well as night-time maintenance and cases of emergency.

The Project is located approximately 200 km north-east of the Siding Spring Observatory, and no impacts from the Project are anticipated. However, several recommendations were made with a consideration of the principles outlined in the DPE's *Dark Sky Planning Guidelines* 2023 and *National Light Pollution Guidelines for Wildlife 2023* which are outlined below in **Section 6.8.4.**

6.8.3.8 Cumulative Impact Assessment

The LVIA identified that, due to Myrtle Creek Solar Farm being in early scoping phase, in depth assessment of cumulative impacts of these two projects will need to be addressed in the Myrtle Creek EIS. However, the LVIA did conclude that based on observations made during the site visit, it is likely both Projects could be viewed simultaneously albeit limited due to existing topography and screening from vegetation along Avenue Road.

The LVIA identified potential cumulative impacts from Summerville Solar Farm and the Project, the majority of which occur along Summerland Way. Twelve private receptors are located between the two Projects. Desktop assessment and observations made during the site visit found the vegetation present surrounding these receptors would be sufficient in fragmenting the view of the projects. Further assessment done by applying the same framework utilised for the Preliminary Assessment indicated that the receptors either require no further assessment as they were assigned to have a 'low' or 'very low' visual impact rating. Based on existing vegetation between the projects, it is unlikely that Summerville Solar Farm and the Project would be able to be viewed simultaneously.

6.8.4 Mitigation Measures

A range of mitigation and management strategies in response to the identified visual impacts of the Project were identified in the LVIA and are summarised below in **Table 6.19**.

Table 6.19 Landscape and Visual Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
LV-01	A 30 m biodiversity corridor will be established along the northern boundary of the Project Area (see **Figure 6.15**). The screening will be: • Planted prior to commencing operation. • Be designed and maintained in accordance with RFS's Planning for Bushfire Protection 2019 (or equivalent) in consultation with Council. • Maintained with appropriate weed management. • Comprised of species that are endemic to the region. The following species are proposed: ○ *Eucalyptus tereticornis, Lophostemon suaveolens, Melaleuca quinquenervia, Eucalyptus siderophloia, Melaleuca alternifolia, Acacia concurrens, Allocasuarina torulosa.*	Construction
LV-02	The following measures will be implemented by Ark Energy to control the level of off-site night lighting from the Project: • Only use lighting for areas that require lighting i.e. paths, building entry points. • Reduce the duration of lighting. • Switch off lighting when not required. • Consider the use of sensors to activate lighting and timers to switch off lighting. • Use the lowest lighting intensity required for the job. • Use energy efficient bulbs and warm colours. • Direct light downwards to eliminate. • Ensure lights are not directed at reflective surfaces. • Use non-reflective dark coloured surfaces to reduce reflection of lighting. • Keep lights close to the ground and / or directed downwards. • Use light shield fittings to avoid light spill.	During Construction

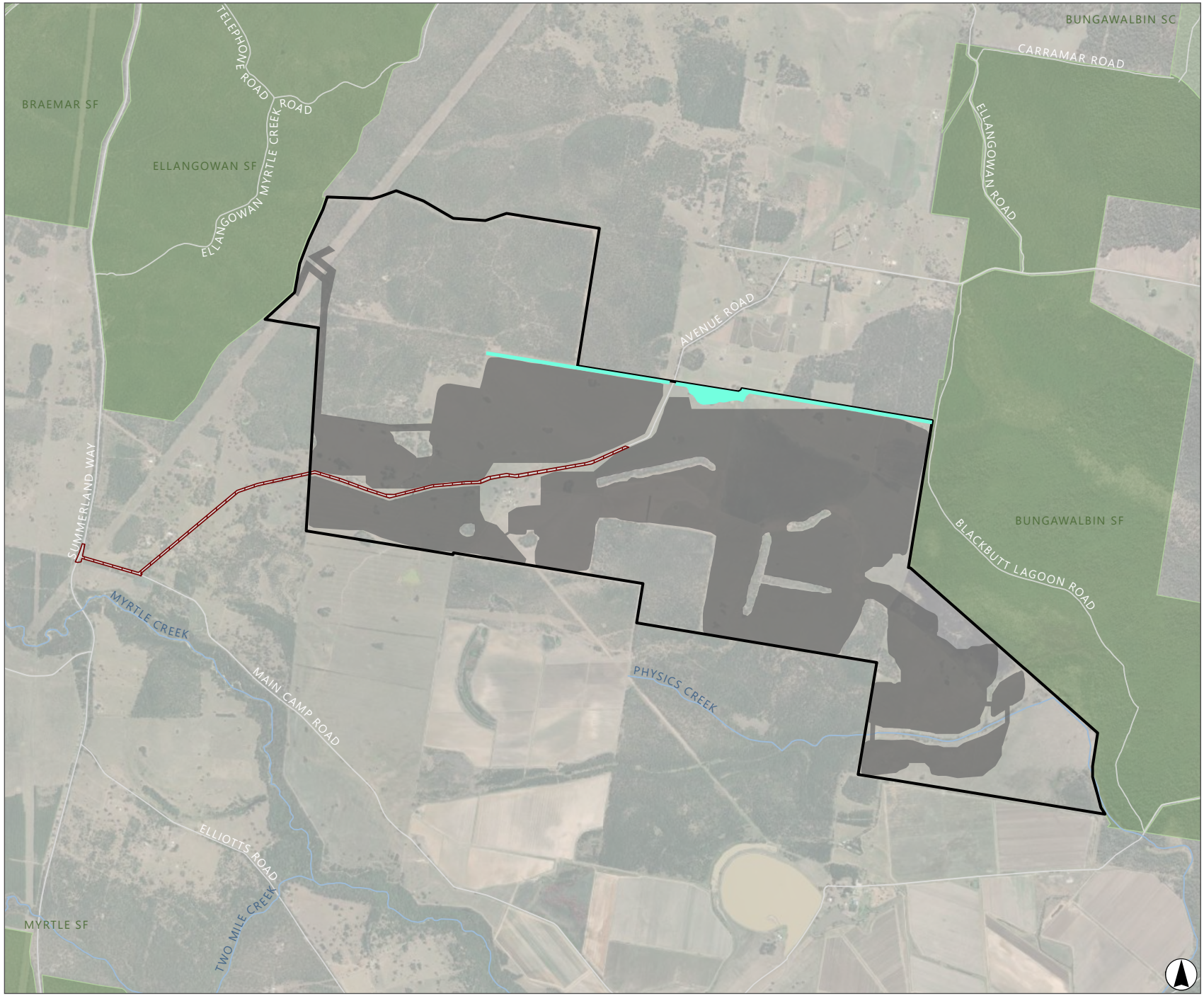
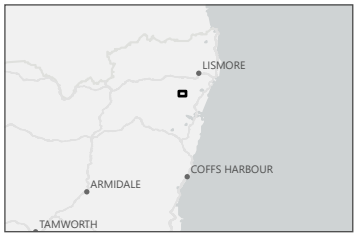


FIGURE 6.15

Biodiversity Corridor

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- Biodiversity Corridor



0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.9 Glint and Glare

A Glint and Glare Assessment (GGA) (see **Appendix 12**) was undertaken by Moir (2024) to assess potential glint and glare impacts associated with the Project. This section outlines the key findings of the GGA, the potential glint and glare impacts of the Project and proposed mitigation and management measures.

The GGA was prepared as required in the Project's SEARs (see **Appendix 1**). It was prepared in accordance with the Guidelines and the Technical Supplement.

6.9.1 Existing Environment

The Project Area (see **Figure 6.14**) and immediate surrounds consist of low-lying flats comprising primarily cleared and modified land to support agricultural activities. Remnant patches of native vegetation are present in pockets throughout the Project Area, which is surrounded by several densely vegetated State Forests and National Park and Conservation Areas.

The Project Area is not located in a Renewable Energy Zone (REZ). There are two renewable energy projects located within close proximity to the Project Area: Myrtle Creek Solar Farm (located directly to the south of the Project) and Summerville Solar Farm (located approximately 1.8 km west of the Project Area) (see **Figure 6.14**).

Richmond Valley Council LEP 2012 recognises up to 143 lots with dwelling entitlements or dwelling opportunities (Richmond Valley Council LEP 2012) within 4 km of the Project Area. A receivers list received from Ark Energy dated 27 June 2023 showed 69 dwellings within 4 km of the Project Area. This list was refined based on feedback from RVC to exclude 17 structures that were determined to be sheds. Therefore, as per the latest data received from Ark Energy dated 27 November 2023, there are 49 structures classified as dwellings within 4 km of the Project Area. One dwelling is located within the Project Area (C3-4) (see **Figure 6.12**) and is an associated dwelling not considered in assessment as part of the GGA.

6.9.2 Methodology

6.9.2.1 Receptor Identification

Three types of receptors were assessed in the GGA in accordance with the Guidelines:

- Private receptors within 3 km to solar array.
- Public (road and rail) receptors within 1 km to solar array.
- Aviation receptors within 5 km to solar array.

Relevant receptors for assessment were identified using the receptor refinement process as applied in the LVIA (see **Section 6.8.2.2**). Each residential receptor was assigned an observation point 'ID' (OPx) (see Table 5 of the GGA).

Each receptor was assigned an impact rating and assessed against relevant performance objectives as outlined in the Technical Supplement. See Section 4–Section 6 of the GGA for detailed scopes, methodologies and performance objectives utilised to assess all receptor types.

6.9.2.2 Modelling

Glare is broadly classified into three categories, represented by three colours:

- Green Glare – Low potential for temporary after-image.
- Yellow Glare – Potential for temporary after-image.
- Red Glare – Retinal burn.

Glint is generally defined as a momentary flash of bright light while glare can be defined as a continuous source of excessive brightness proportionate to ambient lighting (FAA, 2021) Glint and glare from solar panels have the potential to impact road users, rail networks, nearby buildings, air traffic controllers and pilots, however, these impacts are relatively uncommon (DPE, 2022).

The GGA focused on yellow glare, as red glare is not expected for PV and green glare has low potential to cause after image (negligible). After image is defined as an image which continues to appear in the eyes after a period of exposure to the original image.

The GGA utilised the Solar Glare Hazard Analysis (SGHAT) Tool developed by Sandia National Laboratories to determine the nature of potential glare from the Project at identified receptors. The tool was run at a simulation interval of one minute based on the reflectivity of solar rays off PV modules which typically lasts for at least one minute.

Modelling was based on a worst-case scenario assuming or considering the following factors:

- Position of the sun over time with respect to the location of the Project.
- Clear weather all year round, (i.e. no consideration of cloud coverage).
- Tracking axis tilt, tracking axis orientation and properties of the PV modules (see **Section 3.3.2**).
- Potential to screen the impact by surrounding topography (does not take into account intervening elements such as vegetation and built structures).

For the purposes of the GGA, the Project Area was divided in 19 separate PV Array areas for assessment. Although the solar arrays have been divided into 19 separate areas, they have been numbered starting from 1 to 23 due to software limitations and does not impact the overall results of the assessment (see **Figure 6.17**).

6.9.2.3 Backtracking and Operational Management

The Project proposes to utilise a single axis horizontal tracking system which can be configured to undertake 'backtracking' movements. This technique adjusts the angle of solar panels when the sun is low in the morning or evening to prevent one row of panels casting shadows on another. While the panels may not be at the optimal angle for sunlight absorption during backtracking, this compromise is beneficial as it avoids the loss that shading can cause. The GGA considered this operational technique by incorporating backtracking into the modelling utilising ForeSolar technology and produced six 'scenarios' (see **Figure 6.16**).

Scenarios 1, 2, 3, 4, and 5 involve modelling different options with normal tracking, backtracking, and resting angles of 0°, 5°, 22°, 45°, and 60° during nighttime stowing. Scenario 6 was also modelled and included normal tracking of ±60° angle without backtracking and stowing angle. These scenarios were analysed to determine which would be most effective in mitigating potential glare impacts of the Project by altering the functioning of PV arrays during backtracking mode.

The GGA assumed Scenario 1 as the worst-case scenario which includes normal tracking, backtracking and a night time stowing angle of 0°. In this scenario, the panels move between the operational range (maximum tilt).

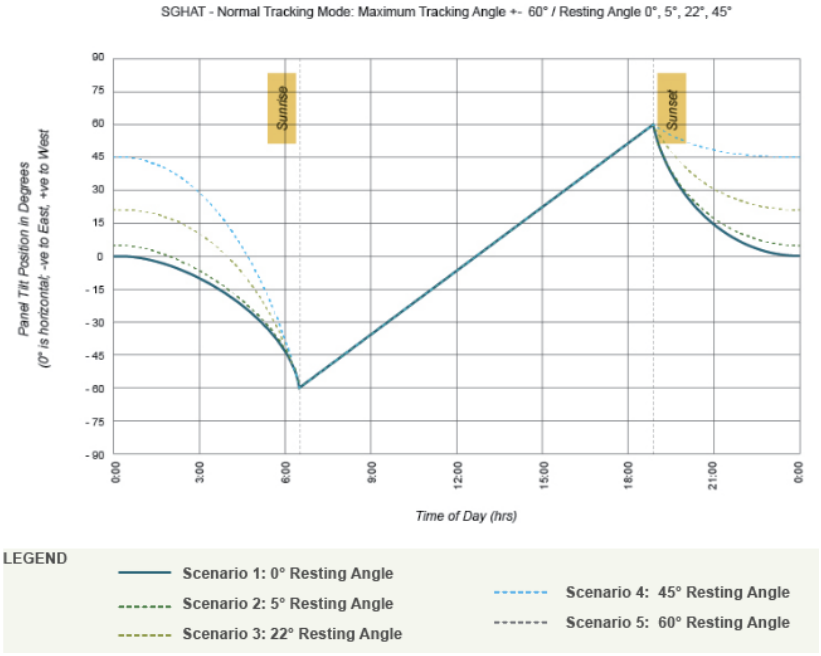


Figure 6.16 Backtracking Scenarios (Moir, 2023)

The modelled scenarios were utilised to identify impacts and inform potential mitigation measures (see **Section 6.9.4**). See Attachment A of the GGA for the full assessment results of scenario one and see attachment B for Scenarios 2–6.

6.9.3 Impact Assessment

As part of the preliminary assessment undertaken in the LVIA the following was identified:

- 33 private receptors within 3 km have a line of sight to the Project.
- Two public (road) receptors (Avenue Road and Main Camp Road) have a line of sight to the Project Area.
- No rail receptors were identified, therefore, no further assessment was required or undertaken.
- No aviation receptors were identified, therefore, no further assessment was required or undertaken.

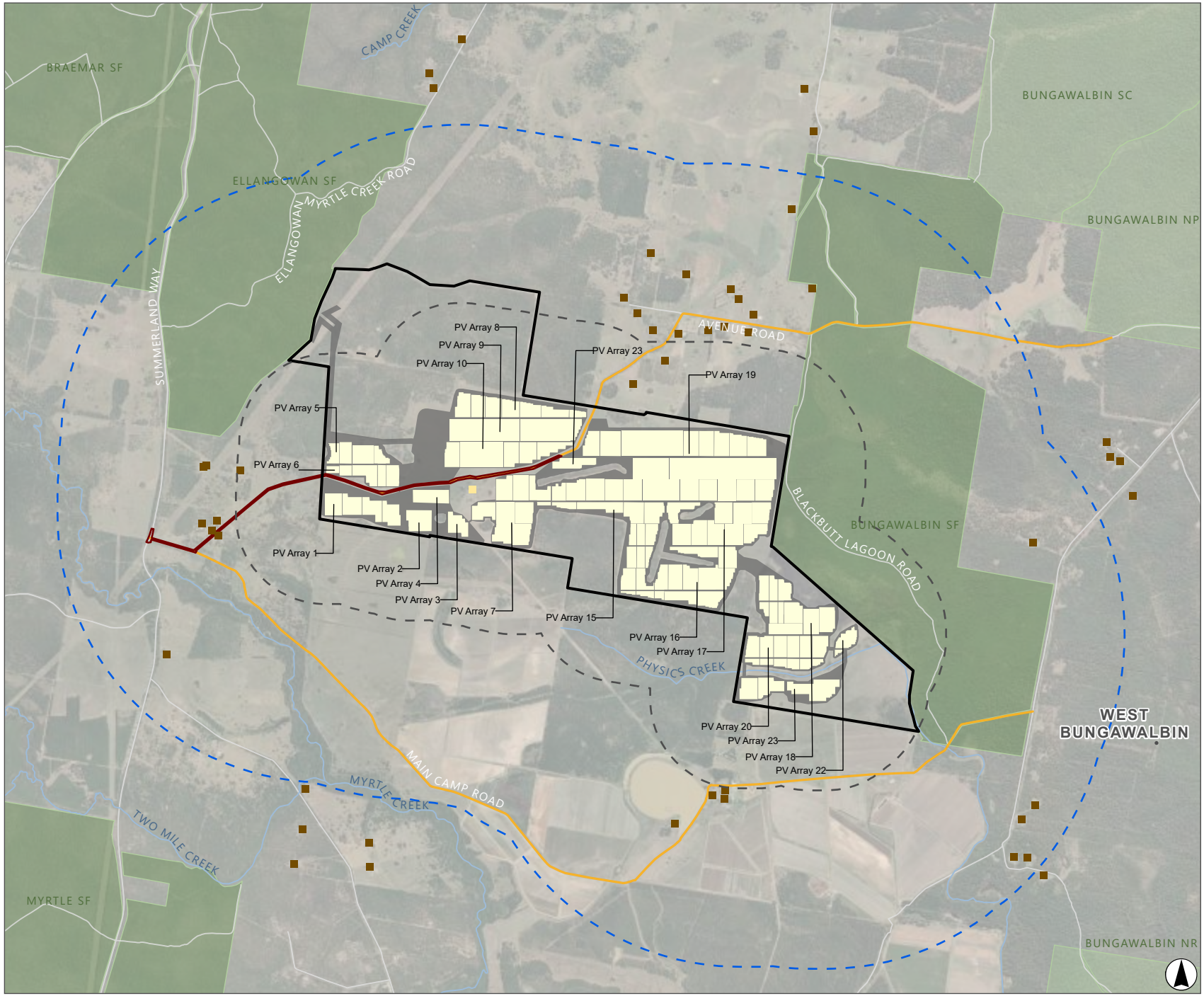


FIGURE 6.17

Glint and Glare Receptors and PV Array Layout

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Solar Array Blocks
- Associated Receptor
- Private Receptor
- Public (Road) Receptor
- 1km to the nearest solar panel
- 3km to the nearest solar panel
- NPWS Reserve
- State Forest
- Roads
- Watercourse

0 1 2

Kilometers

Scale 1:60,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.9.3.1 Private Receptors

Of the 33 private receptors identified, four were assessed as having potential yellow glare. This was identified as originating specifically from PV array 10:

- OP4 (C3-20) – approximately 0.7 hours per year (hr/year).
- OP5 (C3-3) – approximately 1.1 hr/year.
- OP6 (C3-6) – approximately 0.6 hr/year.
- OP7 (C3-8) – approximately 1.9 hr/year.

See Table 5 of the GGA for assessment results of all 33 identified private receptors.

These four private receptors were each assessed as having a **'low'** glare impact rating as they would experience under 10 hr/year of glare from PV Array 10. As a result, no mitigation measures are required or proposed.

6.9.3.2 Public Receptors

Two public receptors were assessed as having potential yellow glare:

- **Main Camp Road**- approximately 2.1 hr/year from PV Array 15.
- **Avenue Road**- approximately 534 hr/year including glare from:
    - PV Array 10 – up to 400.1 hr/year from mid-March to late September, specifically between 5:45 am and 10:15 am and between 12:30 pm and 6:00 pm.
    - PV Array 6 – up to 89.8 hr/year from mid-February to mid-October specifically between 5:00 am and 7:55 am and from mid-April to late August from 4:30–5:30 pm.
    - PV Array 19 – up to 34 hr/year from February to early November.
    - PV Arrays 7,8,15 and 16 are expected to have less than 10 hrs/year of 'Yellow' glare per panel that contributes to the total glare experienced along Avenue Road (534.0 hrs).

See Section 5.3 of the GGA for more detailed assessment results for Avenue Road and Main Camp Road.

Main Camp Road was assessed as having a **'low'** glare impact rating as it would experience under 10 hr/year of glare from PV Array 15. Therefore, no mitigation is required.

Avenue Road was assessed as having a '**high'** glare impact rating as it would experience over 30 hr/year of glare. Therefore, mitigation measures are required in order to reduce impacts as far as practicable.

Desktop assessment of Avenue Road found the presence of limited/no screening vegetation between the impacted section of the road and the relevant solar arrays. Normally, mitigation in the form of vegetation screen planting (as per the Technical Supplement) would be proposed to mitigate the yellow glare from the arrays. However, because Avenue Road is located in a bushfire zone (see **Figure 6.3**), the preference is for alternative mitigation to minimise bushfire risk associated with additional vegetation along the access road.

Therefore, alternative operational management measures have been identified as informed by Scenarios 2-6 as described in **Section 6.9.2.3**.

6.9.3.3 Modelling Scenarios

Scenario 6 was found to be the most effective in eliminating the potential for 'yellow' glare impacts on Avenue Road. **Table 6.20** shows the decrease in hr/year of yellow glare on Avenue Road from 534 to zero with the adoption of Scenario 6.

Table 6.20 Comparative Modelling Scenarios (1 and 6)

PV Array	Scenario 1 (hr/yr)	Scenario 6 (hr/yr)
10	400.1	0
19	34	0
6	89.8	0
Avenue Road total (approx.)	534	0

It was found that utilising alternate tracking patterns, specifically in Scenario 2, 3, 4, or 5, progressively reduced glare, however, did not eliminate it entirely.

6.9.4 Mitigation Measures

A range of mitigation and management strategies in response to the identified glare impacts of the Project are summarised below in **Table 6.21**.

Table 6.21 Glint and Glare Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
GG-01	If the PV arrays 6,10 and 19 (which have been identified as having the potential to for 'yellow' glare) are found to cause 'yellow' glare during operation, then the Project will adopt the following tracking pattern: • Normal tracking angle of ±60° angle. • No backtracking operation. • In this case, the panels will move between the operational range (maximum tilt) and remain at this angle only switching back during the night. This tracking pattern will only be utilised for the periods and times of year when glare impacts are potentially possible (see **Section 6.9.3.2**). Outside of these times, the panels would move as per desired tracking patterns.	Operation

6.10 Traffic and Transport

A Traffic and Transport Impact Assessment (TTIA) (see **Appendix 13**) was undertaken by Access Traffic Consulting Pty Ltd (Access, 2024) to assess potential impacts of the construction, operations and decommissioning phases of the Project on the operation of the surrounding existing road network. This section outlines the key findings of the TTIA, the potential traffic related impacts of the Project and proposed mitigation and management measures.

The TTIA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with:

- Cumulative Impact Assessment Guidelines for State Significant Projects 2022.
- Austroads *Guide to Road Design* (The Guide).
- The TTIA was also supported by an Over Size Over Mass (OSOM) Route Analysis prepared for the Project by EMM Consulting Pty Ltd (EMM Consulting) (2024) to determine potential constraints of the proposed Project transport routes relating to the movement of OSOM vehicles.

6.10.1 Existing Environment

The external road links relevant to the Project were identified based on the proposed transport routes for Project traffic (see **Section 6.10.3**). The Project's critical road links are Summerland Way, Main Camp Road and Avenue Road which are anticipated to accommodate all staff, light and heavy vehicle movements (see **Figure 6.18**).

Table 6.22 details these road links including specific sections relevant to the Project, their classification and configurations.

Table 6.22 Key Project Road Links and Intersections

Road or Intersection Name	Description	Existing Operational Performance
Summerland Way	• State-controlled Road – Transport for NSW (TfNSW). • Runs north-south parallel to the Pacific Highway, connecting the Queensland border to Grafton in the south. • Arterial Road forming part of the TfNSW B-Double and OSOM load Carrying Vehicle Network approved routes. • In the vicinity of the Project Area, the road is configured as a two lane, two-way undivided rural highway cross section where the road is constructed as a 9.5 m wide sealed pavement (including shoulders) and operates under posted speed limit of 100 km/hr.	The existing configurations of Summerland Way is considered adequate to accommodate the forecast existing (2024) traffic volumes as shown in **Table 6.23**.
Main Camp Road	• Council-controlled Road (Richmond Valley Council). • Rural access road running east from Summerland Way. • Approximately 5.15 km section between Summerland Way and Avenue Road will be utilised by all Project traffic. • Two-way, two-lane undivided carriageway with an unsealed road width of approximately 6 m. • No specific speed limit is posted, therefore, a default 100 km/hr speed limit would apply.	The existing configuration of Main Camp Road is considered adequate to accommodate the forecast existing (2024) traffic volumes as shown in **Table 6.23**.

Road or Intersection Name	Description	Existing Operational Performance
Avenue Road	• Rural access road running north- north-east from Main Camp Road under the jurisdiction of Richmond Valley Council. • Approximately 4.4 km section between Main Camp Road and SA3, will be utilised by all Project traffic travelling to/from the Project Area. • Two-way, two-lane undivided carriageway with a varying unsealed width of 4–5 m. • No specific speed limit is posted, therefore, a default 100 km/hr speed limit would apply.	The existing configuration of Avenue Road is considered adequate to accommodate the forecast existing (2024) traffic volumes as shown in **Table 6.23**.
Summerland Way / Main Camp Road intersection	**Layout/Geometry:** • State-controlled road intersection utilised by all Project traffic from the broader road network. • Three-way priority intersection (give way). • No left turn treatment. • Auxiliary right turn (AUR) treatment on the northern and southern Summerland Way approaches.	Summerland Way/Main Camp Road is expected to operate satisfactorily to accommodate the forecast existing (2024) traffic volumes as shown in **Figure 6.19** and **Figure 6.20**.
Summerland Way / Main Camp Road intersection	**Sight Distance:** • A suitable approach site distance (ASD) from Main Camp Road to the intersection and the sight distance to/from the intersection to the north exceeds the requirements for safe intersection sight distance (SISSD) required under the Guide. • However, the existing sight lines to/from the intersection to the south were found to be slightly restricted due to regrowth vegetation on the south-east corner of the intersection (see **Photo 6.2**). • SISD will be achievable with the implementation of minor vegetation clearing works on the south-eastern corner of the intersection.	Summerland Way/Main Camp Road is expected to operate satisfactorily to accommodate the forecast existing (2024) traffic volumes as shown in **Figure 6.19** and **Figure 6.20**.
Main Camp Road / Avenue Road Intersection	**Layout/Geometry:** • Three-way priority intersection (give way). • No turn treatments are provided at the intersection. • The intersection has a relatively minor footprint, with heavy vehicles observed to utilise the full width of the approach and departure of the intersection to travel between Main Camp Road and Avenue Road.	No turning movement count was undertaken for Main Camp Road/ Avenue Road based on the very low volumes (<5 vehicles per hour (vph)) observed for all movements during the site inspection.
Main Camp Road / Avenue Road Intersection	**Sight Distance:** • Adequate sight distances in excess of those required under The Guide were identified in both directions to/from Avenue Road at the intersection.	No turning movement count was undertaken for Main Camp Road/ Avenue Road based on the very low volumes (<5 vehicles per hour (vph)) observed for all movements during the site inspection.

Photo 6.2 Safe Intersection Sight Distance Requirements to/from the South (Access, 2023)

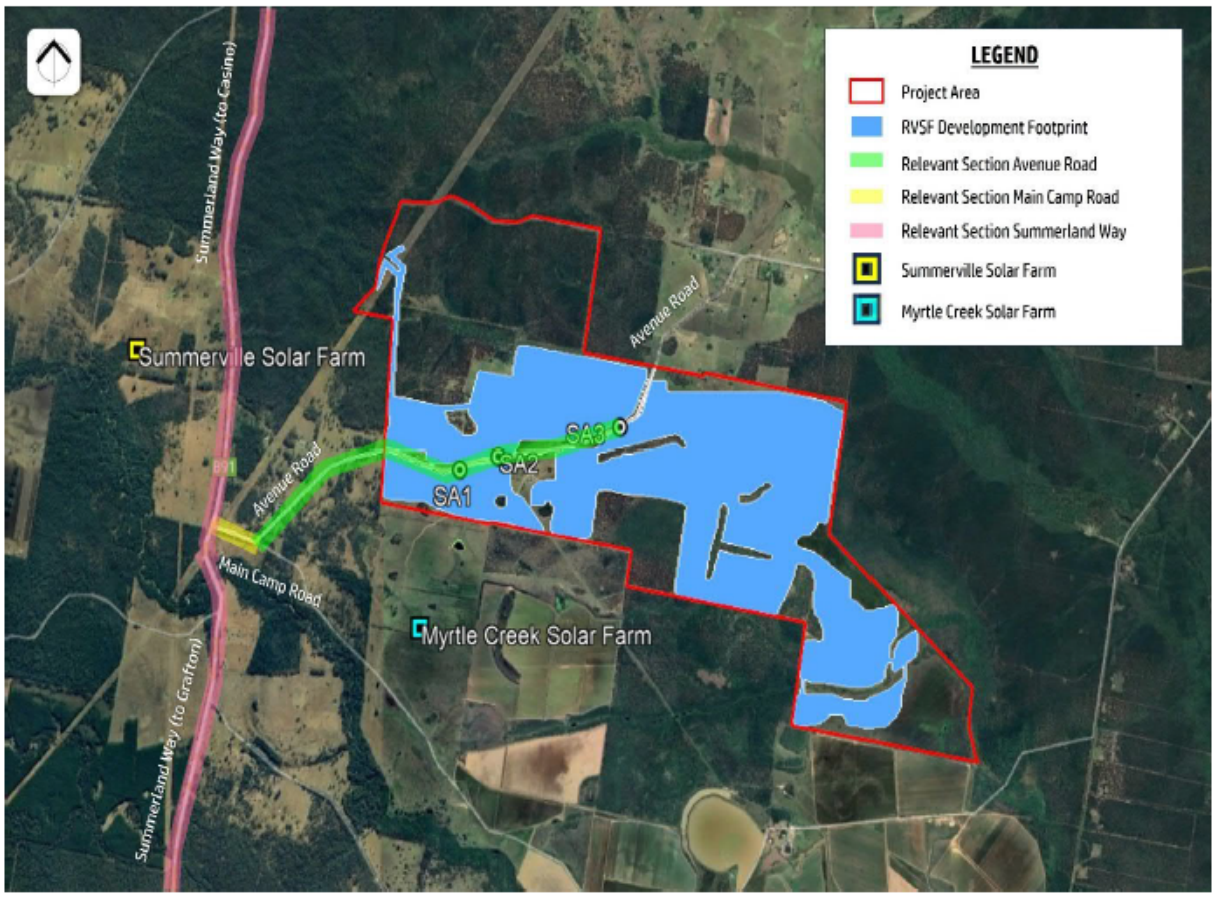


Figure 6.18 Key Project Road Links, Intersections and Site Access

6.10.1.1 Existing Traffic Volumes

Road Link Volumes

Current (2024) traffic volumes for key roads were calculated as follows:

- **Summerland Way** – from available historical count data from TfNSW.
- **Main Camp Road** – from observed peak hour traffic volumes during the site inspection.
- **Avenue Road** – through a conservative estimate based on the application of a daily generation rate of four vehicles per day (vpd) for each of the 20 rural properties currently serviced by the link.

A conservative background growth rate of 3% per annum (compound) was applied to the identified baseline year volumes on Summerland Way and 1% on Main Camp Road and Avenue Road to establish the existing (2024) daily traffic volumes as shown in **Table 6.23.**

Table 6.23 Existing (2024) Daily Traffic Volumes

Road Link	Road	Baseline Year (Bi-Dir)	Existing (2024) Bi-Dir
Summerland Way (Casino to Grafton)	Casino to South Casino	3,801	4,406
Summerland Way (Casino to Grafton)	South Casino to Whiporie	1,280	2,054
Summerland Way (Casino to Grafton)	Whipore to Warragai Creek	2,464	4,073
Summerland Way (Casino to Grafton)	Warragai Creek to Grafton North	6,405	9,406
Summerland Way (Casino to Grafton)	Grafton North to Grafton	24,917	28,885
Main Camp Road	Summerland Way to Avenue Road (0–05.15 km segment)	160	162
Avenue Road	North of Main Camp Road (0–4.443 km segment)	80	80

Intersection Volumes

Turning movement counts were undertaken at the Summerland Way / Main Camp Road intersection during the site inspection to establish existing (2024) traffic volumes. Daily 2024 AM and PM peak hour volumes for both the Project and network peak periods as shown in **Figure 6.19** and **Figure 6.20.**

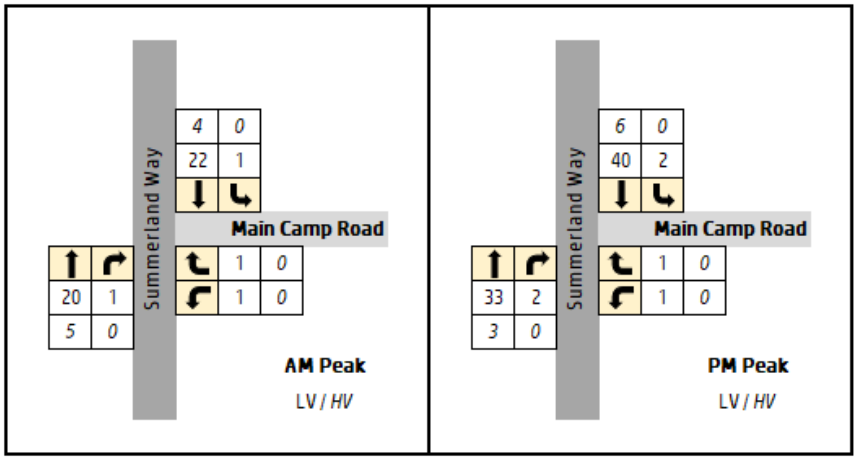


Figure 6.19 Existing (2024) AM Peak Hour Volumes (Project Traffic Peaks)

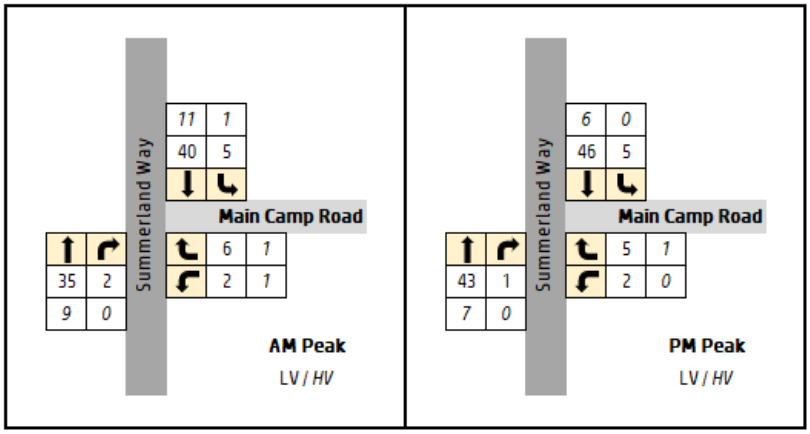


Figure 6.20 Existing (2024) AM Peak Hour Volumes (Network Traffic Peaks)

6.10.1.2 Road Crash History

A review of the road crash history of the relevant sections of Main Camp Road and Avenue Road found zero recorded crashes. However, 52 accidents were identified on the rural section of Summerland Way (Casino to Grafton) between 2018–2022, including 16 and 36 crashes on the section to the north and south of Main Camp Road respectively.

It should be noted that the majority of the identified accidents are single vehicle off path/road crashes which are typical for rural highway environments and generally relate to driver behaviour. Furthermore, no crash clusters were identified to suggest any existing road features or design deficiencies on the network (Summerland Way) likely to be contributing to vehicle accidents.

No recorded crashes were identified at the key intersection of Summerland Way / Main Camp Road.

6.10.1.3 Transport Infrastructure

Due to the rural nature of the Project Area, there is currently no public transport infrastructure located along the key road links. During the site investigation, it was observed that the Summerland Way/Main Camp Road intersection is currently being utilised as an informal stop for school bus movements.

6.10.2 Methodology

The following methodology was utilised in the TTIA:

- Key road links, intersections and public transport infrastructure.
- Desktop assessment and a site investigation undertaken by Access from 17–18 August 2023 were used to identify:
    - Road crash history from TfNSW Centre for Road Safety Database.
    - The current condition (including sight distances for key intersections), traffic volumes and operational performance of the existing road network was determined through site inspection and the Signalised Intersection Design and Research Aid (SIDRA) tool.

- Project details such as key transport routes, workforce numbers, site access points and estimated Project traffic were utilised to estimate traffic generation associated with the construction, operation and decommissioning phases of the Project and the distribution of this traffic on the external road network.
- Predicted traffic volumes from both the Summerville Solar Farm and Myrtle Creek Solar Farm projects were considered as part of the traffic cumulative impact assessment.

This information was then used to undertake a range of traffic impact assessments as outlined in **Table 6.24**.

Table 6.24 TTIA Impact Assessments

Assessment Type	Purpose
Access and frontage assessment	To determine the acceptability of the three proposed Project site access points in line with the Guide.
Turn warrant assessment	The forecast 'with Project' traffic turning movement volumes at Summerland Way/Main Camp Road were examined to establish the turn treatment requirements for the intersection (in line with the Guide) to accommodate additional traffic anticipated from the Project.
Intersection capacity assessment	The proposed treatments (BAL/CHRs) of the Summerland Way / Main Camp Road intersection were assessed using SIDRA to determine their operational performance. See Appendix B of the TTIA for full SIDRA analysis results.
Road link capacity assessment	The addition of the expected construction, operations and decommissioning phase traffic volumes from the Project were assessed to determine their impact on the operation of key road links.
Component transport routes	To assess the impact of OSOM movements on the operation or capacity of roads forming proposed transport routes.
Road safety assessment	A high-level road safety assessment was undertaken to establish the existing and post development road safety risks relevant to the Project against the safety risk score matrix as presented in Figure 48 of the TTIA.
Transport infrastructure assessment	To assess the potential impacts of the Project on relevant existing transport infrastructure.

Mitigation and/or management measures were then identified where required to address the potential traffic impacts of the Project.

6.10.3 Project Transport Routes

The transport routes comprising the road links and intersections anticipated for use by the Project are listed in **Table 6.25**.

Table 6.25 Project Transport Routes

Phase	Component(s)	Vehicle Type	Description
Construction	Workforce	Light	The construction workforce is assumed to commute daily to/from the Project Area from the nearby townships to the south (Grafton) and north (Casino and Ballina), utilising the road links of Summerland Way, Main Camp Road and Avenue Road.
Construction	Major solar and BESS components	Heavy	Major solar and BESS components are proposed to be delivered to the Port of Brisbane and then transported to the Project Area by road using a route consisting of the Port of Brisbane Motorway (M4), Gateway Motorway (M1), Pacific Motorway (M1), Myocum Road, Hinterland Way (B62), Lismore-Bangalow Road (B62), Bruxner Highway (B60), Summerland Way (B91), Main Camp Road and Avenue Road into the Project Area via SA2 on the northern side of Avenue Road. All state-controlled links along this route are approved TfNSW OSOM Load Carrying Vehicle Roads.
Construction	Construction Equipment	Heavy	Construction equipment (bulk earthworks plant, prefabricated buildings) and general construction materials (such as quarry materials, concrete, reinforcing steels, cable, site water, diesel fuel, waste removal etc) are proposed to also be sourced from the larger regional centres to both the south (i.e. Grafton) and north (i.e. Casino and Ballina) of the Project, and travel to/from the site via Summerland Way, Main Camp Road and Avenue Road.
Construction	Large electrical infrastructure	OSOM	Larger electrical infrastructure components such as the transformers and switch rooms for the substation and switching substation are proposed to be transported by OSOM transport vehicles. Transformer deliveries should be assumed to come from/via the Port of Brisbane, while the switch rooms deliveries should be assumed to come from James Energies at 67 Noosa Street, Heathwood, Queensland. The OSOM Route Assessment identified proposed OSOM transport routes for both the transformer and switch room components, with a summary of the proposed transport routes outlined in Section 3.31 and Figures 23 and 24 of the TTIA.
Operations	Workforce	Light	Light vehicles and the workforce would use the local road network from Summerland Way accessing SA2 via Main Camp Road and Avenue Road.
Operations	Maintenance activities, routine removal of waste etc.	Heavy	Heavy vehicle movements during the operations stage of the Project are anticipated to be extremely low, with only occasional movements to/from the Project Area (in the order of 1 vehicle per week). These heavy vehicle movements are expected to originate from the south or north and travel to the Project Area via Summerland Way, Main Camp Road and Avenue Road.

