lightsource bp

Sandy Creek Solar Farm

Environmental Impact Statement

EMM
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Sandy Creek Solar Farm

Environmental Impact Statement

Lightsource bp

E210657 1

March 2024

Version	Date	Prepared by	Reviewed by	Comments
Final for public exhibition	25/03/2024	Sheri Thomson Emily McIntosh	Nicole Armit	Final

Approved by

Nicole Armit
Director

25 March 2024

Level 3 175 Scott Street
Newcastle NSW 2300

Certification

For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979.

Details of persons by whom this EIS was prepared

Emily McIntosh
BSc/BA
Associate Environmental Consultant
25 March 2025

EMM Consulting Pty Limited
Ground floor, 20 Chandos Street
St Leonards NSW 2065

Nicole Armit
BEng (Env)(Hons 1)
Director Environmental Engineer
25 March 2025

EMM Consulting Pty Limited
Level 3, 175 Scott Street
Newcastle NSW 2300

Project details

Project name: Sandy Creek Solar Farm
Application number: SSD-41287735
Address of the land in respect of which the development application is made: The legal property description of the land to be developed is (refer also to Table 3.1 of the EIS): Lots 25,29, 36, 37, 38, 54, 58, 49, 55, 65, 66, 96, 97, 98, 99, 100 and 102 of DP754305; and Lots 7, 8, 20,23, 24, 25, 26, 29, 33, 36, 37 and 66 of DP754317.

Application details

Applicant name: Lightsource Development Services Australia Pty Ltd
Applicant address: Level 10, 420 George Street, NSW 2000

Declaration by registered environmental assessment practitioner

The undersigned declares that this EIS:

- has been prepared in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2021
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates
- does not contain information that is false or misleading
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the Project
- identifies and addresses the relevant statutory requirements for the Project, including any relevant matters for consideration in environmental planning instruments
- has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement
- contains a simple and easy to understand summary of the Project as a whole, having regard to the economic, environmental and social impacts of the Project and the principles of ecologically sustainable development
- contains a consolidated description of the Project in a single chapter of the EIS
- contains an accurate summary of the findings of any community engagement
- contains an accurate summary of the detailed technical assessment of the impacts of the Project as a whole.

Name: Nicole Armit

Registration number: R80025

Organisation registered with: EIANZ

Executive Summary

ES1 Introduction

Lightsource Development Services Australia Pty Ltd (LSbp) proposes to develop Sandy Creek Solar Farm (the Project), which is a large-scale solar photovoltaic (PV) electricity generation facility and associated battery energy storage system (BESS).

The Project is approximately 25 kilometres (km) south-west of the township of Dunedoo, in the Central West of New South Wales (NSW), as shown in Figure ES1, and is within the Central West Orana Renewable Energy Zone (CWO REZ).

The Project is State significant development (SSD) (SSD-41287735) pursuant to Schedule 1 of State Environmental Planning Policy (Planning Systems) 2021. Accordingly, approval is required for the Project under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and this Environmental Impact Statement (EIS) accompanies an SSD application for the Project. Secretary's Environmental Assessment Requirements (SEARs) for the Project were issued on 20 May 2022.

ES2 Strategic context

ES2.1 Project need

The National Energy Market (NEM) is undergoing an unprecedented transformation in the way electricity is generated and consumed in eastern and south-eastern Australia. As Australia moves towards a net zero emissions future, coal fired and other fossil fuels generation is being replaced by renewables, energy storage and other forms of firming capacity. Additionally, the Commonwealth Government set a target for renewables to generate 82% of the NEM requirements by 2030-2031. Further, increased electrification of transport, industry, offices, and homes, which is replacing gas, petrol and other fuels, will require the NEM to double its current capacity by 2050 (AEMO 2022a).

The Australian Energy Market Operator (AEMO) estimates that NSW will see its coal-fired electricity generation reduced to zero by 2040, with Australia's last coal-fired power stations in Queensland planned to go offline in 2043. Given that renewable energy generation needs to be developed prior to the retirement of coal plants, there is an urgent need for the development of this Project in the coming two to five years.

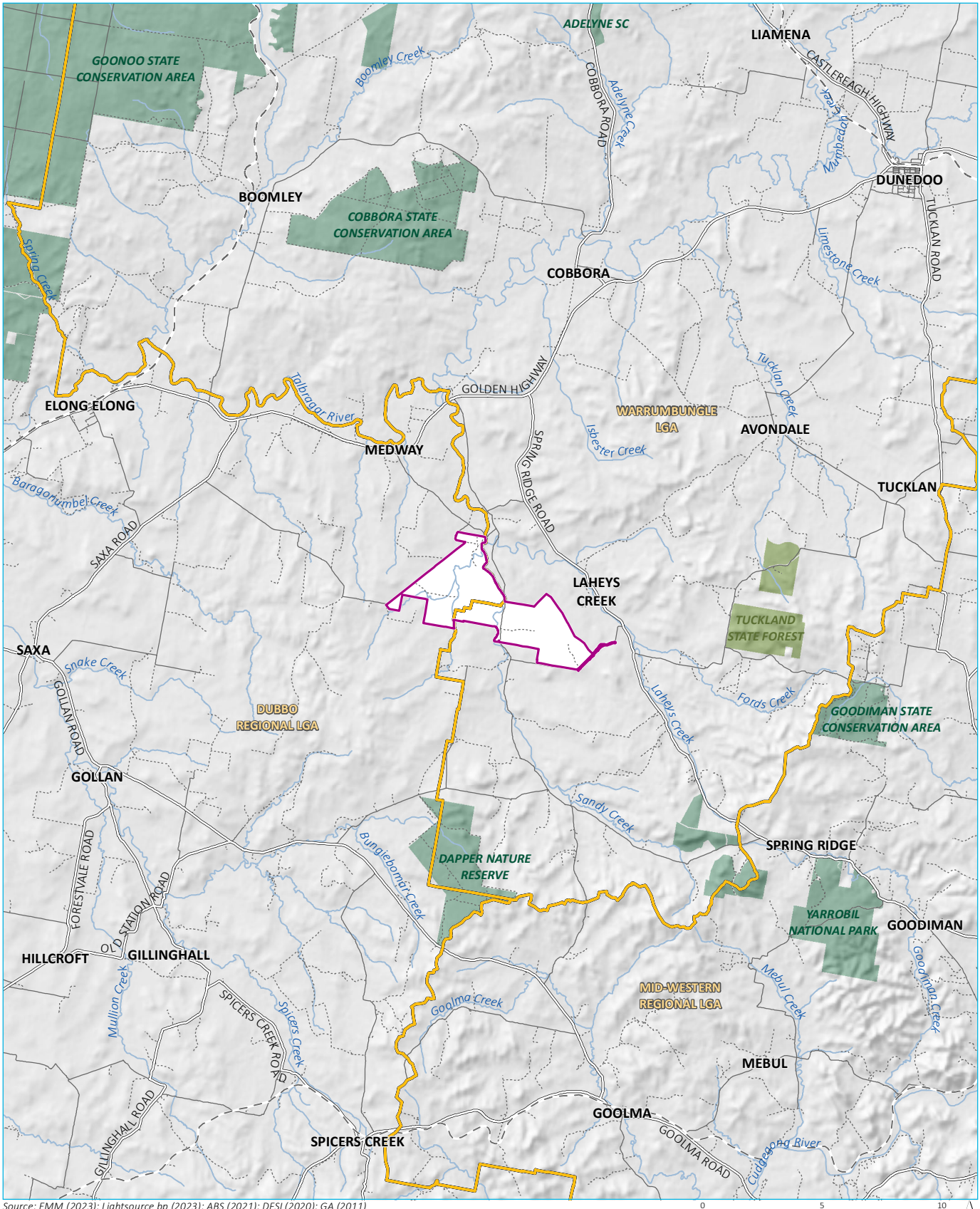
Sandy Creek Solar Farm will help meet the demand for renewable energy by providing up to 700 megawatt alternating current (MW_{ac}) of renewable energy generation and dispatchable capacity to the NEM.

ES2.2 Site selection

The Project site location is highly suitable for development of the Project due to:

- high solar irradiance
- proximity to the proposed Elong Elong Energy Hub (with capacity to export energy into the grid)
- location within the CWO REZ
- limited mapped biophysical strategic agricultural land
- high degree of historical land clearing and absence of high value native vegetation

- RU1 Primary Production zoning under the *Warrumbungle Local Environmental Plan 2013* (Warrumbungle LEP) and the *Dubbo Regional Local Environmental Plan 2022* (Dubbo LEP), which is a prescribed zone where electricity generating works are a permissible land-use and the environmental and planning constraints can be effectively managed
- suitable vehicular access from the Golden Highway and Spring Ridge Road
- adequate development footprint size
- minimal topography constraints
- low flood risk
- landholder willingness to enter into legal agreements
- isolated nature of the surrounding valley and low number of visual receivers relative to the size of the Project
- suitable distance from major townships (approximately 25 km).



Source: EMM (2023); Lightsource bp (2023); ABS (2021); DFSI (2020); GA (2011)

0 5 10 km

GDA 1994 MGA Zone 55

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KEY

- Study area

Existing environment

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Local government area
- NPWS reserve
- State forest

INSET KEY

- Major road
- Central West Orana Renewable Energy Zone
- NPWS reserve
- State forest

Regional context

Sandy Creek Solar Farm
Executive Summary
Figure ES.1

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ES3 Project description

A summary of the Project is provided in Table ES1.

Table ES1 Key elements of the Project

Project element	Summary
Proposed capacity (AC)	Generation capacity of up to 700 MW_{ac}. BESS generation capacity of up to 700 MW_{ac} Storage capacity of up to 2,800 MW (700 MW for 4 hours).
Key infrastructure	Key infrastructure comprises: • development footprint, including: – a network of approximately 1.5 million PV panels and associated mounting infrastructure with a generating capacity of up to 700 MW_{ac} – a direct current (DC) coupled or AC coupled BESS with a capacity of up to 2,800 megawatt hours (MWh) (700 MW for 4 hours) – skid mounted power conversion units (distributed across the site) containing: ▪ two inverters ▪ one medium voltage (MV) transformer – electrical substation containing: ▪ 33/330 kilovolt (kV) high voltage (HV) transformer ▪ 330 kV high voltage switchyard and control room ▪ lightning protection masts – buried and secured MV (i.e. 33 kV) electrical cables and conduits across the site – two high voltage transmission lines running approx. 1 km to the proposed new 330 kV Elong Elong Hub (EnergyCo/ACEREZ scope) – ancillary infrastructure, including: ▪ a temporary workforce accommodation facility located within the development footprint with a separate access point on Dapper Road ▪ parking facilities ▪ internal access roads and electrical cable trenching, including crossings of both Broken Leg Creek and Spring Creek and their tributaries ▪ two internal access road bridge crossings over Sandy Creek, and two separate cable crossings of Sandy Creek ▪ perimeter or partial perimeter access road, designated asset protection zone and security fencing ▪ a communication tower ▪ temporary construction compounds, laydown areas and an operation and maintenance facility ▪ primary access point for heavy and light vehicles ▪ emergency egress points to the surrounding road network ▪ lighting, closed circuit television (CCTV) system ▪ security fencing ▪ landscaping • road upgrade corridor (i.e. area of direct impact for public road upgrade works along a portion of Dapper Road) • construction footprint of the public road crossing of Sandy Creek Road (i.e. proposed intersection between internal access tracks and the public road to allow for construction and operational traffic and cable crossings between the east and west of the development footprint).

Project element	Summary
Footprint size	• The study area covers approximately 1,713 hectares (ha). • The impact footprint covers approximately 1,489 ha and includes the combined area of: – the development footprint, which covers approximately 1,486 ha – the road upgrade corridor, which covers approximately 3 ha.
Location	Approximately 25 km south-west of the township of Dunedoo, in the Central West of NSW. The site is located within the CWO REZ.
Land use and zoning	The entire site is zoned RU1 – Primary Production under the Warrumbungle LEP and the Dubbo LEP. The site is currently and has historically been used for farming (cropping and grazing). There is some Crown land within the site, largely associated with road reserves. The Project includes closure of existing Crown Roads within the Study area.
Site access	The site will be accessed via the Golden Highway, Spring Ridge Road, and Dapper Road.
Project schedule	The construction duration will be between 22-28 months, commencing in approximately quarter two (Q2) 2026 (excludes road upgrades).
Construction hours	• 7:00 am to 6:00 pm Monday to Friday • 8:00 am to 1:00 pm Saturday • no works on Sundays or public holidays. LSbp understands the following construction activities may be undertaken outside these hours without the approval of the Secretary: • activities that are inaudible at non-associated residences • the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons • emergency work to avoid the loss of life, property and/or material harm to the environment.
Construction staging and duration	• Stage 1: site establishment (approximately 3 months) • Stage 2: civil, mechanical, and electrical works plus delivery of construction materials and infrastructure (approximately 14 months) • Stage 3: commissioning and testing (approximately 12 months) The three stages of the Project are anticipated to have significant overlap, with the entire construction and commissioning program likely to take between 22 and 28 months.
Project life	The Project has a life expectancy of approximately 40 years. After this time, it will either be decommissioned or repowered and continue to operate.
Operation hours	The Project will be operated 24 hours per day, 7 days per week, 365 days per year.
Employment	The average construction workforce throughout the 22-28-month construction period will comprise approximately 245 full time equivalent (FTE) jobs. During the peak construction period, a workforce of approximately 350 FTE will be required on site. The Project will directly employ up to 10 FTE during the operation phase.

Project element	Summary
Workforce accommodation	Approval is sought for a temporary workforce accommodation facility. If this facility is required, the facility will be located within the development footprint. The footprint of the accommodation facility is approximately 12 ha, will be located in the south-east section of the development footprint, and will include the following components: • capacity for 350 personnel • one separate access point (for personnel and services) located on Dapper Road, north of the primary site access point • parking for 200 vehicles, including buses • access to services such as 11kV-33kV distribution network, town water and sewerage or suitable alternatives • static water supply (above ground storage steel or concrete tank) with minimum of 50,000 litres (L) • 65 millimetre (mm) Storz outlet connections suitable for firefighting purposes • fire hydrant(s) • fire hose reel system.

ES4 Engagement

LSbp began Project-specific stakeholder engagement in 2021 during the scoping phase and will continue engagement as the Project progresses. Engaged stakeholders include neighbouring landowners; community groups; local indigenous communities; local service providers; the local community; peak business organisations; the CWO REZ Working Group; nearby project proponents; relevant Federal and State government departments and agencies; elected representatives; Dubbo Regional Council; Warrumbungle Shire Council and Mid-Western Regional Council.

Engagement activities were undertaken according to the Project's Community and Stakeholder Engagement plan (CSEP) which was prepared for the scoping phase of the Project and updated for the EIS phase of the Project. The CSEP will be updated again if the Project is approved to proceed.

In addition to the setup of a dedicated Project website, email and phone number, a range of engagement methods have been employed, including posting letters and information sheets; targeted in person and online Project briefings and meetings; community information sessions in Dunedoo and Gulgong; stalls at the annual Dunedoo Show; and participation by LSbp in EnergyCo's information sessions in Dunedoo and Wellington.

Stakeholder and community views of the Project have been varied and include both positive and negative views on a range of topics.

ES5 Assessment of impacts

A range of detailed technical assessments were prepared by technical specialists in accordance with relevant policies, legislation, guidelines, and Project SEARs (included in Appendix A). This EIS describes assessment methods used, the existing environment, the predicted impacts of the Project, and proposed management and mitigation measures that will be implemented by LSbp.

ES5.1 Biodiversity – terrestrial

A biodiversity development assessment report (BDAR) was prepared in accordance with the *Biodiversity assessment method* (BAM) (DPIE 2020).