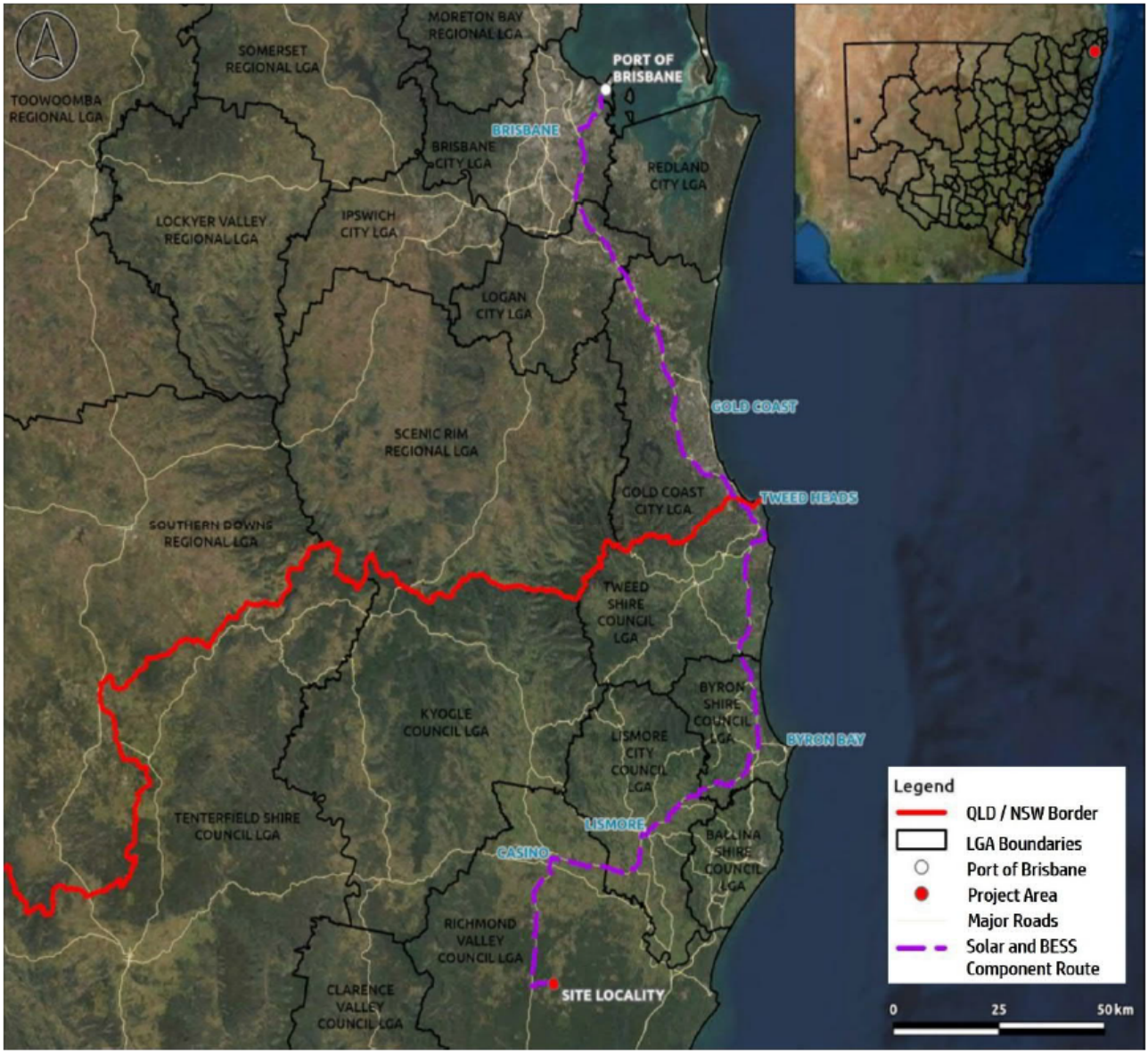


Figure 6.21 Project Construction – Main Solar and BESS Component Transport Route

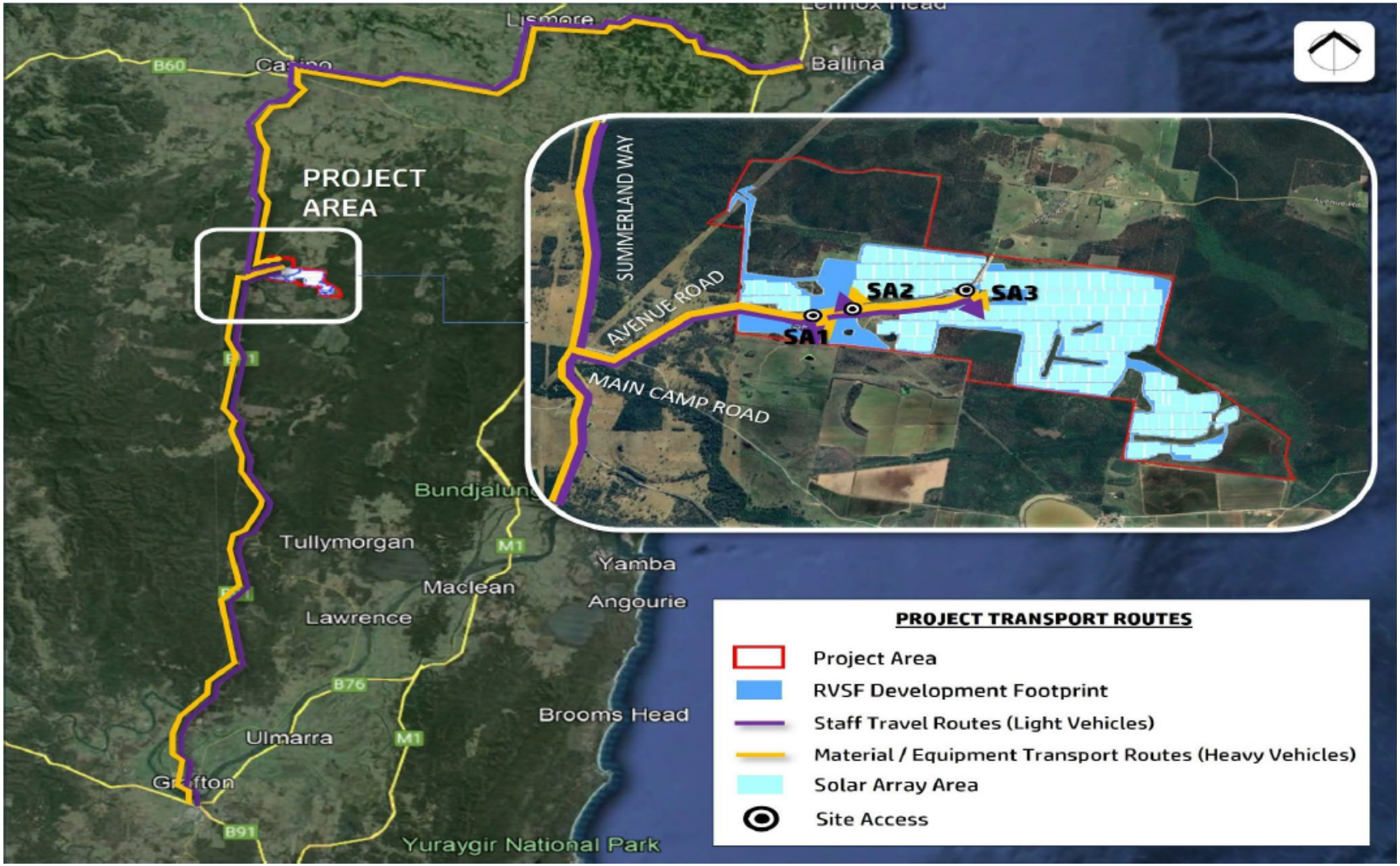


Figure 6.22 Project Construction – Material / Equipment / Staff Transport Routes

6.10.3.1 Site Access

The Project has three proposed access points off Avenue Road, which runs through the centre of the Project Area (see **Figure 6.18**). The main access point (SA2) would be the central access point approximately 3 km from the intersection of Avenue Road and Main Camp Road. The two secondary access points (SA1 and SA3) are located on the southern side of Avenue Road. These access points would cater for all traffic from the construction, operations and decommissioning phases of the Project.

Approximately 52 km of compacted internal access roads would be constructed throughout the Project Area to provide vehicular access between the external road network and the internal site infrastructure.

6.10.3.2 Project Phases and Traffic Volumes

The AM and PM peak periods for Project traffic generation are 6–7 am and 5–6 pm respectively. This is predominantly because these periods would include staff movements to/from the Project Area aligning with proposed construction hours.

The AM and PM peak periods of traffic flow on the adjacent section of the external road network (Summerland Way) as identified from historic traffic data are 8–9 am and 3–4 pm respectively.

Construction

Daily traffic movements to/from the Project Area during the Project's peak construction phase (estimated May 2026) would be 87 movements per day, including 53 heavy vehicles (including buses) and 33 light vehicle movements, equating to additional 174 vehicles per day. Two (2) OSOM movements are also anticipated.

Peak **hourly** Project traffic volumes during the construction phase of the Project would be:

- 28 movements during the AM Project Peak (6–7 am) and 17 movements during the AM Network Peak (8–9 am)
- 20 movements during the PM Project Peak (5–6 pm) and 5 movements during the PM Network Peak (3–4 pm).

Operation

Heavy vehicle movements during the operations phase of the Project are expected to be low (approx. one per week) and are considered to be negligible in terms of the traffic impact on the external road network.

Decommissioning

Project generated peak daily traffic movements would be similar during the decommissioning phase to those generated during the construction phase.

6.10.4 Project Traffic Volumes on the External Road Network

Detailed calculations were undertaken to establish the peak daily Project traffic volumes for each phase of the Project on the relevant sections of the external road network as shown in **Table 6.26**.

Table 6.26 Maximum Daily Project Traffic Volumes on External Road Network Links

Road Link	Road	Peak Construction (Bi-Dir)	Operations (Bi-Dir)	Decomissioning (Bi-Dir)
Summerland Way (Casino to Grafton)	Casino to Main Camp Road	105	14	74
Summerland Way (Casino to Grafton)	Main Camp Road to Grafton	68	20	47
Main Camp Road	Summerland Way to Avenue Road (0–05.15 km segment)	173	32	121
Avenue Road	North of Main Camp Road (0–2.618 km segment)	173	32	121
Avenue Road	North of Main Camp Road (2.618–3.051 km segment)	173	32	121
Avenue Road	North of Main Camp Road (3.051–4.443 km segment)	173	2	121

Detailed calculations were also undertaken to establish peak daily Project traffic volumes for each phase of the Project at the key access intersection of Summerland Way/ Main Camp Road for both the Project traffic and network peaks. See **Figure 6.23** for the identified construction phase traffic volumes during the Project traffic peak and **Figure 6.24** for the Project construction phase traffic volumes during the network peak. These figures illustrate the number of vehicle movements within the peak traffic periods associated with the Project (6-7am and 5-6pm) and the existing network (8-9am and 3-4pm). They also illustrate that these peak periods occur at different times in the AM or PM. See Figures 32, 33, 35 and 36 of the TTIA for operation and decommissioning phase volumes.

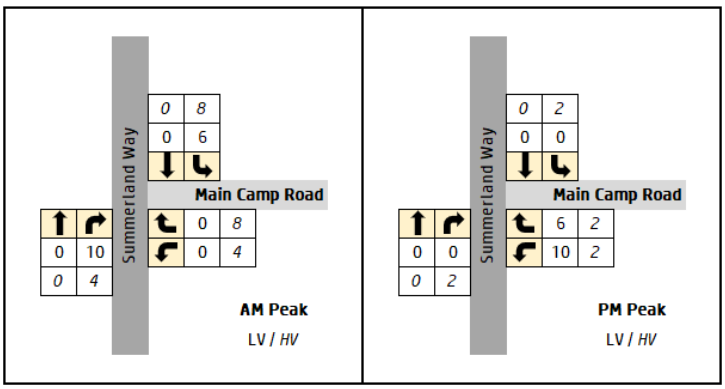


Figure 6.23 Project Construction Phase Volumes (Project Traffic Peaks)

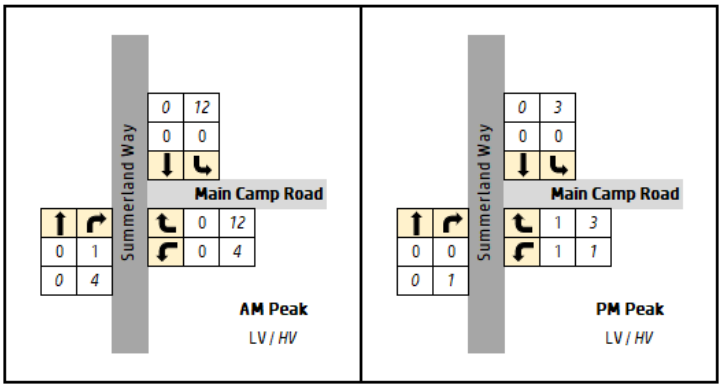


Figure 6.24 Project Construction Phase Volumes (Network Traffic Peaks)

6.10.5 Cumulative Project Traffic Volumes

Based on assumed traffic volumes utilised for the Summerville and Myrtle Creek Solar Farms, relevant daily road link volumes (see **Table 6.27**) and peak hour intersection movement volumes (for all Project phases) at the Summerland Way / Main Camp Road intersection for the external projects were established (see **Figure 6.25**).

Table 6.27 Project Traffic Volumes on External Road Network Links (Cumulative)

Road Link	Road	Summerville Solar Farm (Bi-Dir)	Myrtle Creek Solar Farm (Bi-Dir)	Total External Projects (Bi-Dir)
Summerland Way (Casino to Grafton)	Casino to Main Camp Road	240	240	480
Summerland Way (Casino to Grafton)	Main Camp Road to Grafton	160	160	320
Main Camp Road	Summerland Way to Avenue Road (0–5.15 km segment)	0	400	400
Avenue Road	North of Main Camp Road (0–2.618 km segment)	0	0	0
Avenue Road	North of Main Camp Road (2.618–3.051 km segment)	0	0	0
Avenue Road	North of Main Camp Road (3.051–4.443 km segment)	0	0	0

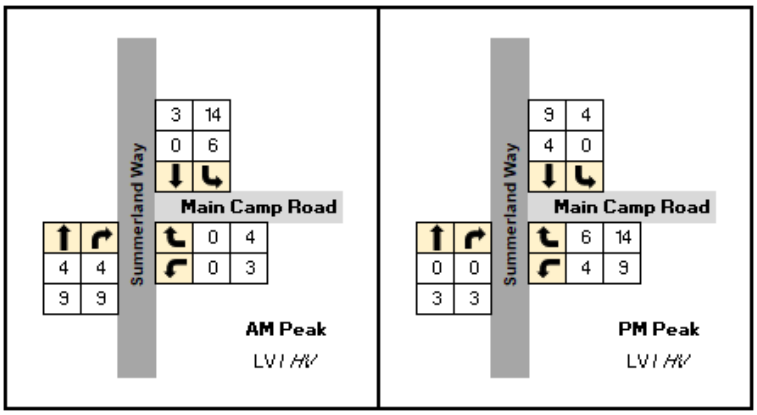


Figure 6.25 Total External Project Construction Phase Volumes (AM & PM Peaks)

6.10.6 Assessment of Impacts

6.10.6.1 'With' and 'Without' Scenarios

After establishing the existing (2024) daily traffic volumes on the external road network (see **Section 6.10.1**) and the anticipated Project traffic volumes on the external road network (see **Section 6.10.4**) forecast traffic volumes on the relevant sections of the road network were established for both 'with' and 'without' Project scenarios. These volumes were developed at the relevant design horizons for each phase of the Project (construction, operation, decommissioning). Cumulative volumes were also established with inputs from the cumulative project traffic volumes in conjunction with other relevant SSDs as determined in **Section 6.10.5**.

Road Link Volumes

Table 6.28 details the forecast 'with' and 'without' road link volumes for the construction phase of the Project. **Table 6.29** details the forecast with and without road link volumes inclusive of cumulative Project traffic volumes on external road network links. See summaries for the operations and decommissioning phases outlined in Table 16 and Table 17 of the TTIA.

Table 6.28 Road Link Daily Traffic Volumes (Construction Phase)

Road Link	Road	2026 Background (without)	Peak Project Construction (Project)	2026 Peak Construction (with)
Summerland Way (Casino to Grafton)	Casino to South Casino	4,675	105	4,780
Summerland Way (Casino to Grafton)	South Casino to Main Camp Road	2,179	105	2,284
Summerland Way (Casino to Grafton)	Main Camp Road to Whiporie	2,179	68	2,247
Summerland Way (Casino to Grafton)	Whiporie to Warragai Creek	4,321	68	4,388
Summerland Way (Casino to Grafton)	Warragai Creek to Grafton North	9,979	68	10,046

Road Link	Road	2026 Background (without)	Peak Project Construction (Project)	2026 Peak Construction (with)
Summerland Way (Casino to Grafton)	Grafton North to Grafton	30,645	68	30,712
Main Camp Road	Summerland Way to Avenue Road (0–5.15 km segment)	165	173	337
Avenue Road	North of Main Camp Road (0–4.443 km segment)	82	173	255

Table 6.29 Road Link Daily Traffic Volumes (Construction Phase – Cumulative Assessment)

Road Link	Road	2026 Peak Construction	Total external projects	2026 Peak Construction (with)
Summerland Way (Casino to Grafton)	Casino to South Casino	4,780	480	5,260
Summerland Way (Casino to Grafton)	South Casino to Main Camp Road	2,284	480	2,764
Summerland Way (Casino to Grafton)	Main Camp Road to Whiporie	2,247	320	2,567
Summerland Way (Casino to Grafton)	Whiporie to Warragai Creek	4,388	320	4,708
Summerland Way (Casino to Grafton)	Warragai Creek to Grafton North	10,046	320	10,366
Summerland Way (Casino to Grafton)	Grafton North to Grafton	30,712	320	31,032
Main Camp Road	Summerland Way to Avenue Road (0–5.15 km segment)	165	169	737
Avenue Road	North of Main Camp Road (0–4.443 km segment)	82	173	255

Intersection Volumes

Traffic volumes at the key Summerland Way / Main Camp Road intersection were established for both Project and network peaks. See **Figure 6.26** for the calculated Project construction phase traffic volumes for the Project traffic peak. See **Figure 6.27** for the calculated cumulative construction phase traffic volumes for the Project traffic peak. Turning volumes at the Summerland Way / Main Camp Road intersection for all phases of the Project are summarised in Figure 40 to Figure 47 of the TTIA.

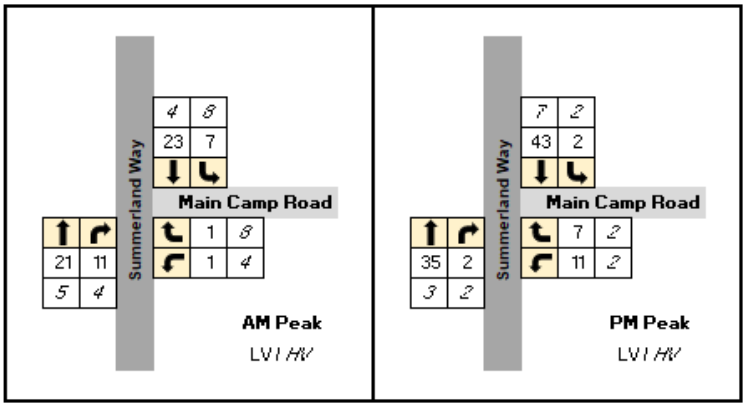


Figure 6.26 2026 Project Construction Phase Volumes (Project Traffic Peaks)

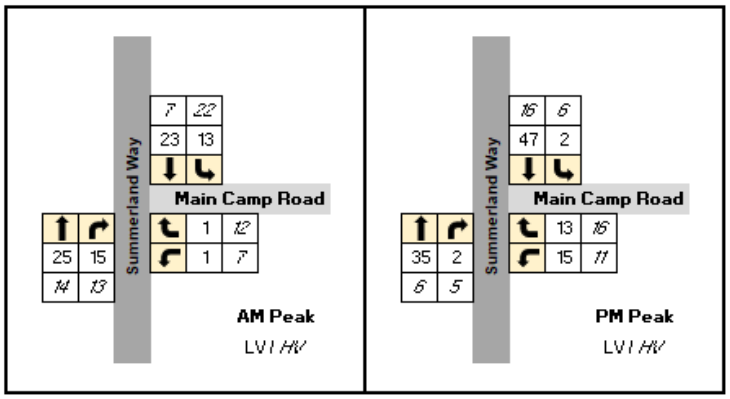


Figure 6.27 2026 Project Cumulative Construction Phase Volumes (Project Traffic Peaks)

6.10.6.2 Access and Frontage Assessment

It is proposed that the Project's three access points (SA1, SA2 and SA3) (see **Figure 6.18**) are constructed generally in accordance with the site access arrangement for articulated vehicles outlined in the Guide.

Furthermore, additional hardstand area is likely to be required to be provided at SA2 to accommodate the swept paths of the OSOM transport vehicles (transformer and electrical switch room). The exact extents of the hardstand areas will be confirmed in subsequent detailed design phases of the Project once the final configuration of these large electrical infrastructure components and associated transport vehicles are confirmed.

6.10.6.3 Turn Warrant Assessment

The assessment found that the required intersection treatments at the Summerland Way / Main Camp Road intersection were a basic left turn (BAL) and basic right turn (BAR) based on the expected peak hour traffic volumes during various phases of the Project. Based on this finding, it was recommended that the intersection be upgraded to a BAL on the northern Summerland Way approach to the intersection and that the existing auxiliary right (AUR) treatment (which is in excess of the required BAR) is retrofitted with the current standard rural channelised right (CHRs) treatment (within existing pavement extents of current AUR treatment.

A concept layout plan of the proposed intersection upgrade works has been completed by Turnbull Engineering Pty Ltd, with a copy of the proposed configuration of the Summerland Way / Main Camp Road intersection shown further in Drawing 0426-CV-101 included for reference as Appendix E of the TTIA.

It was also recommended that traffic management measures including advisory "truck turning" signage be installed on the Summerland Way approaches during the peak construction phase of the Project, to highlight to motorists the presence of the intersections and the potential for turning heavy vehicles to/from Main Camp Road.

6.10.6.4 Intersection Capacity Assessment

Summerland Way/Main Camp Road

The results indicated that that the proposed treatment upgrades are expected to operate satisfactorily against the performance metrics as listed in Section 2.6.1.1 of the TTIA during the peak construction phase traffic scenarios identified for the Project. Performance metrics considered included the following:

- **Degree of Saturation (DOS)** – Defined as the ratio of the volume of traffic observed making a movement (in vehicles per hour) compared to the maximum capacity for that movement (vehicles per hour). For priority-controlled intersections, the maximum acceptable degree of saturation is noted to be 80% or 0.800.
- **Level of Service (LOS) & Average Delay (sec)** – Is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The LOS is closely linked to the delay time (in seconds), which can be expected over all vehicles making a movement in the peak hour. The different LOS (as per RTA NSW Criteria) are described in Table 7 of the TTIA.

Furthermore, the analysis found the cumulative (with Project) construction phase volumes on the intersection would also operate satisfactorily (within acceptable limits) considering the potential increase in traffic volumes because of the concurrent construction of other renewable Projects in the region.

Main Camp Road/Avenue Road

The existing intersection at the intersection of Main Camp Road and Avenue Road is considered adequate to cater for current and predicted traffic movements associated with the Project based on the following:

- The low existing traffic volumes on both Main Camp Road and Avenue Road.
- The temporary nature (24 months) of the increase in traffic volumes at the intersection as a result of Project construction.
- The low volume of ongoing additional traffic at the intersection associated the operation of the Project.
- However, minor widening and sealing works are proposed as shown in the technical drawings at Appendix H of the TTIA.
- As the existing configuration of the intersection will be retained, temporary traffic management measures will be implemented at the intersection (such as traffic controllers/temporary traffic signals) to allow for safe heavy vehicle movements, noting their requirements to utilise the full width of both road legs at the intersection to complete required turning movements.

6.10.6.5 Road Link Capacity Assessment

The addition of traffic associated with the Project was determined to have an insignificant impact on the operation of the identified sections of Summerland Way, with all increases in daily traffic volumes forecast to be less than 5% as shown in **Table 6.30**. The assessment did find more substantial increases on the relevant sections of Main Camp Road and Avenue Road, however, this is primarily due to lower background volumes on these rural access roads.

Table 6.30 Road Link Daily Traffic Volume Comparison (Construction Phase)

Road Link	Road	2026 Background	2026 Peak Construction	% Increase
Summerland Way (Casino to Grafton)	Casino to South Casino	4,675	4,780	2.25
Summerland Way (Casino to Grafton)	South Casino to Main Camp Road	2,179	2,284	4.82
Summerland Way (Casino to Grafton)	Main Camp Road to Whiporie	2,179	2,247	3.10
Summerland Way (Casino to Grafton)	Whiporie to Warragai Creek	4,321	4,388	1.56
Summerland Way (Casino to Grafton)	Warragai Creek to Grafton North	9,979	10,046	0.68
Summerland Way (Casino to Grafton)	Grafton North to Grafton	30,645	30,712	0.22
Main Camp Road	Summerland Way to Avenue Road (0–5.15 km segment)	165	337	104.70
Avenue Road	North of Main Camp Road (0–4.443 km segment)	82	255	209.40

The proposed upgrade works on these two roads, to upgrade their current configuration (6 m wide unsealed road (Main Camp Road) and 4.5 m wide unsealed road (Avenue Road) to provide a 6 m sealed pavement on a 7 m formation, as agreed with Council, is considered adequate to cater for the additional traffic volumes on both Main Camp Road and Avenue Road anticipated from all phases of the Project.

Furthermore, it is proposed that as part of the upgrade works on Avenue Road, the existing road reserve boundary is realigned to ensure the current alignment of the road is wholly contained within the road reserve.

6.10.6.6 Component Transport Routes

As discussed in **Section 6.10.3**, additional sections of the external road network have been identified to be temporarily utilised by the Project as part of the transport routes for both the solar and BESS components, as well as the OSOM transport movements for the large electrical infrastructure (transformer and switch room).

While the solar and BESS components are understood to be containerised and able to be transported on standard rigid truck configurations, the OSOM vehicle movements for the larger electrical infrastructure will be required to be undertaken under permit. As such it is not anticipated that the relatively small number of OSOM movements (approximately six, 3x transformer and 3x switchroom) will have a significant ongoing impact on the operation or capacity of the roads forming the proposed transport routes.

A Traffic Management Plan (TMP) is proposed to be prepared as part of subsequent stages of the Project once the exact configuration of the large electrical infrastructure and the associated OSOM transport vehicles are confirmed. This TMP will be developed in consultation with TfNSW,

The OSOM Route Analysis identified several specific locations or 'pinch points' along the proposed transport routes where additional works will be required to accommodate the swept paths and vehicle clearance envelopes of the proposed transport vehicle configurations. The majority of these points will only required traffic management measures or minimal works (signage relocation). See Table 11 and 12 for a summary of the pinch points requiring modification works for identified transformer and switch room transports routes.

Additionally, the OSOM Route Analysis identified the vehicle carrying the transformer for the Project will have a height of 5.57 m, however, can be lowered by up to 325 mm to pass through structures with lower height clearances. As such, in addition to this OSOM vehicle height adjustment two locations will require a live vertical clearance check to note their actual height clearance (which are likely higher than those sign posted) including:

- The Clothiers Creek Road overbridge (Pacific Motorway) which has a sign posted height clearance of 5.1 m. To meet the height requirements for the overpass, the OSOM vehicle must be lowered by the maximum 325 mm prior to passing through the underpass.
- Bruxner Highway bridge (Truss bridge over Wilsons River, South Lismore) which has a sign posted height clearance of 5.2. To mee the heigh requirements for the overpass, the OSOM vehicle must be lowered by the maximum 325 mm prior to passing through the truss road bridge.

6.10.6.7 Road Safety Assessment

The assessment found that with the implementation of mitigation measures as described in **Section 6.10.7**, all risks have a rating of 'Medium'. A summary of this assessment is provided in **Table 6.31.**

Table 6.31 Road Safety Assessment

Risk Item	Existing	With Project	Mitigation Measure(s)	With Project and Mitigation
All phases of the Project are expected to lead to an increase in turning vehicle movements at the proposed Summerland Way / Main Camp Road. The increase in turning vehicles has the potential to lead to an increase in vehicle conflicts at the access intersection.	Medium	Medium/High	TR-02 TR-04	Medium
All phases of the Project are also expected to lead to an increase in vehicle movements on the relevant sections of Summerland Way (Casino to Grafton), Main Camp Road and Avenue Road. This increase in vehicle movements on these road sections has the potential to lead to an increase in vehicle conflicts.	Medium	Medium	TR-07	Medium
All phases of the Project are also expected to lead to an increase in vehicle movements at the Main Camp Road / Avenue Road intersection. This increase in movements at the intersection has the potential to lead to an increase in vehicle conflicts.	Medium	Medium/High	TR-06	Medium
All phases of the Project are also expected to lead to an increase in vehicle turning movements into the proposed site access points on Avenue Road. This increase in turning movements has the potential to lead to an increase in vehicle conflicts on Avenue Road.	Medium	Medium	TR-03	Medium
The Summerland Way / Main Camp Road is currently being utilised as an informal drop off / pick up point for school bus movements, utilising the shoulder area on the western side of the intersection and Main Camp Road approach to stop. The lack of layby / set down areas for the school bus at this location has the potential to lead to conflict between the bus, and even waiting children, with adjacent vehicle movements at the intersection. The addition of Project traffic at the intersection has the potential to increase the potential for conflict between the bus and its patrons with vehicles at the intersection.	Medium	Medium/High	TR-01	Medium

6.10.6.8 Transport Infrastructure Assessment

During the site investigation, it was observed that the Summerland Way/Main Camp Road intersection is currently being utilised as an informal stop for school bus movements. Additional widening works are recommended on the Summerland Way departures to the intersection (in each direction of travel) as part of the proposed intersection upgrade works for the Project. This is to accommodate layby / set down areas for school bus movements clear of the adjacent intersection traffic.

It was also recommended that specific traffic management measures be identified within the construction management plan for the Project to look to further manage the potential interaction of Project traffic, in particular heavy vehicle movements, with both the school bus movements and any waiting children / parents.

It is noted there are no specific active transport facilities or infrastructure on the surrounding road network (i.e. bike lanes or pedestrian pathways) that could be integrated for use as part of Project vehicle movements.

6.10.7 Mitigation and Management Measures

A range of mitigation and management strategies in response to the identified increase in traffic numbers as result of the Project identified in the TTIA and are summarised below in **Table 6.32**.

Table 6.32 Traffic and Transport Mitigation Measures

ID	Mitigation and Management Measure	Phase
TR-01	Construction of the proposed upgrade works to the Summerland Way / Main Camp Road intersection to provide a rural basic left (BAL) treatment on the northern approach and a rural short channelised right (CHRs) standard treatment on the southern approach, as per Figure 8.2 of Part 4A and Figure A7 of Part 4 of Austroads Guide to Road Design.	Construction
TR-02	Clearing restricting vegetation (permanently to the ground) to enable adequate sight distances (SISD >300 m light vehicles / >317 m heavy vehicles) to/from the southern approach. Ark Energy have commenced discussion with RVC regarding the initial and ongoing management of this required vegetation clearance.	Construction
TR-03	Provision of upgrade works to the relevant sections of Main Camp Road (Summerland Way to Avenue Road – approx. 0.515 km) and Avenue Road (Main Camp Road to proposed Site Access 3 – approx. 4.443 km) to provide a cross section providing a 6 m sealed pavement on a 7 m formation, as agreed with Council.	Construction
TR-04	Provision of additional widening areas on the northbound and southbound departures of the Summerland Way / Main Camp Road intersection to provide bus layby / set down areas, enabling school bus pickup and drop off movements to be completed clear of the adjacent vehicle movements at the intersection.	Construction
TR-05	The existing road reserve boundary of Avenue Road will be realigned to enable the upgraded configuration of the link to be wholly contained within the new extents of the road reserve. Further details of the proposed revised alignment of the road reserve boundaries are proposed to be provided as part of the detailed design of the required road upgrade works to Avenue Road.	Construction

ID	Mitigation and Management Measure	Phase
TR-06	Installation of advisory “truck turning” signage on the Summerland Way approaches to the intersection with the Main Camp Road, to highlight to motorists the presence of the Project access and the potential for turning heavy vehicles to/from the side road.	Construction
TR-07	Provision of suitable traffic management measures (traffic control / temporary traffic signals) at the Main Camp Road / Avenue Road intersection to enable the larger heavy vehicle movements associated with the Project to safely traverse the intersection clear of opposing traffic.	Construction
TR-08	Construction of the three identified access points to the Project Area on Avenue Road (SA1, SA2 and SA3) generally in accordance with the site access arrangement for articulated vehicles outlined in TfNSW’s Typical Rural Property Access – Northern Region standard drawing (as per Figure 7.4 of Austroads Guide to Road Design Part 4: Intersections and Crossings – General).	Construction
TR-09	Completion of minor works along the identified OSOM transport routes to accommodate the swept paths of the OSOM transformer and switch room transport vehicles, including the relocation of signage infrastructure and construction of required temporary hardstand pavement areas as identified in the OSOM Route Assessment for the Project (see Appendix D of the TTIA).	Construction
TR-10	Preparation of a Traffic Management Plan (TMP) for Project outlining proposed management measures and processes to minimise the impact of the Project on the external road network.	Construction

6.11 Biodiversity

A Biodiversity Development Assessment Report (BDAR) (2024) (see **Appendix 14**) was undertaken by Biosis to assess potential impacts of the Project on biodiversity. This section outlines the key findings of the BDAR, the potential impacts of the Project on biodiversity and proposed mitigation and management measures.

The BDAR was prepared in accordance with the requirements of the Project’s SEARs as outlined in **Appendix 1**. The Project meets the criteria for a State Significant Development (SSD) and therefore the Biodiversity Offset Scheme (BOS) is triggered, and a BDAR is required to be prepared by an accredited assessor under the *Biodiversity Conservation Act 2016* (NSW) (BC Act).

6.11.1 Existing Environment

The Subject Land (**Figure 6.28**) (as utilised for BDAR assessment) comprises 1,078.11 hectares (ha) and includes the Development Footprint (see **Figure 6.28**) and additional areas where indirect (see **Section 6.11.3.3**) and prescribed impacts (see **Section 6.11.3.4**) may occur from the Project. This includes a buffer of 100 m surrounding the Development Footprint and 20 m surrounding road upgrade areas. The Development Footprint (as utilised for BDAR assessment) comprises all areas of direct impact from vegetation clearing, construction and operation of the Project including road upgrade areas.

The BDAR Subject Land is privately owned and predominantly comprised of farmland, with one rural residence within the southern portion of the BDAR Subject Land and several farm sheds scattered throughout. The BDAR Subject Land is currently used for livestock grazing and Private Native Forestry (PNF) with a former Melaleuca/Tea Tree plantation under the *Plantations & Reafforestation Act 199*9 (NSW) and Code of Practice. The plantation authorisation for the latter was cancelled as of August 2023. The BDAR Subject Land is characterised by low-lying terrain and contains several farm dams and naturally occurring ephemeral waterways, including Physics Creek.

The Assessment Area (as utilised for BDAR Assessment) comprises approximately 5,302.41 ha and includes the BDAR Subject Land and the area of land within a surrounding 1500 m buffer zone (determined as per the BAM).The BDAR Assessment Area **Figure 6.28** occurs within the South Eastern Queensland and the Clarence Lowlands Interim Biogeographic Regionalisation of Australia (IBRA) subregions (see **Figure 6.29**).

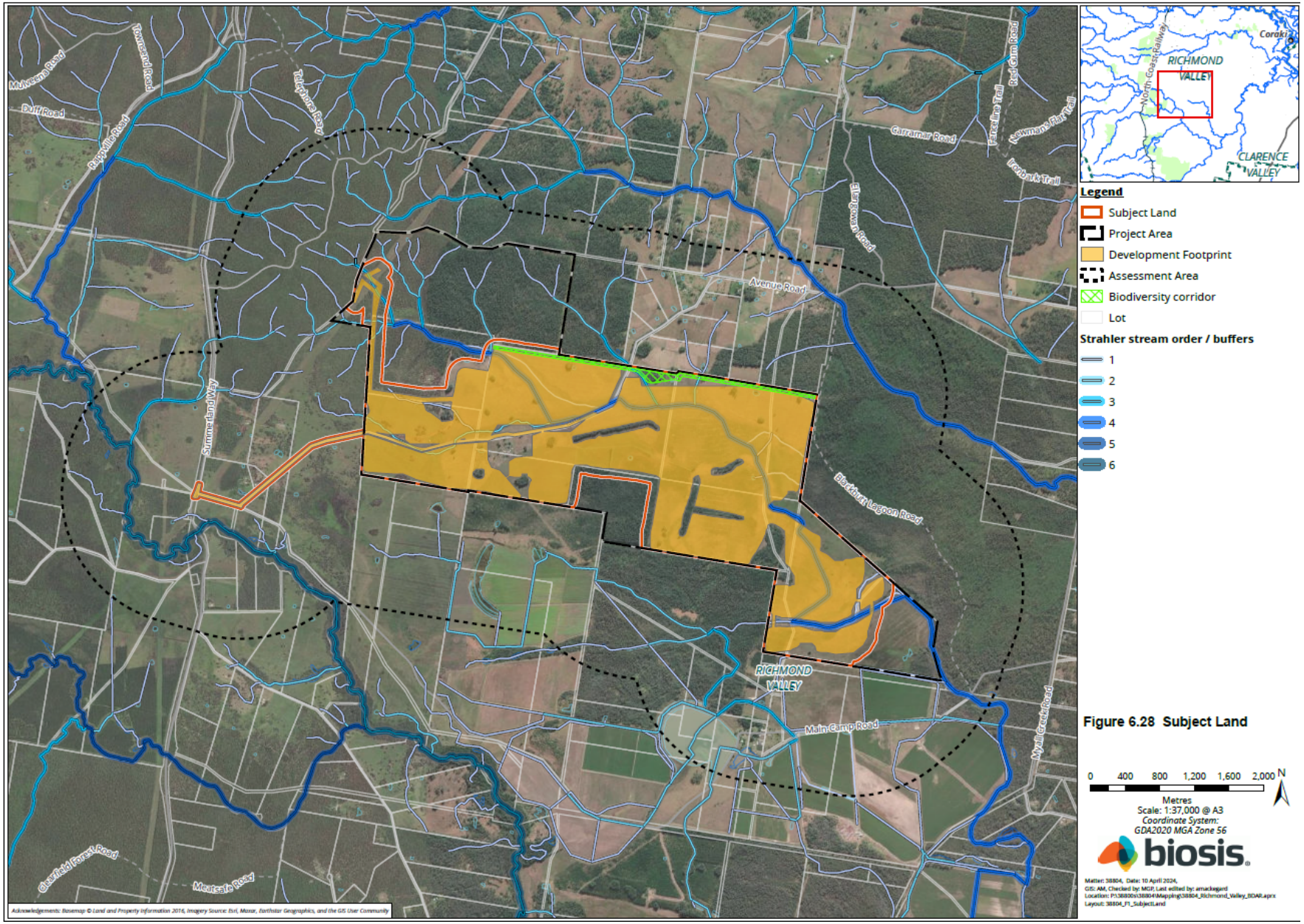


Figure 6.28 Subject Land

6.11.1.1 Hydrology

The BDAR Subject Land is located within the North Coast Local Land Services Region and the Richmond River Catchment. The closest river-mouth is the Evans River located approximately 33 km east of the BDAR Subject Land. The closest major waterbody is Myrtle Creek, a 6th Strahler order waterbody, located approximately 1.3 km to the south-west of the BDAR Subject Land (see **Figure 6.29**).

Key Fish Habitats as mapped by the NSW Department of Primary Industries (DPI) are present within the BDAR Subject Land, comprising a 4th Strahler order tributary of Physics Creek which occurs in the south-east, and a 3rd Strahler order tributary in the north-west (DPI 2013). Physics Creek and connected tributaries to the north are mapped as freshwater fish habitat for Southern Purple Spotted Gudgeon *(Mogurnda adspersa)* (DPI 2023). However, as no records of this species or other threatened aquatic species have been recorded within 10 km of the BDAR Subject Land it is unlikely for Physics Creek to constitute habitat for these species. Further information on the condition of waterways on the site is provided in **Section 6.5**.

Forested swamp/wetland vegetation consistent with PCT 4001 (see **Table 6.33**) occurs within the south-east of the BDAR Subject Land in a moderate to good ecological condition. No areas of the BDAR Subject Land, and more specifically, the Development Footprint, are mapped as a Wetland in the DoIW of Australia (Cth DCCEEW 2005). The closest Directory of Important Wetlands (DoIW) wetland is the Lower Bungawalbin Catchment Wetland Complex located approximately 5.5 km north-east of the BDAR Subject Land.

The Ramsar wetland 'Little Llangothlin Nature Reserve' is located approximately 161.6 km south-west of the BDAR Subject Land. Ramsar wetlands are defined as representative, rare or unique wetlands, or are important for conserving biological diversity. They are included on the List of Wetlands of International Importance developed under the Ramsar convention.

6.11.1.2 Connectivity

The majority of the BDAR Subject Land comprises Category 1-exempt land (see **Section 6.11.1.5**) however, tracts of forested areas of varying patch size are present within the BDAR Subject Land. This includes wetland areas and vegetation in the south-east which may provide movement and dispersal areas for water bird and semi-terrestrial species. Similarly, tributaries of Physics Creek may provide for transient habitat corridors throughout the BDAR Subject Land.

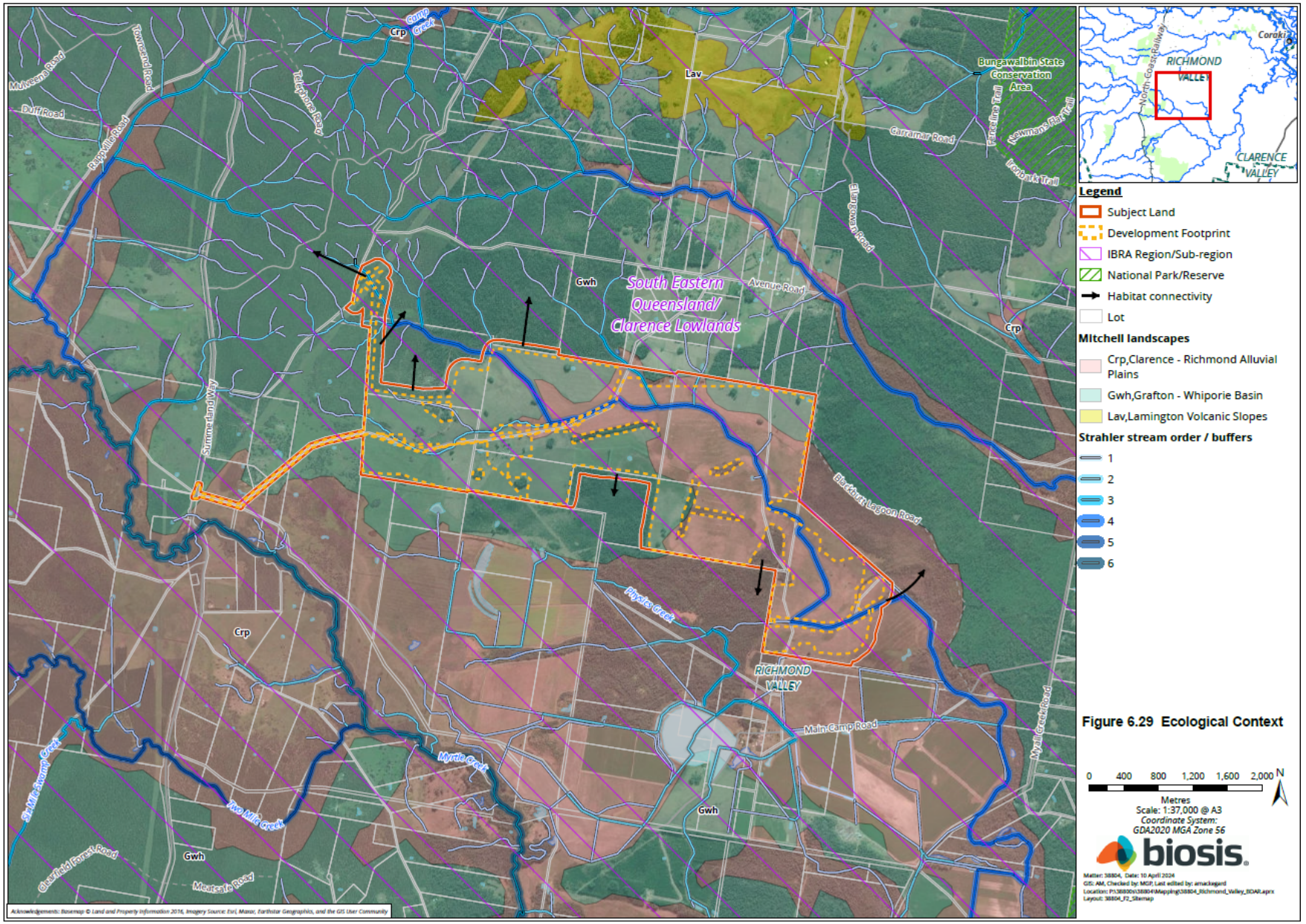
Forested areas within the BDAR Subject Land provide connectivity to larger patches of native vegetation, as well as reserves including Bungawalbin State Forest and National Park to the east and Ellangowan State Forest to the north-west of the BDAR Subject Land (see **Figure 6.29**). Habitat connectivity is critical for maintaining healthy populations, as it promotes biological diversity through the exchange of genes.

6.11.1.3 Areas of Outstanding Biodiversity Value and Mapped Important Areas

Under the BC Act, the Minister for the Environment has the power to declare Areas of Outstanding Biodiversity Value (AOBVs). To date, no AOBVs have been declared within the Development Footprint or BDAR Subject Land (NSW DCCEEW 2024c). Similarly, the BDAR Subject Land is not within any Mapped Important Area of any relevant species (DPIE 2022a).

6.11.1.4 NSW (Mitchell) Landscape

The BDAR Subject Land is partially located within the Clarence-Richmond Alluvial Plains (49.6 %) and the Grafton-Whiporie Basin (50.4%) 'Mitchell Landscapes' (as identified using the Mitchell Landscapes Version 3.0 dataset) (see **Figure 6.29**). See Section 2.1.8 of the BDAR for detailed descriptions of these landscapes.


Crp
Camp Creek
Lav
Bungawalbin State Conservation Area
Mylneem Road
Duff Road
Townsend Road
Telephone Road
Reppville Road
Carramar Road
Tasmine Trail
Newmans Rail Trail
Bicentennial Trail
Ellangowan Road
Gwh
South Eastern Queensland/ Clarence Lowlands
Avenue Road
Crp
Summerland Way
Blackburn Lagoon Road
Pipeline Creek
RICHMOND VALLEY
Main Camp Road
Myall Creek Road
Crp
Six Mile Branch Creek
Myrtle Creek
Two Mile Creek
Gwh
Gwh
Glenfield Forest Road
Mentone Road
Coraki
RICHMOND VALLEY
North Coast Railway
CLARENCE VALLEY
Legend
Subject Land
Development Footprint
IBRA Region/Sub-region
National Park/Reserve
Habitat connectivity
Lot
Mitchell landscapes
Crp,Clarence - Richmond Alluvial Plains
Gwh,Grafton - Whiporie Basin
Lav,Lamington Volcanic Slopes
Strahler stream order / buffers
1
2
3
4
5
6
Figure 6.29 Ecological Context
0 400 800 1,200 1,600 2,000
N
Metres
Scale: 1:37,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56
biosis
Matter: 38804, Date: 10 April 2024
GIS: AM, Checked by: MGP, Last edited by: amackegard
Location: P:\38800s\38804\Mapping\38804_Richmond_Valley_BDAR.aprx
Layout: 38804_F2_Sitemap
Acknowledgements: Basemap © Land and Property Information 2016, Imagery Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

6.11.1.5 Land Categorisation and Non-Native Vegetation

Under the BC Act, Category 1-exempt land is defined as land where native vegetation can be cleared without approval from Local Land Services NSW. Category 2-regulated land is land that is not Vulnerable or Sensitive regulated land however authorisation from Local Land Services may be required to clear native vegetation.

Native Vegetation Regulatory (NVR) and land category mapping (obtained during consultation with DCCEEW) was used as the primary determinant to determine the land categories of the BDAR Subject Land. Historical imagery, PCT mapping and field validation were compared with the NVR map to determine the extent of the BDAR Subject Land subject to assessment under the BAM and BC Act. NVR mapping for the BDAR Subject Land is shown in Figure 5 of the BDAR. Areas identified as non-native vegetation or Category 1-exempt land by Biosis are shown on **Figure 6.30**.

The majority of the BDAR Subject Land (approximately 937.6 ha (87%)) comprises Category 1 land which has minimal biodiversity value and is unlikely to provide suitable habitat for threatened flora and fauna species. This land has no native over storey or mid storey cover (uppermost and middle layers of vegetation, consisting of the tallest and median height trees forming a canopy) and met the definition of non-native vegetation and Category 1-exempt land (see **Photo 6.3**). This land categorisation was agreed to by the NSW Biodiversity, Conservation and Science (BCS) division following a site visit in November 2023.This is largely due to historical land disturbances such as cattle grazing and cropping and the former tea tree plantation. A total of 800.9 ha of Category 1 land would be impacted by the Project.

Most areas identified as Category 1-exempt land were subject to the former Tea Tree Plantation authorisation, however, the authorisation has since been cancelled (August 2023) and the land returned to improved pasture grazing and cropping, releasing any obligation to retain and manage these areas. However, for the purpose of BAM application and due to their viability and connectivity in the broader landscape, these areas presented as sensitive regulated land on the NVR map were subsequently identified as a high constraint during preliminary assessment. Direct impacts on this area have therefore been avoided.

Areas not shown as native vegetation cover within **Figure 6.31**, and which do not provide habitat for threatened species were not included for further assessment in the BDAR. In accordance with section 6.8(3) of the BC Act, because the BDAR has conducted assessment in accordance with the BAM, it has excluded assessment of the impacts of clearing of native vegetation on Category 1-exempt land. Non-native vegetation which does provide habitat for threatened species was assessed in the BDAR.

Photo 6.3 Non-native vegetation/Category 1 Land within the Subject Land

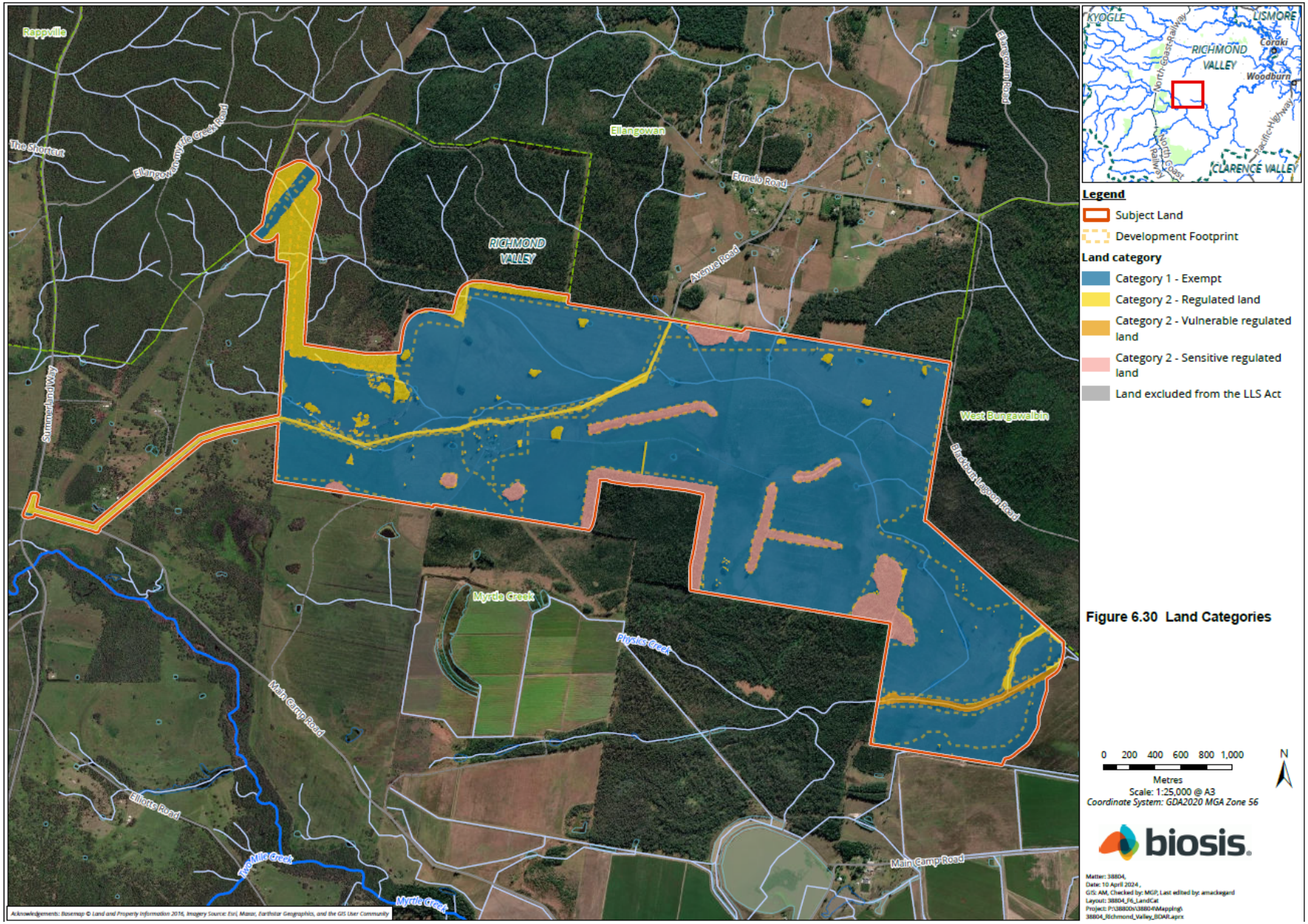


Figure 6.30 Land Categories

No areas of Critically Endangered Ecological Communities (CEEC) required to be re-categorised as Category 2-regulated land under the BAM were identified within the Subject Land. Marginal areas of habitat for Critically Endangered species such as Scrub Turpentine (*Rhodamnia rubescens)* and Native Guava *(Rhodomyrtus psidioides)* within Category 1-exempt land were converted to Category 2-regulated land and subjected to survey, although these areas contained small, degraded patch sizes.

6.11.1.6 Native Vegetation

The BDAR Subject Land totals 1,076.9 ha of vegetation comprising of 137.56 ha of native vegetation, 1.74 ha of planted native vegetation, and 937.6 ha of Category 1-exempt land. Native vegetation within the BDAR Subject Land is comprised of dry sclerophyll forest, eucalypt floodplain forest and forested wetlands that occur in varying conditions due to historical disturbances such as clearing of overstory forest species, private forestry and understory cattle grazing. See **Figure 6.31** for all areas of native vegetation within the BDAR Subject Land. Areas not shown are considered cleared/Category 1-exempt land, or non-native vegetation.

A large patch of intact remnant and regenerating vegetation occurs within the northernmost section of the BDAR Subject Land, having been recently burnt in the 2019–2020 bushfires, and is also designated under a private forestry agreement.

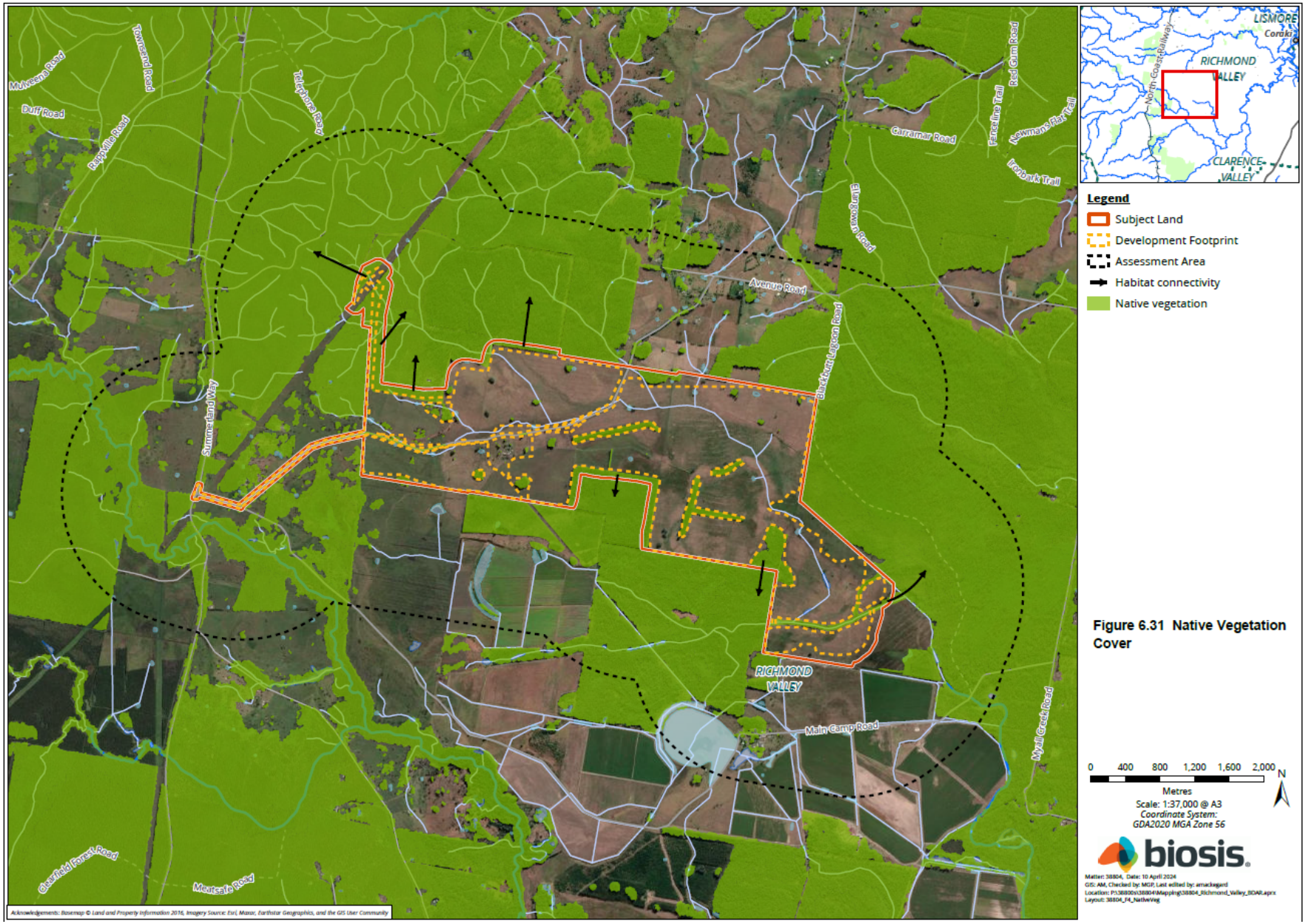


Figure 6.31 Native Vegetation Cover

Plant Community Types

Four plant community types (PCTS) (see **Table 6.33**) are present within the Subject Land (see **Figure 6.32** and **Figure 6.33**). See Section 3.1.6 of the BDAR for more detail on these PCTs.

Table 6.33 Plant Community Types within the Subject Land

PCT ID	PCT Name	Condition	Subject Land (ha)
PCT 4046	*Northern Lowland Swamp Turpentine-Red Gum Forest*	Several conditional states including moderate and riparian	55.51 ha
PCT 4001	*Northern Floodplain Paperbark Fern Swamp Forest*	Low condition	1.1 ha
PCT 3428	*Northern Lowland Red Gum-Swamp Turpentine Grassy Forest*	Moderate and low conditional states	16.7 ha
PCT 3420	*Clarence Lowland Ironbark-Spotted Gum Grassy Forest*	Several conditional states including good, moderate and regenerating	64.25 ha
N/A	**N/A**	**Total Area**	**137.56 ha**

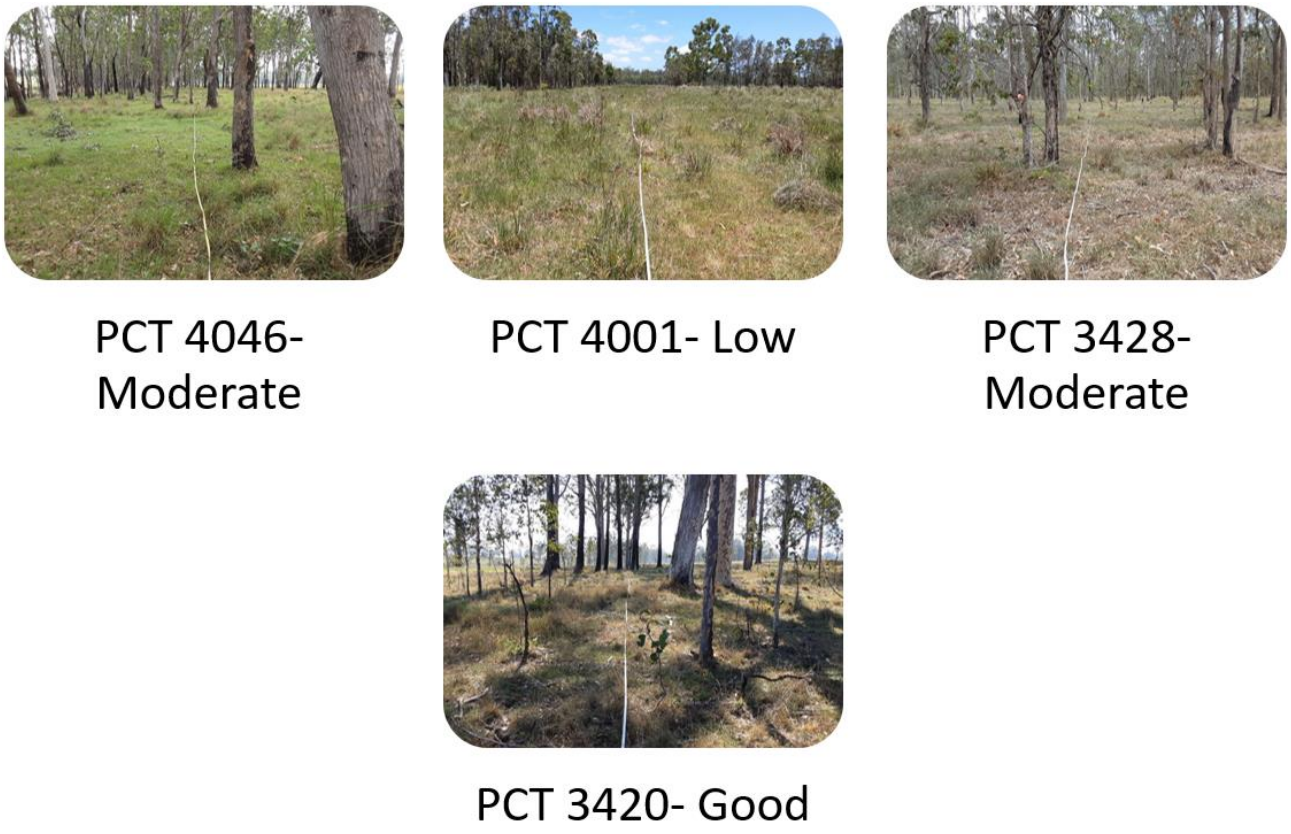


Figure 6.32 PCTs Photographed within the Subject Land (Biosis, 2023)

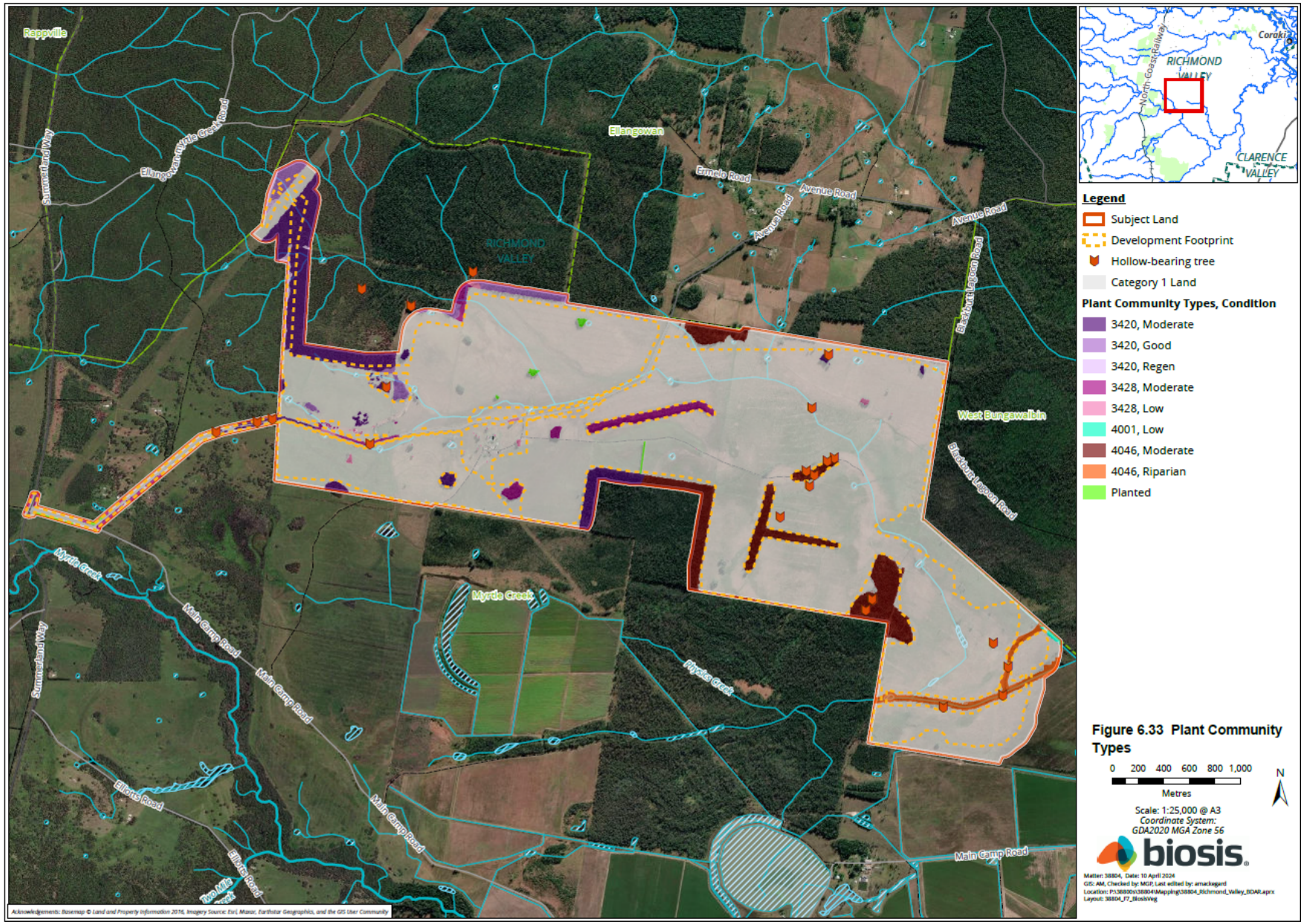


Figure 6.33 Plant Community Types

Threatened Ecological Communities

Vegetation within the BDAR Subject Land is representative of two threatened ecological communities (TECs) listed under the BC Act and one TEC listed under the EPBC Act (see **Table 6.34** and **Figure 6.34**).

Table 6.34 TECs within the Subject Land

TEC	Listing	Subject Land (ha)	Development Footprint (Ha)
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	Endangered (BC, EPBC)	72.22	5.6
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered (BC, EPBC)	1.1	0
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered (EPBC)	70.28	4.33

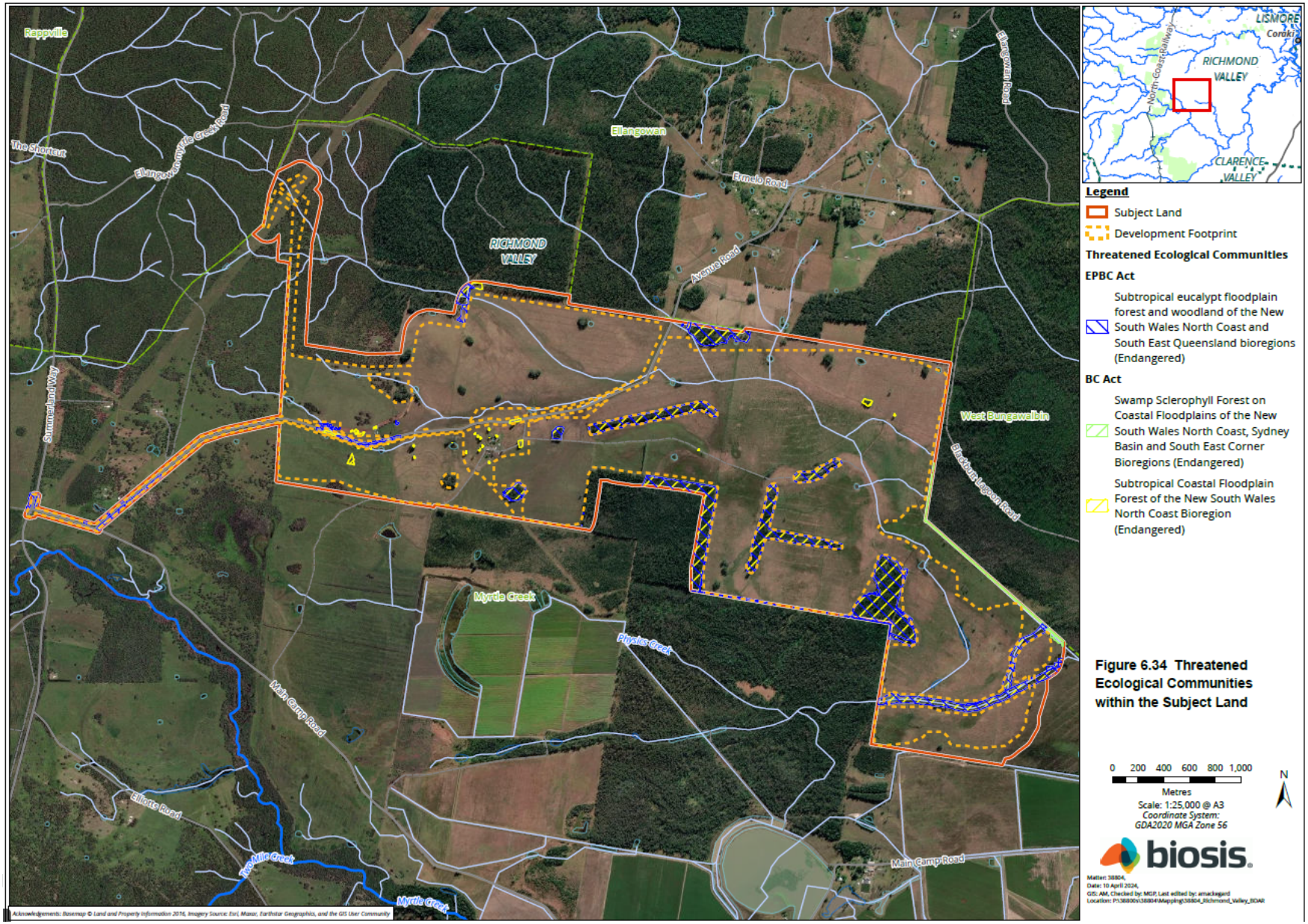


Figure 6.34 Threatened Ecological Communities within the Subject Land

Vegetation Zones and Patch Size Classification

PCTs within the BDAR Subject Land were assessed and stratified based on broad condition state into vegetation zones. The BDAR Subject Land comprises 11 vegetation zones. See **Table 6.35** for a description of these zones, their condition and associated BAM floristic plots (see **Figure 6.35**).

Patch size classes for each zone were also assessed and illustrated that native vegetation within the BDAR Subject Land comprises a larger patch of connecting vegetation with an area of approximately >9000 ha (See Figure 9 of the BDAR). This patch comprises Bungawalbin State Forest and State Conservation Area, and Ellangowan State Forest (see **Figure 6.29**), as well as intact bushland adjacent to the north-west and south-east of the BDAR Subject Land.

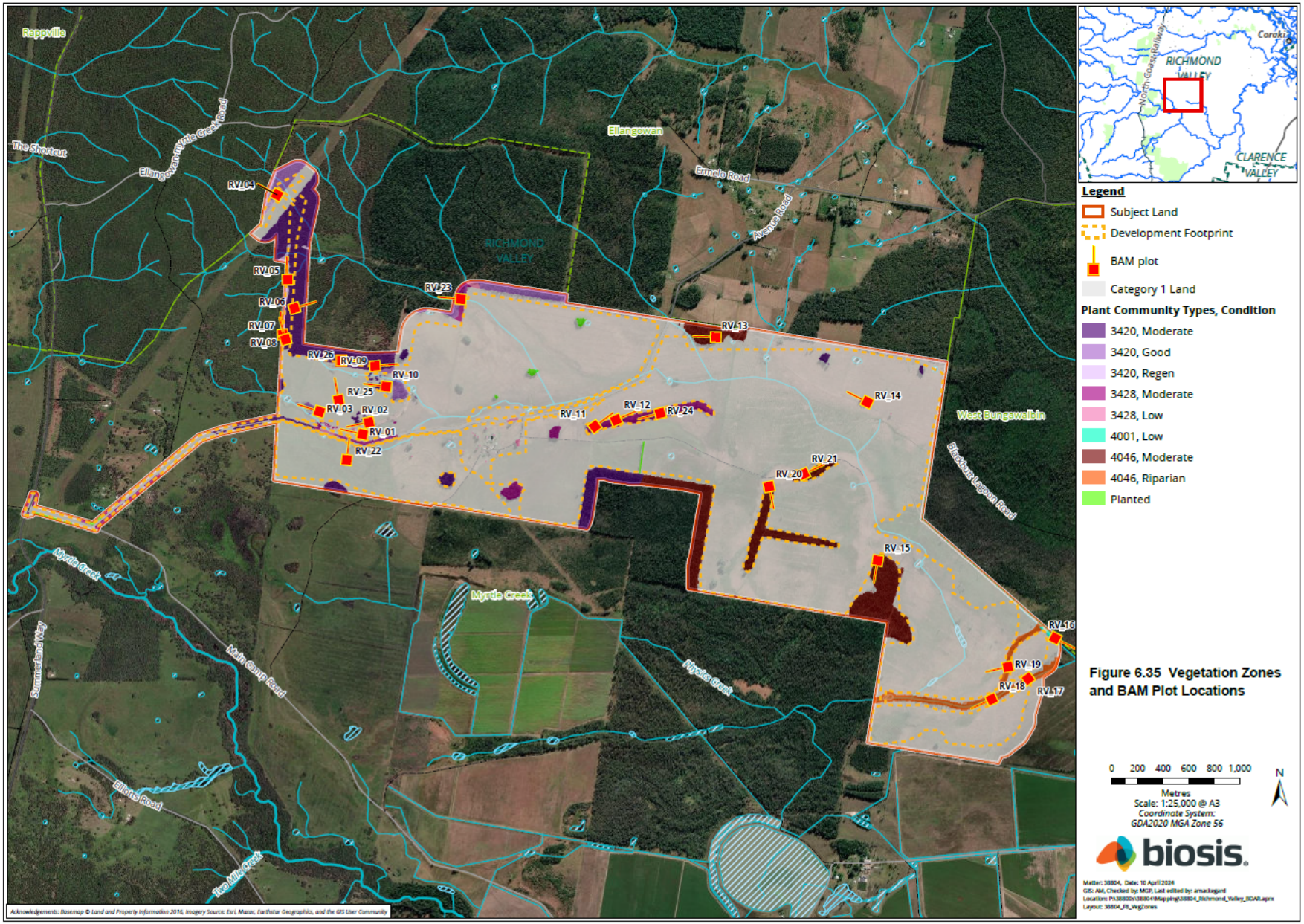

Rappville
The Sherrout
Ellangowan-Myrtle Creek Road
Ellangowan
Ennicle Road
Nestle Road
RICHMOND VALLEY
RV 04
RV 05
RV 06
RV 07
RV 08
RV 23
RV 13
RV 26
RV 09
RV 10
RV 25
RV 03
RV 02
RV 01
RV 22
RV 11
RV 12
RV 24
RV 14
West Bungawalbin
Blackbutt Lagoon Road
RV 21
RV 20
RV 15
RV 16
RV 19
RV 18
RV 17
Myrtle Creek
Summerland Way
Main Camp Road
Myrtle Creek
Ellems Road
Two Mile Creek
Coraki
RICHMOND VALLEY
North Coast Railway
CLARENCE VALLEY
Legend
Subject Land
Development Footprint
BAM plot
Category 1 Land
Plant Community Types, Condition
3420, Moderate
3420, Good
3420, Regen
3428, Moderate
3428, Low
4001, Low
4046, Moderate
4046, Riparian
Planted
Figure 6.35 Vegetation Zones and BAM Plot Locations
0 200 400 600 800 1,000
Metres
Scale: 1:25,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56
N
biosis

Table 6.35 Vegetation Zones within the Subject Land

Vegetation Zone	PCT	Condition	BAM plots completed	Hollow bearing trees?	Area (ha)
4046_Moderate	PCT 4046 – Northern Lowland Swamp Turpentine-Red Gum Forest	Moderate	4 (RV_13,15,20,21)	Yes	44.42
4046_Riparian	PCT 4046 – Northern Lowland Swamp Turpentine-Red Gum Forest	Riparian	3 (RV_17,18,19)	No	11.09
4001_Low	PCT 4001 – Northern Floodplain Paperbark Fern Swamp Forest.	Low	1 (RV_16)	No	1.1
3428_Moderate	PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	Moderate	4 (RV_11,12,23,24)	Yes	14.76
3428_Low	PCT 3428 – Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	Low	3 (RV_01,14,22)	Yes	1.94
3420_Good	PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest.	Good	3 (RV_02,03,04)	Yes	12.16
3420_Moderate	PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest.	Moderate	5 (RV_06,09,09,10,26)	Yes	48.57
3420_Regen	PCT 3420 – Clarence Lowland Ironbark-Spotted Gum Grassy Forest.	Regenerating	2 (RV_05,07)	No	3.52

Vegetation Integrity

Vegetation integrity (condition) was assessed using data obtained from undertaking BAM plots within the vegetation zones. See Table 14 of the BDAR for a full list of all 26 BAM plots. Data obtained from each plot was entered into the BAM calculator to determine the vegetation integrity scores for each identified vegetation zone as show in **Table 6.36**.

Table 6.36 Vegetation Integrity Scores

Vegetation Zone	VI score (/100)	Hollow-bearing trees present	Offset credits required
4046_Moderate	66.0	Yes	Yes
4046_Riparian	37.5	No	Yes
4001_Low	10.9	No	No
3428_Moderate	39.4	Yes	Yes
3428_Low	24.2	Yes	Yes
3420_Good	61.5	Yes	Yes
3420_Moderate	51.6	Yes	Yes

Vegetation Zone	VI score (/100)	Hollow-bearing trees present	Offset credits required
3420_Regen	28.8	No	Yes
Planted	N/A	No	Yes
Scattered	N/A	Yes	Yes
Category 1 Land	0.4	No	Yes

Scattered Paddock Trees

A total of 42 scattered/paddock trees were identified within the BDAR Subject Land (see Figure 11 of the BDAR). Scattered paddock trees found in Category 1-exempt land (PCT 4046 or 3428) consist of isolated individual canopy species such as Swamp Turpentine, Pink Bloodwood, Forest Red Gum and Narrow-leaved Red Gum. Scattered paddock trees associated with PCT 3420 occur predominantly as isolated Large-leaved Spotted Gum.

Each of these trees has been categorised into one of the following classes:

- Class 1: trees that are <20 cm DBH and without hollows.
- Class 2: trees that are ≥20 cm DBH and less than the large tree benchmark for the most likely plant community type or trees that are <20 cm DBH that contain at least one hollow.
- Class 3: trees that are greater than or equal to the large tree benchmark for the most likely plant community type.

Two trees were categorised as class two and 26 trees as class three. No trees were classified as class one.

Planted Vegetation

Several small, isolated patches of planted vegetation areas are present within the northern portion of the BDAR Subject Land in the form of Category 1-exempt land or surrounded by cleared Category 1-exempt land, as well as wind break vegetation across the BDAR Subject Land and along the verges of Avenue Road. These patches consist of uniform line plantings of Dunn's White Gum (*Eucalyptus dunni*) with a predominantly exotic understorey, and plantation stands of *Melaleuca alternifolia.*

Planted trees and shrubs are generally immature individuals with no evidence of nests or hollows. No evidence of use by species credit species was observed during any survey periods. Mitigation is proposed to minimise any potential impacts resulting from the removal of planted vegetation (See **Section 6.11.4.2**).

6.11.1.7 Threatened Flora and Fauna

A list of predicted 'ecosystem credit species' expected to occur within the BDAR Subject Land was generated in accordance with the BAM. Predicted impacts on these species requires assessment, however targeted survey isn't required as the presence of these species is assumed based on existing data. Species were identified using the Threatened Biodiversity Data Collection (TBDC). See Table 19 of the BDAR for a full list of these species.

Similarly, a list of predicted 'species credit species' assumed to occur within the BDAR Subject Land was generated in accordance with the BAM. Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species in the BDAR Subject Land, or alternatively the species can be assumed to be present (see Appendix 2 for the full list of these species).

No expert reports have been conducted for the Project. Targeted surveys have been undertaken for most species and presence was assumed for three species (Brush-tailed Phascogale (*Phascogale tapoatafa)*, Common Planigale *(Planigale maculate)* and Green-thighed Frog *(Litoria brevipalmata)*) where survey requirements were not able to be met.

Threatened Flora

Due to the impacts of historical plantation activities, grazing, private forestry and disturbance by fire, there is a lack of presence of threatened flora within areas of Category 1-exempt land. Additionally, it is unlikely for threatened flora to be present within disturbed native vegetation including patches of scattered trees, planted areas, low condition, and regenerating vegetation.

Appropriate habitat for threatened flora species was found to occur in higher vegetation condition classes such as moderate and good condition dry sclerophyll forest, coastal swamp forest and coastal floodplain wetland communities.

Table 20 of the BDAR provides a full list of candidate flora species credit species which were considered in the BDAR. None of these flora species were identified during targeted surveys (see **Table 6.37**).
See **Figure 6.36** for the polygons showing identified habitat for these threatened flora species within the BDAR Subject Land.

Table 6.37 Targeted Flora Survey Results

Species Name	Common Name	Associated PCT	Survey Results
Ancistrachne maidenii	*Ancistrachne* maidenii	3420	Not recorded during surveys.
Indigofera baileyi	Bailey's Indigo	3420, 3428	Not recorded during surveys.
Arthraxon hispidus	Hairy Jointgrass	4046, 4001, 3428	Not recorded during surveys.
Grevillea masonii	Mason's Grevillea	3428, 3420	Not recorded during surveys.
Melichrus gibberagee	Narrow-leaf Melichrus	4046, 3420	Not recorded during surveys.
Polygala linariifolia	Native Milkwort	4046, 3428, 3420	Not recorded during surveys.
Callistemon linearifolius	Netted Bottle Brush	3428	Not recorded during surveys.
Geodorum densiflorum	Pink Nodding Orchid	3420	Not recorded during surveys.
Prostanthera sejuncta	*Prostanthera sejuncta*	4046, 3428, 3420	Not recorded during surveys.
Rotala tripartita	*Rotala tripartita*	3428, 3420	Not recorded during surveys.
Acacia ruppii	Rupp's Wattle	4046, 3428	Not recorded during surveys.
Angophora robur	Sandstone Rough-barked Apple	3428, 3420	Not recorded during surveys.
Rhodamnia rubescens	Scrub Turpentine	4046, 4001	Not recorded during surveys.
Eucalyptus glaucina	Slaty Red Gum	4046, 3420	Not recorded during surveys.
Marsdenia longiloba	Slender Marsdenia	3420	Not recorded during surveys.

Species Name	Common Name	Associated PCT	Survey Results
Lindsaea incisa	Slender Screw Fern	4046, 4001, 3428, 3420	Not recorded during surveys.
Eucalyptus tetrapleura	Square-fruited Ironbark	3428, 3420	Not recorded during surveys.
Olax angulata	Square-stemmed Olax	3420	Not recorded during surveys.
Oldenlandia galioides	Sweet False Galium	4046, 3428	Not recorded during surveys.
Persicaria elatior	Tall Knotweed	4001	Not recorded during surveys.
Thodomyrtus psidiodies	Native Guava	4046,4001,3428	Not recorded during surveys.

Threatened Fauna

Fauna habitat throughout the BDAR Subject Land is generally degraded and consists of small patch sizes and understorey habitats considered to be of little value to potential candidate fauna species that rely on higher condition understorey habitats for survival. However, larger patches in the north-west, and surrounding the boundaries of the BDAR Subject Land were found to contain higher condition states and several other habitat features which could support threatened species credit species. These areas and species were a focus of targeted fauna surveys. See Table 25 of the BDAR for a detailed description of all habitat features identified with the potential to support threatened species credit species.

Koala *(Phascolarctos cinereus)* (Vulnerable and E2, BC Act. Endangered, EPBC Act) and Coastal Emu (*Dromaius novaehollandiae)* (E2, BC Act) are known to have habitat within the BDAR Subject Land and general locality, however, no individuals were identified during surveys. It is likely that these species may utilise the BDAR Subject Land occasionally or infrequently reside there, however the BDAR Subject Land is not considered to contain optimal habitat for these species given its level of degradation. Therefore, these species were only addressed as ecosystem species within the BDAR, with avoidance of the highest biodiversity value areas and mitigation measures proposed where required (see **Section 6.11.4**).
See **Table 6.45** for an assessment of the Project against the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (NSW) – Chapter 4: Koala habitat protection 2021.