The study area has a pastoral history and is therefore largely cleared of woody vegetation and is primarily comprised of paddocks at various stages of cropping and grazing. Six Plant Community Types (PCTs) have been identified within the study area, four of which align with threatened ecological communities (TECs) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) within at least one vegetation zone. Two PCT's identified

within the study area align with TECs listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) within at least one vegetation zone. These PCTs are shown in Table ES2.

Table ES2 Threatened Ecological Communities recorded in the impact footprint

Threatened Ecological Community	EPBC Act	BC Act	Associated PCTs and vegetation zones	Extent in impact footprint (ha)
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - **Woodland**	E[1]		PCT 81: zone 1	1.39
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions – Talbragar Valley - **Woodland**		E	PCT 81: zone 1 and zone 2	1.50
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland - **Woodland**	CE[2]		PCT 266 zone 7 PCT 599 zone 10	0.98
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions - **Woodland**		CE	PCT 266 zone 7 PCT 599 zone 10,11,12	1.20
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – **Derived Native Grassland**		CE	PCT 599 zone 12	0.90
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions - **Woodland**		E	PCT 201 zone 4	0.68

Notes
1. Endangered
2. Critically endangered

The Project will impact 19.42 ha of native vegetation (including the TEC's listed in Table ES2). With a total impact footprint of 1,489 ha, the area of native vegetation being cleared by the Project represents 1.3% of the impact footprint. This small portion of native vegetation in the impact footprint is consistent with the historic use of the site for agriculture. The Project requires a total of 480 ecosystem credits to compensate for impacts on native PCTs, scattered trees and ecosystem credit species. LSbp will offset the residual biodiversity impacts via conservation mechanisms established under the NSW Biodiversity Offset Scheme (BOS). LSbp's preferred approach to offsetting the residual impacts of the Project is through purchasing credits off the market. The second preference is through a payment to the Biodiversity Conservation Trust Fund.

ES5.2 Biodiversity – aquatic

An aquatic ecology impact assessment (AEIA) report was prepared in accordance with the SEARs and aquatic ecology related Project elements.

There are three creeks in the study area: Sandy Creek (5th order), and its tributaries; Broken Leg (3rd and 4th order); and Spring Creek (3rd order). Avoidance and minimisation strategies were considered, resulting in the inclusion of riparian protection zones in the Project design to reduce potential impacts to aquatic biodiversity values. The buffer zones will protect, enhance, and promote healthy riparian corridors whilst maximising development potential. Impacts to aquatic biodiversity will be further minimised through the formalisation of creek crossings to reduce overall disturbance within creeks. The crossings will be designed to avoid spawning habitat and allow fish passage.

Where all relevant guidelines and policies are followed and proposed mitigation measures implemented, residual negative impacts on aquatic ecosystems in the Spring Creek, Broken Leg Creek and Sandy Creek catchments are unlikely. Improvements to current aquatic ecosystem conditions across the study area are anticipated due to the formalisation of access roads and waterway crossings.Where riparian protection zones are introduced and managed, riparian vegetation condition along Sandy Creek is likely to improve and in turn, improve aquatic ecosystem health.

ES5.3 Aboriginal heritage

An Aboriginal cultural heritage assessment (ACHA) report was prepared for the Project to document the results of archaeological investigations undertaken, characterise cultural materials, provide management and mitigation measures and outcomes of consultation with the local Aboriginal community.

Consultation for the Project was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a). The consultation process identified 51 Aboriginal stakeholders, with nine groups registering an interest in the Project. Four registered Aboriginal party (RAP) site officers attended study area surveys and five RAPs attended test excavations.

The assessment involved archaeological field survey which identified 38 Aboriginal sites within the study area. Test excavations were undertaken, generally focused on the surrounds of Sandy Creek. A total of 118 stone artefacts were recovered from 97 test pits, primarily in two locales, both in the northern portion of the study area in pits closest to Sandy Creek. A total of 41 Aboriginal sites are within the study area, including previously discovered sites listed on the Aboriginal Heritage Information Management System (AHIMS), and a subsurface site discovered during test excavation.

Through ongoing Project refinement, 11 of the 41 sites have been avoided by the Project design and 30 could be adversely affected by the proposed development activities and will be salvaged prior to disturbance. Only sites of low and moderate significance will be impacted by the Project as no sites of high significance are located within the study area.

While the Project would result in some loss of cultural materials, the current and proposed impacts of the Project and associated material loss can be considered to have some benefits. In the first instance, investigations of the study area have significantly improved archaeological and scientific understanding of a previously poorly understood locale. Information on the past people and their activities within the Project area have now come to light, as well as an improved understanding of contemporary sites and values. Such information will only be added to and further refined through future Project development stages.

ES5.4 Historic heritage

A statement of heritage impact (SoHI) was completed to investigate and characterise potential historical objects, determine potential impacts to historical heritage by the Project, and provide management and mitigation measures.

The study area does not contain any items listed on the National Heritage List; Commonwealth Heritage List; State Heritage Register; NSW s170 Register; the Warrumbungle LEP; or the Dubbo LEP. However, eight items of local significance were identified within or near the study area during field survey. This includes Dapper Union Church, which is approximately 100 m from the southern boundary of the Project site and has been nominated for a listing of local significance (noting this item has not yet been added to Schedule 5 of the Warrumbungle LEP but will be considered in future updates).

Construction and operation of the Project will result in impacts to heritage values within the study area. There will be a loss of significance of the existing rural agricultural and pastoral landscape, which consists of cleared fields, paddocks, fences, and archaeological sites. The current aesthetic of the valley cut through by a creek, which is one that is recognisable from its early historical phase, will experience a low to moderate landscape character impact.

Overall, impacts to historical cultural values are not predicted to be significant, and where loss of value occurs, it can be recorded and mitigated using accepted methods.

ES5.5 Land, agriculture and rehabilitation

A land and rehabilitation assessment (LRA) report was prepared to assess potential impacts to land resources and provide management and mitigation measures.

The study area contains four different soil orders according to the Australian Soil Classification (ASC) scheme, which range from moderately low inherent soil fertility to moderately high. Soil surveys and assessment found the study area contains land with land and soil capability (LSC) classes 3, 4, 5, 6 and 7. The majority (56%) of the study area is LSC Class 3. Land suitable for cropping is typically identified as LSC Class 1-3. There is also a small area of mapped biophysical strategic agricultural land (BSAL) present in the central-southern section of the western portion of the study area, associated with the Mebul soil landscape. The findings of the soil investigation undertaken for the Project indicate those particular areas represent LSC Class 3.

Approximately 957 ha of LSC Class 3 land will be impacted by the Project. This represents 0.34% of LSC Class 3 land mapped across the CWO REZ.

The study area will be unavailable for intensive agriculture such as cropping or cattle grazing for the life of the Project; however, sheep grazing amongst the solar panels will be undertaken during the operation of the Project to offset much of the agricultural productivity losses.

If fully removed from agricultural land use, the study area would account for 0.27% and 0.19% of the agricultural land in the Dubbo and Warrumbungle LGAs being removed, respectively, which is insignificant.

Overall, potential Project impacts to soil resources and agricultural activity during construction and operation are considered minor and can be adequately managed through the implementation of mitigation measures.

ES5.6 Visual

A landscape and visual impact assessment (LVIA) was prepared to assess the potential visual impacts from the Project and provide management and mitigation measures.

Project infrastructure has been located to reduce impacts on the landscape and visual amenity by utilising the undulating landscape and existing vegetation as screening (where possible); locating infrastructure away from sensitive receptors; and strategic location of the BESS and switchyard to minimise visibility.

The LVIA determined most assessed viewpoints and receptors will have a low visual impact due to topography and/or existing vegetation, though some infrastructure could still be visible. Only one non-associated receptor (R09) was assessed as having a high visual impact as a result of the Project, and one non-associated receptor (R14) is predicted to experience a moderate visual impact. To mitigate these impacts, planting vegetation along the Project's boundary for screening is proposed for these two receptors, reducing the impact rating from a high to moderate at R09, and reducing the impact rating from a moderate to low at R14.