A total of 42 hollow bearing trees, including seven trees with significant hollows were recorded sporadically throughout the BDAR Subject Land (see **Figure 6.33**). Whilst there is potential for these trees to provide habitat for hollow bearing fauna, the BDAR Subject Land comprises largely immature trees where many hollows are yet to form in significant size or numbers. Hollow dependent fauna species are unlikely to be present given their requirement and bias towards high hollow bearing tree densities along floodplains and riparian areas.

Table 21 of the BDAR provides a full list of candidate fauna species credit species which were considered in the BDAR and Table 19 provides the list of ecosystem credit species. See **Table 6.38** for fauna species which were observed during surveys or assumed present. See Appendix 4 of the BDAR for a full list of all fauna species (with and without conservation significance) recorded within the BDAR Subject Land.
See **Figure 6.36** for the polygons showing identified habitat for these threatened fauna species within the BDAR Subject Land.

Table 6.38 Targeted Fauna Survey Results

Attributes	Species Name	Common Name	Status (BC Act)	Results
Nocturnal birds	*Ninox connivens*	Barking Owl	VU	**Observed within Project Area** (see **Photo 6.5**) slightly outside Subject Land. The species polygon aligns with 800 m buffers around potential nest trees containing hollows of at least 20 cm diameter and at least 4 m above ground within associated PCTs (4046, 4001, 3428, 3420) within the Subject Land, clipped within the Development Footprint.
Microbats	*Myotis macropus*	Southern Myotis	VU	**Observed within the Project Area.** The species polygon aligns with associated PCTs (3420, 3428, 4001 and 4046) within 200 m of waterbodies with 3 m or wider stretches, suitable for species' foraging activities. Including artificial dams that contain suitable habitat for foraging purposes.
Microbats	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	VU	**Acoustic detection within the Subject Land.** Call confidence rating: C- Almost Certain. Call characteristics diagnostic matched those described in reference material, including species reference calls.
Microbats	*Miniopterus australis*	Little Bent-winged Bat	VU	**Acoustic detection within the Subject Land. However, no breeding habitat present.** Call confidence rating: C- Almost Certain. Call characteristics diagnostic matched those described in reference material, including species reference calls.
Microbats	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	VU	**Acoustic detection within the Subject Land. However, no breeding habitat, such as caves, present.** Call confidence rating: C- Almost Certain. Call characteristics diagnostic matched those described in reference material, including species reference calls.
Microbats	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	VU	**Acoustic detection within the Subject Land.** Call confidence rating: C- Almost Certain. Call characteristics diagnostic matched those described in reference material, including species reference calls.

Attributes	Species Name	Common Name	Status (BC Act)	Results
Microbats	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	VU	**Acoustic detection within the Subject Land.** Call confidence rating: PR- Probable. Call most likely to represent this species, but there exists a low probability of confusion with species of similar call type or frequency, or call lacks sufficient detail (e.g. call quality) to be definite.
Microbats	*Scoteanax rueppellii*	Greater Broad-nosed Bat	VU	**Acoustic detection within the Subject Land.** Call confidence rating: PR- Probable. Call most likely to represent this species, but there exists a low probability of confusion with species of similar call type or frequency, or call lacks sufficient detail (e.g. call quality) to be definite.
Mammals	*Petaurus norfolcensis*	Squirrel Glider	VU	**Observed within Project Area** (see **Photo 6.4**), but outside the Subject Land. The species polygon aligns with associated PCTs (3420, 3428, 4001 and 4046) connected to the patch where the species was observed.
Mammals	*Phascogale tapoatafa*	Brush-tailed Phascogale	VU	**Assumed present** in relevant associated PCTs (3420, 3428, 4001 and 4046).
Mammals	*Planigale maculata*	Common Planigale	VU	**Assumed present** in relevant associated PCTs (3420, 3428, 4001 and 4046).
Frogs	*Litoria brevipalmata*	Green-thighed Frog	VU	**Assumed present** in relevant aquatic habitats and a buffer, incorporating the PCTs with which the species is associated (3428, 3420, 4001 and 4046).

Photo 6.4 Observed Squirrel Glider within the Project Area

Photo 6.5 Barking Owl observed within the north-west of the Subject Land

The following threatened fauna species were recorded during incidental surveys:

- Grey-crowned Babbler *(Pomatostomus temporalis*) (Vulnerable, BC Act) – Multiple observations foraging within the Subject Land near Physics Creek.
- Square-tailed Kite *(Lophoictinia isura)* (Vulnerable, BC Act) – Observed foraging within forested vegetation within the southern portion of the Subject Land.

The following common species (no conservation significance) were also identified during targeted surveys:

- Nocturnal bird surveys: Six suitable breeding hollows within the Subject Land, with several found to be inhabited by common species such as Barn Owl *(Tyto alba)* and Brush-tailed possums *(Trichosurus vulpecula).*
- Amphibian surveys: Large and significant numbers of the highly invasive Cane Toad *(Rhinella marina)* were observed in multiple locations during surveys (see **Photo 6.6**). Observations of other common frog species were limited. The large numbers of Cane Toads are considered a threat to common frog species, and importantly threatened fogs, as a competitor for other food sources as well as a food source themselves, therefore mitigation has been proposed (see **Section 6.11.4**).

Photo 6.6 Cane toads present within the Subject Land (Biosis, 2023)

Furthermore, several additional microbat species of no conservation significance were acoustically detected with identification ratings ranging from C-Almost Certain to PR-Probable. A full list of these species is outlined in Table 38 of the BDAR.

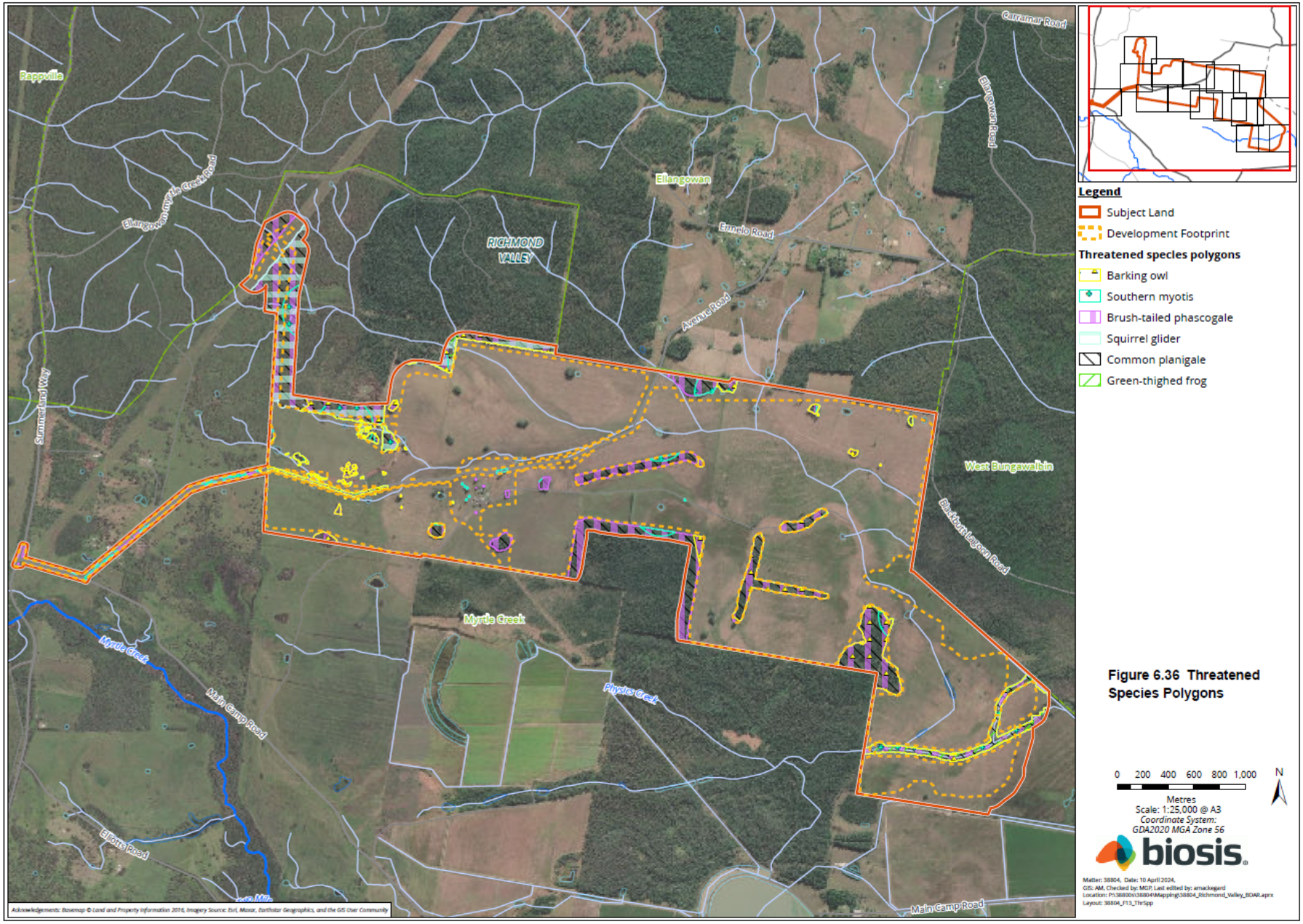


Figure 6.36 Threatened Species Polygons

6.11.2 Methodology

The BDAR was prepared in accordance with the Biodiversity Assessment Method (BAM) to assess the biodiversity values in the Project Area:

- Desktop review of a search area of 10 km past the BDAR Assessment Area was undertaken of: the BAM calculator (BAM-C) relevant databases, spatial data, datasets, literature review and various previous Project reports was undertaken to inform the context of the BDAR Assessment Area and to inform survey methods for the field surveys.
- The BDAR Subject Land was surveyed in accordance with BAM and involved:
    - Targeted flora and fauna surveys.
    - The identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database.
    - Undertaking floristic BAM plots within each vegetation zone considering varying condition states and avoidance of ecotones, areas of disturbance, and edges. Locations of floristic BAM plots surveyed are shown on **Figure 6.35**.
    - The identification of native and exotic plant species.
    - Incidental observations using the "random meander" method.
    - Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the Project Area.
    - An assessment of the natural resilience of the vegetation of the site.
    - Identifying and mapping fauna habitats (e.g., hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species' habitat constraints.
    - Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches, fur, feathers and diggings).
- Opportunistic and rapid assessment surveys of vegetation and habitat were conducted in April 2023 to inform the Richmond Valley Solar Farm Biodiversity Constraints and Opportunities Assessment (COA) (Biosis, 2023) which supported the referral of the Project under the EPBC Act.
- Systematic biodiversity assessment comprising targeted flora and fauna surveys were then conducted during:
    - April 2023 – Rapid assessment and vegetation mapping of Project Area.
    - August 2023 – Targeted fauna surveys, opportunistic/incidental surveys.
    - September 2023 – Targeted flora and fauna surveys, opportunistic/incidental surveys.
    - December 2023 – BAM plots, targeted flora and fauna surveys, opportunistic/incidental surveys.
    - January 2024 – Vegetation mapping, BAM plots and targeted flora surveys of additional road upgrade and transmission line areas.

- Analysis of the field survey results and mapping to identify potential impacts of the Project on biodiversity including:
    - Direct – Direct habitat loss due to Project infrastructure, removal of flora/native vegetation).
    - Indirect – Dust impacts from construction, noise, etc).
    - Prescribed – Impacts prescribed to be assessed under the biodiversity offset scheme as dictated under Section 6.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation) (NSW).
    - Serious and irreversible – In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because of the principles as outlined in Section 8.4 of the BDAR.
    - Cumulative – An assessment of proposed and current renewable and other projects within similar PCTs, habitats and sited in the broader locality in conjunction with the predicted impacts of the Project.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the Project. The Project's offset obligations were determined by entering ecological field data into the BAM-C.
- Identify measures to avoid, mitigate and offset impacts, with the objective of achieving an overall 'improve or maintain' environmental outcome for the Project.
- Assess the Project against relevant legislation such as the EPBC Act, EP&A Act and BC Act.

6.11.2.1 Consultation

Consultation was carried out with the NSW Biodiversity Conservation and Science (BCS) north-east office on several occasions throughout the life cycle of the Project from July 2023–2024 to discuss the suitability of the Project based on technical expertise. This included a site visit on 11 April 2023.

6.11.3 Impact Assessment

Following the application of BAM and a consideration of the findings from the field investigation, the following direct, indirect and prescribed impacts associated with the construction and operation of the Project were identified in the BDAR.

6.11.3.1 Avoidance and Minimisation of Impacts

The principal approach to amending Project design to reduce impacts on biodiversity values has been to 1) avoid any impact 2) minimise the removal of native vegetation and fauna habitat 3) mitigate and manage the residual impacts (see **Section 6.11.4.2**).

The Project Area has been selected based on previous disturbance within the BDAR Subject Land and surrounding landscape, which is subject to agricultural processes such as livestock grazing, private native plantation and forestry.

The Development Footprint has been refined throughout the lifecycle of the Project informed by the findings of the COA and BDAR and other specialist technical investigations. This process led to a Development Footprint largely comprising Category 1 Land (97.26 %). For a full list of biodiversity values avoided/minimised see Section 5.3 of the BDAR.

To minimise impact on biodiversity values key changes to the Project's design included:

- Avoidance and minimisation of impacts on the EPBC listed Subtropical Coastal Floodplain Forest EEC by relocating the transmission line infrastructure along the north-western boundary of the Subject Land.
- Avoidance of approximately 66 % of hollow bearing trees, including those with active hollows flagged throughout the iterative Project design process.

6.11.3.2 Direct Impacts

Direct impacts include vegetation clearing calculated from the area of proposed lot boundaries, roads and easements for service infrastructure. Direct impacts in terms of vegetation clearance arising from the Project are outlined in **Table 6.39**, **Table 6.40** and **Table 6.41**.

These impacts will be permanent and occur during the construction phase of the Project. Mitigation and Management Measures are proposed to minimise these impacts (see **Section 6.11.4**).

Table 6.39 Direct Impacts to Remnant Native Vegetation

Direct Impact	Impact Extent (ha)
PCT 4046 - Northern Lowland Swamp Turpentine-Red Gum Forest	1.12 ha (Comprising approximately 2% of the total PCT presence in the Subject Land)
PCT 3428 - Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	4.48 ha (Comprising approximately 26.8 % of the total PCT presence in the Subject Land) 4.33 ha of this PCT represents Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions (Endangered, EPBC Act))
PCT 3420 - Clarence Lowland Ironbark-Spotted Gum Grassy Forest	15.67 ha (Comprising approximately 24.4% of the total PCT presence in the Subject Land) 5.6 ha of this PCT represents Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Endangered, BC Act))
Total	**21.7 ha**

Table 6.40 Direct Impacts to Individual Threatened Species Habitat

Direct Impact	Impact Extent (ha)
Brush-tailed Phascogale assumed habitat	21.27 ha (Comprising approximately 2.6 % of the Development Footprint)
Barking Owl habitat buffer	7.84 ha (Comprising approximately 0.96% of the Development Footprint)
Squirrel Glider habitat	10.09 ha (Comprising approximately 1.23 % of the Development Footprint)
Southern Myotis habitat buffer	7.44 ha (Comprising approximately 0.91 % of the Development Footprint)
Common Planigale assumed habitat	21.27 ha (Comprising approximately 2.6 % of the Development Footprint)
Green-thighed Frog assumed habitat	0.64 ha (Comprising approximately 0.07% of the Development Footprint)
Total	**Up to 21.27 ha**

Table 6.41 Direct Impacts to Planted Vegetation, Scattered and Hollow Trees

Direct Impact	Impact Extent
Planted vegetation	Removal of 1.32 ha (in addition to the above 21,27 ha).
Scattered paddock trees	Out of the 42 scattered trees identified, 28 will be impacted (removed) (66%), with 14 being retained. Two of these trees are classified as class 2 and 26 as class 3 trees in accordance with the BAM.
Hollow-bearing trees	Removal of 21 hollow- bearing trees, including hollow- bearing scattered paddock trees.

6.11.3.3 Indirect Impacts

Indirect impacts are impacts which can potentially occur in areas outside the Development Footprint, but within the BDAR Subject Land. In accordance with the BAM, it is allowed that a project proponent can retire credits to offset indirect impacts that cannot be avoided or adequately minimised.

In the case of the Project, all indirect impacts will be mitigated through a Biodiversity Management Plan (BMP) and Vegetation Management Plan (VMP) via active management and improve and maintain principles (see **Section 6.11.4**). Potential indirect impacts associated with the Project are summarised in **Table 6.42** and discussed in full in Table 46 of the BDAR.

Table 6.42 Assessment of Indirect Impacts

Indirect Impact	Extent	Likelihood/consequences
Inadvertent impacts on adjacent habitat or vegetation	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** Impacts on adjacent vegetation during construction and operational phase will be prevented or minimised through appropriate exclusion fencing, implementation of a Biodiversity Management Plan (BMP) and Construction Environmental Management Plan (CEMP) or similar detailing best practice environmental protection measures, strict water quality practices and stormwater controls, and by ensuring any lighting is directed towards the developed area, rather than towards adjacent retained habitat.
Reduced viability of adjacent habitat due to edge effects	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** Adjacent habitats are currently subject to disturbance via clearing and existing agricultural land use. Improve and maintain principles will apply within the BMP and Vegetation Management Plan (VMP) to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts.
Reduced viability of adjacent habitat due to noise, dust or light spill	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** Adjacent habitat may be impacted in a small way by noise, dust, compaction and light spill, during construction and operation. However, this will be managed via best practices outlined in a BMP and CEMP or similar. Improve and maintain principles will apply within the BMP and VMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts.
Transport of weeds and pathogens from the site to adjacent vegetation	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** Weeds occurring within the Subject Land are similar to those occurring within adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur but will be managed by biosecurity measures outlined in the CEMP.
Increased risk of starvation, exposure and loss of shade or shelter	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** Improve and maintain principles will apply within the BMP and VMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts. While the removal of sheltering vegetation within the Development Footprint is a small proportion of the habitat available within the Subject Land and broader Project Area, the removal of potential roost/sheltering sites is a more adverse impact, but not one that is likely to result in mortality of individuals, however, may result in an increase of competition for remaining habitat features.
Loss of breeding habitats	116.29 ha of adjacent vegetation subject to monitoring and enhancement 13 retained hollow bearing trees	**Low.** 10 hollow-bearing trees will be removed by the Project out of the 42 recorded within the Subject Land. 28 will be retained in adjacent vegetation. Indirect impacts associated with the loss of breeding habitats are not considered likely to be substantial or significant to any locally occurring threatened, or non-threatened, species.
Trampling of threatened flora species	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** No threatened flora species were found within the Subject Land. Improve and maintain principles will apply within the BMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts.

Indirect Impact	Extent	Likelihood/consequences
Increase in predators and pest animal populations	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Moderate.** Wild dogs were observed during field surveys, however this is a common occurrence in this rural area, along with rabbits, foxes and cats. The Project is not expected to increase numbers of the species with the implementation of mitigation and management measures. However, movement through the Subject Land and increased visibility of predators may be considered to be exacerbated with construction and improved access roads through the Subject Land. The BMP will detail pest management regimes in order to control pest species within the Subject Land during construction and operations.
Changed fire regimes	N/A	**Low.** Appropriate asset protection zones and fire mitigation systems will be implemented for the Project and the implementation of bushfire management and mitigation measures for the Project will help to manage risk of fire within the Subject Land.
Disturbance to specialist breeding and foraging habitat, e.g. important mapped areas	1.1 ha of adjacent wetland vegetation subject to monitoring and enhancement	**Low.** No mapped important areas occur within the Subject Land. A small area of forested wetland occurs within the far south-east portion of the Subject Land, providing potential foraging habitat for wetland species. However, this area will not be impacted by the Project. Impacted dams occur in a low condition and are not likely to support the foraging or breeding behaviours of migratory species. Retained areas will be managed and improved under a BMP implemented for the Project.
Fragmentation of movement corridors	116.29 ha of adjacent vegetation subject to monitoring and enhancement	**Low.** The Subject Land has been subjected to previous historical disturbances such as clearing and fire and is heavily modified in terms of mature woody vegetation. Patches of movement corridors have been maintained within the Development Footprint for more mobile fauna. Improve and maintain principles will apply within the BMP and VMP to ensure retained adjacent habitat and revegetated areas do not decline or are subjected to adverse impacts. A biodiversity corridor will be implemented at the northern end of the Subject Land to connect areas of vegetation, but also act as a visual amenity screen. Perimeter fencing may disturb the movement of larger ground dwelling fauna such as Kangaroos and Emus as well movement of Koalas, however patches of vegetation will be retained to allow movement, and the creation of a new biodiversity corridor will occur within the northern portion of the site. Fauna escape structures will be implemented as part of the BMP to allow species such as Koala to escape in the unlikely event they become contained within the perimeter fencing.

6.11.3.4 Prescribed Impacts

Identification and assessment of prescribed biodiversity impacts are summarised in **Table 6.43** and explained in full in Table 47 of the BDAR.

Table 6.43 Identification of Prescribed Impacts

Prescribed Impact	Threatened Species Likely to Use Habitat	Importance of Habitat Feature to Impacted Species
Karst, caves, crevices, cliffs, rocks and other geological features of significance	N/A	The Subject Land does not contain any karst, caves, crevices, cliffs, rocks and other geological features of significance.
Occurrences of human-made structures and non-native vegetation	Barking Owl Southern Myotis	**Low.** Non-native vegetation may act as marginal foraging habitat for raptors and owls, given increased visibility of prey. However, these areas are not likely to contain a sufficient amount of a particular resource to be considered important to the fauna species recorded or assumed present in relation to the amount of forested areas that will be retained both within and adjacent to the Subject Land. Raptors and Owls will continue to forage in adjacent forested and cleared areas. Improve and maintain principles to be applied within BMP and VMP implemented for the Project. Rural-residential dwellings will not be impacted as part of the Project with the implementation of appropriate mitigation.
Corridors or other areas of connectivity linking habitat for threatened entities	Subtropical Coastal Floodplain Forest EEC Swamp Sclerophyll Forest EEC Barking Owl Brush-tailed Phascogale Southern Myotis Common Planigale Green-thighed Frog Emu Koala	**Low.** While the Project will diminish local connectivity, this is unlikely to prevent genetic exchange of the threatened entities known, or assumed to be, inhabiting the Subject Land and broader Project Area. A biodiversity corridor will be implemented at the northern end of the Subject Land to connect areas of vegetation, as well as acting as a visual amenity screen. Fauna escape structures will be implemented as part of the BMP to allow species such as Koala to escape in the unlikely event they become contained within the perimeter fencing.
Water bodies or any hydrological processes that sustain threatened entities	Green-thighed Frog Southern Myotis	**Negligible.** No significant alterations to hydrology are anticipated and drainage lines and wetlands have largely been avoided. Two stream crossings would be required across Physics Creek (3rd order) and Physics Creek (3rd and 4th order) Strahler streams. Residual impacts such as sedimentation and pollution to be mitigated through implementation of appropriate mitigation measures as detailed in **Section 6.5.4**.

Prescribed Impact	Threatened Species Likely to Use Habitat	Importance of Habitat Feature to Impacted Species
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Common Planigale	**Low.** Ground-dwelling threatened species assumed present may be impacted by vehicle strike within the transmission line corridor. Increased heavy vehicle movements will occur due to the Project, predominantly during construction. In addition, non-threatened, ground dwelling fauna known to inhabit the general area, particularly macropods such as Eastern Grey Kangaroo are notoriously prone to vehicle strike. Vehicle strike of small marsupials and macropods is likely to be an impact already in place, which may be exacerbated during construction. Low or reduced speed limits and construction timing during construction will be proposed to reduce impacts to macropods and nocturnal species within the CEMP.

6.11.3.5 Impacts Considered Uncertain

A total loss of groundcover has been assumed to occur as a direct impact from Project infrastructure including areas of temporary shading and in between solar panel row alignments as well as APZs. This has been assumed conservatively, as groundcover and a level of biodiversity value is known to persist in currently operating solar farms in NSW.

It is possible direct impacts from the Project may not result in complete loss of all biodiversity value. However, with required management between arrays and APZs, the level of value that remains post construction is highly uncertain and difficult to quantify. It is broadly estimated at approximately an 80% loss of biodiversity value compared to that prior to construction and under current land use regimes. However, this is not anticipated to be considerable for this Project, given the quantity of Category 1-exempt land that currently comprises a low level of native biodiversity.

6.11.3.6 Serious and Irreversible Impacts

In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- Principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
- Principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
- Principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
- Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

Two species; Little Bent-winged Bat *(Miniopterus australis)* and Large Bent-winged Bat (*Miniopterus orianae oceanensis),* were found to meet one or more of these principles and were recorded within the BDAR Subject Land. However, no breeding habitat for these species defined in TBDC such as caves, tunnels, mines, culverts or other breeding structures were found to occur within the BDAR Subject Land or surrounding locality. Therefore, the Project will not result in impacts to breeding habitat and no further assessment is required.

6.11.3.7 Assessment Against Biodiversity Legislation

6.11.3.8 EPBC Act

As discussed in **Section 1.1**, an EPBC Act referral for the Project was lodged on 5 September 2023. This referral was supported by the following reports undertaken by Biosis:

- Constraints and Opportunities Assessment (COA) (2023).
- Matters of National Environmental Significance Report (the MNES Report) (2023).

The Project was deemed Controlled Action (EPBC 2023/09516) on the 22 November 2023 based on listed threatened species and communities as the relevant controlling provisions. The Minister for the Environment and Water determined the Project was likely to have a significant impact on the following MNES:

- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Koala (*Phascolarctos cinereus*) (combined populations of Queensland, New South Wales and the Australian Capital Territory) – Endangered
- Slaty Red Gum (*Eucalyptus glaucina*) – Vulnerable.

Supplementary SEARs were issued on 4 March 2024. Since the referral decision and issuing of supplementary SEARs, the Project design has undergone further refinement and is now deemed unlikely to have a significant impact on the EPBC Act threatened entities as identified from the referral with the implementation of proposed mitigation measures (see **Section 6.11.4.2**) and substantial reduction of direct impacts. This is primarily associated with the avoidance of impacts through design refinements as demonstrated in **Section 6.11.3.1**.

Whilst these entities were assessed in the MNES Report, all SEARs and EPBC Act requirements are also addressed and assessed in the BDAR, in accordance with the NSW Assessment Bilateral Agreement.

In accordance with the supplementary SEARs, Table 53 of the BDAR summarises impacts on relevant MNES entities and Appendix 2 of the BDAR contains a summary of species predicted from the BAM-C, as well as those that are known or have a moderate or greater likelihood of occurrence. For species thought to have a moderate to higher likelihood of occurrence within the Subject Land, Significant Impact Criteria (SIC) assessments were undertaken (see Appendix 5 of the BDAR). These SIC assessments were undertaken as part of the MNES Report and were updated with the findings of the BDAR.

These assessments determined that significant impacts on any of these MNES is unlikely. See **Table 6.44**. A combination of management and mitigation measures (see **Section 6.11.4**) and offsets (see **Section 6.11.4.1**) will be implemented to address impacts under the EPBC Act.

Table 6.44 Potential Impacts of the Project on MNES

MNES	Project specifics	Potential for significant impact
Threatened species	Prior to the targeted survey program undertaken as part of the BDAR, a total of 17 EPBC Act listed species (such as Slaty Red Gum, Spotted-tailed Quoll, Koala, Grey-headed Flying Fox and Glossy Black Cockatoo) were thought to have a medium or higher likelihood of occurring as per the COA. Therefore, preliminary SIC assessment was undertaken (see Appendix 5 of the BDAR) as part of the MNES Report and submitted as part of the EPBC referral. However, targeted surveys as undertaken for the BDAR did not detect the presence of these EPBC listed species, and none were candidate species assumed present.	**Unlikely.** No MNES assessed were considered to have a significant impact resulting from the Project following targeted survey and avoidance of direct impacts.
Threatened ecological communities	Direct and indirect impacts are considered to occur to one listed EPBC Act TEC: Subtropical eucalypt floodplain forest and woodland.	**Unlikely.** The Project would constitute a small reduction in the area of Subtropical eucalypt floodplain forest and woodland. Mitigation measures outlined in **Section 6.11.4.2** will be implemented to ensure indirect impacts are reduced. Detailed assessment is provided in Appendix 5 of the BDAR.
Migratory species	Background searches and habitat assessment undertaken in the COA identified the following migratory species as having a medium or higher potential to occur in the Subject Land: • White-throated Needletail *Hirundapus caudacutus* • Black-faced Monarch *Monarcha melanopsis* • Spectacled Monarch *Monarcha trivirgatus* • Yellow Wagtail *Montacilla flava* • Satin Flycatcher *Myiagra cyanoleuca.*	**Unlikely.** There is no, or limited, suitable habitat within the Subject Land for migratory shorebird species, particularly those that are largely associated with tidal mudflats or coastal beaches and estuaries. Migratory species that may occur in inland areas such as Latham's Snipe and Glossy Ibis, may occasionally utilise wetland areas within the south-east. Impacts on these areas are likely to be minimal, if any, with the Project design largely avoiding any impacts to wetland habitats. The nature and scale of the Project is unlikely to result in impacts on aerial species such as White-throated Needletail and Fork-tailed Swift, which forage on the wing and are unlikely to be affected by ground level disturbance.

MNES	Project specifics	Potential for significant impact
National Heritage Places	The Subject Land contains no World Heritage Properties or National Heritage Places.	**None.** There are no national or world heritage places within or near the Subject Land.
Wetlands of International Importance (Ramsar sites)	There are no Ramsar wetland areas within or near the Subject Land. The Ramsar listed Little Llangothlin Nature Reserve is located 161.6 km to the south-west of the Subject Land.	**None.** Given the large geographical separation between Ramsar Wetlands and the Subject Land, no direct or indirect impacts on the wetlands are likely to occur as a result of the Project. Potential impacts from the Project are expected to be localised and not result in any direct or indirect impacts on the hydrological regime or ecological character of the identified wetlands.

6.11.3.9 Biodiversity Legislation and Policy Assessment

See **Table 6.45** for an assessment of the Project against relevant biodiversity legislation:

Table 6.45 Legislation and Policy Assessment

Legislation/policy	Assessment
***Fisheries Management Act 1994* (NSW)**	The potential for the Project to impact on entities protected under the Act is considered low. Any waterway crossings would be in accordance with the Act and have been assessed in the BDAR. Management and mitigation have been developed to mitigate the identified risk as specified in the CEMP and OEMP including erosion and sediment controls.
***Biosecurity Act 2015* (Cth)**	The invasion and establishment of the cane toad in NSW has been identified as a key threatening process under the BC Act and infestation poses a threat to the biosecurity of NSW. The large numbers observed during surveys suggest an infestation is evident. Landowners have a biosecurity duty under the Act to prevent the spread of cane toads from where they are currently established (north-east NSW to the Clarence River). Therefore, mitigations implemented are required to contain, and minimise the impacts of the cane toads in this region. As of February 2024, Fire ants *(Solenopsis Invicta)* have been detected in the community of Wardell, approximately 42 km north-east of the Subject Land. As a result, an NSW Biosecurity (fire ant) Emergency Order (No 3) has been implemented within northern NSW and southern Queensland (QLD). Therefore, mitigations implemented are required to contain, and minimise the spread of Fire ants in this region.
Local Land Services Act 2013 and Local Land Services Act Amendment 2016	An assessment of non-native vegetation or areas exempt from further assessment was undertaken in accordance with BC Act s6.8(3), which states that any assessment relating to biodiversity is to exclude the clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Amendment Act 2016* (LLS Act)). This excludes any impacts prescribed by the regulations under section 6.3. Additionally, in accordance with Section 1.5 of the BAM, biodiversity values that do not need to be assessed include: (d) biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation.
***State Environmental Planning Policy (Biodiversity and Conservation) 2021 (NSW)* - Chapter 4: Koala habitat protection 2021**	The aim of this chapter is to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline. These aims and considerations have been addressed through the preparation of the BDAR. Habitat and opportunistic surveys have been undertaken for Koala to ascertain their presence within the Subject Land with measures to avoid and minimise impacts on the species have been employed (see **Section 6.11.4.2**).

6.11.3.10 Cumulative Impacts

Impacts resulting from the Project are largely consistent with impacts considered to occur at other nearby projects within 50 km or less. Based on available published information, cumulative impacts to similar PCTs, TECs including Subtropical Coastal Floodplain Forest, and threatened species will occur within the broader locality. See **Table 6.46** for a summary of potential cumulative impacts on biodiversity.

Table 6.46 Cumulative Impact Summary

Project	Distance from subject land	Overview	Potential biodiversity impacts
Myrtle Creek Solar Farm, Richmond Valley (EIS stage)	Directly south	Includes construction and operation of 100 MWac solar farm, including 215,000 solar PV panels and BESS, over approximately 240 ha.	Scoping Report - Direct impacts to six PCTs comprising two TECs including Coastal Swamp Oak Forest and Subtropical Coastal Floodplain Forest.
Summerville Solar Farm, Rappville (Response to Submissions)	1.4 km east	Includes construction and operation of 90 MWac solar farm, including 215,000 solar PV panels and BESS, over approximatley 240 ha.	EIS/BDAR – Estimated impacts to 124.33 hectares of native vegetation, including four PCTs and two TECs. Impacts to Subtropical Coastal Floodplain Forest are anticipated. Impacts to SAII entity *Rotala tripartita*.
Pacific Highway – Woolgoolga to Ballina (Approved)	19 km west	Staged road upgrades of the Pacific Highway from Woolgoolga to Ballina, providing 155 km of four-lane divided road.	EIS/BDAR – Impacts to approximately 948 hectares of native vegetation comprising 5 TECs, 11 threatened flora species, twenty threatened fauna species and one endangered population.
Richmond Valley Power Station (Approved)	20 km north	Includes 30 MW gas fired power project and associated coal seam gas field development.	EIS/BDAR – Impacts to native vegetation avoided.
Coraki Quarry (Approved)	24 km east-north-east	Quarry establishment and extraction of approximately 800,000 tonnes of hard rock material per annum.	EIS/BDAR – Direct impacts to pre-disturbed native vegetation including scattered paddock trees, planted amenity screens and heavily disturbed and exotic-dominated patches of regrowth.
Lismore BESS facility (EIS stage)	26 km north-east	Includes a battery system that will store approximately 200 MWh of electricity and 100 MW battery power.	EIS/BDAR - Impacts to a single native tree.
Casino Biohub (bioenergy facility) (EIS stage)	27 km north	Process around 900,000 tonnes of waste per year (mainly liquid waste) to generate 2.2 megawatts or 16,000 megawatt hours of electricity annually.	EIS/BDAR – Estimated direct impacts to 0.57 hectares of native vegetation comprising one PCT occuring as scattered trees and degraded patches.

Project	Distance from subject land	Overview	Potential biodiversity impacts
Champions Quarry (Approved)	30 km north-east	Expansion of sandstone quarry from 2 to 16 hectares to increase extraction rate to 250,000 tonnes per annum.	EIS/BDAR – Impacts to 134 trees (approximately 1.5) hectares of native vegetation.
Lismore Hospital Redevelopment – Stage 3C (Approved)	38 km north-east	Addition of 4 storeys to the approved (and to be constructed) northern tower at the back of the recently developed southern tower.	EIS/BDAR – No impacts to biodiversity.
Blakebrook Quarry (Approved)	40 km north-east	Increase of quarry extraction rate from 237,000 tonnes per annum to 600,000 tonnes per annum and the use of mobile crusher plant within the quarry pit.	EIS/BDAR – Impacts to approximately 25.8 hectares of native vegetation, one threatened flora species, seven threatened fauna species, one EEC.
Lismore to Mullumbimby Transmission Upgrade (Approved)	50 km north-west	Upgrade and installation of 132 kV transmission line and construction of two 132/11 kV substations.	EIS/BDAR- Impacts to two TEC's including Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest.
Clarence Valley Solar Farm (EIS stage)	50 km south	Includes construction and operation of 85 MWac solar farm, including a BESS, over approximatley 280 ha.	EIS/BDAR - Likely impacts to five PCTs comprising three TECs including Subtropical Coastal Floodplain Forest. Extent of impacts unknown at this time.

6.11.4 Mitigation and Management Measures

6.11.4.1 Identification of Impacts Requiring Offset

The Project's offset requirements were determined through the BAM calculator which are shown for ecosystem, species and scattered tree credits in **Table 6.47**. The required offsets for the Project relate to the Project's residual impacts on biodiversity values following all efforts to avoid and minimise those impacts (see **Section 6.11.3.1**).

Impacts on Native Vegetation (Ecosystem Credits)

As outlined in Section 9.2.1 of the BAM, the Project's accredited assessor (Biosis- Mitchell Palmer (BAAS17051) must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

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

Given the identified VI scores shown in **Table 6.36**, offsets are required for all vegetation zones. Offset requirements (ecosystem credits) were determined using the BAM calculator and are shown in **Table 6.47**.

Indirect impacts do not require offsetting and are subject to detailed mitigation and management to improve and maintain vegetation within criteria set in the BMP (see **Section 6.11.4.2**).

Impacts on Threatened Species and their Habitat (Species Credits)

As outlined in Section 9.2.2 of the BAM, offsets are also required for the Project's impacts on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥17.

Offset requirements (species credits) were determined using the BAM calculator and are shown in **Table 6.47.**

Impacts on Scattered Trees

Offsets are required for the proposed clearing of Class two (two scattered trees) and Class three (26 scattered trees) paddock trees and are shown in **Table 6.47**.

Table 6.47 Offsets Required

Class	Vegetation Zone/Species	Impact	Offset Requirement (credits)
Ecosystem	4046_Moderate	Clearance	16
Ecosystem	4046_Riparian	Clearance	12
Ecosystem	3428_Moderate	Clearance	63
Ecosystem	3428_Low	Clearance	15
Ecosystem	3420_Good	Clearance	56
Ecosystem	3420_Moderate	Clearance	266
Ecosystem	3420_Regen	Clearance	22
Species	Barking Owl	Direct	22
Species	Southern Myotis	Direct	172
Species	Squirrel Glider	Direct	249
Species	Brush-tailed Phascogale	Assumed	500
Species	Common Planigale	Assumed	500
Species	Green-thighed Frog	Assumed	9
Scattered Trees	PCT 3420 - Clarence Lowland Ironbark-Spotted Gum Grassy Forest	4 cleared	4
Scattered Trees	PCT 3428 - Northern Lowland Red Gum-Swamp Turpentine Grassy Forest	13 cleared	11
Scattered Trees	PCT 4046 - Northern Lowland Swamp Turpentine-Red Gum Forest	11 cleared	11

6.11.4.2 Mitigation Measures

A range of mitigation and management strategies in response to the identified impacts of the Project on biodiversity were identified in the BDAR and are summarised below in **Table 6.48**.

Table 6.48 Biodiversity Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
BD-01	• Preparation and implementation of a Biodiversity Management Plan (BMP). • The BMP will be reviewed and approved by NSW Biodiversity Conservation and Science (BCS) prior to construction, and include the following framework and Project commitments: ○ Protecting vegetation and fauna habitat outside the development footprint such as Koala habitat. ○ Managing the remaining remnant vegetation and fauna habitat within or surrounding the subject land toward a benchmark state using improve and maintain principles, minimising indirect impacts, especially to known threatened flora species and potential fauna species such as Barking Owl, Square-tailed Kite, Brush-tailed Phascogale, Common Planigale, Southern Myotis, and Green-thighed Frog. ○ Demarcation of retained areas of vegetation. ○ Ongoing vegetation monitoring of retained vegetation areas within the subject land including collection of BAM plots prior to construction (if no baseline data is applicable) and at year 1, year 3 and year 5 post construction. ○ Training and education awareness for all construction staff and operational staff on key threatened species, both flora and fauna, relevant to the region and Project. ○ Contain relevant sub plans for overall weed and biosecurity management (biosecurity management plan), pest animal management and rehabilitation management to reduce the risk of spreading biosecurity items in/out of the Project Area upon implementation. ○ Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas. ○ Fauna monitoring and management protocols including identification and reporting of fauna mortalities to the relevant BCS office. ○ Collection of detailed baseline weed data and ensuring no increase of key emerging weeds or invasive pests. ○ Commit to ongoing consultation with Local Land Services (LLS) on fox control and baiting programs. ○ Measures to contain and minimise impacts on Cane Toads. ○ Marking and identification of retained tree hollows and measures to minimise impacts to these features. ○ Two stage pre-clearing protocols, including pre-clearing inspections, establishment of exclusion zones (including flashing on perimeter fence) and on-ground identification of specific habitat features to be retained and/ or relocated. ○ Procedures for unexpected threatened species finds and fauna handling. ○ Clear performance targets and monitoring criteria. ○ Timing and responsibilities of management activities and corrective actions. ○ Annual reporting requirements and consultation program with the relevant regulator.	Pre-construction, construction and post construction

ID	Mitigation and Management Measure	Phase
	○ Include a species lists for revegetation of the biodiversity corridor (see mitigation measure BD-02). • A recommended outline of the BMP is provided in Section 7.1 of the BDAR.	
BD-02	• A biodiversity corridor will be established on the northern boundary of the Project Area to increase visual amenity and connectivity between vegetation patches.	Construction and post construction
BD-03	• Exclusion zones will be established including: ○ Installation of flashing on perimeter fencing to restrict climbing Koalas and escape structures near forested areas retained vegetation should Koala become trapped within the perimeter fencing. ○ Frog exclusion fencing will be set up at the limit of clearing and surrounding riparian corridors to be retained.	Construction
BD-04	• All material stockpiles, vehicle parking and machinery storage, and other ancillary works will be located within areas considered impacted within the current assessment to date (at the time of EIS submission) and will not be located within retained vegetation outside the impact area unless an updated impact assessment is undertaken.	Pre-construction and construction
BD--05	• Dust suppression will be undertaken as required using water sprays, water carts or other media on: ○ Unpaved work areas subject to traffic or wind. ○ Sand, spoil and aggregate stockpiles. ○ During the loading and unloading of dust generating materials.	Pre-construction and construction
BD-06	• A Construction Environment Management Plan (CEMP) will be implemented by Ark Energy and will include an adaptive management component for impacts on biodiversity that are uncertain such as: ○ Inadvertent impacts on native vegetation adjacent to the Development Footprint. ○ Introduction of pests, pathogens and weeds to native vegetation adjacent the Development Footprint and further afield ○ Vehicle strikes. ○ Weed species would be managed as part of the CEMP. • A biosecurity management plan prepared as part of the Project's CEMP/OEMP is recommended and will reduce the risk of spreading weeds and pathogens, and other biosecurity items into or out of the impact area upon implementation.	Pre-construction, construction and post-construction
BD-07	• Shading and artificial light impacts will be minimised through detailed design. • Lighting will be designed in general accordance with Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting.	Construction
BD-08	• Any potential noise impacts on biodiversity will be managed as part of the Project's CEMP. Biodiversity values will be considered as sensitive receivers in the NVMP.	Post-construction

6.12 Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment (ACHA) (see **Appendix 15**) was undertaken by Umwelt (2024) to assess potential impacts of the Project on Aboriginal cultural heritage. This section outlines the key findings of the ACHA, the potential impacts of the Project on identified Aboriginal cultural heritage values and proposed mitigation and management measures.