ES5.7 Noise and vibration

A noise and vibration impact assessment (NVIA) was prepared for the Project to determine background noise levels, background plus Project noise levels, and to provide management and mitigation measures.

Construction noise levels are predicted to exceed noise management levels at up to six receptor locations, largely in relation to site establishment works and piling, and typically only when works are being undertaken in close proximity to the receiver location. Appropriate management and mitigation measures will be implemented. No exceedance of the 'Highly Noise Affected' level is expected.

Operational noise will comply with the project trigger noise levels (PNTL) at all non-associated receivers.

Road traffic noise will increase with construction of the Project, although noise will remain in compliance with assessment criteria for arterial and sub-arterial roads under the *Road Noise Policy* (RNP) (DECCW 2011). However, due to low existing traffic counts on Spring Ridge Road, the predicted relative increase for the night period is greater than the 12 dB limit in the RNP. Despite this traffic being assessed against the night period criterion, most Project related traffic movements on Spring Ridge Road will likely occur during a shoulder period between 6 am and 7 am. This relative increase will be temporary during the construction period only, with minimal impact predicted during the operational phase of the Project.

During the detailed design phase of the Project, all plant and equipment will be reviewed to ensure noise levels predicted in the noise assessment can be achieved through selection of plant and equipment, site layout and orientation of equipment, utilisation and operational procedures consistent with the assumptions in the assessment, or a combination of the above measures.

ES5.8 Traffic and transport

During peak construction, approximately 350 personnel will be working on site, most of whom will lodge in the proposed temporary workforce accommodation facility. Without this accommodation facility, daily traffic during peak construction is expected to comprise approximately 60 light vehicles, 20 shuttle buses and 37 other heavy vehicle movements, with a total of 117 daily vehicles (234 daily vehicle movements). However, if an on-site accommodation facility is provided, the total daily traffic movements will be reduced by approximately 50% to 118 daily vehicle movements (i.e. it will significantly reduce the daily site light vehicle movements and shuttle bus traffic). The TIA was undertaken on the most conservative scenario; that is, without the accommodation facility in place.

Site access will be via Dapper Road, utilising an existing property access location. A separate access point north of the main access point will be used for the temporary workforce accommodation facility.

The key findings of the TIA include:

- the key intersections are expected to maintain a level of service (LOS) A and will be capable of handling additional traffic from the Project
- it is expected that Dapper Road, between Elong Elong Energy Hub and Project site access, will need to be widened to accommodate construction traffic
- it is understood that EnergyCo will upgrade the Spring Ridge Road/Dapper Road intersection to accommodate expected traffic volumes and allow for large trucks including over size over mass (OSOM) vehicles.

ES5.9 Water resources

A water resources assessment (WRA) was prepared for the Project which considered potential impacts to both surface water and groundwater.

The study area is located within the Macquarie-Bogan River Catchment and many watercourses traverse the Project site. Sandy Creek and tributaries of Sandy Creek intersect the development footprint, including Broken Leg Creek, Spring Creek, and minor unnamed watercourses. Several small farm dams are located within the development footprint, both on and adjacent to watercourses.

Project design includes buffer zones around riparian areas, which inherently locates infrastructure away from watercourses and their associated floodplains.

The estimated water demand for Project construction is approximately 70 megalitres (ML) per year, or 165 ML over the 28-month construction period. Most of this water will be required for dust suppression, with other minor uses including site amenities, fire protection and washing of construction equipment and plant.

Estimated water demand for the proposed temporary workforce accommodation facility is 180 litres (L) per person per day (L/p/day), seven days per week, peaking at 350 workers during the height of construction. Additionally, it is expected that 10 office workers will require 37 L/p/day six days per week. The total estimated water demand and wastewater load for the Project from the temporary workforce accommodation facility and offices is 53 ML over 28 months.

During construction, non-potable water required for the Project, not associated with the accommodation facility, will be sourced via multiple groundwater bores. A drawdown assessment determined the predicted worst-case scenario for water yield of 150 ML/year is more than capable of supporting the Project's non-potable water demands.

Potable water is expected to be trucked in from a licensed source under commercial agreement, with the primary purpose of water supply to the temporary workforce accommodation facility and construction offices.

Wastewater management for the temporary workforce accommodation facility and construction offices will be managed on-site via a septic system.

Overall, potential surface water and groundwater impacts during construction and operation are considered minor and can be adequately managed through the implementation of mitigation measures.

ES5.10 Hazard and risks

A preliminary hazard analysis (PHA) was prepared for the Project to identify possible hazards and risks which may be associated with the Project and to detail management measures to reduce these hazards and risks to acceptable levels when implemented.

A preliminary risk screening against the *Hazardous and Offensive Development Application Guidelines Applying SEPP 33* (DoP 2011d) was undertaken for the Project which found the Project does not qualify as offensive development or potentially hazardous industry under the State Environmental Planning Policy (Resilience and Hazards) 2021.

A total of 17 hazardous events were identified in the risk analysis, comprising 16 'very low' risk events and one 'medium' level risk event.

The PHA identified a series of controls and mitigation measures to combat Project risks and concludes that:

- for all identified events associated with the proposed operation of the Project, the resulting consequences are not expected to have significant off-site impacts
- the Project meets the Hazardous Industry Planning Advisory Papers (HIPAP) No. 4 qualitative risk criteria.

ES5.11 Bushfire

A bushfire strategic study (BSS) was completed for the Project to assess the risk of bushfire in accordance with *Planning for Bushfire Protection* (PBP) (NSW RFS 2019) and to provide protection measures which mitigate potential bushfire impacts to the Project.

The study area is mapped as Category 1 and Category 2 bushfire prone land with a 'moderate risk' of bushfire. However, no detailed fire history has been recorded in the study area and it is not documented as a fire path. Modelling shows the study area has a lower fire intensity risk as the managed and modified landscapes lack woody vegetation types and positioning on lower slopes and plains subsequently avoids steep slopes and fire runs.

The Project will be designed with a minimum 10 m wide asset protection zone (APZ) around Project infrastructure, and an 11 m wide APZ between the temporary workforce accommodation facility and grassland.

Emergency services capability will be supported by ensuring access and water volumes are maintained for any bushfire emergency response. As the locality does not have reticulated water supplies, the Project will be serviced by static water supply dedicated to community fire protection.

The Project will result in a reduction of unmanaged bushfire prone grassland vegetation and connectivity to the locality such that adjoining land uses would potentially benefit from an overall reduced bushfire risk and increased capacity for bushfire detection and emergency response.

The BSS determined that:

- the site is suitable for development in the context of bushfire risk
- new development on bushfire prone land can comply with the performance as detailed in PBP but recognises some environmental impacts must be considered and approved
- the planning and design will provide for adequate infrastructure associated with emergency evacuation and firefighting operations
- the planning and design will facilitate appropriate ongoing land management practices.

ES5.12 Social

A social impact assessment (SIA) was prepared for the Project in accordance with the *Social Impact Assessment Guideline* (DPIE 2021) and Project SEARs. Potential positive and negative social impacts of the Project were assessed based on the change to, or perceived change to the social, economic, and biophysical environment.

The Project is expected to have a positive impact on intergenerational equity (fairness between generations) due to a reduction in carbon emissions which will slow the impacts of human activity induced climate change. Additionally, the Project will employ many local people and contract local businesses to provide services which will benefit the local economy. Local employment is particularly important as it could provide employment for vulnerable groups including youth, women, and First Nations. To engage with potentially vulnerable groups regarding employment opportunities, the Project will promote several methods to share and gather interest in Project opportunities amongst the First Nations community.

The most common concern raised by stakeholders was cumulative impacts relating to housing and accommodation. A shortage of rental housing in the area was identified, and short-term accommodation could be impacted by the Project. Therefore, a temporary workforce accommodation facility is proposed to mitigate potential negative impacts on both temporary and long-term housing.

Project impacts are largely associated with impacts arising from the influx of the construction workforce, including those to labour and service competition, access to housing and services, and changes to the local community dynamic due to the presence of workers. The regional study area may experience more indirect impacts associated with use of infrastructure, supply chains, transportation of goods, materials and equipment, employment, accommodation demand, and movement of workers, along with cumulative impacts arising from other projects in the area.

An adaptive management approach is proposed, allowing LSbp to manage and respond to changing circumstances and new information over time through ongoing monitoring and periodic review of mitigation strategies allowing for modification if required. An adaptive approach will ensure the effective management of the social impacts identified in the SIA and the enhancement of social benefits experienced by the community.

ES5.13 Economic

The Project will result in significant economic benefits to the region. The Project will require approximately $1.19 billion in investment during the construction phase (of which approximately $179 million will be retained in the Dubbo Regional Council LGA, Warrumbungle Shire Council LGA, and Mid-Western Regional Council LGA). Approximately 245 direct and 390 indirect FTE positions will be supported in the national economy on average over the 28-month construction period, with a peak of 350 FTE direct jobs. Once operational, 10 direct and 30 indirect FTE jobs will be supported nationally by the Project. Of these national totals, the regional area (i.e. the Dubbo Regional, Warrumbungle Shire, and Mid-Western Regional LGAs) is expected to benefit from 130 FTE construction jobs and 16 FTE ongoing jobs (direct and indirect) associated with the Project.

ES5.14 Waste management

Consideration has been made as to how the Project's waste will be managed in accordance with the relevant government assessment requirements, guidelines and policies, and in consultation with Dubbo Regional Council and Warrumbungle Shire Council.

Waste streams generated during the construction stage will be typically associated with construction packaging and offcuts, cleared vegetation, and the presence of staff. The Project is likely to generate a manageable amount of waste which will be managed in accordance with the NSW *Protection of the Environment Operations Act 1997* and the NSW *Waste Avoidance and Resource Recovery Act 2001*, following the waste hierarchy.

While the Project will produce several waste streams during construction, operation and decommissioning, there will be no material impact in relation to the management of waste, assuming the proposed management measures are implemented.

ES5.15 Air quality

An air quality impact assessment (AQIA) was undertaken for the Project to assess the potential impacts of construction of the Project on air quality and identify management and mitigation measures.

The Project's main air quality impacts will be temporary as they will occur during construction. Potential construction air quality impacts will be caused by dust generation from surface disturbance works, exhaust emissions from diesel powered construction equipment and soil, mud and other organic debris carried out of the construction site by vehicles (track-out).

A construction environmental management plan (CEMP) will be developed and implemented for the Project and will include measures to manage dust. Recommended mitigation measures include logging dust complaints, carrying out regular inspections and recording results, ensuring that exposed areas are kept moist, and ensuring that vehicles entering and leaving sites with loads are covered to prevent escape of materials during transport.

The proposed mitigation measures are considered sufficient to ensure off-site impacts from the Project are effectively managed and mitigated.

ES5.16 Cumulative impacts

The Project will contribute to the overall development of the CWO REZ. Projects within the CWO REZ and projects within a radius of approximately 50 km from this Project were identified as future projects for consideration of potential cumulative impacts.

The cumulative impacts of biodiversity; Aboriginal heritage; land use, property and agriculture; visual; noise and vibration; traffic; social; and economic issues were identified and assessed.

There is potential for cumulative social benefits primarily due to the construction of multiple renewable energy projects and the influx of out of area workers which will increase the region's economic activity, provide job opportunities and result in road upgrades.

Potential negative cumulative impacts also largely relate to the influx of out of area workers which can reduce access to accommodation and housing, and place additional pressure on social services, transport and infrastructure. The Project's temporary accommodation facility will minimise the contribution of the Project to accommodation and housing related impacts.

Additionally, the visual landscape character of the area will change from predominantly rural agriculture to renewable energy infrastructure.

ES6 Justification and conclusion

The Project involves the development and operation of a large-scale solar PV generation facility along with battery storage and associated infrastructure. The Project is supported by Commonwealth, State, regional and local plans and policies, and will support meeting the Commonwealth and State governments' renewable energy generation targets and greenhouse gas emission reduction targets. Importantly, the Project will contribute to the continued growth of renewable energy generation and storage capacity in the CWO REZ.

The Project is justified economically due to the significant economic benefits and stimulus it will provide to the local region. The Project will generate an average of 245 direct and 390 indirect FTE positions over the 28-month construction period. During operations, it will generate 10 direct and 30 indirect FTE jobs and will provide ongoing economic benefits for both the local economy and broader region.

The site is suitable for the Project due to several factors, notably its location within the CWO REZ. Additionally, the study area is favourable for construction and operation of a solar and battery project due to the available solar resource, physical conditions (flat to gently undulating topography and predominantly cleared, agricultural land), suitable vehicular access from the Golden Highway and Sandy Creek Road, and relatively few neighbours living within close proximity. Further, the Project's proximity to the proposed Elong Elong Energy Hub means infrastructure will be within the immediate area with capacity to export Project generated electricity to the grid.

The residual environmental and social impacts identified in this EIS will be effectively managed through the mitigation and management measures described throughout, such that the Project will not result in significant impacts on the environment or the local community, while achieving the following key benefits:

- contribution to energy security and reliability in NSW and assisting in the change from fossil fuel energy generation to renewable energy generation
- reducing the impacts of climate change through reduced greenhouse gas emissions
- economic stimulus locally, regionally, and nationally through direct and flow-on benefits
- provision of employment and business opportunities during construction.

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Appendices

Tables

Figures

Abbreviations

Item	Definition
ABS	Australian Bureau of Statistics
AC	Alternating current
ACEREZ	Consortium of energy providers including ACCIONA, COBRA and Endeavour Energy, who are the preferred network generator for the Central-West Orana Renewable Energy Zone
ACHA	Aboriginal cultural heritage assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
ADGC	Australian Dangerous Goods Code
AEIA	Aquatic ecology impact assessment
AEMI	Australian Emergency Management Institute
AEMO	Australian Energy Market Operator
AEP	Annual exceedance probability
AER	Australian Energy Regulator
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ALERP	Australia's Long-Term Emissions Reduction Plan
ALUM	Australian land use and management
APZ	Asset protection zone
AQIA	Air quality impact assessment
ARRB	Australian Road Research Board
AS	Australian Standards
ASC	Australian Soil Classification
asl	Above sea level
AUL	Auxiliary lane left turn
AUR	Auxiliary lane right turn
AVTG	*NSW Assessing Vibration – a technical guideline 2006*
BAM	Biodiversity assessment method
BCD	Biodiversity Conservation Department
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity development assessment report
BESS	battery energy storage system
BFPL	Bushfire prone land
BoM	Bureau of Meteorology

Item	Definition
BOS	Biodiversity offset scheme
BSAL	Biophysical Strategic Agricultural Land
BSS	Bushfire strategic study
C	Construction
C	Celsius
CCTV	Closed circuit television
CE	Critically endangered
CEA	NSW Climate and Energy Action
CEEC	Critically endangered ecological community
CEMP	Construction environmental management plan
CHL	Commonwealth heritage list
CIC	Critical industry clusters
CIS	Community information session
CNVG	*Construction noise and vibration guideline 2016*
COAG	Council of Australian Governments
CPI	Consumer price inflation
CR	Closure and rehabilitation
CSBS	Community shared benefit strategy
CSEP	Community and Stakeholder Engagement Plan
CSG	Coal seam gas
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWCT	Central West Cycling Trail
CWO	Central-West Orana
dB	Decibels
DC	Direct current
DG	Dangerous goods
DECCW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEL	Delay
DNA	Deoxyribose nucleic acid
DNG	Derived native grassland
DO	Dissolved oxygen
DoP	Department of Planning
DOS	Degree of saturation
DP	Deposited plan