The ACHA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with several guidelines for Aboriginal cultural heritage assessment and management including:

- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (Office of Environment and Heritage, 2011).
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (the Consultation Requirements) (Department of Environment Climate Change and Water, Aboriginal cultural heritage consultation requirements for proponents 2010, 2010).
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (the Code of Practice) (Department of Environment Climate Change and Water, 2010).

6.12.1 Existing Environment

The people of the Bundjalung Nation are recognised as the Traditional Custodians of the Study Area (see **Figure 6.37**). The Study Area is located in a landscape of low undulating hills and stagnant alluvial plains within the Bungawalbin catchment area and is part of the Richmond River catchment. The Study Area does not contain any perennial waterways, however, several ephemeral waterways, swamps and floodplains are present. This suggests that more permanent nearby water sources such as Bungawalbin Creek may have been preferred for long-term Aboriginal habitation.

The Study Area has been disturbed and largely cleared of vegetation by two main historical land uses: pastoral grazing and commercial forestry (see Figure 3.4–Figure 3.6 of the ACHA). Topsoils across the Study Area are typically less than 20 cm in depth and have been disturbed from livestock trampling, cropping and commercial forestry. There are only a few portions in the south-east of the Study Area with potential to host deep non clay-based soils which are in an area of flood risk. Additionally, the Road Upgrade Area (see **Figure 6.37**) has been subject to intense disturbance regimes which are likely to have removed topsoils layers.

6.12.2 Methodology

The ACHA aimed to identify Aboriginal cultural heritage values relevant to the Study Area including Aboriginal objects and sites, Aboriginal socio-cultural or historical values (which might not be related to Aboriginal objects) and/or areas of archaeological sensitivity. For purposes of the ACHA, the Study Area included a combination of the Project Area and Road Upgrade Area (see **Figure 6.37**).

The following approach was undertaken to identify and assess potential impacts of the Project's construction and operation on Aboriginal cultural heritage values. Additionally, to identify appropriate mitigation and management measures for potentially impacted values.

6.12.2.1 Desktop Assessment

A desktop assessment was undertaken to describe and characterise the existing environment relevant to the Study Area. This involved a general literature review, a search of the Aboriginal Heritage Information Management Systems (AHIMS) and considered inputs from other technical assessments completed as part of this EIS as well as from previously undertaken relevant archaeological investigations.

The desktop assessment was carried out to describe and characterise the existing environment and identify Aboriginal cultural heritage values. This includes Aboriginal objects and sites as well as other Aboriginal socio-cultural or historic values and areas of archaeological sensitivity.

6.12.2.2 Aboriginal Community Consultation

Aboriginal consultation was undertaken with the Project's Registered Aboriginal Parties (RAPs) to identify and assess the significance of Aboriginal objects and/or places present within the Project Area. The ACHA is guided by Aboriginal people being the primary determinants of what is defined as the 'cultural significance' of their heritage. As such, the RAPs also provided insight to inform mitigation and management measures.

Aboriginal consultation was undertaken in accordance with the Consultation Requirements, which outlines the following four-step process:

- **Stage 1 – Notification and registration of Aboriginal Parties –** Based on the advice of several government agencies including Heritage NSW, RVC, Bogal Local Aboriginal Land Council, Native Title Tribunal, Office of the Registrar – NSW *Aboriginal Land Rights Act 1983*, Native Title Service Provider (NTSCORP) and the North Coast Local Land Services, Umwelt sent expressions of interest to several Aboriginal parties inviting them to become RAPs for the Project. A notification was placed in a local newspaper detailing Project information and a request for Aboriginal knowledge holders to express their interest in the Project. As a result of the expressions of interest and public notice, Five RAPs registered their interest in being consulted for the Project:
    - AT Gomilaroi Cultural Consultancy
    - Koori Digs
    - Bandjalang Aboriginal Corporation prescribed body corporate (PBC) Registered native title body corporate (RNTBC)
    - Lois Cook
    - Casino Boolangle Local Aboriginal Council.
- **Stage 2/3 – Presentation of Information (stage 2) and gathering cultural information (stage 3) –** Umwelt issued a letter to the RAPs outlining key information and the proposed methodology for the ACHA for their feedback. No responses were received relating to the proposed ACHA methodology, however, several RAPs expressed interest in being involved in the field survey for the ACHA (see **Section 6.12.2.4**).
- **Stage 4 – Review of the Draft ACHA –** A draft version of the ACHA inclusive of background Project information, results of the desktop assessment and field survey and draft significance and mitigation/management recommendations were issued to the RAPs for review and comment on 1 December 2023. One set of comments was received in return, agreeing with the ACHA and endorsing the Project.

6.12.2.3 Predictive Model

As at the time of drafting the ACHA there was no commonly established predictive model specific to the Richmond Valley Local Government Area (LGA). To assist with the assessment a predictive model was developed for the Project Area based on the findings of the desktop assessment.

The predictive model aimed to identify the landforms within the Study Area most likely to feature areas of Aboriginal cultural heritage sensitivity. The predictive model was utilised to inform the field survey strategy as discussed below in **Section 6.12.2.4**.

6.12.2.4 Field Survey

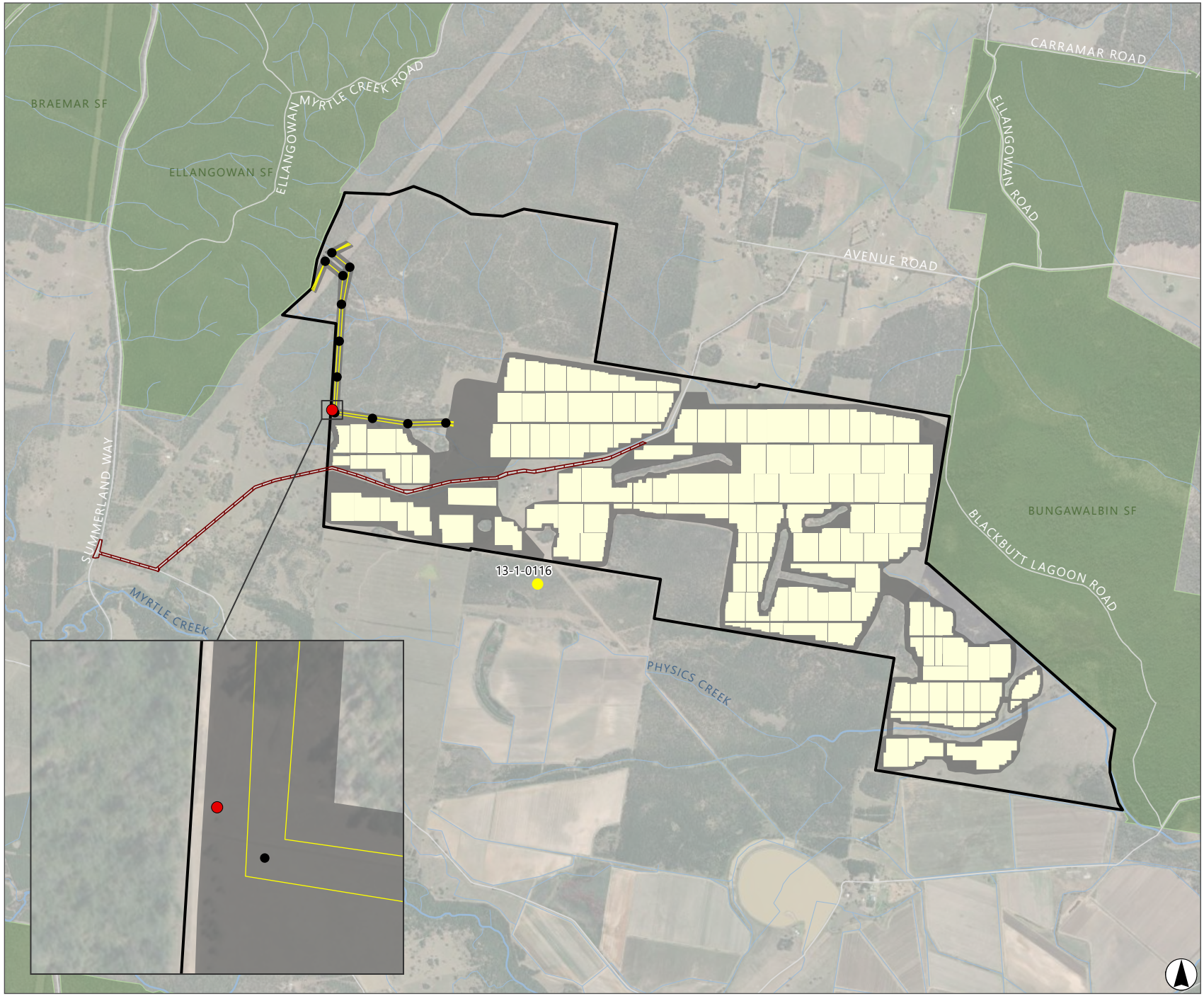
An archaeological field survey (the field survey) was conducted between 25 and 27 July 2023 and attended by Umwelt team members as well as representatives from two RAP groups - Bandjalang Aboriginal Corporation PBC RNTBC (Elder Warren Williams) and Casino Boolangle Local Aboriginal Land Council (Craig Torrens) who were engaged as Site Officers.

The field survey aimed to:

- Identify Aboriginal sites (areas identified as potential high archaeological sensitivity) and/or places.
- Categorise the Study Area into landform units. Sampling extent of each unit was determined by their predicted levels of archaeological sensitivity.
- Assign an overarching visibility and exposure percentage for each landform class.
- Focus on landforms most likely to feature Aboriginal sites and/or places whilst also gathering a representative sample of landforms less likely to feature Aboriginal sites to confirm predictions of the predictive model.
- Sample a portion of the Development Footprint and Road Upgrade Area instead of the entirety of the Study Area as informed by the predictive model in accordance with the requirements for archaeological survey established in the Code of Practice.

FIGURE 6.37

Aboriginal Cultural Heritage values in the Study Area

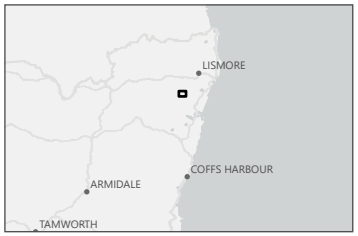


Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Transmission Poles
- Transmission Lines
- Solar Array Blocks
- State Forest
- Watercourse
- Roads
- Open Artefact Site RVSF-UMW-01

AHIMS Search Results

- Culturally Modified Tree



0 500 1,000

Metres

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023); AHIMS (2023)

6.12.3 Impact Assessment

6.12.3.1 Desktop Assessment

The ACHA found that the Development Footprint and Road Upgrade Area are not located within a particularly sensitive archaeological landscape. The lack of resource hotspots and/or perennial waterways throughout the Study Area indicates a lack of potential for long-term Aboriginal habitation and the associated presence of archaeological materials. Nearby areas with more permanent water sources such as the nearby Bungawalbin Creek may have been the preferred location for long term Aboriginal habitation. Furthermore, previous archaeological investigations undertaken in the region have confirmed that similar swampy areas were also unsuitable for long-term Aboriginal habitation ((SKM, 2012); (Woolgoolga to Ballina Planning Alliance, 2013)). It is unlikely that any undisturbed archaeological remains would be present within areas of cleared landscape within the Study Area, which contains the Development Footprint.

The western half of the Project Area is comprised of landforms with higher potential for previous Aboriginal occupation such as gentle slopes and crests, however, these landforms were found to have been subject to historical pastoral landscape disturbance, therefore limiting the potential for archaeological evidence. The most archaeological sensitive areas of the Project Area are in the north-west and contain forested crested landforms, however, these are not intersected by the Development Footprint.

A search of the AHIMS inclusive of the Study Area and surrounds found that there are no AHIMS sites present within the Study Area. However, one culturally modified tree site (ID 13-1-0116) is recorded 300 m south of the Study Area (See **Figure 6.37**).

The search found that most recorded Aboriginal sites in the region occur close to easily accessible sources of water. The search identified that the most common Aboriginal site type in the region surrounding the Study Area is culturally modified trees. The search also indicated several ceremonial or culturally restricted sites (including ceremonial rings) as present in the broader region, however, none were identified within the Study Area.

6.12.3.2 Predictive Model

Utilising the findings of the desktop assessment, the predictive model indicated that the most likely Aboriginal sites to be present within the Study Area would be stone artefact sites on spurs overlooking the floodplain. Utilising the predictive model, the Study Area was categorised into landform units. Sampling undertaken as part of the survey was informed by the model's prediction of respective levels of archaeological sensitivity. A description of the landform classes utilised in the survey and their respective proportions of the Study Area is shown in **Table 6.49**.

Table 6.49 Landform Classes and their Portion of the Study Area

Landform Class	Area (ha)	Area (%)
Crest	200.167	13.58
Hill slope 1 (<10%)	440.126	29.86
Hill slope 2 (> 10%)	14.047	0.95
Flat	589.207	39.97
Watercourse (1st and 2nd order)	115.628	7.84
Watercourse (3rd order)	17.043	1.16
Watercourse (4th order)	97.837	6.64
Road Upgrades	0.0019 within Project Area plus 3.8201 outside of the Project Area)	0.0001
Totals	**1475 ha**	**100%**

6.12.3.3 Field Survey

The field survey identified one Aboriginal site located on the slope of a 'crest' landform on the edge of a vehicle track in eastern edge of the Project Area (see **Figure 6.37**). The site consisted of a single artefact: a Fine Grained Silicious (FGS) flake (see **Photo 6.7**). This site of the artefact, with a 5 m buffer, will be registered on the AHIMS as site RVSF-UMW-01.

Photo 6.7 Ventral view of artefact comprising site RVSF-UMW-01

The ACHA suggests the lack of identified artefacts within the Survey Area is likely due to "marshy" conditions of the landscape, indicating it was unlikely to be suitable for long-term Aboriginal habitation. Furthermore, the broader Project Area was found to be highly disturbed and lacking in areas of high archaeological sensitivity, as noted in the predictive model.

Due to a lack of ground visibility whilst undertaking the field survey, it is acknowledged that potential remains for undetected artefact sites to be present. However, it is very unlikely for any preserved and undetected artefacts to be present within the Study Area. Furthermore, if there was a need to test for their presence, the high level of disturbance throughout the Study Area would inhibit any further archaeological investigation.

Therefore, the ACHA concluded that the Study Area does not warrant further archaeological investigation, particularly, due to the lack of presence of landscape features meeting the definition of a Potential Archaeological Deposit (PAD). PAD sites are areas where sub-surface stone artefacts and/or other cultural materials are likely to occur (DECCW, 2010). These areas are generally recorded as areas where test excavation in accordance with the Code of Practice.

The stone artefact (RVSF-UMW-01) was found on the slope of a crest landform located on the edge of a vehicle track, near a gate (see **Figure 6.37**). The artefact is not considered to be rare, as the material (FGS) and type (flake) are found to commonly occur within the region surrounding the Study Area. Therefore, the artefact is considered to have low representativeness, integrity or research potential and thus has low scientific significance.

The location of RVSF-UMW-01 indicated that the Study Area has likely been historically visited and potentially temporarily occupied by Aboriginal peoples, as opposed to long term habitation which would have likely left traceable archaeological material in the landscape. The lack of additional stone artefacts identified during the field survey provides an indication that the artefact within the Study Area may have been simply left as individuals moved throughout the broader landscape. It confirms the outcomes of the predictive model that the Study Area lacks characteristics conducive to long-term habitation by Aboriginal people historically.

Both Site Officers (RAP representatives) in attendance expressed the same opinion that the Study Area would not have been especially suitable for long term Aboriginal habitation, although, that their ancestors would have likely passed through the Study Area as they moved to other campsites or in search of resources. They both explained that they had no knowledge of any cultural sites or values associated with the Study Area and did not think any additional parts of the Study Area needed further investigation.

The Project's Development Footprint would impact on the Aboriginal site (RVSF-UMW-01) as indicated in **Figure 6.37**. To mitigate the impact, RVSF-UMW-01 will be collected and subject to analysis. Furthermore, aspects of Aboriginal cultural heritage associated with the Study Area will be managed under the implementation of an Aboriginal Cultural Heritage Management Plan (ACHMP).

Additionally, several remnant native forested areas are located within the Project Area and were observed to be generally less disturbed. However, these portions were only surveyed where they were within the Development Footprint. The areas that were surveyed were found to have low potential for archaeological sensitivity as they were in partially cleared, regrowth vegetation and not intact remnant native mature forest. Remnant native forested portions of the Project Area will not intersect with Project Infrastructure. However, some minor tracts of partially cleared forest (see **Photo 6.8**) would be impacted on by the transmission line, but which is also pre-disturbed.

Photo 6.8 Pre-disturbed remnant native vegetation along the Western edge of the Project Area near the transmission corridor (Umwelt, 2023)

Regarding additional potential development impacts, earthworks associated with the construction of the Project would be limited to portions of the Project Area requiring resurfacing for temporary construction facilities (i.e. laydown areas, construction compounds and carpark) as well as permanent operational infrastructure including the substation, BESS and ancillary infrastructure. Additional minor earthworks would also be required to allow for the installation of PV modules. These works may include some grading or levelling including 'cutting and filling' where required as well as grading around lower order streams and drainage channels to manage erosion.

6.12.4 Cultural Significance

The assessment of the cultural significance of the Study Area was completed in the ACHA against two of the four recognised classes of value of the Burra Charter (ICOMOS, 2013): scientific and cultural value.

The two Site Officers (RAP representatives) explained that they believed that the stone artefact (RVSF-UMW-01) found during the field survey was culturally significant as it acts as tangible confirmation of their ancestor's presence of moving through the Study Area. They also noted that the Study Area has intrinsic cultural heritage value due to its location in Bunjalung Country. This was the only comment received throughout the consultation process in relation to cultural values linked to the Study Area.

Furthermore, during the Project's early planning phase, a desktop constraints analysis and preliminary archaeological surveys were undertaken to identify the most archaeologically sensitive areas of the Project Area. This allowed for the Project's design to ensure that Project Infrastructure avoided these areas and any potential substantial impact on Aboriginal sites. Project infrastructure has been specifically sited with a minimum setback distance from Physics Creek as well as several forested portions of the Project Area.

6.12.4.1 Cumulative Impacts

The ACHA also considered the cumulative impacts of the Project as they relate to impacts on cultural heritage values. The ACHA considered several nearby solar farm projects within the region, including Summerville and Myrtle Creek Solar farms, both proposed within 10 km of the Study Area (see **Appendix 20**).

At the time of reporting for the ACHA (January 2024) the EIS for Myrtle Creek Solar Farm was not yet in the process of drafting, however, the EIS for Summerville Solar Farm had completed an ACHA as part of its EIS submission. No Aboriginal sites or objects were located during the project's surveys nor did the RAPs identify any areas or objects of cultural heritage significance relevant to the project. Neither of these projects are present in an area of particular archaeological sensitivity nor are there any PADs with research potential proposed to be impacted by the projects located in the locality. The most sensitive portions of these project areas are areas that have not been cleared by past historical disturbances. Within the project current study areas, forested portions with increased archaeological sensitivity will not be impacted and will therefore be conserved for future generations. Therefore, the development of the project would only cause minimal impact to existing archaeological resources in addition to impact from historical land uses.

6.12.5 Mitigation and Management Measures

A range of mitigation and management strategies in response to the identified impacts of the Project on Aborignal cultural heritage were identified in the AHCA and are summarised below in **Table 6.50**.

Table 6.50 Aboriginal Cultural Heritage Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
AH-01	RVSF-UMW-01 will be collected by a qualified archaeologist(s) and RAP representatives prior to construction. The collection method will be as follows: • The stone artefact (and any previously undetected stone artefact associated with the site) will be flagged on the ground and recorded with GPS and photography. • All artefact(s) will be collected into snap lock plastic bags marked with the Project name, site name, collection date and waypoint number. • All artefact(s) will be sorted and recorded post-fieldwork with respect to technological type, implement type, raw material, and dimensions.	Pre-construction
AH-02	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed following Project approval in consultation with Heritage NSW and RAPs. It will provide details of: • All Aboriginal sites identified during the archaeological investigation for the Project. • Management measures and their progress towards completion. • RAP access arrangements for a selection of significant sites for educational purposes. • Measures to ensure ongoing consultation and involvement of Project RAPs. • RAP access arrangements for a selection of significant sites for educational purposes. • Protocols for newly identified sites.	Construction

ID	Mitigation and Management Measure	Phase
	• Protocols for educating staff and contractors of their obligations relating to Aboriginal cultural heritage values through a site induction process. • Protocols for suspected human skeletal materials. • Protocols for the ongoing care of salvaged Aboriginal objects. • Provisions for review and updates of the ACHMP. In addition to the points above, the ACHMP will address all relevant conditions of approval and provide for more details of the measures outlined above.	

6.13 Historic Heritage

A Historic Heritage Impact Assessment (HHIA) (see **Appendix 16**) was undertaken by Umwelt (2024) to assess the impact of the Project on any listed and/or unlisted items of historic heritage significance located within or in proximity to the Project Area. This section outlines the key findings of the HHIA, the potential impacts of the Project on historic heritage and proposed mitigation and management measures.

The HHIA was prepared in accordance with the Project's SEARs as outlined in **Appendix 1**. It was also prepared with consideration of the best practice principles contained in the:

- The Australia ICOMOS Charter for Places of Cultural Significance 2013 (the Burra Charter) (Australia ICOMOS, 2013).
- Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Environment and Heritage, 2009).
- The Historical Archaeology Code of Practice (Department of Planning, 2006).

6.13.1 Existing Environment

The Project Area is located in a landscape of gently undulating hills rising to a crest in the north and is characterised by low lying, predominantly cleared agricultural land. The Project Area comprises numerous open grassed paddocks with some areas of mature tree stands. Due to its relatively flat terrain, the Project Area has largely limited views.

6.13.1.1 Early Settlement of the Region

Pastoral settlement of the Richmond Valley region occurred from the early 1840s and the Project Area has been subject to little development since then. Those using the land at this time were referred to as 'squatters' who established pastoral runs. Due to a change in rules and regulations in 1847 surrounding occupation of Crown land, squatters were granted pastoral leases for their stations and/or runs. It is likely that one of these leases encompassed the Project Area, however this cannot be confirmed due to the undocumented and frequently changing boundaries of early homesteads in the area (Stubbs, 2007). It is most likely that the Project Area was located within the run originally owned by Yabsley or as part of an outstation of Ellangowan run owned by Clarke Irving.

6.13.1.2 Main Camp Homestead

The heritage listed Main Camp Homestead (Richmond Valley LEP Item I143) (see **Section 6.13.3**) is located approximately 800 m south of the Project Area. By the 1860s, the Main Camp homestead building was included as part of Irving's pastoral property. The Project Area may have been included in the boundaries of the pastoral property; however, it is unclear what activities associated with the property may have extended into the Project Area.

6.13.1.3 20th Century and Melaleuca Homestead

As seen in the 1907 Parish Map for the County of Richmond, Parish of Darke, several smaller parcels of land owned by several land owners made up the Project Area at this point in time. By the 1920s, the Middleton Family owned the majority of the Project Area. At this time, there was no information available regarding the presence of any structures or houses built within the Project Area.

Aerial imagery available for the Project Area in the 1960s shows the only structures within the Project Area at this time were a residence and ancillary building group associated with the Melaleuca homestead. Comparison of the 1960s aerial with modern aerial imagery suggests that this structure is likely the same residence and ancillary structures, or replacement buildings which are still located within the Project Area. Other modifications visible in the aerial imagery from the 1960s include the digging of dams and terracing of some paddocks in the landscape.

The other two existing structures on the Project Area (a shed and sheep coral and shelter) are not visible in aerial imagery until the late 1990s. See **Section 6.13.3** for a more detailed discussion of these items.

6.13.2 Methodology

The following approach was utilised to assess the impacts of the Project on any listed and/or unlisted items of historic heritage significance located within or in proximity to the Project Area and to identify appropriate mitigation and/or management measures.

Desktop assessment of all relevant historical heritage databases was undertaken to identify any listed heritage items located within or in 5 km proximity to the Project Area. This included searches of:

- The Commonwealth and National Heritage Lists (established under the EPBC Act).
- The State Heritage Register (established under the *Heritage Act 1977* (NSW) (Heritage Act)).
- Section 170 Heritage and Conservation Registers (where publicly accessible) (NSW State agency heritage registers).
- Relevant Local Environmental Plans (LEPs).

Additionally, a visual field inspection of the Project Area was undertaken by Umwelt in July 2023 to confirm the setting and context of the Project Area, and to identify if any unlisted items of heritage significance were located within the Project Area.

Furthermore, any areas of historical archaeological potential were identified within the Project Area. Archaeological potential of the Project Area was informed by the extent of disturbance present in the Project Area which was determined by a desktop review of relevant land use history.

The following was undertaken:

- An assessment of the likelihood, extent and nature of potential impacts on identified listed or unlisted items of heritage significance was undertaken using the heritage impact gradings included at Table 6.1 of the HHIA. The impact ratings were developed in accordance with Heritage NSW guidelines and the Burra Charter.
- The HHIA then outlined appropriate measures to avoid, manage and/or mitigate any identified impacts.

6.13.3 Impact Assessment

No heritage items or places listed on the Commonwealth, National or State Heritage Lists are located within the Project Area, as confirmed by the visual field inspection of the Project Area. Furthermore, no items listed on any s170 Heritage and Conservation Registers (NSW State agency heritage registers) or Schedule 5 of an LEP are located within the Project Area.

6.13.3.1 Main Camp Homestead and Surrounds

The nearest local heritage item to the Project Area is the 'Main Camp Homestead & Surrounds' (Richmond Valley LEP Item I143) (see **Photo 6.9**) located 800 m south of the Project Area, on Main Camp Road (see **Figure 6.38**). The Project Area may have been included in the boundaries of the pastoral property; however, it is unclear what activities associated with the property may have extended into the Project Area. Based on understandings of pastoral and agricultural practices of the mid to late nineteenth century, it is likely that the Project Area was utilised for timber felling and pastures for the sheep, cows and horses recorded to have been raised as part of the Main Camp homestead.

The homestead and surrounds are described as comprising the following main components (NSW State Heritage Inventory, 2007):

- *Main homestead – c 1930 high set large weatherboard house with several rooms infilled underneath. At least one of these appears to be a store room. Hipped iron roof extends over the verandahs which encircle the house. The rear and part of the western side verandah has been enclosed. Timber steps lead to the front door. Brick chimney intact. Original joinery in windows and doors. Yard surrounded by a post and rail fence. Grounds contain mature trees including a very large camphor, tennis court and swimming pool. Just to the west of the house is an iron shed with a turn table iron gate. This may have led to a school building which has now been demolished.*
- *Round Stockyards – a set of round stockyards stands to the rear of the main house. The sides are high (approximately 2 m) with five rails. Its exact purpose is unknown. They will need to be maintained if they are to remain as an important part of the Main Camp story.*
- *Old stockyards – many posts and rails in the old stockyards have been replaced but the image shows some of the very old posts still in use. They would have a diameter of about 1 m.*
- *Tea tree industry – a more recent office building remains as a reminder of the operations of Main Camp Holdings and near the road are various pieces of equipment used by the tea tree industry. (NSW SHI 2007).*

The following Statement of Significance is available on the NSW State Heritage Inventory entry for the 'Main Camp Homestead and surrounds' ((NSW State Heritage Inventory, 2007):

> *The Main Camp property is historically significant for its early settlement, association with Cunningham Henderson and its later roll as the site of one of the areas large tea tree plantations. Parts of the property, particularly at the current house site are likely to have archaeological potential and the cook's cottage, stockyards (particularly the round stockyards) and tea tree equipment are of significance. The c1930s homestead is listed on the shire's LEP.*

Photo 6.9 View towards Main Camp Homestead (Umwelt, 2023)

6.13.3.2 Hindmarsh Grave

Another local heritage item 'Hindmarsh Grave' (Richmond Valley LEP Item I120) Is located approximately 2.4 km north of the Project Area (see **Figure 6.38**). The heritage item is described as:

> *Located on a grazing property this isolated grave is not visible from the Myrtle Creek - Ellangowan Road. The grave consists of a concrete bed with a ledger slab to which a marble tablet is attached which simple says" In loving memory of Alexander Hindmarsh Died 1849 Aged 5 years." It is surrounded by a sturdy concrete and iron rail fence.*

The following Statement of Significance is available on the NSW State Heritage Inventory (SHI) entry for the 'Hindmarsh Grave':

> *This isolated grave is historically significant being associated with an early settler, Walter Hindmarsh, and his extended family. The grave belongs to Alexander Hindmarsh who died in 1849, aged 5 years, and is one of the earliest graves on the Richmond River.*

6.13.3.3 High Conservation Value Old Growth Forest

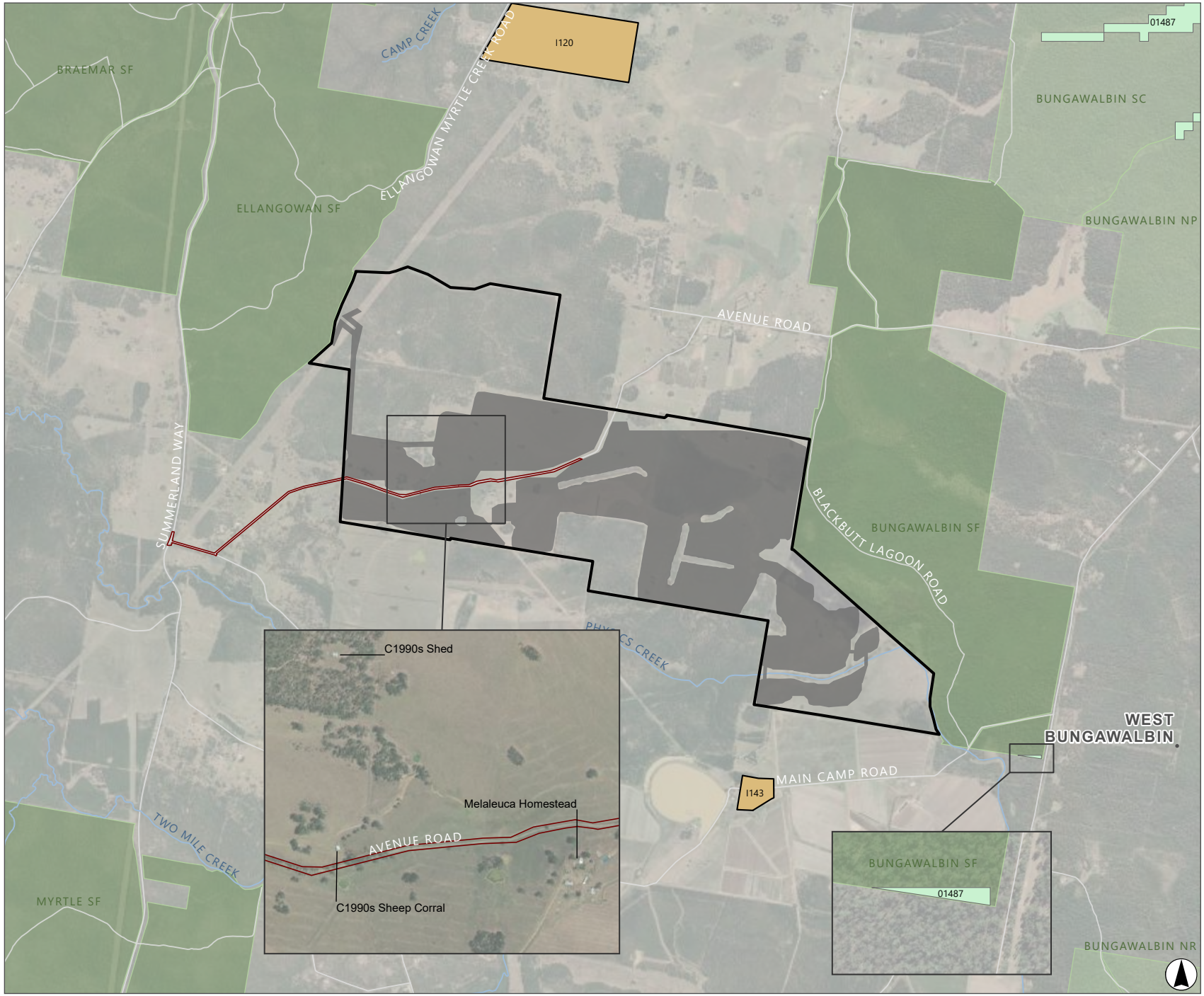
The closest State listed heritage item to the Project Area is Sate Heritage Register (SHR) Item #01487 'High Conservation Value Old Growth Forest'. This is a group listing of several areas of the identified natural heritage item and is located across the wider Richmond Valley region. The nearest gazetted area of this SHR group is located approximately 940 m east of the Project Area and the next closest gazetted area being approximately 5 km east, with other areas located at greater distances all directions from the Project Area (see **Figure 6.38**).

The following Statement of Significance is available on the NSW SHR inventory form for the 'High Conservation Value Old Growth Forest' (NSW State Heritage Inventory, 2017):

High Conservation Value Old Growth forest is ecologically mature eucalypt forest showing few signs of human disturbance. The upper canopy trees are no longer growing in height or spreading their crowns and show signs of old age. High Conservation Value Old Growth forest represents the best examples remaining of such forests (NSW SHI, 2017).

FIGURE 6.38

Heritage Context



Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- NPWS Reserve
- State Forest
- Roads
- Watercourse
- State Heritage Register Curtilage

EPI Heritage

- Item - General

0 1 2

Kilometers

Scale 1:60,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.13.3.4 Non-Listed Items of Potential Heritage Significance

No items of potential heritage significance (non-listed) were identified during the visual field inspection. The Project Area was found to comprise grassed paddocks with some areas of mature tree strands. The visual field inspection found evidence of terracing, a variety of fences and access tracks mirroring aerial imagery from the 1960s as well as:

A post-1950s house and associated sheds/ancillary structures known as Melaleuca Homestead. The Homestead is located on a rise roughly in the centre of the Project Area (see **Photo 6.10**).

Photo 6.10 Melaleuca homestead and associated buildings (Umwelt, 2023)

A circa 1990s former sheep corral and shelter, located in the western portion, on the north side of Avenue Road. This consists of a series of timber and metal fences, with a small open sided rectangular shelter constructed of timber posts and beams with a skillion corrugated metal sheet roof (see **Photo 6.11**).

Photo 6.11 Post-1960s shelter and sheep corral, adjacent to Avenue Road (Umwelt, 2023)

A circa 1990s shed, located in the western portion. The shed is surrounded by trees. It consists of a rectangular building built on a concrete slab and clad in corrugated sheet metal, with a gabled roof form and timber bargeboards to the gable ends (see **Photo 6.12**).

Photo 6.12 Shed located in the north of the Project Area

6.13.3.5 Areas of Historical Archaeological Potential

The HHIA found that the Project has a low potential to contain historical archaeological remains from early land use.

The first record of potential land use near to the Project Area occurs in the 1860s related to Main Camp homestead. Archaeological remains associated with likely land uses for the homestead are likely to be limited to post holes of fences or ad hoc shelters for other squatters present within the region. It is unlikely these activities would have resulted in any clearly detectable footprint following their removal. If present, evidence of these structures would likely be limited to post-holes or footings, which would not reveal any new or significant information that would contribute meaningfully to an understanding of the Project Area or local area's history.

The Melaleuca homestead is present within the Project Area and consists of post-1950s house and associated sheds/ancillary structures. Primary domestic and occupation activities likely occurred within the homestead area. When considering the local topography of the Project Area, it is likely these activities were contained to the hill crest where existing buildings are grouped.

Historical records do not indicate that any structures or outbuildings associated with Main Camp or other pastoral stations would be located within the Project Area. No other historical land uses are recorded for the Project Area, and it is considered unlikely that the Project Area has the potential to contain archaeological remains of significance.

6.13.3.6 Direct Impact(s)

The Project would not result in a direct physical impact on any listed heritage items as no listed or non-listed heritage items or areas of historical archaeological potential were identified within the Project Area

The nearest local heritage item to the Project Area is the Main Camp Homestead & Surrounds located 800 m south of the Project Area and 900 m from Project infrastructure. The nearest state heritage item to the Project Area is SHR Item #01487 'High Conservation Value Old Growth Forest', with the nearest gazetted area of this SHR group is located approximately 940 m east of the Project Area.

No works to the significant fabric of the Main Camp Homestead or any other heritage item in the vicinity of the Project Area would occur. The Project would therefore not result in any direct physical impact to any of the above listed heritage items.

6.13.3.7 Indirect Impact(s)

The Project will introduce infrastructure into the landscape of the Project Area which is currently dominated by sparse rural dwellings, remnant vegetation and ancillary structure. This will change the setting and views across the Project Area and reduce inherent landscape characteristics of the broader landscape. However, the predominant areas of change are located away from the local and state listed heritage items as discussed in **Section 6.13.3** and the broader landscape character in the vicinity of these heritage items would not be affected by the Project.

The Landscape and Visual Impact Assessment (LVIA) prepared for the Project (see **Appendix 11**) found that based on the topography of the Project Area, less than 50% of the Project's Development Footprint would be visible from Main Camp Homestead (I143). Additionally, that this would be further reduced by the existing vegetation present between the existing buildings and the Development Footprint. Although the Project would be partially visible from this heritage item, the LVIA found that the potential for visual impact (as per the Department of Planning and Environment Large-Scale Solar Energy Guideline 2022 and Technical Supplement) is considered to be low. The HHIA further determined that any potential for changes to the landscape character north of the heritage item from the Project would be mitigated by the vegetation which would provide screening to the majority of the new elements from the Project in the landscape, with the exception of the south-east corner of the Project Area, where new solar panel arrays are proposed in an area of open flat paddock.

The statement of significance and description for the item (see **Section 6.13.3.1**) does not identify any significant view associated with the item, and it is unlikely that any views of the Project Area from the homestead building would contribute to the overall significance of the item. Whilst the Project would be visible from this heritage item, it would not change, or degrade, any identified significant views or vistas. Additionally, the immediate setting of this heritage item would not be subject to change as part of the Project and any visual impacts associated with the Project are likely to be minor and would not result in an adverse impact to the overall significance of the heritage item.

Similarly, the LVIA (see **Appendix 11**) found that the visibility of the Development Footprint from Hindmarsh Grave (I120) is generally limited, however that a small portion on the south-east of the allotment for the heritage item would have up to 50% visibility of the Development Footprint. Although the Project would be partially visible from this heritage item, the LVIA found that the potential for visual impact (as per the Department of Planning and Environment Large-Scale Solar Energy Guideline 2022 and Technical Supplement) is considered to be low. The HHIA similarly found that the available information for this heritage item does not identify any significant views or vistas, and there is no associated listed with the heritage item and the Project Area. Any changes to the views from this heritage item would not detract from historical significance of this site in the development of the Richmond River area. There would be no indirect, visual heritage impact to the Hindmarsh Grave resulting from the Project.

A small part of the SHR Item #01487 'High Conservation Value Old Growth Forest' is located approximately 940 m east from the Project Area. It is located within the south-east corner of the Bungawalbin State Forest, and is physically and visually separated from the Project Area by the existing vegetation of the state forest that prevents any views of the SHR item to the Project Area. No visual impacts would occur as a result of the Project on the 'High Conservation Value Old Growth Forest'.

All other heritage items in the vicinity of the Project are located a greater distance from the Project Area such that no visual impacts would occur.

6.13.3.8 Impacts on Historical Archaeology

As discussed in **Section 6.13.3.5**, the Project Area has low potential to contain historical archaeological remains.

The construction of the Project would result in some ground disturbing works, such as leveling, installation of footings for new structures (including solar panels, onsite substation etc.), underground cabling and formation of internal access tracks all contained within the Development Footprint. Although these works are proposed within the Project Area, it is anticipated that any archaeological remains, should they be present, would be limited to fragmented remains of structures that are unlikely to have any identifiable heritage significance at a state or local level. Direct impacts to historical archaeological remains of significance are therefore not anticipated in association with the Project.

6.13.4 Mitigation Measures

A range of mitigation and management strategies in response to the identified impacts of the Project on historic heritage were identified in the HHIA and are summarised below in **Table 6.51**.

Table 6.51 Historic Heritage Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
HH-01	• An unexpected heritage finds protocol will be established and included in the Heritage Management Plan for the Project. The protocol will clearly identify contact persons and steps to be implemented. • A heritage-specific induction will be undertaken by all Project team members and construction contractors to support the effective implementation of the protocol.	Construction
HH-02	• In the unlikely event that unexpected historical archaeological material is discovered, all works on the Project will cease and a suitably qualified archaeologist will be consulted to determine an appropriate course of action. • Depending on the extent and significance of the archaeological remains encountered, additional assessment and investigations, and consultation with Heritage NSW may be required prior to the re-commencement of works.	Construction

6.14 Soils, Land Use & Agriculture

A Soil, Land Use and Agriculture Impact Assessment (SLAIA) (see **Appendix 17**) including a detailed Land Use Conflict Risk Analysis (LUCRA) was prepared by Minesoils Pty Ltd (Minesoils, 2024) to assess potential soils, land use and agricultural impacts associated with the Project. This section outlines the key findings of the SLAIA and the LUCRA, the key land use risks of the Project and proposed mitigation and management measures.

The SLAIA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with:

- DPE's Large-Scale Solar Energy Guideline (2022).
- Land and Soil Capability Assessment Scheme (OEH, 2012).

6.14.1 Existing Environment

The Project Area features undulating hills, including flat alluvial plains with drainage lines and creeks that contribute to minor elevation deviations. The south-eastern portion of the Project Area is at approximately 25 m AHD which rises to the west at 70 m AHD on crested areas. Historical clearing of areas of dense vegetation has resulted in a generally cleared landscape with isolated areas of remnant native trees on some hill crests and hillslopes. The Development Footprint has between 90–100% vegetation cover, currently used for livestock grazing and fodder cropping. Vegetation connecting to Ellangowan State Forest and to Bungawalbin National Park border the Project Area to the west and east respectively.

The underlying geology of the region is characterised as a Mesozoic sedimentary basin known as the Clarence Moreton Basin. The Clarence Moreton Basin features soft sandstone, siltstone and claystone and occurs from Grafton to Casino which includes the Project Area.

Neighbouring properties are primarily used for livestock grazing or forestry with isolated cultivation in the broader locality. Sensitive agricultural activities such as intensive plant or livestock agriculture is undertaken within the Project Area and immediate vicinity. The annual productivity of the agricultural land within the Project Area ranges from $261,237 to $305,572 based on modelling productivity estimates. This modelling assumes grazing of cattle (coastal weaners) on improved pasture and Growing Out Steers (240–460 kg).

6.14.2 Methodology

Broadly the assessment involved:

- Desktop review of NSW state government regional mapping data for soil landscapes, soil types, inherent soil fertility and LSC as applied to the Survey Area (Development Footprint).
- Site clearances and dial before you dig (DBYD) plans were undertaken as part of the safety planning requirements and identified underground services were avoided during excavation activities.
- Survey points were irregularly located according to the survey teams 'judgement' to enable the delineation of soil boundaries as shown on **Figure 6.39**.

- A survey intensity of 1 site per <25 ha was applied to the Survey Area.
- Soil cores were excavated by a soil corer to a depth of approximately 0.8–1.0 m or to a point of refusal.
- Soil profiles were assessed in accordance with the 'Australian Soil and Land Survey Field Handbook soil classification procedures' (NCST, 2009).
- Soil profile logging was undertaken in the field using Minesoils' soil data sheets, including GPS recordings and photographs of the landforms and soil profiles.
- Soil samples were collected at each of the assessment site's soil horizons to a depth of 1 m, with a total of 128 samples collected. Of the 128 samples collected, 49 were considered representative and subject to laboratory testing.
- Full details of the assessment approach and methodology are provided in **Appendix 17** which was conducted in accordance with the Solar Guidelines 2022.

The survey program aimed to satisfy the field assessment, sampling and testing requirements related to soil and land resources of the LSSE Guideline. The fieldwork plan outlined below was designed to satisfy the following requirements:

- Soil survey and mapping at a 1:25,000 survey intensity (1 site every 25 ha), including collection of landform pattern and element information, soil profile data, and taxonomic parameters to distinguish soil units according to the Australian Soil Classification criteria, within the Project Area.
- LSC verification through desktop assessment and survey verification. The LSC system required data on biophysical features from in situ measurements and regional mapping.
- Soil qualities and risks recorded during survey to determine potential Acid Sulphate Soils (ASS), soil salinity and erosive soils including tunnelling, rill, gully and sheet erosion, which may require specific handling and management techniques during construction or operational activities.

6.14.3 Assessment of Impacts

6.14.3.1 Impacts on Agricultural Land

The Project involves using approximately 790 ha of agricultural land for a solar farm, during this time the land will not be used for agricultural operations. After decommissioning, approximately 786 ha will be restored for agricultural use. A permanent reduction of approximately 4 ha will occur due to the switching substation, subject to the discretion of Transgrid. This reduction is considered negligible in the context of the total agricultural land area in the Richmond Valley Council LGA.

The temporary impact on agricultural productivity during the Project's duration is estimated at $305,572 per year, with a permanent impact of up to $1,547 per year post-Project. Across the Richmond Valley LGA, agricultural enterprises for 2020–2021 was $71 million with livestock slaughtering accounting for half of this value (ABS, 2022). Both are considered negligible compared to the overall agricultural industry gross value in the area.

The Project will not affect agricultural productivity outside the Development Footprint and will have a negligible impact on local and regional agricultural support services. It is expected that changes in these services will be driven more by broader social and market trends rather than the Project. Overall, the Project will not impact critical mass thresholds of agricultural activity due to the established agricultural industries in the region and state.

6.14.3.2 Soil Disturbance

Five predominant soil mapping units were identified within the Study Area and were assessed analytically with laboratory results in Appendix 4 of the SLAIA. These are detailed on **Figure 6.4** and listed below, including a description and approximation of their coverage:

Soil Unit 1: Chromosols – Covering 55 ha

- Chromosol soils are typically found in undulating landscapes and exhibit a distinct textural difference between the topsoil (loamy) and subsoils (clay) layers. The pH levels in Chromosols are moderately acidic in the upper layers, becoming strongly acidic deeper down. Chromosols are important for supporting various types of vegetation and land uses due to their unique properties.

Soil Unit 2: Kurosols – Covering 191 ha

- Kurosols soils have a strong increase in clay content between topsoil and subsoil and contain moderate or strongly acidic pH in the topsoil with strong acidic subsoils, which are occasionally sodic. The topsoil contains weak to moderate structure and generally have low agricultural potential.

Soil Unit 3: Sodosols – Covering 147 ha

- Sodosols are generally found the within the lower, mid and upper slopes and crests across the Development Footprint. They have a strong textural contrast between the topsoil and subsoil. The pH level within Sodosols is generally slightly acidic and the subsoil has a high concentration of sodium.

Soil Unit 4: Dermosols – Covering 339 ha

- Dermosols are found within the open drainage lines across the Development Footprint and the texture between the topsoil and subsoil is generally consistent. Dermosols generally have an increase in clay content in the subsoil when compared to the topsoil.

Soil Unit 5: Kandosols – Covering 71 ha

- Kandosols are found within the open drainage lines across the Development Footprint and contain a mixture of sand and nutrient rich soil. The texture of the topsoil is moderate to weak while the sub soil is generally weakly structured. Kandosols have low salt content, are strongly acidic and have a high presence of sodium. Based on these characteristics they have low to moderate agricultural potential.

- Additional physical soil descriptions and photographs of each sampling site and soil profile are provided in **Appendix 17**.

Soil disturbance will vary across the Development Footprint depending on the infrastructure and activity taking place. For example, establishment of access tracks, panel and cabling installation and rehabilitation will result in relatively minor soil disturbance and accounts for more than 780 ha within the disturbance area. Soil disturbance as part of the construction of the substation, BESS, transmission network and O&M facility includes a small portion of the Development Footprint although these areas will be subject to high impact disturbance.

Negligible impacts are anticipated on soil properties where the ground beneath the panels is maintained. If ground cover degrades during the operational phase or as a result of improper maintenance of topsoils during construction, soil may be temporarily sterilised and will require additional efforts at the time of site decommissioning to restore the soil to a level of productivity equivalent to pre-disturbance conditions.

Impacts to soils as a result of direct disturbance is anticipated to be minimal and temporary. The exception is the substation which will be permanent.

Soil erosion as a result of direct disturbance is anticipated although appropriate controls outlined in **Section 6.14.4** will reduce potential impacts to surface soils and waterways.

6.14.3.3 Land and Soil Capability

A Land and Soil Capability (LSC) Assessment was undertaken to verify the results of the desktop analysis of the NSW regional based maps of LSC. The desktop analysis indicated that the Development Footprint consists of LSC class 4, LSC class 5 and LSC class 6.

Based on the results of the LSC verification assessment, it is concluded that the Study Area contains two LSC classes:

- LSC class 4: high capability land – covering approximately 731 ha.
- LSC class 5: moderate capability land – covering approximately 72 ha.
- The extent of each LSC class is shown in **Figure 6.40** and a description of the LSC classes verified within the Study Area is provided below:
    - Class 4 land has moderate to high limitations for cropping, high intensity grazing and horticulture and needs to be consciously managed to prevent considerable soil and land degradation. Class 4 soil limitations are due to a combination of soil structure, water permeability and acidity (OEH, 2012).
    - Class 5 land has severe limitations for high impact land management uses such as cropping. These limitations will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation. The key limitations of this class within the Development Footprint are salinity, soil acidity and waterlogging (OEH, 2012).

Due to the minor surface works across the Study Area, the Project will have minor impacts to LSC. Following decommissioning of the Project, stockpiles of topsoil and subsoil would be respread over disturbed areas (if required) and rehabilitated with either native vegetation or improved pastures depending on the intended future land use. The exception to this is the area designated for the substation which will be permanently removed from agricultural use. It is anticipated that there will be no permanent impacts to LCS within the study area except for the 4 ha retained by the substation.

6.14.3.4 Biosecurity, Weeds and Pest Species

Biosecurity, weeds and pests are an existing component of agricultural land use. It is not expected that the change in land use will increase the potential for these impacts.

With appropriate mitigation measures in place, there is low potential for weeds and invasive pests to spread or impact neighbouring land.

As detailed in **Section 6.14.4**, Ark Energy will prepare and implement an OEMP, which would outline appropriate measures to manage biosecurity, weeds and pest species.

6.14.3.5 Air Quality and Dust

Air quality and dust issues from the Project may be caused by increased traffic movements, vegetation removal, and localised dust emissions generated by land disturbance. Air emissions from the Project Area would be predominately associated with the proposed construction activity which are temporary (24 months). Construction and decommissioning activities that would involve dust and air borne particles include traffic accessing the Project Area from Avenue Road and other construction activities including road repairs, site preparations and decommissioning as well as plant and equipment exhaust emissions. These dust and emission sources are temporary in nature as the road repairs and upgrades package will occur as the first stage of construction. The sealing of Avenue Road and Main Camp Road will significantly reduce the dust emissions potentially generated across all phases of the Project.

Air quality and dust issues will be managed through appropriate controls and specified in the CEMP and OEMP as detailed in **Section 6.14.4**.

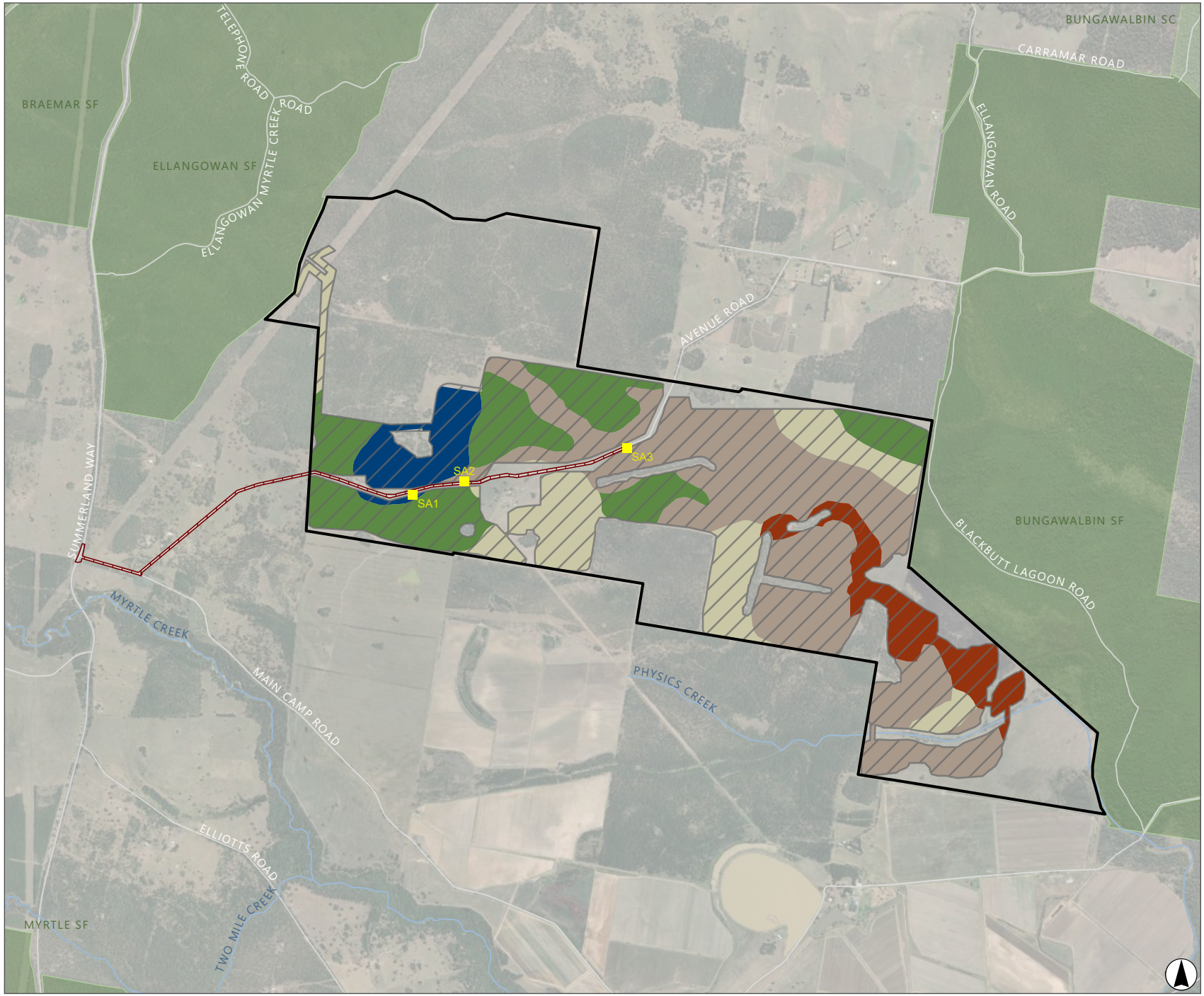


FIGURE 6.39

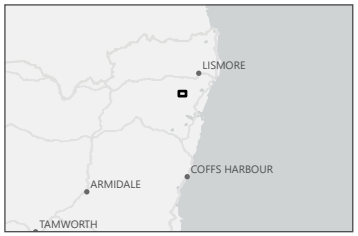
Identified Soil Types

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Access Points
- NPWS Reserve
- State Forest
- Roads
- Watercourse

Soil Types Determined by Soil Surveys

- Soil Unit 1 - Chromosols
- Soil Unit 2 - Kurosols
- Soil Unit 3 - Sodosols
- Soil Unit 4 - Dermosols
- Soil Unit 5 - Kandosols



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Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

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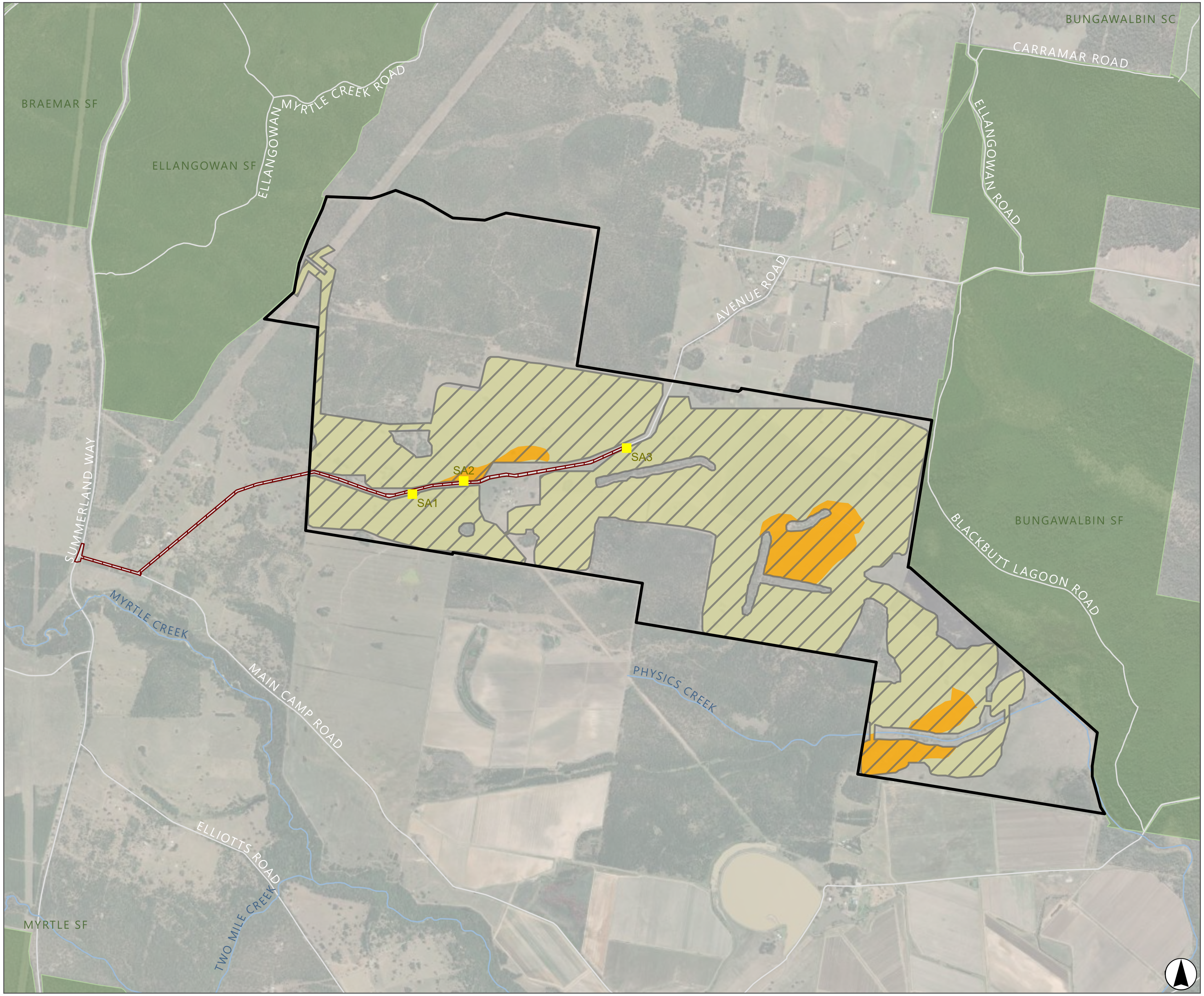


FIGURE 6.40

Verified Land and Soil Capability

Legend

- Project Area
- Development Footprint
- Road Upgrade Area
- Access Points
- NPWS Reserve
- State Forest
- Roads
- Watercourse

Verified Land and Soil Capability

- 4 - Moderate to severe limitations
- 5 - Severe limitations

0 1 2

Kilometers

Scale 1:45,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.14.3.6 Land Use Conflict

A risk identification and ranking process has been undertaken as part of the Land Use Compatibility and Risk Assessment (LUCRA) in accordance with Land Use Conflict Assessment Guide (DPI, 2011) and presented in detail Appendix 1 of the Soil, Land and Agriculture Impact Assessment found in **Appendix 17**.

Methodology

The LUCRA evaluates the Project in relation to neighbouring land uses and activities to identify any potential conflicts or incompatibilities. This assessment is informed by the risks and impacts outlined in Section 5 of the SLAIA, as well as the proposed mitigation measures and controls detailed in **Section 6.14.4**. Each potential conflict between the Project operation and surrounding land has undergone thorough evaluation, with risk rankings assigned based on the likelihood and severity of consequences, as delineated in Appendix 2 of the SLAIA.

Results

Of the 45 risk items that were considered as part of the LUCRA, 36 were considered minor once mitigation measures and controls were implemented as detailed in **Section 6.14.4**. Once mitigation and management measures are implemented, the 36 minor risks are considered manageable within normal operations.

Key risks identified during this process include changes to groundwater disturbance, traffic during construction and decommissioning, amenity impacts, weed/plant/disease management, bushfires spreading offsite into nearby vegetation, property valuation and the long term viability of agricultural and environmental assets.

With the implementation of measures outlined in **Section 6.14.4** the potential impact of change in land use on the surrounding land and land users will be manageable and moderate to minor. Additionally, once decommissioned, the Development Footprint will be remediated to enable agricultural production including cropping and grazing to resume at the previous capacity.

6.14.3.7 State Significant Agricultural Land

State Significant Agricultural Land (SSAL) is mapped across 279 ha across the Study Area, see Figure 12 of the SLAIA. A method for the verification or assessment requirements of SSAL is currently not available and consideration of SSAL is not a requirement of the LSSE Guideline. Upon decommissioning, it is projected that there will be minimal disturbance to existing SSAL within the Development Footprint, which will be returned to agricultural capacity.

6.14.3.8 Cumulative Impacts

The cumulative risk to agricultural land and productivity across NSW due to projected extent of large-scale solar development is estimated to be very low (DPE, 2022). The Australian Energy Market Operator (AEMO) has identified that NSW will require approximately 20,000 MW of solar generation to achieve the 2050 decarbonisation commitments. This would require approximately 40,000 ha or 0.06% of rural land in NSW (DPE, 2022).

Within the Myrtle Creek suburb boundary, there is 5,652 ha land mapped as SSAL with several solar projects within the region that are approved or undertaking approval. Of this land, 478 ha, or 8.5%, lies within the combined Development Footprints of the Project (279 ha or 5%), Summerville Solar Farm (69 ha or 1.2%) and Myrtle Creek Solar Farm (estimated at 130 ha, or 2.3%). While temporary reduction in SSAL land available to agricultural operations within Myrtle Creek are anticipated, downstream impacts to the regional agricultural industry and support services are unlikely to occur. As detailed above, the gross value of agricultural enterprises within the Richmond Valley LGA for 2020–2021 is $71 million which is not anticipated to be reduced by a measurable amount as a result of the cumulative impacts that the Project will contribute to.

6.14.4 Management and Mitigation

Management and mitigation measures will be implemented to address key land use issues associated with the Project as detailed in **Table 6.52**.

Table 6.52 Soil and Agricultural Impact Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
SL-01	An Erosion and Sediment Control Plan (ESCP) will be prepared that addresses specific soil dispersion risks based on disturbance activity during each phase of the Project. The ESCP will be developed in accordance with the Managing Urban Stormwater: Soils and Construction Volume 1 (NSW DPIE, 2004)"The Blue Book".	Pre construction
SL-02	A biosecurity management plan prepared as part of the Project's CEMP/OEMP is recommended and will reduce the risk of spreading weeds and pathogens, and other biosecurity items into or out of the Project Area upon implementation.	Pre construction
SL-03	During construction, all soil stripping will be localised and soil will be maintained as per the ESCP to maintain soil profiles when soil is reinstated. Targeted soil controls will be implemented to manage the risk to sodic and dispersive soils throughout the Development Footprint. In areas of high impact soil disturbance, topsoil stripping will take place to ensure availability during rehabilitation. Topsoil materials will otherwise be stockpiled separately to subsoils and subsoils to be treated with gypsum prior to stockpiling.	Construction
SL-04	An OEMP will be developed in consultation with DPI Agriculture and will be implemented post construction. The OEMP will detail the management requirements, including: • Inspection of all vehicles and machinery entering the Project Area, and cleaning if applicable to remove weeds including seeds. • Appropriate weed management practices to be adopted, including regular weed spraying. • Appropriate pest management practices to be adopted. • Limit vehicle access to the established internal road network.	Operation

6.15 Economics

An Economic Impact Assessment (EIA) (see **Appendix 18**) was undertaken by Ethos Urban Pty Ltd (Ethos Urban, 2024) to assess the economic impacts of the Project. This section outlines the key findings of the EIA, the potential economic impacts of the Project and proposed mitigation and management measures.

The EIA was prepared in accordance with the requirements of the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with DPE's Large-Scale Solar Energy Guideline (2022) and consideration of the Draft Energy Policy Framework (2023).

6.15.1 Existing Environment

The EIA Study Area represents the likely labour force, accommodation and supply chain linkages that support and will be impacted by the Project. The host and surrounding LGAs included in the EIA Study Area are aligned with the SIA and include:

- Richmond Valley (project location)
- Clarence Valley
- Lismore
- Ballina.

The main regional cities/townships/settlements in the EIA Study Area are located within a 60-minute drive from the Project Area. These townships include Casino, Grafton, Lismore and Ballina.

6.15.1.1 Population

The population of the EIA Study Area totalled 170,380 persons as of June 2023 (ABS Estimated Resident Population, 2023). Over the period 2022–2036, annual population growth in the EIA Study Area is expected to be +0.5% pa (or +830 persons per annum over 13 years) compared to the NSW growth rate of +1.1% p.a. The Lismore LGA is projected to experience population decline over the coming years. In this regard local investment projects (such as the proposed Project) can generate new employment opportunities for residents, workers transitioning from the mining sector or affected by recent flooding as well as more diverse income streams for local farmers. These factors may contribute to retaining, and potentially expanding, population levels within this area.

6.15.1.2 Labour Force, Occupational and Business Structure

As of June 2023 (latest available), the EIA Study Area had an unemployment rate of 3.3%, which is similar to the rate for NSW (3.2%). The Project is likely to require 150 workers on average over the construction phase (or 327 workers at the Project's construction peak), with potentially 20% of these workers (30 workers) sourced locally or from within the EIA Study Area, providing short term opportunities for unemployed job seekers (subject to appropriate skills match).

The latest available employment related census data (ABS Census 2016) shows 32.2% of employed residents in the EIA Study Area were occupied in activities generally associated with the types of skills required for the construction of a solar farm (e.g., technicians and trades workers, machinery operators and drivers, and labourers). The EIA Study Area's representation in these occupations is well above the State average of 26.1%, indicating a generally suitable occupational base for the proposed Project is present in the region.

The EIA Study Area's occupational and business structures indicate a good base exists to service the needs of the Project with 22,440 workers and 2,590 businesses involved in construction-related industries.

6.15.1.3 Accommodation

Commercial Accommodation Capacity

It is estimated that the EIA Study Area has approximately 1,760 rooms/cabins across 68 providers (see **Table 6.53**).

A conservative estimate of 70% occupancy rates across hotel and motel accommodation has been utilised based on consultation undertaken during the SIA. Provided this occupancy rate of 70% for commercial accommodations in the EIA Study Area, it is estimated that 528 rooms will be vacant. It is conservatively assumed that 30% of these 528 rooms are accessible for The Project equating to 158 rooms available for use by the workforce.

Table 6.53 Commercial Accommodation, Considering Occupancy Rates

Locality	Number of Providers	Total Number of Rooms	Number of rooms at 70% occupancy	Rooms available at 30% utilisable
Casino SAL[9]	9	203	61	18
Lismore UCL[10]	13	345	104	31
Grafton UCL	17	396	119	36
Ballina SAL	29	817	245	74
Total	**68**	**1,761**	**528**	**158**

Private Accommodation

Private accommodation is also a consideration for the Project workforce and may include the temporary leasing of holiday homes and investment properties. An overview of the private accommodation options that may become available to the Project is provided below:

- As of the 2021 Census, the EIA Study Area has 6,805 unoccupied dwellings that may enter the market to support the Project and other major infrastructure projects in the region.
- As of September 2023, the vacancy rate for long-term rental properties in the EIA Study Area was 1.6% or approximately 250 properties highlighting a constrained market.

[9] SAL – Suburb and Locality.
[10] UCL – Urban Centre and Locality.

- As of December 2023, 557 active short-term rentals were advertised in the EIA Study Area which represents approximately 1,114 rooms, based on an average of 2 rooms per rental (conservative estimate). Based on the occupancy rate of 70% and assuming 30% of these unoccupied listings are available for the Project, 100 rooms may be available to non-local workers required for the construction phase of The Project.

6.15.1.4 Township Services

The major regional townships of Casino, Ballina and Grafton have the capacity and labour force to service many aspects of the Project. These include equipment hire, fuel, vehicle mechanical services and other services from businesses located in the immediate region. Lismore has services although these will generally be required for the ongoing Lismore flood recovery effort and reconstruction activities.

6.15.2 Methodology

The EIA undertook a baseline analysis of population, labour markets and occupational and business structures for the EIA Study Area and NSW to allow an assessment of the:

- Capacity and opportunities of townships in the EIA Study Area to participate and service the Project.
- Potential for retention of Project investment in the EIA Study Area.
- Direct and indirect Project employment.
- Business and industry participation opportunities, with reference to baseline analysis outcomes regarding workforce size and skills composition and procurement activities.
- Agricultural impacts including employment and production impacts through land consumption and disruption to activities, and benefits to host landowners from new incomes and improved on-site infrastructure.
- Accommodation and housing impacts with reference to the baseline analysis and the estimated number of construction workers that may require accommodation at the Project's peak.
- Cumulative impacts relating to the potential concurrent construction of major infrastructure projects within 100 km of the Project Area.
- Economic stimulus impacts including Project wages and spending, uplift in Council rates revenues, and Proponent's Community Shared Benefits Strategy payments.

Based on this assessment, mitigation measures relating to accommodation, workforce and procurement and community benefit sharing were proposed (**Section 6.15.5**).

6.15.3 Assessment of Economic Impacts

The net economic impacts of the Project, as presented in the EIA, are shown in **Table 6.54**.

Table 6.54 Net Economic Outcomes

Factor	Value
Negative Economic Outcome: Temporary loss of agricultural land (30 years)	803 ha
Permanent loss of agricultural land (substation)	4 ha
Negative Economic Outcome: Loss of employment (direct and indirect)	2–3 jobs
Positive Economic Outcome: EDC	Approximately $1.2 billion
Positive Economic Outcome: EIA Study Area investment (including wage stimulus)	+$180 million (assumes 15% of total investment)
Positive Economic Outcome: National construction employment (direct and indirect)	Direct Employment: 150 FTE jobs Indirect Employment: 240 FTE jobs
Positive Economic Outcome: EIA Study Area construction employment (direct and indirect)	Direct Employment: 30 FTE jobs Indirect Employment: 50 FTE jobs
Positive Economic Outcome: National operational employment (direct and indirect)	Direct Employment: 13 FTE jobs Indirect Employment: 40 FTE jobs
Positive Economic Outcome: EIA Study Area operational employment (direct and indirect)	Direct Employment: 13 FTE jobs Indirect Employment: 8 FTE jobs
Operational Economic Stimulus: Total net local economic stimulus (operational wage stimulus, community/neighbour payments, increased Council land tax returns)	+$145 million (over 30 years)
Total Economic Benefits	**+$385 million (Construction and Operational Phases)**

6.15.3.1 Project Investment and Employment

The Project will involve approximately $1.2 billion in investment during the construction phase, of which approximately $180 million will be retained in the EIA Study Area during construction.

In total (direct and indirect), the construction period will require 390 Full Time Equivalent (FTE) jobs and the operational period will require 13 FTE direct jobs. At the Project's peak, approximately 327 direct and 525 indirect FTE positions will be supported in the national economy (on average) over the six-month peak construction period. Direct employment is assessed as jobs created to support the on-site construction and operation of the Project. Indirect employment is assessed as jobs supported through the supply-chain and consumption/induced impacts of each Project stage. The location of the workforce is also broken down by those employed from within the Study Area and those employed from outside the Study Area as defined in **Section 6.15.1**. A summary of the average FTE positions in the national economy over the 24-month construction period and 30-year operational period is represented below in **Figure 6.41**.

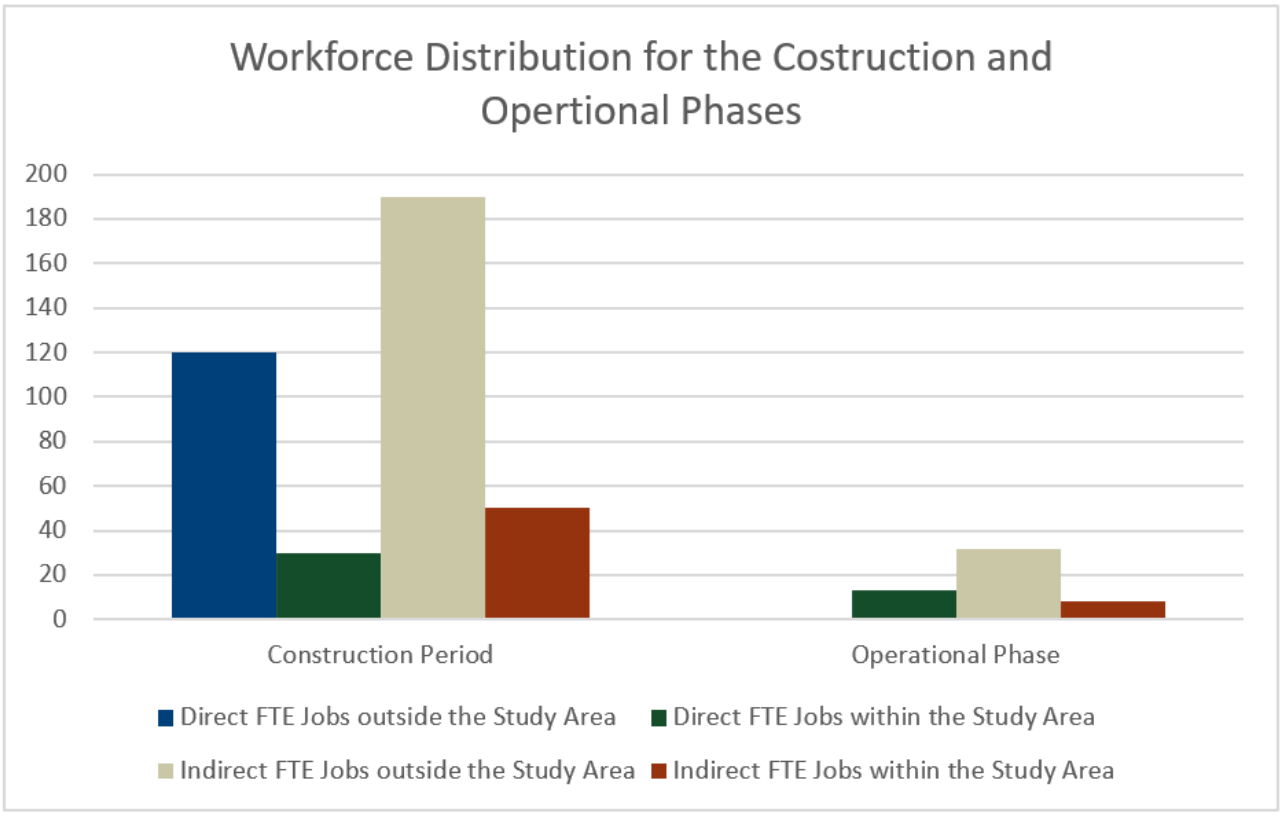


Figure 6.41 Workforce Distribution for the Construction and Operational Phases

The EIA Study Area has moderate capacity in terms of construction-related workers and businesses to manage both the requirements of the Project, and concurrent regional infrastructure projects if required. The Project will provide new participation opportunities for businesses and workers located in the EIA Study Area, having regard for the good match of skills and resources available.

This level of employment will equate to an estimated $18 million in wages (2023 dollars). It is anticipated that approximately $9.0 million of these wages will be spent within the EIA study area which will be directed to local and regional businesses during the construction period. The increased number of FTE equivalent jobs that this spending will generate has been included in the indirect employment figures for the EIA study area detailed in **Table 6.54**.

6.15.3.2 Accommodation

On average, the construction workforce across the construction phase requiring accommodation will be 120 FTE workers. This is anticipated to increase for a six month period during the peak construction period when 260 non local FTE workers will require accommodation within a 60 minute drive of the Project. Importantly, it is assumed that 20% of the workforce will be from within 60 minutes of the Project Area and will not require accommodation.

As detailed in **Section 6.15.1.3**, 158 commercial rooms/cabins and 100 short-term rooms will be available to the Project. This reflects 258 rooms of accommodation that are likely to be available without generating an unsustainable impact on local short-term accommodation. This represents significantly more accommodation options than the average accommodation requirements of 120 FTE workers during the construction phase of the Project. The accommodation requirement of 260 rooms during peak construction period are not currently met by the available accommodation options within a 60-minute drive of the Project by 2 rooms. Given the conservative assumptions utilised in generating this assessment, the shortfall is not considered significant.

Further capacity is available in caravan parks (powered sites), workers staying with family and friends (where available) and potentially unoccupied dwellings – some of which may become available to the market to support the Project.

An Accommodation and Employment Strategy would form part of pre-construction planning (refer to **Section 6.15.3**) to minimise impacts on the local community.

6.15.3.3 Agricultural

The Project will require 790 ha of existing agricultural land which is currently used for cattle grazing. The remaining 13 ha of the 803 ha Development Footprint will remain as remnant bushland. Once the Project is fully decommissioned, 4 ha will be retained and not returned to agricultural land by the substation and electrical infrastructure. Sheep grazing is not recommended to be co-located with the Project and the 2–3 existing agricultural jobs will be made redundant. These jobs will be replaced by the project related workforce resulting in a net increase in on-site employment. Additional agricultural impacts are detailed the SLAIA (**Appendix 17**) and summarised above in **Section 6.14.3**.

6.15.3.4 Ongoing Economic Stimulus

Ongoing economic stimulus associated with the operation of the Project is estimated at approximately $145 million (rounded) over 30 years, (2022 dollars, CPI inflated) relating to operational wage stimulus, community fund payments and net land tax revenue to Council. Further details on each of these elements are provided in **Appendix 18**.

6.15.3.5 National Grid Supply Stimulus

With an operational capacity of 500 MW DC, the Project has the potential to provide sufficient renewable energy to support the annual electricity needs of the equivalent of approximately 181,000 NSW households, representing over two and a half times the annual electricity requirements of the Study Area and highlighting the importance of the facility from a renewable energy generation perspective.

6.15.4 Cumulative Economic Impacts

Cumulative economic impacts were assessed in the EIA (refer to **Appendix 18**) and are associated with the development of renewable energy projects in proximity to the Project.

Competition for labour and accommodation during the construction phase are the primary cumulative impacts of relevance from an economic perspective. Developments considered for the EIA include Clarence Valley Solar Farm, Summerville Solar Farm and Myrtle Creek Solar Farm. As detailed in the Section 4.3 of the EIA, the construction period of Summerville Solar Farm is considered to have a medium risk of overlapping with the construction period of the Project. The impacts associated with Clarence Valley Solar Farm and Myrtle Creek Solar Farm are considered to be low due to the anticipated timing of their construction phases.

6.15.5 Mitigation and Management

To minimise potential Project impacts and maximise Project benefits, the following mitigation measures are proposed in:

Table 6.55 Economic Impact Management and Mitigation Measures

ID	Mitigation and Management Measures	Phase
EC-01	Prepare an AEPS prior to construction. The AEPS will include: • Measures to ensure there is sufficient accommodation for the workforce associated with the construction phase of the Project, especially at the peak of the Project's construction. • Avoid the use of established long term rental properties to house construction workers (unless market conditions identify a surplus of stock). • Measures to address any specific cumulative impacts arising associated with other SSD projects in the area. • Consideration of ongoing impacts on labour and housing of the Lismore flood recovery program (if still relevant). • Measures to prioritise the employment of local workers and the procurement of local businesses for the construction and operation of the Project. • A program to monitor and review the effectiveness of the strategy over the life of the Project, including regular monitoring and review programs.	Pre-construction
EC-02	Develop a Community Shared Benefit Strategy (CSBS)/CBF. Details regarding the proposed CBF are provided in **Section 2.7.3** of this EIS.	Throughout

6.16 Noise and Vibration

A Noise and Vibration Impact Assessment (NVIA) (see **Appendix 19**) was undertaken by Umwelt (2024) to assess the potential noise and vibration impacts associated with the Project. This section outlines the key findings of the NVIA, the potential noise and vibration impacts of the Project and proposed mitigation and management measures.

The NVIA was prepared in accordance with the Project's SEARs as outlined in **Appendix 1**. It was also prepared in accordance with the following guidelines:

- Noise Policy for Industry (NPfI), NSW Environment Protection Authority (EPA), 2017.
- Interim Construction Noise Guideline (ICNG), NSW Department of Environment and Climate Change (DECC), 2009.
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011.
- Assessing Vibration: A Technical Guideline (the Vibration Guideline), Department of Environment and Conservation (DEC), 2006.
- British Standard BS7385 (1993) Part 2 Evaluation and measurement of vibration in buildings (BS7385) (The British Standard).
- German Institute for Standardisation DIN 4150-3:1999-02 Structural vibration – Effects of vibration on structures (DIN4150) (the German Standard).
- AS2436-2010 (2016) Guide to Noise Control on Construction, Demolition and Maintenance Sites (AS2436-2010).
- Construction Noise and Vibration Guideline (CNVG), Transport for NSW (TfNSW), 2023.

6.16.1 Existing Environment

The Project Area is located in a rural setting with typically low background noise levels (see **Figure 6.42**).

Richmond Valley Council LEP 2012 recognises up to 143 lots with dwelling entitlements or dwelling opportunities within 4 km of the Project Area. A receivers list received from Ark Energy dated 27 June 2023 showed 69 dwellings within 4 km of the Project Area. This list was refined based on feedback from RVC to exclude 17 structures that were determined to be sheds. Therefore, as per the latest data received from Ark Energy dated 27 November 2023, there are 49 structures classified as dwellings within 4 km of the Project Area.

In accordance with the NPfI, the several residential receivers located in the Project Area and surrounds are defined as noise-sensitive land uses (sensitive receivers). The NPfI defines a receiver as, the noise-sensitive land use at which noise from a development can be heard. There are no other sensitive land uses (such as schools or places of worship) within or surrounding the Project Area.

Identified sensitive receivers surrounding the Project Area are listed in **Table 6.57** and shown on **Figure 6.42**. One residential receiver located within the Project Area is an associated dwelling (C3-4) and is therefore not considered to be a 'sensitive receiver'. The closest non-associated sensitive receiver is located approximately 480 m north of the Development Footprint (see **Figure 6.42**).

To simplify the assessment and impact assessment of sensitive receivers, they were groups into two Noise Catchment Areas (NCAs) as shown on **Figure 6.42** and described in **Table 6.56**.

Table 6.56 Noise Catchment Area Descriptions

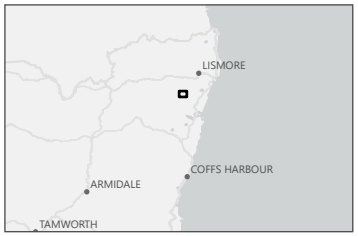
NCA	Description
NCA_1	An area in proximity to Summerland Way and representing the rural areas near the western extent of the Project. Background data based on monitoring location L1.
NCA_2	An area representing the rural areas to the northern, east and south of the Project, that are located away from Summerland Way. Background data based on monitoring location L2.