Item	Definition
DPE	Former NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	Former NSW Department of Planning, Infrastructure and the Environment
DSW	Dry sheep equivalent
E	Endangered
EC	Electrical conductivity
eDNA	Environmental deoxyribose nucleic acid
EEC	Endangered ecological community
EIA	Economic impact assessment
EIS	Environmental Impact Statement
EnergyCo	Energy Corporation of NSW
EMF	Electric and magnetic fields
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Federal *Environment Protection and Biodiversity Conservation Act 1999*
EPC	Engineering, procurement, and construction
EPI	Environmental planning instrument
EPL	Environment protection licence
ERP	Emergency response plan
FDI	Fire danger index
FMP	Fire management plan
FMP	Flood management plan
FM Act	*Fisheries Management Act 1991*
FRNSW	Fire and Rescue New South Wales
ft	Feet/foot
FTE	Full-time equivalent
GFDI	Grassland fire danger index
GDE	Groundwater dependant ecosystems
GLVIA	*Guidelines for Landscape and Visual Impact Assessment Third Edition 2013*
GML	General mass limit
GW	Gigawatt
H	Hazard
ha	Hectares
HAZID	Hazard identification
HHMP	Historical heritage management plan

Item	Definition
HIPAP	Hazardous industry planning advisory papers
Hon.	Honourable
HV	High voltage
IAP2	International Association of Public Participation
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	Interim construction noise guideline
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IIO	infrastructure investment objectives
IPA	Inner protection area
ISP	Integrated System Plan
KFH	Key fish habitat
kL	Kilolitre
kL/day	Kilolitre per day
Km	Kilometres
Km^2	Square kilometres
Km/h	Kilometres per hour
kV	kilovolt
L	Litre
L_{Amax}	The maximum root mean squared 'A-weighted' sound pressure level (or maximum noise level) received during a measuring interval.
L_{Aeq}	The energy average noise from a source. This is the equivalent continuous 'A-weighted' sound pressure level over a given period.
$L_{Aeq,\ 15\ min}$	This is the equivalent continuous 'A-weighted' sound pressure level over a 15-minute period. The $L_{Aeq,15min}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
LCZ	Landscape character zone
LEP	Local environmental plan
LGA	local government area
LoS	Level of service
L/p/day	Litres per person per day
LRA	Land and rehabilitation assessment
LRET	Large Scale Renewable Energy Target
LSbp	Lightsource bp Development Services Australia Pty Ltd
LSC	Land and soil capability
LSPS	Local Strategic Planning Statement
LVIA	Landscape and visual impact assessment

Item	Definition
m	Metre
m^3	Cubic metres
MDB	Murray-Darling Basin
ML	Megalitre
mm	Millimetre
MNES	Matters of National Environmental Significance
MP	Member of Parliament
MSA	Meat Standards Australia
m/s	Metres per second
MV	Medium voltage
MVA	Megavolt amperes
MW	Megawatt
MWAC	Megawatts alternating current
MWDC	Megawatts direct current
MWp	megawatt-peak
MWRC	Mid-Western Regional Council
NCG	*NSW Noise Criteria Guideline 2015*
NEM	National Electricity Market
NMG	*NSW Noise Mitigation Guideline 2015*
NML	Noise management level
NPfI	Noise policy for industry
NPWS	National Parks and Wildlife Service
NRM	Natural resource management
NSW	New South Wales
NVIA	Noise and vibration impact assessment
O	Operation
OECC	Office of Energy and Climate Chage
OEH	Office of Environment and Heritage
OSOM	Over size, over mass
PANL	Project amenity noise level
PBP	Planning for bushfire protection
PC	Pre-construction
PCT	Plant community type
PCU	Power conditioning unit

Item	Definition
pH	Potential hydrogen – a figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral
PHA	Preliminary hazard analysis
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PM_{10}	Particulate matter with a diameter or 10 micrometres or less
PNTL	Project noise trigger level
POEO	*Protection of the Environment Operations Act 1997*
PV	Photovoltaic (solar panels)
Q	Quarter
RAP	Registered Aboriginal party
RBL	Rating background levels
REZ	Renewable Energy Zone
RFS	New South Wales Rural Fire Service
RNP	Road noise policy
SAII	Serious and irreversible impacts
SAT	Single axis tracker
SCADA	Supervisory control and data acquisition
SEARs	Secretary's environmental assessment requirements
SEP	Stakeholder engagement plan
SEPP	State Environmental Planning Policy
SIA	Social impact assessment
SISD	Safe intersection sight distance
SMU	Soil mapping unit
SoHI	Statement of heritage impact
SPSG	Southern Purple-spotted Gudgeon
SSAL	State Significant Agricultural Land
SSD	State significant development
SWMP	Soil and water management plan
TEC	Threatened ecological community
TfNSW	Transport for New South Wales
TIA	Traffic impact assessment
T-Link	Transmission Link
TSS	Total suspended solids
WAL	Water access licence

Item	Definition
WM	Water management
WRA	Water resources assessment
WSAS	Construction workforce and accommodation strategy

1 Introduction

1.1 Overview

Lightsource Development Services Australia Pty Ltd (LSbp) propose to develop Sandy Creek Solar Farm (the Project), which is a large-scale solar photovoltaic (PV) electricity generation facility and associated battery energy storage system (BESS).

The Project comprises the following key components:

- construction and operation of a large-scale solar farm with a generation capacity of approximately 700 megawatt (MW) alternating current (AC) and approximately 840 MW direct current (DC)
- construction and operation of a BESS with capacity to store approximately 700 MW/2800 megawatt hours (MWh) (both AC and DC options are being considered as part of this Project).

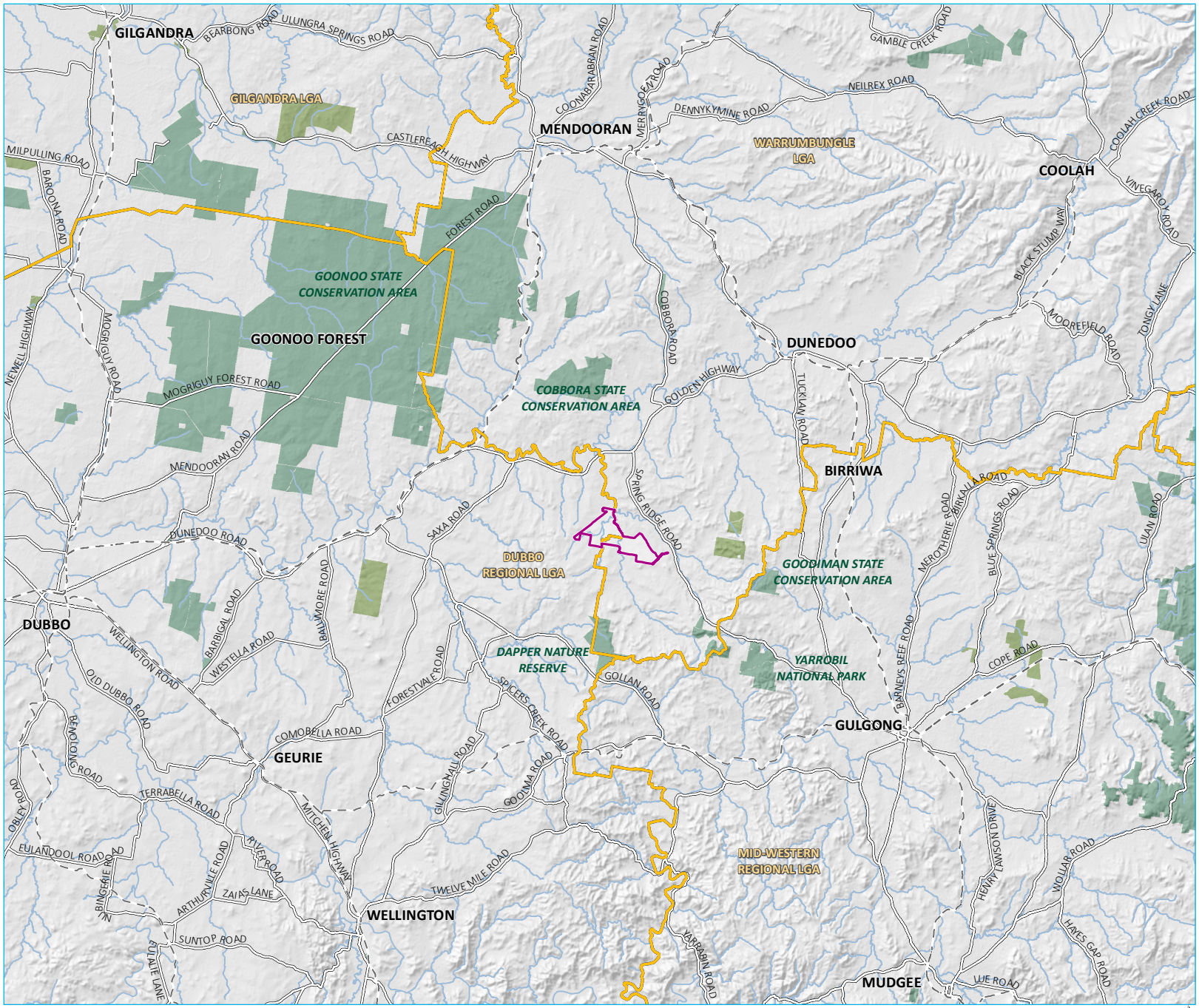
The electricity generated from the Project will be sold to one or more registered energy retailing organisations, large energy users (governmental or private) or to the National Electricity Market (NEM) that is operated by the Australian Energy Market Operator (AEMO).