FIGURE 6.42

Sensitive Receivers, NCAs and Background Noise Monitoring Locations

Legend

- Project Area
- Development Footprint
- Associated Sensitive Receiver
- Non-Associated Sensitive Receiver
- Noise Monitoring Locations
- NCAs
- Transmission Lines
- Myrtle Creek Solar Farm
- Summerville Solar Farm
- NPWS Reserve
- State Forest
- Roads
- Watercourse



0 1 2

Kilometers

Scale 1:50,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

Table 6.57 Identified Receivers

Noise Catchment Area	Receiver ID	Receiver Type	Receiver Details	Approximate Distance to Development Footprint	Approximate Distance to Road upgrades
NCA_1	C3_1	Residential	7460 Summerland Way Myrtle Creek	1.3 km	650 m
NCA_1	C3_3	Residential	82 Avenue Road Myrtle Creek	1.15 km	30 m
NCA_1	C3_4	Landowner	420 Avenue Road Myrtle Creek	Within Project Area	120 m
NCA_1	C3_6	Residential	75 Avenue Road Myrtle Creek	1.35 km	170 m
NCA_1	C3_8	Residential	95 Avenue Road Myrtle Creek	1.2 km	45 m
NCA_1	C3_10	Residential	7460 Summerland Way Myrtle Creek	1.3 km	650 m
NCA_1	C3_11	Residential	125 Avenue Road Myrtle Creek	900 m	350 m
NCA_1	C3_20	Residential	95 Avenue Road Myrtle Creek	1.15 km	75 m
NCA_1	C4_5	Residential	7270 Summerland Way Myrtle Creek	> 1.5 km	1.2 km
NCA_2	D3_1	Residential	55 Ermelo Road Ellangowan	1.2 km	> 1.5 km
NCA_2	D3_2	Residential	695 Avenue Road Ellangowan	1.1 km	> 1.5 km
NCA_2	D3_3	Residential	660 Avenue Road Ellangowan	900 m	> 1.5 km
NCA_2	D3_4	Residential	690 Avenue Road Ellangowan	1 km	> 1.5 km
NCA_2	D3_5	Residential	760 Avenue Road Ellangowan	1.1 km	> 1.5 km
NCA_2	D3_6	Residential	770 Avenue Road Ellangowan	1.2 km	> 1.5 km
NCA_2	D3_7	Residential	770 Avenue Road Ellangowan	1.1 km	> 1.5 km
NCA_2	D3_8	Residential	70 Ermelo Road Ellangowan	1.3 km	> 1.5 km
NCA_2	D3_47	Residential	610 Avenue Road Ellangowan	480 m	1.2 km
NCA_2	D3_49	Residential	2116 Myall Creek Road West Bungawalbin	> 1.5 km	> 1.5 km
NCA_2	D4_1	Residential	840 Main Camp Road Myrtle Creek	1.1 km	> 1.5 km
NCA_2	D4_3	Residential	2465 Myall Creek Road West Bungawalbin	> 1.5 km	> 1.5 km
NCA_2	D4_4	Residential	2395 Myall Creek Road West Bungawalbin	> 1.5 km	> 1.5 km
NCA_2	D4_5	Residential	2475 Myall Creek Road West Bungawalbin	> 1.5 km	> 1.5 km
NCA_2	D4_7	Residential	2371 Myall Creek Road West Bungawalbin	> 1.5 km	> 1.5 km
NCA_2	D4_9	Residential	840 Main Camp Road Myrtle Creek	> 1.5 km	> 1.5 km
NCA_2	D4_10	Residential	840 Main Camp Road Myrtle Creek	1.1 km	> 1.5 km
NCA_2	D4_23	Residential	840 Main Camp Road Myrtle Creek	970 m	> 1.5 km

6.16.1.1 Unattended Noise Monitoring

The ambient (existing) noise levels (LAeq) for day, evening and night periods for the Project were calculated through unattended noise monitoring at two locations (L1 and L2) (see **Figure 6.42**). Similarly, the Assessment Background Level (ABL) was determined (day, evening and night) during each 24-hour period. The Rating Background Level (RBL) was evaluated as the median value of the ABL determined in each period.

The results of noise monitoring are summarised in **Table 6.58**. The full results of noise monitoring are shown in Appendix B of the NVIA.

Table 6.58 Noise Monitoring Results, dB(A)

ID	RBL: Day	RBL: Evening	RBL: Night	Ambient noise level $L_{Aeq, period}$: Day	Ambient noise level $L_{Aeq, period}$: Evening	Ambient noise level $L_{Aeq, period}$: Night
L1	25	23	17	46	55	44
L2	28	24	16	47	41	40

6.16.1.2 Methodology

The following methodology was utilised for the NVIA:

- Residential receivers within 4 km of the Project Area were identified. Assessment of noise at these locations was undertaken to determine potential noise impacts.
- Sensitive receivers were grouped into two NCAs to simplify the assessment of residential noise impacts and the presentation of results.
- Unattended long-term noise monitoring was carried out in accordance with AS1055:2018 and the NPfI at two locations (L1 and L2) (see **Figure 6.42**) thought to be representative of potentially impacted noise receivers within the respective NCAs.
- The Project's operational noise levels were determined using the proprietary computer noise modelling software CadnaA (Version 2023). Impacts were predicted based on indicative sound power level data provided by Ark Energy for proposed Project equipment. This was supplemented with additional source data from Umwelt's noise source library.
- The Project's construction noise levels were determined using CadnaA. Construction noise impacts were predicted based on the Project's construction activities and associated required equipment.
- The Project's predicted traffic volumes, baseline traffic volumes on the external road network and proposed transport routes (as determined in the TTIA (see **Section 6.10.3.2**) were utilised to predicted road traffic noise for all phases of the Project.
- For all calculations and assessment, the following time periods were assumed:
    - Day period – 7.00 am–6.00 pm Monday–Saturday and 8.00 am–6.00 pm Sunday and Public Holidays.
    - Evening period – 6.00 pm-10.00 pm.
    - Night period – 10.00 pm to commencement of day period.
- Cumulative noise impacts were determined through considering other developments in the area.

6.16.2 Noise and Vibration Criteria

6.16.2.1 Operational Noise Criteria

The NPfI sets out two noise criteria to assess the potential noise impacts resulting from industrial activity. The first criterion is used to control short-term intrusive noise and its impacts on residences whilst the second criterion is used to protect against cumulative noise impacts and maintain noise level amenity for particular land uses including residential.

The Project Noise Trigger Levels (PNTLs) provides a benchmark or objective for assessing a proposal or site. The PNTL is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response, for example, further investigation of mitigation measures. The PNTL, feasible and reasonable mitigation and consideration of residual noise impacts are considered together to assess noise impact and manage the noise from a proposal or site.

PNTLs are developed specifically for individual circumstances/projects to account for a range of factors which may affect the level of impact including, background noise environments, time of day of the activity, character or the noise and/or types of surrounding receivers. The PNTLs for each NCA for the Project are shown in **Table 6.59**.

The PNTL is the lower (that is, the more stringent) value of the Project Intrusiveness Noise Level (PINL) and Project Amenity Noise Level (PANL) determined in the NPfI Sections 2.3 and 2.4. The PINL aims to protect against significant changes in noise levels, whilst the PANL seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. The LAeq descriptor is used for both the PINL and the PANL.

The PINL ($L_{Aeq(15\ minute)}$) is defined as the RBL (see **Section 6.16.1.1**) + 5 dB. The RBL is determined by measurement of the long-term background noise level L_{A90}. The derived PINLs based on the RBLs for the Project are shown in Table 4.2 of the NVIA.

The PANL ($L_{Aeq(period)}$) is defined as the recommended amenity noise levels in NPfI Table 2.2 minus 5 dB(A). For derivation of the PNTLs, the PANLs $L_{Aeq(period)}$ are converted to $L_{Aeq(15\ minute)}$ by the addition of 3 dB(A). The PANL for all receivers surrounding the Project Area are shown Table 4.3 of the NVIA.

Table 6.59 Project Noise Trigger Levels – Residential Receivers, Laeq(15 minute)A, dB(A)

Receiver	Time of Day	PINL	PANL	PNTL
NCA_1 All residential receivers	Day	40	48	40
NCA_1 All residential receivers	Evening	35	43	35
NCA_1 All residential receivers	Night	35	38	35
NCA_2 All residential receivers	Day	40	48	40
NCA_2 All residential receivers	Evening	35	43	35
NCA_2 All residential receivers	Night	35	38	35

6.16.2.2 Construction Noise Criteria

Assessment levels for noise from construction activities, excluding noise from construction-related traffic on public roads, are defined in ICNG. The assessment levels are intended to guide the need for and the selection of feasible and reasonable work practices to minimise construction noise impacts.

Table 6.60 presents the ICNG Construction Noise Management Levels for representative receivers surrounding the Project Area.

Table 6.60 ICNG Construction Noise Management Levels, dB(A)

Land use	Construction time	Noise Management Level $L_{Aeq(15\ min)}$
Residential	**Recommended Standard Hours** Monday to Friday – 7 am to 6 pm Saturday – 8 am to 1 pm No work on Sundays or Public Holidays	Noise affected: RBL + 10 dB(A)
Residential	**Recommended Standard Hours** Monday to Friday – 7 am to 6 pm Saturday – 8 am to 1 pm No work on Sundays or Public Holidays	Highly noise affected: 75 dB(A)
Residential	**Outside recommended standard hours**	Noise affected: RBL + 5 dB(A)

Construction Noise Management Levels for the Project's sensitive receivers are summarised in **Table 6.61** based on the adopted RBLs presented in **Table 6.60**.

Table 6.61 Project Construction Noise Management Levels (NML) dB(A)

Receiver	Standard hours of Construction $L_{Aeq(15\ min)}$	Highly Noise Affected $L_{Aeq(15\ min)}$
NCA 1 All residential receivers	45	75
NCA 2 All residential receivers	45	75

6.16.2.3 Construction Vibration

The Vibration Guideline presents non-mandatory preferred and maximum values for the use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. The Vibration Guideline specifies that vibration and its associated effects are usually classified as continuous, impulsive or intermittent (see **Table 6.62**). Criterion under the Vibration Guideline for relevant sensitive receivers to the Project are outlined in Section 4.2.2.1 of the NVIA.

Table 6.62 Examples of Types of Vibration

Continuous Vibration	Impulsive vibration	Intermittent vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery)	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZECC (1990).	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria.

6.16.2.4 Structural Vibration

Criteria for vibration effects on building structures recommended in the vibration guideline are given in the British Standard. The criteria in the British Standard are given in terms of peak component (x-, y- or z-axes separately) vibration velocity values from transient (impulsive) vibration events. The criteria for continuous vibration are recommended to be 50% lower than for impulsive vibration.

The vibration criteria for the protection of structures and buildings from cosmetic damage (e.g. hairline cracks in drywalls, etc.) are shown in Table 4.12 of the NVIA.

6.16.2.5 Road Traffic Noise Criteria

The RNP sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments, or planned building developments. See Table 4.13 of the NVIA for road traffic noise criteria for residential land uses along Summerland Way and Main Camp Road / Avenue Road.

6.16.2.6 Cumulative Noise Criteria

A PANL that is 5 dB(A) below the recommended amenity noise level was adopted to ensure that industrial noise levels from up to three or four industrial noise sources (as in the case for this Project) remain within the recommended amenity noise level for an area. See Table 4.6 of the NVIA for cumulative noise limits under the NPfl.

6.16.3 Impact Assessment

6.16.3.1 Operational Noise Assessment

Project equipment, utilisation, quantities and sound power levels are summarised in Table 5.1 of the NVIA.

The predicted operational noise levels at the Project's sensitive receivers are presented in **Table 6.63** and shown graphically as noise contours in **Figure 6.43**.

The Project's operational noise levels are predicted to comply with the day, evening and night-time noise limits at all non-associated sensitive receivers. Therefore, no additional noise mitigation is anticipated to be needed for the operation of the Project.

Table 6.63 Predicted Operational Noise Levels, LAeq,15minute dB(A)

Rec ID	Structure	PNTL, D/E/N	Predicted Operational Noise
C3_1	Residential	40/35/35	26
C3_3	Residential	40/35/35	25
C3_4	Landowner	-	50
C3_6	Residential	40/35/35	24
C3_8	Residential	40/35/35	24
C3_10	Residential	40/35/35	26
C3_11	Residential	40/35/35	28
C3_20	Residential	40/35/35	25
C4_5	Residential	40/35/35	< 20

Rec ID	Structure	PNTL, D/E/N	Predicted Operational Noise
D3_2	Residential	40/35/35	30
D3_3	Residential	40/35/35	32
D3_4	Residential	40/35/35	28
D3_5	Residential	40/35/35	27
D3_6	Residential	40/35/35	24
D3_7	Residential	40/35/35	21
D3_8	Residential	40/35/35	29
D3_47	Residential	40/35/35	35
D3_49	Residential	40/35/35	< 20
D4_1	Residential	40/35/35	23
D4_3	Residential	40/35/35	< 20
D4_4	Residential	40/35/35	< 20
D4_5	Residential	40/35/35	< 20
D4_7	Residential	40/35/35	< 20
D4_9	Residential	40/35/35	< 20
D4_10	Residential	40/35/35	21
D4_23	Residential	40/35/35	22

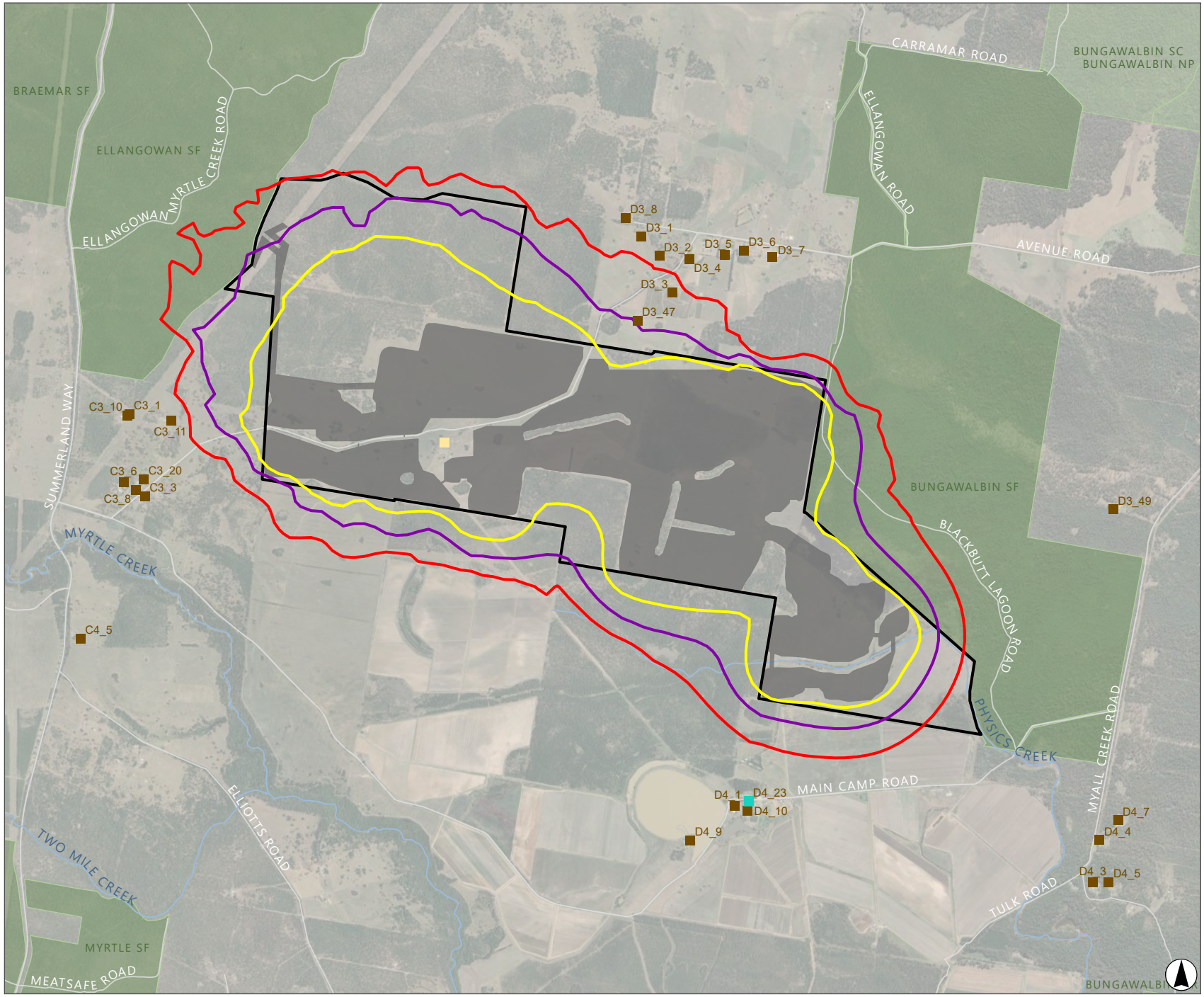


FIGURE 6.43

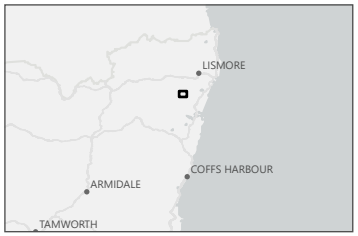
Predicted Operational Noise Levels under default Worst-case Meteorological Conditions, LAeq(15 min) dB(A)

Legend

- Project Area
- Development Footprint
- Associated Sensitive Receiver
- Non-Associated Sensitive Receiver
- NPWS Reserve
- State Forest
- Roads
- Watercourse

Predicted Noise Levels, LAeq(15 min) dB(A)

- 30
- 35
- 40



0 1 2

Kilometers

Scale 1:50,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.16.3.2 Transmission Line

During operation of the electricity transmission network, noise emission (hissing or cracking noise) associated with the power lines can result from an effect called corona discharge (or corona effect).

The nearest non-associated sensitive receiver (C3_11) is located approximately 1.1 km from the proposed transmission line (se**e Figure 6.42**). Potential noise impacts from corona discharge are not anticipated due to this distance.

6.16.3.3 Construction Noise Assessment

Based on the Project's key stages, construction hours (see **Section 3.4**) and typical sound power levels (SWLs) of the Project's construction equipment (see Section 6.1.3 of the NVIA), eight indicative construction scenarios were determined (see **Table 6.64**).

Table 6.64 Indicative Construction Scenarios, Equipment and Sound Power Levels

Construction Stages / Scenarios	Activity description	Equipment	Sound Power Levels LAeq(15 min) dB(A)/ unit	Combined Sound Power Level $L_{Aeq(15\ min)}$ dB(A)
Sc.1	Site Establishment and civil works	Asphalt paver	114	120
Sc.1	Site Establishment and civil works	Grader	113	120
Sc.1	Site Establishment and civil works	Dozer	110	120
Sc.1	Site Establishment and civil works	Dump truck	110	120
Sc.1	Site Establishment and civil works	Roller	109	120
Sc.1	Site Establishment and civil works	Delivery trucks	108	120
Sc.1	Site Establishment and civil works	Water truck	107	120
Sc.1	Site Establishment and civil works	Excavator	106	120
Sc.1	Site Establishment and civil works	Compactor	106	120
Sc.1	Site Establishment and civil works	Bobcat	104	120
Sc.1	Site Establishment and civil works	Generator	103	120
Sc.1	Site Establishment and civil works	Mobile crane / telehandler	98	120
Sc.1	Site Establishment and civil works	Light vehicle	90	120
Sc.2	Piling and foundations	Pneumatic pile driving rig	117 (112 + 5)	118
Sc.2	Piling and foundations	Concrete truck	109	118
Sc.2	Piling and foundations	Excavator	106	118
Sc.2	Piling and foundations	Bobcat	104	118
Sc.2	Piling and foundations	Mobile crane / telehandler	98	118
Sc.2	Piling and foundations	Light vehicle	90	118
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Pneumatic wrench	113	116

Construction Stages / Scenarios	Activity description	Equipment	Sound Power Levels LAeq(15 min) dB(A)/ unit	Combined Sound Power Level $LA_{eq(15\ min)}$ dB(A)
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Powered hand tools	110	116
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Truck	108	116
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Mobile crane 130 T	105	116
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Compressor	103	116
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Generator	103	116
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Mobile crane / telehandler	98	116
Sc.3	Assembly / installation of all equipment / onsite structures (trackers, inverters, modules, BESS, substation balance of system)	Light vehicle	90	116
Sc.4	Underground cabling	Loader	112	113
Sc.4	Underground cabling	Bobcat/trencher	104	113
Sc.4	Underground cabling	Cable trenching and laying equipment	100	113
Sc.4	Underground cabling	Light vehicle	90	113
Sc.5	Commissioning	Power hand tools	110	113
Sc.5	Commissioning	Electrical works/testing	110	113
Sc.5	Commissioning	Mobile crane	98	113
Sc.5	Commissioning	Light vehicle	90	113
Sc.6	Site rehabilitation, removal of temporary construction facilities	Dump truck	110	113
Sc.6	Site rehabilitation, removal of temporary construction facilities	Truck	108	113
Sc.6	Site rehabilitation, removal of temporary construction facilities	Forklift	100	113

Construction Stages / Scenarios	Activity description	Equipment	Sound Power Levels LAeq(15 min) dB(A)/ unit	Combined Sound Power Level LAeq(15 min) dB(A)
Sc.6	Site rehabilitation, removal of temporary construction facilities	Mobile crane / telehandler	98	113
Sc.6	Site rehabilitation, removal of temporary construction facilities	Light vehicle	90	113
Sc.7	Main Camp Road/Avenue Road upgrades	Dump truck	110	118
Sc.7	Main Camp Road/Avenue Road upgrades	Asphalt paver	114	118
Sc.7	Main Camp Road/Avenue Road upgrades	Grader	113	118
Sc.7	Main Camp Road/Avenue Road upgrades	Roller	109	118
Sc.7	Main Camp Road/Avenue Road upgrades	Line marking truck	108	118
Sc.7	Main Camp Road/Avenue Road upgrades	Water truck	107	118
Sc.7	Main Camp Road/Avenue Road upgrades	Line marking truck	108	118
Sc.7	Main Camp Road/Avenue Road upgrades	Mobile crane / telehandler	98	118
Sc.8	Summerland Way/Main Camp Road upgrades	Dump truck	110	118
Sc.8	Summerland Way/Main Camp Road upgrades	Asphalt paver	114	118
Sc.8	Summerland Way/Main Camp Road upgrades	Grader	113	118
Sc.8	Summerland Way/Main Camp Road upgrades	Roller	109	118
Sc.8	Summerland Way/Main Camp Road upgrades	Line marking truck	108	118
Sc.8	Summerland Way/Main Camp Road upgrades	Water truck	107	118
Sc.8	Summerland Way/Main Camp Road upgrades	Line marking truck	108	118
Sc.8	Summerland Way/Main Camp Road upgrades	Mobile crane / telehandler	98	118

The predictions for each construction scenario (Sc.1 to Sc.8) for all receivers are presented in **Table 6.65** without the application of any mitigation controls. The predictions are conservative and assume all equipment associated with each scenario is operating simultaneously at the closest point within the Development Footprint to the respective receiver location.

Some exceedances are predicted at D3_3 and D3_47 for Scenarios 1, 2 and 3 but these are considered relatively low (< 6 dB(A)). Larger exceedances are predicted at up to seven receivers, during Scenarios 7/ 8 however, as these are associated with road upgrades, works would be transient in nature and impacts temporary.

Whilst the Noise Management Levels at some sensitive receivers are predicted to be exceeded, no receiver is predicted to be 'highly noise affected' (i.e. in accordance with the ICNG, exposed to noise levels greater than 75 dB(A)).

The predicted noise levels for the worst-case scenario (Scenario 1 combined with Scenarios 7/ 8) are shown graphically as noise contours in **Figure 6.44**.

Because the predicted construction noise levels are above the Noise Management Levels, reasonable and feasible noise mitigation and management strategies are required (see **Section 6.16.4**), to reduce potential impacts on sensitive receivers.

Table 6.65 Predicted Daytime Construction Scenario Noise Levels, $LA_{eq(15\ min)}$, dB(A)

Rec ID	Structure	Standard Hours Noise Management Level, $LA_{eq(15\ min)}$	Sc.1	Sc.2	Sc.3	Sc.4	Sc.5	Sc.6	Sc. 7	Sc. 8
C3_1	Residential	45	37	35	33	30	30	30	**46**	42
C3_3	Residential	45	43	41	39	36	36	36	**74**	44
C3_4 [11]	Landowner	-	65	63	61	58	58	58	64	< 20
C3_6	Residential	45	38	36	34	31	31	31	**59**	**50**
C3_8	Residential	45	42	40	38	35	35	35	**72**	**47**
C3_10	Residential	45	37	35	33	30	30	30	**47**	43
C3_11	Residential	45	40	38	36	33	33	33	**53**	40
C3_20	Residential	45	39	37	35	32	32	32	**68**	**46**
C4_5	Residential	45	34	32	30	27	27	27	40	37
D3_1	Residential	45	43	41	39	36	36	36	37	< 20
D3_2	Residential	45	44	42	40	37	37	37	37	< 20
D3_3	Residential	45	**48**	**46**	44	41	41	41	38	< 20
D3_4	Residential	45	42	40	38	35	35	35	32	< 20
D3_5	Residential	45	44	42	40	37	37	37	34	< 20
D3_6	Residential	45	42	40	38	35	35	35	27	< 20
D3_7	Residential	45	38	36	34	31	31	31	25	< 20
D3_8	Residential	45	42	40	38	35	35	35	36	< 20
D3_47	Residential	45	**51**	**49**	**47**	44	44	44	39	< 20
D3_49	Residential	45	25	23	21	< 20	< 20	< 20	< 20	< 20
D4_1	Residential	45	43	41	39	36	36	36	23	< 20
D4_3	Residential	45	31	29	27	24	24	24	< 20	< 20
D4_4	Residential	45	33	31	29	26	26	26	< 20	< 20
D4_5	Residential	45	26	24	22	< 20	< 20	< 20	< 20	< 20

[11] Receiver C3_4 is associated with the Project (host receiver) and the Noise Management Levels are not applicable.

Rec ID	Structure	Standard Hours Noise Management Level, $LA_{eq(15\ min)}$	Sc.1	Sc.2	Sc.3	Sc.4	Sc.5	Sc.6	Sc. 7	Sc. 8
D4_7	Residential	45	30	28	26	23	23	23	< 20	< 20
D4_9	Residential	45	34	32	30	27	27	27	< 20	< 20
D4_10	Residential	45	39	37	35	32	32	32	< 20	< 20
D4_23	Residential	45	39	37	35	32	32	32	< 20	< 20

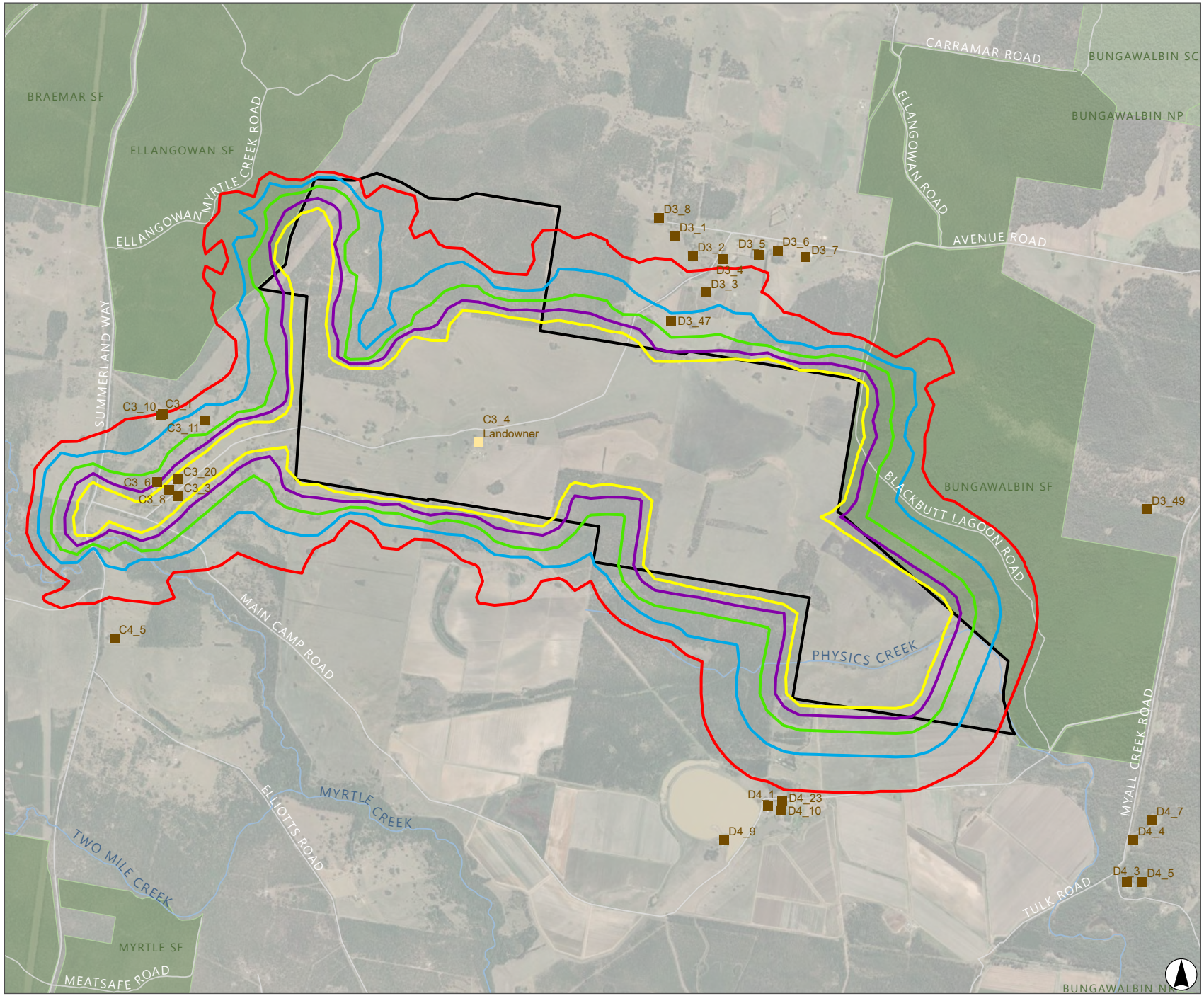


FIGURE 6.44

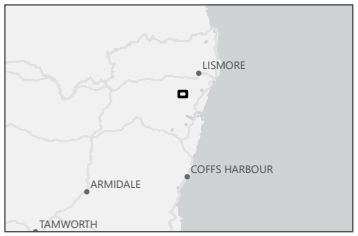
Construction Scenario 1, 7 and 8 Combined - Predicted Noise Levels, LAeq(15 min) dB(A)

Legend

- Project Area
- Associated Sensitive Receiver
- Non-Associated Sensitive Receiver
- NPWS Reserve
- State Forest
- Roads
- Watercourse

Predicted Noise Levels, LAeq(15 min) dB(A)

- 45
- 50
- 55
- 60
- 65



0 1 2

Kilometers

Scale 1:50,000 at A4
GDA 1994 MGA Zone 56

Image Source: ESRI Basemap (2023) | **Data Source:** NSW DFSI (2023)

6.16.3.4 Construction Vibration

Due to large distances between the Development Footprint and sensitive receivers vibration impacts from construction activities are anticipated to be negligible from solar farm and BESS construction.

In regards to road upgrades, all receivers fall outside the minimum working distances for cosmetic damage. For Avenue Road Upgrade works, receivers C3_3, C3_8 and C3_20 fall within the minimum working distance for human response for some plant items (i.e., vibratory roller 4> tonnes and large hydraulic hammer >18 tonnes). However, given the transient nature of the works, human disturbance impacts are anticipated to be low. Construction vibration mitigation strategies are discussed in **Section 6.16.4**.

6.16.3.5 Construction Traffic

The predicted road traffic noise levels for the construction phase of the Project at Summerland Way and Avenue Road are shown in full in Table 7.2 and Table 7.3 of the NVIA.

For the northern and southern approach of Summerland Way to the Project Area, the Project's construction traffic noise levels on Summerland Way are predicted to comply with the criteria.

The predicted road traffic noise levels indicate for Avenue Road, the construction traffic noise levels will comply with the criteria at the majority of the receivers. Exceedances are predicted during the night-time period at receivers C3_3 and C3_8 as shown in **Table 6.66**.

Potential noise mitigation measures include, restricting the speed of the Project vehicles along Avenue Road to 60 km/h; and car-pooling and the use of buses/mini-vans to reduce the total number of light vehicle movements (see **Section 6.16.4**).

Table 6.66 Avenue Road Predicted Construction Traffic Noise levels, LAeq, dB(A) (Exceedances)

Road	Time Period	Receiver / Distance from road edge	Existing traffic noise levels, dB(A)	Existing + Project Combined traffic noise levels, dB(A)	Noise Limit, dB(A)	Noise Level Change due to Project, dB(A)	Comply/ Exceed
Avenue Road	Night (10.00 pm–7:00 am) $L_{Aeq(1\ hour)}$	C3_3	50	**55**	50	4.9	**Exceeds – limit exceeded & change > 2 dB(A)**
Avenue Road	Night (10.00 pm–7:00 am) $L_{Aeq(1\ hour)}$	C3_8	47	**52**	50	5.0	**Exceeds – limit exceeded & change > 2 dB(A)**

6.16.3.6 Operational Traffic

Given the small number of staff and workforce numbers as described in **Section 3.4.4**, noise from operational traffic movements is anticipated to be negligible.

6.16.3.7 Cumulative Assessment

Apart from the proposed Summerville Solar Farm and Myrtle Creek Solar Farm projects (see **Figure 6.42**), other projects are located at significant distances (i.e. greater than 19 km) from the Project Area. Therefore, the assessment of cumulative impacts has been limited to the potential contribution from Summerville Solar Farm and Myrtle Creek Solar Farm. Indicative construction-related traffic volumes for these projects are presented in Table 7.1 of the NVIA.

When assessing cumulative noise levels, two aspects must be considered:

- The existing ambient noise levels within an area from all industrial noise sources. The recommended amenity noise levels for all receivers surrounding the Project Area are shown in Table 4.3 of the NVIA.
- The second is the Project-specific contribution to the ambient noise levels.

Construction Noise

Should the projects proceed as currently proposed, Summerville Solar Farm and Myrtle Solar Farm projects could occur concurrently. Therefore, there is potential for cumulative construction noise at sensitive receivers located near the project areas, to the west of the Project (see **Figure 6.42**). Mitigation measures as discussed in **Section 6.16.4** are applicable to the cumulative construction noise impacts. A collaborative approach to managing potential construction noise impacts may be necessary at times to minimise potential noise impacts at the sensitive receivers nearest to both projects.

Operational Noise

Cumulative operational noise impact from existing and approved projects in the area was determined to be within the noise limits. According to the NPfI, in circumstances where the PANL cannot be feasibly and reasonably met, an assessment of existing industrial noise, combined with the project-specific contribution, is required. However, where the PANL applies and it can be met, no additional consideration of cumulative industrial noise is required. As the PANL for the Project can be met, no additional consideration of cumulative industrial noise is required.

Road Traffic Noise

The cumulative traffic noise levels considering the simultaneous construction traffic from Summerville Solar Farm and Myrtle Creek Solar Farm on Summerland Way are presented in **Table 6.67**. The predicted noise levels are conservative and assume that peak construction traffic movements for all projects, are occurring simultaneously, which is unlikely to occur.

The predicted cumulative road traffic noise levels indicate that the potential traffic noise level complies with the daytime noise limit/assessment period of 60 dB(A) LAeq(15hr) and the night-time noise limit/assessment period of 55 dB(A) LAeq(9hr) at 40 m from the road edge. Within 40 m, exceedance of the limits is predicted, as additional Project and external Project traffic, exceeds the 2 dB(A) allowance.

Proposed mitigation measures to manage exceedances as shown in **Table 6.67** are discussed in **Section 6.16.4**.

Table 6.67 Summerland Way Predicted Cumulative Construction Traffic Noise levels, LAeq, dB(A)

Road	Time Period	Receiver / Distance from road edge	Existing traffic noise levels, dB(A)	Cumulative (existing + Project + external projects) traffic noise levels, dB(A)	Noise Limit, dB(A)	Noise Level Change due to Project + external projects, dB(A)	Comply/Exceed
Summerland Way North of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	10 m	65	67	60	2.6	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way North of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	20 m	61	63	60	2.5	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way North of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	30 m	58	61	60	2.6	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way North of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	40 m	57	59	60	2.6	Complies – change not > 2 dB(A)
Summerland Way North of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	10 m	57	60	55	3.0	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way North of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	20 m	53	56	55	3.1	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way North of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	30 m	51	54	55	3.1	Complies – limit not exceeded
Summerland Way North of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	40 m	49	52	55	3.2	Complies – limit not exceeded

Road	Time Period	Receiver / Distance from road edge	Existing traffic noise levels, dB(A)	Cumulative (existing + Project + external projects) traffic noise levels, dB(A)	Noise Limit, dB(A)	Noise Level Change due to Project + external projects, dB(A)	Comply/Exceed
Summerland Way South of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	10 m	65	67	60	1.9	Complies – change not > 2 dB(A)
Summerland Way South of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	20 m	61	63	60	1.9	Complies – change not > 2 dB(A)
Summerland Way South of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	30 m	58	60	60	2.0	Complies – limit not exceeded
Summerland Way South of Main Camp Road	Day (7.00 am–10.00 pm) LAeq(15 hour)	40 m	57	59	60	2.0	Complies – limit not exceeded
Summerland Way South of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	10 m	57	59	55	2.3	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way South of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	20 m	53	56	55	2.5	**Exceeds – limit exceeded & change > 2 dB(A)**
Summerland Way South of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	30 m	51	53	55	2.6	Complies – limit not exceeded
Summerland Way South of Main Camp Road	Night (10.00 pm–7.00 am) LAeq(9 hour)	40 m	49	52	55	2.7	Complies – limit not exceeded

Decommissioning Noise

The decommissioning of the Project would involve undertaking the construction activities in reverse. From a noise and vibration generating perspective activities such as pile driving is not required. Noise emissions during decommissioning activities are therefore expected to be less than the construction activities.

6.16.4 Mitigation Measures

6.16.4.1 General Noise Controls

As discussed above, there would be instances where predicted noise levels may exceed the nominated noise limits. As such, the following reasonable and feasible general noise controls are proposed:

- Engineering noise controls including attenuators, temporary barriers, enclosures.
- Management strategies including scheduling of noise activities.
- Substitution of equipment and/or processes.
- Commercial agreements with affected landholders.

AS2436-2010 provides a guide to the typical reduction that can be expected from different noise control methods. The likely noise reduction associated with each proposed mitigation and management measure is shown in **Table 6.68**.

Table 6.68 Typical Effectiveness of Mitigation Measures

Control Method	Likely noise reduction, dB(A)
Separation Distance	An increase of separation distance reduces noise levels at a rate of 6 dB(A) per doubling of distance
Screening	5 to 10 dB(A)
Enclosure	15 to 25 dB(A)
Silencing	5 to 10 dB(A)

6.16.4.2 Noise Mitigation Measure Triggers

In accordance with the CNVG, the triggers for the implementation of noise mitigation measures are described in **Table 6.69**. See Table 6.6 of the NVIA for a full description of potential noise mitigation measures in accordance with the CNVG including Period Notification (PN), Verification Monitoring (V) and Specific Notification (SN).

Table 6.69 Triggers for the Implementation of Noise Mitigation Measures

Construction hours	Receiver Perception	dB(A) above NML	Additional Management Measures
Standard Hours Monday–Friday (7 am–6 pm) Saturday (8 am–1 pm)	Noticeable	0	-
Standard Hours Monday–Friday (7 am–6 pm) Saturday (8 am–1 pm)	Clearly audible	< 10	-
Standard Hours Monday–Friday (7 am–6 pm) Saturday (8 am–1 pm)	Moderately intrusive	> 10 to 20	PN, V
Standard Hours Monday–Friday (7 am–6 pm) Saturday (8 am–1 pm)	Highly intrusive	> 20	PN, V
Standard Hours Monday–Friday (7 am–6 pm) Saturday (8 am–1 pm)	75 dB(A) or greater	N/A	PN, V, SN

According to the predicted construction noise levels as determined in **Table 6.65**, the following additional noise mitigation measures in accordance with the CVNG are triggered (see **Table 6.70**). To ensure best practice, the Project will implement all three additional noise mitigation measures: Period Notification (PN), Verification Monitoring (V) and Specific Notification (SN). These mitigation measures are described in detail in **Table 6.71**.

Table 6.70 Additional CVNG Mitigation Measures

REC ID	Structure	Construction Scenario 7
C3_3	Residential	PN,V
C3_6	Residential	PN,V
C3_8	Residential	PN,V
C3_20	Residential	PN,V

6.16.4.3 Mitigation Measures

A range of mitigation and management strategies in response to the identified noise and vibration impacts of the Project were identified in the NVIA and are summarised below in **Table 6.71**.