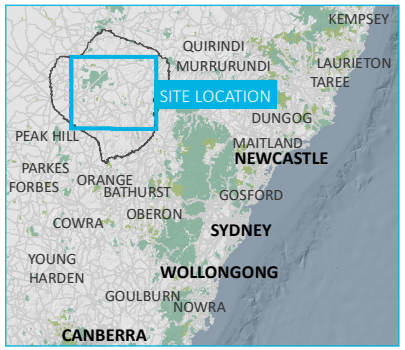
The Project will power the equivalent of approximately 253,000 Australian households.

The Project is approximately 25 kilometres (km) south-west of the township of Dunedoo, in the Central West of New South Wales (NSW), as shown in Figure 1.1. The Project is within the local government areas (LGAs) of Warrumbungle Shire Council and Dubbo Regional Council, and is within the NSW Government-declared Central West Orana Renewable Energy Zone (CWO REZ).

The NSW Government has set a target of 4.5 gigawatts (GW) of new transmission capacity to be developed in the region by 2026 (EnergyCo 2023). To support the development of the CWO REZ, the Energy Corporation of NSW (EnergyCo) is planning several new 500 and/or 330 kilovolt (kV) transmission lines and related connection infrastructure ('Energy Hubs') as well as augmentation of the existing 330 kV network. The Project will complement the proposed renewable energy generation assets within the CWO REZ and during operation will contribute to the overall storage capacity and reliability of the NEM.

The Project will play an important part in LSbp's network of solar projects in Australia and aligns closely with its mission statement on sustainability (LSbp 2022). The Project's objectives align with the Commonwealth and NSW Government's objectives for energy security and reliability and emissions reductions, thereby contributing to the continued growth of renewable energy generation and storage capacity in NSW.





KEY

- Study area

Existing environment

- Rail line
- Major road
- Named watercourse
- Local government area
- NPWS reserve
- State forest

INSET KEY

- Major road
- Central West Orana Renewable Energy Zone
- NPWS reserve
- State forest

Project location

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 1.1

EMM
creating opportunities

Source: EMM (2023); Lightsource bp (2023); ABS (2021); DFSI (2020); GA (2011)

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1.2 The applicant

The applicant is Lightsource Development Services Australia Pty Ltd (LSbp), a subsidiary of Lightsource bp. Founded as a small UK start-up in 2010 named Lightsource Renewable Energy, Lightsource became the largest solar energy company in the UK before partnering with global energy company bp in 2017. The 50:50 partnership rebranded as Lightsource bp, accelerating the deployment of solar power across the globe.

LSbp is a global leader in the development, management, and operation of solar projects and has successfully progressed projects from early-stage development through to operation. LSbp is taking action to address the consequences of climate change through their sustainability strategy which is aligned to the United Nations (UN) Sustainable Development Goals, Goal 7: Affordable and Clean Energy and Goal 13: Climate Actions goals. LSbp's core contribution to global sustainability is in decarbonising the world's energy landscape through responsibly developing solar projects.

The applicant's details are outlined in Table 1.1.

Table 1.1 Applicant details

Name	Lightsource Development Services Australia Pty Ltd
Postal address	Level 29, 420 George Street, NSW 2000
Registered Address	CBW 181 William Street, MELBOURNE VIC 3000
Contact	Stephen Archer
ABN	26 623 301 799

1.3 Project objectives

The Project will contribute to the objectives of several stakeholders including State and Federal governments, and AEMO Services as outlined in the draft infrastructure investments objectives (AEMO 2023). This includes:

1. Minimising the cost of electricity services to the NSW customer
2. Meeting reliability standards
3. Meeting energy security targets
4. Managing the transition away from fossil-fuel based generation in a coordinated and timely manner.

The Project will also contribute to the NSW Government's emissions reduction target of 70% reduction on 2005 levels by 2035, as set out in the *Climate Change (Net Zero Future) Act 2023*, and the Federal Government's 43% reduction by 2030 target (DCCEEW 2023).

Project specific objectives are shown in Table 1.2.

Table 1.2 Objectives of Sandy Creek Solar Farm

Objective	How will the proposal achieve this objective?
Deliver affordable and sustainable renewable energy to businesses and communities within NSW	The Project site is located within the CWO REZ, an area with favourable solar energy producing conditions. The Project is adjacent to Elong Elong Energy Hub, allowing the Project to assist in the delivery of cost effective, clean, renewable energy, which is affordable to customers.

Objective	How will the proposal achieve this objective?
Assist in AEMO's Infrastructure Investment Objective (IIO) of completing construction of generation projects capable of producing a combined 33,600 GWh of electricity per year by the end of 2029.	The Project is anticipated to be operational by 2028 and will produce 700 MWAC or 840 MWDC of electricity, which will contribute to AEMO's IIO electricity generation objective.
Support the NSW Government's plan to replace retiring coal-fired power plants with renewable energy and provide new electricity storage as per the Electricity Infrastructure Roadmap.	The Project will produce 700 MWAC or 840 MWDC of renewable energy, with storage capacity of up to 700 MW (4 hours).
Contribute to NSW Government's emissions reduction target of 70% by 2030 and the Federal Government's reduction target of 43% by 2030 and net zero emissions by 2050.	The Project will provide enough clean, renewable energy to power approximately 250,000 homes, saving 1,400,000 metric tonnes of carbon dioxide (CO_2) per year compared to coal fired power plants (LSbp).
Support the local and regional economy by preferencing local workers and business in the development, construction, and operation of the Project.	The Project will create approximately 350 FTE positions during peak construction and up to 10 FTE positions during operation. The Project will use several methods to engage with potentially vulnerable groups and the First Nations Community regarding employment opportunities.
Facilitate community engagement and participation in the design, development, and operation of the Project	Several community engagement activities were undertaken to consult the community and capture feedback to assist in developing the most appropriate Project. The feedback received to date is included within this EIS.
Minimise environmental and heritage impacts to the Project site through adaptive design.	The development footprint was considered in relation to the site's key environmental constraints including: • biodiversity • Aboriginal heritage • waterways • riparian corridors.

1.4 Strategy to avoid, mitigate and offset impacts

Refinement of the Project has been iterative during preparation of this EIS, with the outcomes of technical field survey efforts and respective assessments informing the design process. This is particularly evident through the refinement of the development footprint to exclude key terrestrial and aquatic ecology constraints. Anticipated environmental and social impacts of the Project were key considerations throughout project refinement, and consultation with local stakeholders provided crucial input during the process. Avoidance and minimisation of impacts has been at the centre of project design development, and a summary of these project refinements is provided in Table 1.3 and discussed further in Section 2.6.

Table 1.3 Project refinement

Refinement	Description
Reduction in the number of decentralised BESS units for the final design	Through an iterative noise modelling process, where key design components were modelled for noise disturbance, the number of decentralised BESS units was reduced from 144 to 128 to lower noise levels near sensitive receivers.