Table 6.71 Noise and Vibration Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
NS-01	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The NVMP will generally follow the approach in the *Interim Construction Noise Guideline (ICNG), NSW Department of Environment and Climate Change* (DECC) 2009 and identify: • All potential significant noise and vibration generating activities associated with the Project. • Feasible and reasonable mitigation measures to be implemented. • A monitoring program to assess performance against relevant noise and vibration criteria. • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures. • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. • The CEMP and NVMP should be regularly updated to account for any changes in noise and vibration management of the Project.	Operation
NS-02	All sensitive receivers likely to be affected will be notified at least seven days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will include: • Details of the Project. • The construction period and construction hours. • Contact information for project management staff. • Complaint and incident reporting. • How to obtain further information. • Proposed mitigation measures.	Construction
NS-03	All employees, contractors and subcontractors will receive an environmental induction. The induction will include at a minimum, all applicable mitigation measures; hours of works; any limitations on high noise-generating activities; location of nearest sensitive receivers; designated parking areas; relevant approval conditions and incident procedures.	Pre-Construction
NS-04	Advanced warning of upcoming works and potential disruptions can assist in reducing the impact on the community. Typically distributed on a monthly basis, notifications may consist of a letterbox drop, and/or email mailing lists, and published on the website. Updates detail work activities, time periods over which these will occur, impacts and mitigation measures. Notification should be a minimum of seven days prior to the start of works. The approval conditions for projects may specify requirements for notification to the community about works that may impact on them.	Pre-Construction, Construction

ID	Mitigation and Management Measure	Phase
NS-05	Verification monitoring of noise and/or vibration levels will be undertaken during construction in the form of routine checks of noise levels or following reasonable complaints, conducted at the affected receiver(s) or a nominated representative location. Where monitoring finds that the actual levels exceed those predicted in the assessment then immediate refinement of mitigation measures may be required and the management plan amended. Attended measurements will be undertaken within a period of 14 days from the commencement of construction activities (or as agreed with the DPHI/EPA). For project durations greater than three months, attended measurements are to be repeated on a three-monthly basis, where reasonable and feasible, as part of the audit cycle. Where outside of standard work hours (OOWH) are required, attended measurements must be undertaken at the time intervals described in the management, OOWH assessment, approval and/or licence conditions.	Construction
NS-06	Specific notifications will be letterbox dropped, hand distributed, or via phone calls, to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. Alternatively (or in addition to), communications representatives from the contractor will visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing. The specific notification provides additional information when relevant and information to more highly affected receivers than covered in general letterbox drops. This form of communication is used to support periodic notifications, or to advertise unscheduled works.	Construction
NS-07	Contractors will keep noise to a minimum, including limiting the use of loud stereos/radios, shouting on site and car door slams.	Construction
NS-08	The noise levels of plant and equipment will have operating Sound Power or Sound Pressure Levels consistent with those nominated in Table 6.1 of the NVIA.	Construction, Operation
NS-09	Noise emitting plant will be directed away from sensitive receivers and be throttled down or shut down when not in use.	Operation
NS-10	Non-tonal reversing beepers will be fitted and used on all construction vehicles and mobile plant used regularly on site and for any out of hours work.	Construction
NS-11	Where feasible and reasonable, construction should be carried out during the standard daytime working hours in accordance with the *Interim Construction Noise Guideline* (ICNG), NSW Department of Environment and Climate Change (DECC), 2009: • Monday to Friday: 7.00 am – 6.00 pm • Saturday: 8.00 am – 1.00 pm • Sunday and public holidays: No work.	Construction

ID	Mitigation and Management Measure	Phase
	In cases of emergencies, major asset inspection or maintenance programs may be required to be undertaken outside standard hours. In these situations, where practical, Richmond Valley Council and surrounding landholders would be notified of any works expected to be performed outside standard daytime work hours that may be expected to cause noise exceedance to neighbouring dwellings. Work generating high noise will be scheduled during less sensitive time periods.	
NS-12	Project traffic will be restricted to 60 km/h along Avenue Road.	Construction, Operation
VB-01	The actual construction equipment to be used on site would be confirmed by the construction contractor during the detailed design phase. For any additional vibration generating plant, minimum working distances will need to be established. In the event that any vibration-generating equipment would be used within the recommended safe working distances nominated in Table 6.3 of the NVIA, the following is recommended: • An independent specific structural assessment is undertaken on the structure to ascertain the structural integrity and its ability to withstand vibration, and establishment of an appropriate vibration criterion. • A dilapidation survey is undertaken on the structure prior to works commencing, and regular inspection of the structure throughout the construction activities. • A pre-construction vibration monitoring to establish baseline vibration impacts induced on the structure from existing sources. • Establish site specific vibration minimum working distances for the nominated equipment on site. • Where appropriate, continuous vibration monitoring is conducted on the structure for the duration of the period of construction while vibration generating equipment is used. The vibration logger should be equipped with the facility to remotely alert the site to reduce or cease construction activities if vibration levels are approaching the criterion threshold.	Pre-construction, Construction, Operation

6.17 Waste

An assessment of waste was undertaken by Umwelt to assess the potential risks associated with waste management of the Project. This section outlines the key findings of the waste assessment, the potential waste streams and quantities associated with the Project and proposed mitigation and management measures.

The assessment of waste was prepared in accordance with the requirements of the Project's SEARs and DPE's Large-Scale Solar Energy Guideline (2022).

6.17.1 Existing Environment

Waste management facilities located in proximity to the Project Area are outlined below in **Table 6.72**. There are 4 facilities within 75 km of the Project Area which accept a range of different waste streams. These facilities generally cover all of the expected forms of waste from the solar farm that cannot be recycled or re used for the Project.

Table 6.72 Waste Facilities Available to the Project

LGA	Distance from the Project	Accepted Forms of Waste
Richmond Valley – Nammoona Waste and Resource Recovery Facility	28 km north of the Project	Accepts a range of waste types including commercial and industrial, construction and demolition waste.
Ballina – Ballina Waste Facility	54 km north-east of the Project	Accepts green waste, general recyclables, commercial mixed waste, soil, contaminated soil, scrap metal, electronic waste.
Clarence Valley – Grafton Regional Landfill	73 km south of the Project	Accepts general waste disposal, eWaste, scrap metal and concrete recycling, oil waste storage, organic composting facility and asbestos disposal (in line with requirements).
Lismore – Lismore Recycling & Recovery Centre	35 km north-east of the Project	The use of Lismore Recycling and Recovery Centre has been excluded from the waste assessment due to the ongoing flood recovery program.

6.17.2 Methodology

A qualitative waste assessment was undertaken for the Project, as presented in this section, which involved:

- Identification of waste types (including the appropriate waste classification) and estimates of waste expected to be generated at each stage of the Project.
- Consideration of circular design principles and strategies to mitigate impacts and reduce waste generation throughout all stages of the Project (such as using recycled, reusable and low-impact raw materials where possible).
- Consideration of end-of-life reuse, refurbishment and recycling strategies for PV panels and associated equipment that maximise high recovery methods.

- Identification of end markets for waste materials generated at each stage of the Project.
- Review of the capacity of, and acceptable wastes that can be received by, waste management facilities in the LGA.

The *NSW Waste Avoidance and Resource Recovery Strategy* (EPA, 2014a) outlines the requirements for best practice waste management, which combines the principles of ecologically sustainable development with the implementation of resource management hierarchy principles as specified in the WARR Act (refer to **Figure 6.45**), which include:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling, and energy recovery consistent with the most efficient use of the recovered resources).
- Disposal, including management of all disposal options in the most environmentally responsible manner in accordance with the *Waste Avoidance and Resource Recovery Strategy 2014–2021* (EPA, 2014).

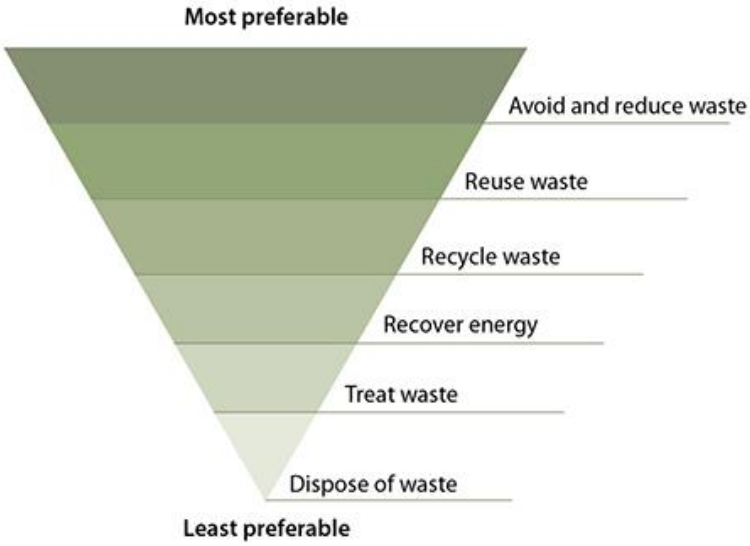


Figure 6.45 NSW EPA Waste Hierarchy (EPA, 2017)

6.17.3 Anticipated Waste Generation

Under the *Waste Classification Guidelines – Part 1: Classifying wastes* (EPA, 2014b), waste can be classified into six different classes based on risks to the environment and human health. These are:

- Special waste – asbestos, waste tyres and clinical wastes.
- Liquid waste – wastewater effluent, fuels and lubricants.
- Hazardous waste – contaminated soils.
- Restricted solid waste.

- General solid waste (putrescible) – food waste, organics and animal wastes.
- General solid waste (non-putrescible) – glass, plastic, rubber, bricks, concrete, metal, paper, cardboard and other domestic waste.

Identified waste types and quantities expected to be generated by the Project during the construction, operation and decommissioning phases are included in **Table 6.73**, assessed in the context of the above guidelines. The below waste quantities are indicative only and will be refined further prior to and during construction pending final design refinements.

Table 6.73 Waste Generation Activities, Classification and Expected Waste Types

Phase	Waste Type	Estimated Volume	End Market/Facility
Construction	Green Waste	To be determined during detailed design. Anticipated disposal of 60 m^3 (approximately 100 tn)	Processed at Nammoona Waste and Resource Recovery Facility
Construction	Hazardous Waste	0	N/A
Construction	Liquid Waste	200 tn	Processed at Casino Sewage Treatment Plant
Construction	General Solid Waste (Non-Putrescible) – Mixed	10 tn	Landfill/Nammoona Waste and Resource Recovery Facility
Construction	General Solid Waste (Non-Putrescible) – Office	10 tn	Landfill/Nammoona Waste and Resource Recovery Facility
Construction	General Solid Waste (Non-Putrescible) – Cardboard	2500 m^3	Recycled/Nammoona Waste and Resource Recovery Facility
Construction	General Solid Waste (Non-Putrescible) – Steel	10 tn	Recycled/Nammoona Waste and Resource Recovery Facility
Construction	General Solid Waste (Non-Putrescible) – Timber	5000 m^3	Recycled/Nammoona Waste and Resource Recovery Facility
Operation	Green Waste	60 m^3	Processed at Nammoona Waste and Resource Recovery Facility
Operation	Hazardous Waste	To be determined by BESS Supplier during detailed design	Landfill/Nammoona Waste and Resource Recovery Facility
Operation	Liquid Waste	6 m^3	Processed at Casino Sewage Treatment Plant
Operation	General Solid Waste (Non-Putrescible) – Mixed	<1000 m^3	Landfill/Nammoona Waste and Resource Recovery Facility
Operation	General Solid Waste (Non-Putrescible) – Office	1 tn	Landfill/Nammoona Waste and Resource Recovery Facility
Operation	General Solid Waste (Non-Putrescible) – Cardboard	250 m^3	Recycled/Nammoona Waste and Resource Recovery Facility
Operation	General Solid Waste (Non-Putrescible) – Steel	2 tn	Recycled/Nammoona Waste and Resource Recovery Facility
Operation	General Solid Waste (Non-Putrescible) – Timber	250 m^3	Recycled/Nammoona Waste and Resource Recovery Facility

Phase	Waste Type	Estimated Volume	End Market/Facility
Decommissioning	Green Waste	60 m^3	Processed at Nammoona Waste and Resource Recovery Facility
Decommissioning	Hazardous Waste	To be determined by BESS Supplier during detailed design	Landfill/Nammoona Waste and Resource Recovery Facility and BESS equipment to be returned to the supplier
Decommissioning	Liquid Waste	200 tn	Casino Sewage Treatment Plant
Decommissioning	General Solid Waste (Non-Putrescible) – Mixed	10 tn	Landfill/Nammoona Waste and Resource Recovery Facility, BESS equipment to be returned to the supplier
Decommissioning	General Solid Waste (Non-Putrescible) – Office	10 m3	Landfill/Nammoona Waste and Resource Recovery Facility
Decommissioning	General Solid Waste (Non-Putrescible) – Cardboard	250 m^3	Recycled/Nammoona Waste and Resource Recovery Facility
Decommissioning	General Solid Waste (Non-Putrescible) – Steel	~20,000 tn	Recycled/Nammoona Waste and Resource Recovery Facility
Decommissioning	General Solid Waste (Non-Putrescible) – Timber	500 m^3	Recycled/Nammoona Waste and Resource Recovery Facility

Ark Energy has consulted with Council on the waste streams and quantities detailed above. The council has confirmed that the listed waste streams are within the capacity of local waste management facilities. Waste quantities will need to be reviewed by Council prior to construction and for any potential exceedances, additional services will be contacted via existing council relationships.

6.17.4 Impact Assessment

The majority of Project waste would be generated during the construction and decommissioning stages with minor quantities of waste to be generated by the day-to-day operation of the Project. If not appropriately stored and managed, waste generated by the Project could have a range of environmental and health impacts, including:

- Aesthetic quality and visual amenity of the Project Area and adjacent landholders.
- Pollution of hydro lines, local watercourses and drainage lines if wastes are not effectively controlled. This is particularly relevant for gross pollutants (litter) that may become wind borne and enter any watercourses during construction.
- Health and safety of workers and other visitors to the Project Area.
- Changes to the capacity of waste disposal facilities detailed in **Section 6.17.1**.
- Potential spread of pest species.
- Reduction in future land capability if not appropriately stored and handled.

Ark Energy has consulted with Council on the waste streams and quantities detailed above. The council has confirmed that the listed waste streams are within the capacity of local waste management facilities and for any potential exceedances, additional services will be contacted via existing council relationships. Green waste will be processed in Nammoona Waste and Resource Recovery Facility before being transferred to Grafton Waste Transfer and Recycling Facility.

Measures outlined in **Section 6.17.4.1** would be implemented during the construction of the Project to suitably manage these waste impacts.

6.17.4.1 Cumulative Impact

Renewable projects proposed within the region a detailed in **Appendix 20**, are anticipated to generate similar waste types and classifications. The capacity of waste management and recycling facilities within the region as mentioned in **Section 6.17.1** are time sensitive and as such unable to be confirmed at this stage. Council has been consulted regarding the Project waste volumes and streams and have considered the cumulative impacts of other developments in their approval. Prior to and during construction, Ark Energy will contact relevant Councils and organise to ensure waste is transported to a facility which has capacity to process each waste stream.

6.17.5 Mitigation Measures

A range of mitigation and management strategies in response to the identified impacts of the Project on waste are summarised below in **Table 6.74**.

Table 6.74 Waste Mitigation and Management Measures

ID	Mitigation and Management Measure	Phase
W-01	A Waste management Plan (WMP) will be prepared including a detailed breakdown of the waste types and quantities in accordance with relevant legislation and guidelines. The WMP will include the following measures: • A summary of the waste types, classification and estimated annual quantities of wastes produced during the construction of the Project. • Measures to manage waste disposal in accordance with the principles of the waste hierarchy, with emphasis on reducing, reusing and recycling wastes prior to disposal. • The procedure for assessing, classifying and storing waste in accordance with EPA guidelines. • Procedures for storage, transport and disposal of waste. • Monitoring, record keeping and reporting, including the use of waste tracking data to demonstrate the lawful disposal of contaminated products, waste or residues generated by the Project (if any).	Pre construction

6.18 Cumulative Impacts

As discussed in **Section 6.18**, there are currently five existing and proposed renewable energy projects proposed within 50 km of the Project. When considered in isolation, the environmental, social, economic and other impacts associated with a development may be considered minor. However, these minor impacts may be more substantial when the impact of multiple developments on the same receivers are considered.

This section presents an assessment of the potential cumulative impacts associated with the construction and operation of the Project when considered together with other developments and activities occurring near the Project and presents the approach to the management of these impacts. The assessment of cumulative impacts is conducted under the assumption that proposed projects will be approved and that construction timelines will align with the Project construction phase. The cumulative assessment takes a conservative approach to assessing cumulative impacts indicating the cumulative impacts could be overstated.

This assessment was conducted in accordance with the requirements the SEARs, which require the EIS to include an assessment of the likely impacts of all stages of the development, including any cumulative impacts of the site and existing or proposed developments in the region, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice including the Large-scale Solar Energy Guideline (DPIE 2018) and the Cumulative Impact Assessment Guideline (DPIE, July 2021).

6.18.1 Assessment Methodology

In accordance with the CIA Guidelines a cumulative scoping assessment was undertaken to identify the potential for cumulative impacts to occur as a result of the Project (refer to **Appendix 20**).
The methodology used in the scoping summary is outlined below.

Nearby developments with the potential to result in cumulative impacts with or as a result of the development were identified using the following sources:

- NSW DPE Major Projects website including renewable and other projects in the area.
- Google Maps.
- Council development application register.
- Transport for NSW current projects register (relative to transport routes).

Developments were selected based on the following screening criteria:

- **Location** – proximity to areas and activities assessed as part of each staged assessment.
- **Timeframe** – relevant projects recently completed or likely to be carried out at some point during the construction, operation and/or decommissioning of, and would interact with, the project.
- **Scale** – potential impacts of a scale that could cause cumulative impacts with each staged assessment.
- **Status** – the stage of the project at the time of each staged assessment (including forecast timeframes for construction and operation). Stages includes approved projects, proposed projects and local strategic plans.

Generally, cumulative impacts have been qualitatively assessed, with the expected cumulative impacts determined based on the perceived likelihood of impact and scale of interaction between the Project and those identified for the cumulative assessment (refer to **Table 6.75**).

6.18.2 Identified Developments

Developments that may contribute to the cumulative impacts of the Project are summarised in **Table 6.75**. Not all of these impacts require further cumulative impact assessment under **Section 6.18.3** as they have been determined to have a low potential for cumulative impact as opposed to impacts identified as having a moderate or high potential for cumulative impacts (See **Appendix 20**).

As outlined in the cumulative scoping summary provided in **Appendix 20**, impacts associated with the operations phase of the Project and other renewable energy developments within the area will be limited with the majority of the potential impacts associated with the construction phase. Therefore, developments that are already operational or currently under construction are considered unlikely to result in cumulative impacts as a result of the Project as there would be limited or no overlap of construction activities.

In some instances, sufficient detail relating to the developments is not currently available to inform a detailed assessment. However, where construction timeframes are not known, predictions have been made about the likelihood of overlapping construction periods, based on the most current and publicly available information at the time of writing this EIS.

The developments identified in **Table 6.75** are in various stages of delivery and planning, with a number of developments yet to be approved by the relevant authority. The likely impacts of these developments will be assessed by the relevant approval authority as part of the development consent process for each individual development.

Table 6.75 Cumulative Impact Summary

Project	Distance from the Project Area	Detail	Potential Cumulative Impact
Summerville Solar Farm (SSD-46982232)	1.4 km east	A 90 MW solar farm and associated battery energy storage system (BESS) with a capacity of 90 MW and up to four hours storage. An EIS has been publicly exhibited and the proponent is now preparing a Response to Submissions. Construction expected to begin in Q4 2024 and with peak construction requiring approximately 200 personnel for 1–2 months. On average 60–80 personnel require on site. Construction	Traffic Visual Social Bushfire Biodiversity Aboriginal Heritage Historic Heritage Land Use Hazards Economic

Project	Distance from the Project Area	Detail	Potential Cumulative Impact
Myrtle Creek Solar Farm (SSD-12360774)	Directly south of the Project Area.	A 100 MW solar farm with battery storage of up to 100 MW hrs over a 424.3 ha site. SEARs were issued in April 2024. An EIS is being prepared and has not yet been submitted to DPHI or publicly exhibited. Approximately 150 workers on site during peak construction. There is a low potential overlap in construction phases between Myrtle Creek Solar Farm and the Project.	Traffic Visual Social Noise Hazard Bushfire Biodiversity Aboriginal Heritage Historic Heritage Land Use Hazards Economic
Clarence Valley Solar Farm (SSD-31430090)	50 km south	An 85 MW solar farm with an 85 MW BESS. SEARs were issued in December 2021. An EIS is being prepared and has not yet been submitted to DPHI or publicly exhibited. The construction phase for the entire Project is expected take approximately 12 months and create approximately 100 FTE jobs.	Social Traffic Economic
Lismore Battery Energy Storage System (SSD-27165998)	26 km north-east	Standalone 100 MW/ 200 MWh Battery Energy Storage System (BESS) and associated ancillary infrastructure, approximately 12 km southwest of Lismore (the Proposal). SEARs for the Project were issued in October 2021. An EIS is being prepared and has not yet been submitted to DPHI or publicly exhibited.	Social Traffic Economic
Casino Biohub (bioenergy facility) (SSD-61548752)	27 km north	Construction & operation of a bioenergy facility with a capacity to process up to 903,000 tpa of organic waste using anaerobic digestion technology to generate up to 4.4 MW of electricity & 16,000 MW/hr of heat to the Casino Food Co-op. SEARs for the Project were issued in October 2023. An EIS is being prepared and has not yet been submitted to DPHI or publicly exhibited. Due to the stage that the Project is at in the planning pathway, there is low potential for overlap between the Casino Biohub and the Project.	Social Traffic Economic

6.18.3 Assessment of Cumulative Impacts

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 summarised in **Table 6.75**, this assessment has focused on particular identified projects and relevant impacts.
Such impacts including the potential traffic and transport, noise, social impacts, the cumulative impacts are discussed below.

6.18.3.1 Traffic and Transport

Additional traffic volumes from both the Summerville Solar Farm and Myrtle Creek Solar Farm projects were considered as part of the assessment in the TTIA including:

- Calculated Project traffic volumes on key road link of the external road network to the Project (see **Table 6.43**).
- Total Project traffic volumes estimated at the intersection of Main Camp Road and Summerland Way for both AM & PM peaks (see **Figure 6.30**).

Analysis in the TTIA found the cumulative (with Project) construction phase volumes on the key intersection of Summerland Way / Main Camp Road would operate satisfactorily (within acceptable limits) considering the potential increase in traffic volumes as a result of the concurrent construction of other renewable Projects in the region.

6.18.3.2 Noise

The NVIA considered cumulative noise and vibration impacts from the proposed Summerville Solar Farm and Myrtle Creek Solar Farm projects. Other developments were excluded from the assessment as they were determined to be too far from the Project Area (i.e. greater than 19 km) to contribute to the cumulative impacts of the Project.

Construction Noise

In the event that Summerville Solar Farm and Myrtle Creek Solar Farm projects proceed simultaneously, cumulative construction noise is predicted to effect sensitive receivers to the west of the Project Area. Measures discussed in **Section 6.16.4** will aid in the mitigation and management of cumulative impacts contributed by the Project, and a collaborative approach will be applied to managing noise and vibration impacts associated with nearby developments to minimise noise impacts on sensitive receivers.

Operational Noise

Once operational, it is anticipated that there would be no cumulative noise impacts due to the operation of the Project adjacent the Summerville Solar Farm and Myrtle Creek Solar Farm projects.

Road Traffic Noise

The cumulative construction traffic from Summerville Solar Farm and Myrtle Creek Solar Farm on Summerland Way was assessed for traffic noise levels at nearby receivers. Cumulative assessment indicates compliance with daytime and night-time noise limits at a distance of 40 m from the road edge.
While exceedance of limits is predicted within 40 m due to additional project and external traffic, this is unlikely to affect sensitive receivers located further than 40 m from the road edge. Predicted noise levels are conservative and consider peak construction traffic movements for all projects simultaneously, though this scenario is improbable. Proposed mitigation measures are discussed in **Section 6.16.4**.

6.18.3.3 Social / Economic

Both the SIA and Economic Assessment considered cumulative social and/or economic impacts of the Project and other developments that may interact, as detailed in **Table 6.3** and identified in **Table 6.54**.

As discussed in **Section 6.3**, there is sufficient accommodation to support the non-local workforce for the Project and in the event that the construction phases occur concurrently, impacts associated with incoming construction workforces, including the need for short term accommodation, could be exacerbated.

Ark Energy has committed to the development and implementation of AEPS identified as a mitigation and management measure by the SIA and Economic Assessment, which will assist in the management of the 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 within the Richmond Valley LGA and neighbouring LGAs.

Assumptions used in the assessment of accommodation availability were conservative as nearby Projects are at different stages of the planning approval process, strategies in the AEPS will enable the project to respond to availability during construction. Based on the conservative nature of the assessment of accommodation options in the region, existing providers are likely to be sufficient to address potential cumulative impacts of nearby developments. It is noted that at certain times accommodation can be less or more available and measures to manage these impacts will be a consideration in the development of the AEPS.

In consideration of the likelihood of the identified developments constructure phases overlapping with the construction phase of the Project, as well as the economic capacity of the region, the SIA considers that the potential cumulative impacts associated with the Project will be manageable. Ark Energy acknowledges that the potential for cumulative social impacts 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. It is acknowledged this will remain a key challenge for renewable energy developers, and other key stakeholders (Government, local businesses and service providers, community groups and landholders/residents) during the renewable energy transition.

These 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. The CSEP that will continue to be developed and implemented by Ark Energy for the Project will include measures to address potential cumulative impacts (both positive and negative) and provide an appropriate platform for Ark Energy to manage the contribution of the Project to the relevant cumulative impacts (positive and negative).

6.18.3.4 Visual

The LVIA also undertook a cumulative impact assessment of nearby renewable energy projects within 8 km of the Project Area in accordance with DPE's Cumulative Impact Assessment Guidelines 2023. Two projects were identified and utilised in cumulative impact assessment as part of the LVIA.

The LVIA identified that, as Myrtle Creek Solar Farm is in an early scoping phase, an in depth assessment of cumulative impacts of the Project and Myrtle Creek Solar Farm has not been possible and would need to be addressed in the Myrtle Creek Solar Farm EIS. However, from observations made during Moir's site visit, it was found to be likely that both the Project and the Myrtle Creek Solar Farm could be viewed simultaneously. Views from Avenue Road towards both projects would be limited due to existing topography and screening from vegetation.

The LVIA identified potential cumulative impacts from Summerville Solar Farm and the Project, largely occurring along Summerland Way. Based on desktop assessment and observations made during the site visit, it was found that existing vegetation present would be sufficient in fragmenting views of the projects from nearby receptors.

Both receptors were found to require no further assessment as they were assigned to have a 'low' or 'very low' visual impact rating.

6.18.3.5 Biodiversity

The BDAR reviewed proposed and current renewable and other Projects sited in the broader locality of the Project with the potential to impact the same or similar PCTs and habitats to determine potential cumulative impacts of the Project on biodiversity. The assessment found that potential impacts of the Project on biodiversity are similar with potential impacts from nearby renewable energy projects.

Based on available published information, cumulative impacts on similar PCTs, TECs including Subtropical Coastal Floodplain Forest and threatened species will occur within the broader locality.

See Table 48 of the BDAR for a full summary of potential cumulative impacts from the Project on biodiversity.

6.18.3.6 Waste

Proposed renewable projects outlined in **Appendix 20** are expected to produce waste streams that are similar to the Project and may have construction timelines that align with the Project. Waste management facilities in Richmond Valley and neighbouring LGAs include Nammoona Waste and Resource Recovery Facility, Ballina Waste Facility, Grafton Regional Landfill, and Lismore Recycling & Recovery Centre.

Ark Energy has engaged in discussions with Council to identify the most suitable facilities for managing Project related waste throughout each phase. These consultations will continue before and during stages of the Project that waste is anticipated to be higher than usual, such as construction and decommissioning. Opportunities also exist for collaboration with nearby projects on the management of waste with increased quantities across all projects increasing the viability of recycling and other alternative waste management to reduce quantity of materials going to landfill.

6.18.4 Management and Mitigation Measures

The environmental management measures for key issues outlined throughout **Section 6.0** and summarised in **Appendix 6** will be implemented to minimise the cumulative impacts of the Project.

6.19 Summary of Mitigation and Management Measures

Ark Energy will be responsible for implementing the management and mitigation measures identified in the EIS. The management and mitigation measures will be implemented through a CEMP an OEMP and supplementary management and construction plans. These plans will be prior to each stage of the Project by Ark Energy and the relevant contractor, and in consultation with relevant Government Agencies. **Appendix 6** provides a consolidated list of the management and mitigation measures applicable to the Project and relevant timing for implementation.

7.0 Justification of the Project

The SEARs require the EIS to provide both a 'a strategic justification of the development focusing on site selection and the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land uses (including existing land use, other proposed or approved solar and major projects, rural/residential development, Crown lands within and adjacent to the project site and subdivision potential), having regard to the Solar Guidelines.

This section addresses this requirement and provides a conclusion discussing the justification for the Project (**Section 7.1**), taking into consideration the suitability of the Project Area (**Section 7.2**), and the environmental, social and economic impacts (**Section 7.3**).

Section 7.4 discusses the principals of Ecologically Sustainable Development (ESD) as defined in Division 5, Section 193 (1) of the EP&A Regulation 2021.

As outlined in **Section 2.0** the project is consistent with the strategic context. The Project is also consistent with and will comply with the relevant statutory requirements as outlined in **Section 4.0**.

7.1 Project Justification

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 would provide a number of benefits at Federal, State, regional and local levels, including:

- Generating enough electricity to supply approximately 181,000 households on an annual basis in NSW.
- Diversifying land use and economic activity in regional NSW.
- Generating a capital investment of approximately $1.2 billion, including $180 million in local investment during construction and $145 million during operations over the course of the 30-year operating life.
- Providing on average 150 direct jobs during the construction phase, 327 direct jobs during the peak construction period and 13 direct jobs nationally during the operational phase.
- Establishing indirect benefits to local services through the construction and operation phases.

The Project is justified and of interest to the public as:

- It is suitably located in a region with ideal climatic and physical conditions for large-scale solar energy generation.
- Contains suitable terrain and topography to support large-scale solar energy infrastructure.
- The Project Area has access to existing transmission line infrastructure that has capacity to transport the electricity to the grid. This minimises the need for construction works and disturbance associated with additional infrastructure (i.e. new transmission lines) often required to connect large-scale renewable energy projects to the electricity market.

- It would not result in significant negative biophysical, social or cultural impacts although would present significant positive economic outcomes.
- Potential to create employment opportunities and benefits to the local and regional economy.

Ark Energy is committed to reducing impacts on the land within the Project Area.

The consequences of not proceeding with the Project would result in:

- Loss of opportunity to move towards cleaner electricity generation, reduce CO^2 emissions and their impact on climate change.
- Loss of increased energy security and supply to the Australian grid.
- Loss of significant social and economic benefits created through capital investment and provision of direct and indirect employment opportunities during the construction and operation of the Project. A CBF in consultation with the Council will also be developed for the Project.

7.2 Suitability of the Project Area

In preliminary phases of the Project, the former proponent Epuron (now Ark Energy) undertook a site constraints and opportunities analysis to identify the most appropriate Project Area. This analysis involved the following considerations for suitability of the Project Area:

- Current land use.
- Land available to purchase and lease.
- Capability to connect to the electricity grid and access to transmission line network.
- Environmental and social constraints, including biodiversity and heritage.
- High quality solar irradiation levels.
- Land suitability (i.e. topography) to support a solar farm.

Specifically, this Project Area was identified as suitable due to the following:

- The Project Area is strategically located to connect to existing transmission infrastructure and in an area with high solar energy potential.
- The Project Area has only two landholders.
- The Project Area has been disturbed and/or historically cleared for agricultural land use practices, primarily cattle grazing.
- The Project would supply electricity to the NEM via an onsite connection to the existing overhead transmission line traversing the north-west corner of the Project Area (**Figure 1.2**).
- The Project Area has lower impacts on environmental aspects including aboriginal heritage, hydrogeology, biodiversity and reduced bushfire threat than alternatives considered.

Table 7.1 Land Use Considerations

Land Use Consideration	Identified Features and Assessment
Existing Land Use	• The Project Area largely comprises areas that have previously been disturbed and/or historically cleared associated with agricultural and forestry land use. • Forestry uses have previously ceased in the Project Area and the Project would not impede future agricultural activities in line with existing operations following decommissioning of the Project. • The conceptual layout has been developed to maximise the use of existing disturbed areas and avoid and minimise impact to identified biodiversity, hydrology and Aboriginal cultural heritage values on the Project Area. • Structures within the Project Area currently used for agricultural activities will not be impacted by the Project and would be useable post decommissioning phase.
Nearby Projects	• Nearby developments considered include Clarence Valley Solar Farm, Summerville Solar Farm and Myrtle Creek Solar Farm. Consideration of cumulative impacts has been undertaken in specialist assessments for social, water, hazards, visual amenity, traffic, biodiversity, heritage, land and soils, economic, noise and vibration and waste. • Cumulative impacts have been considered in accordance with the Cumulative Impact Assessment Guidelines for State Significant Projects (CIA Guidelines) (DPE, 2022c). Further details on cumulative impacts are provided in **Appendix 20**.
Rural and Residential Development	• The Project does not impede the possible development of rural or residential dwellings within proximity to the Project Area. • Development for the purposes of housing would be excluded from the Project Area for all phases of the Project with potential dwelling construction occurring post decommissioning. • Within 4 km of the Project Area there are 49 dwellings.
Crown Land	• The Project Area includes land designated as Crown Roads. • Ark Energy and Umwelt met with Crown Lands on 3 August 2023 and have undertaken ongoing consultation with Crown Lands to enable the provision of landowners consent for the purposes of lodging this EIS. • Ark Energy have undertaken ongoing consultation with Crown Lands to enable the provision of landowners consent. Ark Energy, will seek to formally acquire Crown Land parcels (crown roads) within the Project Area to facilitate the construction and operation of the Project.
Subdivision Potential	• Land on which the substation is constructed will require a subdivision of Lot 32 DP 755607 as this is the typical requirement of Transgrid, the likely owner/operator of the cut-in section of the switching substation. • Post decommissioning, the subdivided lot may be purchased from the current owner and ownership transferred to Transgrid as the Network Service Provider. • Once the final location of the switching substation is determined, the proposed subdivision will be the subject of ongoing discussion with Council, DPHI and the host landholders. • During the construction, operation and decommissioning of the Project, subdivision will be subject to the landholder's agreement as detailed in **Appendix 5**.

7.3 Environmental, Social and Economic Impacts

As highlighted throughout the EIS, the Project has been designed using an iterative approach. The conceptual layout for the solar arrays, transmission line corridor, Project access, internal access roads and other supporting infrastructure has been subject to ongoing refinement with the aim of minimising associated environmental and social impacts. Measures taken to avoid, mitigate and minimise impacts is outlined in **Table 2.1**.

The environmental, social and economic impacts of the Project have been identified and were subject to detailed assessment based on:

- Assessment of the site characteristics (existing environment).
- Focused consultation with relevant government agencies.
- Engagement with local community and other stakeholders.
- Environmental and social risk analysis.
- Application of the principles of ESD, including the precautionary principle, intergenerational equity, conservation of biological diversity and valuation and pricing of resources.
- Expert technical assessment.

The key issues identified, including those specified in the SEARs, were subject to comprehensive specialist assessment to identify the potential impacts of the Project on the existing environment. These assessments are detailed in **Section 6.0** and the appendices to this EIS. Additionally, community views were assessed through a range of consultation approached and mechanisms to identify a social baseline and the values which are import to the local population (**Section 5.0**).

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. These impacts are summarised in **Table 6.75**, which focused on developments within 50 km of the Project which have relevant impacts associated with the Project impacts. Such impacts including the potential traffic and transport, noise, social impacts, the cumulative impacts

As outlined in **Section 6.0**, the potential environmental, cultural 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 proposed management and mitigation measures is provided in **Appendix 6**.

The impacts of the Project have been kept to a minimum through:

- Obtaining a detailed understanding of the issues and impacts by scientific evaluation and stakeholder engagement.
- Detailed project planning considering the environmental and social constraints of the locality and investigation of various project alternatives which resulted in changes to the Project that reduced impacts.

- Active engagement with key stakeholders, including proximal landholders to identify key concerns and issues and to allow these to be considered in the Project design process.
- A commitment to proactive and appropriate strategies to avoid, minimise, mitigate, offset and/or manage a range of potential environmental impacts (refer to **Section 6.0**.

7.4 Ecologically Sustainable Development

An object of the EP&A Act is to encourage ESD within NSW. As noted in **Section 4.1**, the Project is classified as SSD in accordance with the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) and has been subject to an environmental impact assessment under Part 4, section 4.1 of the EP&A Act.

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.
- Intergenerational equity.
- Conservation of biological diversity.
- Valuation, pricing and incentive mechanisms.

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.

7.4.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> *i. 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.*

To achieve a level of scientific certainty in relation to potential impacts associated with the Project, the EIS includes an extensive evaluation of all the key components of the Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EIS.

The assessment process has involved a detailed study of the existing environment (refer to **Section 6.0**), and where applicable the use of scientific modelling to assess and determine potential impacts as a result of the Project (such as noise and flooding). To this end, there has been careful evaluation as part of the project design and assessment process to avoid, where possible, irreversible damage to the environment. The Project has been designed and located to avoid native vegetation and sensitive environments (i.e. waterways) as much as possible and to minimise the use of natural and artificial resources while considering the social and economic welfare of the local community. Specialist studies were undertaken to provide accurate information to assist with the evaluation and development of the Project.

An example of how the precautionary principle has been applied to the Project includes the conservative approach to workforce accommodation availability. A conservative estimate of 70% occupancy rates across hotel and motel accommodation was utilised based on consultation undertaken during the SIA. Provided this occupancy rate of 70% for commercial accommodations it was also conservatively assumed that 30% of these rooms will be accessible for The Project. It is likely that more rooms will be available to the Project during this time although by applying the principles of the precautionary approach, Ark Energy will compensate for a lack of certainty that can be gained while quantifying the accommodation availability.

The decision-making process for the design, impact assessment, consultation and development of management processes has applied the precautionary principle in the following respects:

- Government authorities, landholders potentially affected by the Project, the local community, RAP groups including Bandjalang Aboriginal Corporation PBC RNTBC and Casino Boolangle LALC and other stakeholders were consulted during preparation of this EIS (refer to **Section 5.0**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures.

- The community has been engaged throughout the development and assessment of the Project through a range of mechanisms including one-on-one meetings, community information sessions to inform project design and management of key issues, and community information sheets, amongst other mechanisms (refer to **Section 5.0**) which provided landholders and stakeholders with both information and the opportunity to influence Project outcomes.

- Ark Energy will develop 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. The CEMP and OEMP will incorporate the additional controls committed to in this EIS (refer to **Appendix 6**).

7.4.2 Intergenerational Equity

The EP&A Regulation defines the principle 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.

The objectives of the Project are outlined in **Section 1.6** and in relation to intergenerational equity, they include to:

- Implement the Project in an environmentally responsible manner to minimise project specific and cumulative environmental and social impacts.

- Minimise additional disturbance by maximising the use of disturbed area (due to historical and current and grazing activities) within the Project Area.

- Generate local and regional employment opportunities as well as potential for training and upskilling opportunities.
- Develop comprehensive mitigation and management strategies to mitigate and offset predicted impacts associated with the Project.
- Further to the Project objectives, a range of environmental management measures discussed in **Section 6.0** and **Appendix 6** have been developed and evaluated to minimise the impact on the environment to the greatest extent reasonably possible.
- The Project would benefit future generations by reducing the reliance on energy sources derived from non-renewable resources, which produce greenhouse gas emissions. Once decommissioned, the land within the Development Footprint will have the capacity to be returned to its existing land use.
- The EP&A Act requires consent authority to consider matters of relevance to the public interest. Intergenerational equity is a matter of public interest and will be achieved by the proposed Project through the conservative approach taken in the assessment and mitigation of impacts, the implementation of renewable energy, increased employment across the 30-year operational lifespan of the Project and providing options to return the Project Area to preexisting agricultural conditions.

7.4.3 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 have been assessed in the BDAR (refer to **Appendix 14**). Potential biodiversity related impacts are outlined in **Section 6.11.3** and proposed mitigation measures to manage residual impacts of the Project on biodiversity are outlined in **Section 6.11.4**.

The development of the Project design went through several stages. This included identifying key constraints areas that needed to be avoided. For example, sensitive regulated land on the NVR map and areas designated as wetlands under the Richmond Valley LEP (Richmond Valley Council, 2012). After an avoidance lens was applied, the minimisation of ecological impacts was prioritised by the minimisation of impacts to KFH located in the south eastern portion of the Project Area, remnant vegetation that provides fauna connectivity across the Project Area, hollow bearing trees within the Project Area and EPBC listed Subtropical Coastal Floodplain Forest EEC within the rejected transmission line infrastructure option. Once a minimisation lens was applied the Project design, mitigation strategies were applied to reduce potential impacts on species and communities that were not avoided. The inclusion of a biodiversity corridor has been designed into the Project to improve habitat connectivity for potentially impacted species, a BMP will be implemented as part of the Project's CEMP demonstrating adaptive management strategies to ensure key milestones are achieved, exclusion zones will be established around sensitive features and other mitigation measures as detailed in **Section 6.11.4.2**.

7.4.4 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 follows:

- *That environmental factors should be included in the valuation of assets and services, such as:*
    - *Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement;*
    - *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; and*
    - *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 environmental consequences of the Project have been assessed in this EIS (refer to **Section 6.0**) and mitigation measures identified for factors with potential for adverse impact (**Appendix 6**). Implementing the mitigation measures would impose an economic cost on the proponent, increasing both the capital and operating costs of the Project. This signifies those environmental resources have been given appropriate valuation.

The Project has been developed and designed with the objective of avoiding and minimising potential impacts on the environment. It is acknowledged that uncertainties remain with regards to detailed design and the assumptions and limitations of the impact assessments contained within this EIS. These have been identified throughout and will be continually monitored and addressed as the Project progresses through the post approval design phase.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in **Appendix 6** provide an auditable environmental management commitment to these parameters. The Project aligns with the principals of ESD and is considered to be satisfied, due to the social, economic and environmental benefits provided in **Section 1.6**, and the mitigation measures put in place to protect from adverse impacts on the environment.

7.5 Conclusion

As outlined in **Section 7.4**, the Project has been assessed against the principles of ESD as required by the EP&A Act and EP&A Regulation. This assessment has indicated that while the Project, would have some impacts, these impacts can be effectively managed, mitigated and offset and the development will result in significant economic and environment benefits in the form job creation and production of renewable energy for the NEM. The assessment therefore concludes that the Project is consistent with the principles of ESD.

The Project would 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 an investment of approximately $1.2 billion of which approximately $180 million will be retained in the region over the life of the Project. It is anticipated that $480 million or 40% of the total Project investment will be retained within NSW with 50% attributed to imports and 10% to other states and territories.
- Employment generation creating on average 150 direct jobs during the construction phase and 13 direct jobs nationally during the operational phase.
- Indirect benefits to local services through the construction and operation phases.
- CBF payments and increased Council land tax returns from the Project Area.

Ark Energy has applied an iterative approach through the development of this EIS responding to both environmental constraints and community concerns through refinement of the layout and the overall Project approach. Residual impacts where avoidance was not possible are addressed through the implementation of best practice management. As such the potential environmental and cultural heritage impacts associated with the Project can be appropriately avoided or managed. Avoidance and mitigation of impacts also address concerns raised by the community and associated social impacts identified during the stakeholder engagement process. Ark Energy will develop and implement an EMS post approval to provide the strategic framework for environmental management. Given the net benefit and commitment from Ark Energy 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. The Project aligns with the principals of ESD and is considered to be satisfied, due to the social, economic and environmental benefits.

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