Refinement	Description
Avoidance of key biodiversity constraints	29.49 ha of threatened ecological community (TEC) woodland vegetation in the study area have been avoided by the Project design, which is approximately 89.29% of all woodland areas identified within the study area. Native woodland identified as serious and irreversible impact (SAII) entities in the study area include Box Gum Woodland and Fuzzy Box Woodland. It also includes some areas of Box Gum Woodland derived native grassland (DNG). 39.49 ha of SAII woodland and DNG vegetation has been identified across the study area. 2.94 ha are proposed to be impacted. The development footprint has avoided 36.55 ha of these SAII areas, which is approximately 92.56% of all the SAII areas identified within the study area. Native woodland patches containing Grey Box Woodland, which is a TEC though not an SAII, will also primarily be avoided. 10.52 ha of Grey Box Woodland has been identified within the study area. 1.5 ha of this woodland will be impacted. The larger woodland patches containing these communities have primarily been avoided, with generally only scattered patches of less than three trees within 50 m of each other impacted by the design, plus minor impacts to the edges of EPBC listed Grey Box Woodland for the security fence along Tallawonga Road, and the road upgrades along Dapper Road. Therefore, 9.02 ha of these Grey Box Woodland areas have been avoided, which is approximately 86.75% of all the Grey Box Woodland areas identified within the study area. By avoiding trees and tree patches where possible, the Project design avoids 262 of the 291 hollow bearing trees. This is approximately 90% of the hollow bearing trees recorded in the study area. The Project design avoids all 12 records of Pine Donkey Orchid in the impact footprint. It also provides additional 10 m avoidance buffers outside of the Pine Donkey Orchid habitat to ensure there are no indirect impacts.
Incorporate riparian protection zones along key watercourses within the study area	The avoidance of ephemeral watercourses involved moving PV panels out of areas away from certain sections of the watercourses and riparian protection zones that were originally considered for development. Waterway crossings of Sandy Creek have been designed to avoid spawning habitat of threatened species and all for fish passage. Additionally, the Project design includes riparian protection zones and management of riparian zones that will improve overall riparian vegetation cover.
Location of the accommodation facility within the development footprint	The Project design considered the impact to the area's accommodation and flow-on effects that would arise if workers utilised commercial accommodation during Project construction. To avoid potential negative impacts to the local community (i.e. increases on the local road network, and reduced tourism due to exhausted local accommodation facilities), the Project developed an on-site accommodation strategy which utilises an area that will be used in the operational phase (as an easement corridor) but is available during construction.

1.5 Purpose of this document

This EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of LSbp to support an application for development consent under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project is classified as State significant development (SSD) under the EP&A Act as it is within the meaning of 'electricity generating works' (section 20) under Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021.

This EIS addresses the specific requirements provided in the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DPE) (now the Department of Planning, Housing and Infrastructure (DPHI)) on 20 May 2022 (SSD-41287735). A referral was also submitted under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Commonwealth Department of Climate Change, Energy, the Environment and Water determined the Project will not have a significant impact on matters of national environmental significance (MNES) and was deemed not a controlled action on 8 March 2024.

The EIS has been prepared in general accordance with the following guidelines:

- *State Significant Development Guidelines – Preparing an Environmental Impact Statement* (DPE 2022a)
- *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE 2022b)
- *Undertaking Engagement Guidelines for State Significant Projects* (DPE 2022c)
- *Social Impact Assessment Guideline for State Significant Projects* (DPE 2022d)
- *Large-Scale Solar Energy Guideline* (DPE 2022e).

The primary objective of this EIS is to inform the public, government authorities and other stakeholders about the Project and the measures that will be implemented to mitigate, manage and/or monitor potential impacts, together with a description of the residual social, economic and environmental impacts.

1.6 Structure of this report

This EIS consists of a main report and a series of appendices (Appendix A–T). The main report describes the Project in the context of the existing environment, the planning framework, key environmental issues, potential impacts, proposed mitigation measures, and residual impacts. The main report is informed by the technical assessments contained in Appendix G to Appendix T and provides a summary of each technical assessment.

Project SEARs are attached in Appendix A, with a reference to where each requirement has been addressed within this EIS. The structure of this EIS is summarised in Table 1.4.

Table 1.4 EIS structure

Chapter	Content
Preliminary	EIS certification and executive summary.
Abbreviations	Contains abbreviations used in this EIS.
Chapter 1: Introduction	Introduces the Project and the applicant; provides a brief discussion on the background of the Project; discusses the objectives and benefits of the Project; and outlines the document structure.
Chapter 2: Strategic context	Describes the strategic justification of the Project; provides a brief overview on the regional context of the Project and site suitability; and discusses the feasible alternatives to the Project.
Chapter 3: Project description	Describes the Project including construction and operational parameters, as well as the Project location.
Chapter 4: Statutory context	Identifies the relevant State and Commonwealth environment and planning legislation and regulations, the applicable local and regional environmental planning instruments and discusses other approvals and permits that may be applicable to the Project.
Chapter 5: Engagement	Describes the engagement strategies for the Project and details how consultation has been addressed in the Project's design and assessment.
Chapter 6: Assessment of Impacts	Assesses the key environmental issues, identifying the potential impact of the Project. Chapter 6 also includes an assessment of cumulative impacts of the Project combined with other renewable energy projects in the area. A description of the management measures proposed to mitigate and reduce potential adverse environmental risk of the Project and/or offset any unavoidable impacts are provided.
Chapter 7: Justification	Summarises the evolution of the Project design; strategic justification; statutory compliance; alignment with community views; the Project impacts; cumulative impacts; how compliance will be ensured; key uncertainties, proposed mitigation measures; and conclusions.

Chapter	Content
References	Contains references used in this EIS.
Appendices:	
Appendix A	SEARs compliance table
Appendix B	Copies of landowner consent
Appendix C	Detailed maps and plans
Appendix D	Statutory compliance table
Appendix E	Stakeholder engagement activities
Appendix F	Mitigation measures table
Appendix G	Biodiversity development assessment report
Appendix H	Aquatic ecology impact assessment
Appendix I	Aboriginal cultural heritage assessment
Appendix J	Statement of heritage impact
Appendix K	Land and rehabilitation assessment
Appendix L	Visual impact assessment
Appendix M	Noise and vibration impact assessment
Appendix N	Traffic impact assessment
Appendix O	Water assessment
Appendix P	Preliminary hazard assessment
Appendix Q	Bushfire strategic study
Appendix R	Social impact assessment
Appendix S	Economic impact assessment
Appendix T	Air quality impact assessment

1.7 EIS terminology

The key terminology applied throughout the EIS is outlined in Table 1.5.

Table 1.5 EIS terminology

Project area term	Definition
Study area	The area of assessment (approximately 1,713 ha) for baseline surveys and studies conducted to inform the EIS. The study area comprises the maximum area considered for the Project based on the extent of land where LSbp holds landholder agreements and the area of potential impact for road upgrades. It is understood that different technical studies may have different study areas. The study areas are defined in each individual technical report (see below).

Project area term	Definition
Technical study specific study area	Technical assessment specific study areas are to be defined in the technical report if they differ from the Project level study area. E.g. 'EIA study area' or 'SIA study area' for the economic and social impact assessments respectively.
Impact footprint	The maximum extent of ground disturbing work (total area is 1,489 ha), associated with the construction and operation of the Project, including: • the development footprint (see definition below) • the road upgrade corridor (see definition below)
Development footprint	The area to be developed within land where LSbp holds landholder agreements. All operational components of the Project (such as the PV panels, BESS, substation, switchroom, internal access roads, etc.) will be within the development footprint. It also contains the construction accommodation facility. The development footprint includes the area of direct impact for construction of the public road crossing of Sandy Creek Road (see definition below). The development footprint is the outcome of the iterative process outlined in this EIS. The development footprint comprises an area of approximately 1,486 ha.
Road upgrade corridor	The area of direct impact for public road upgrade works along the portion of Dapper Road from EnergyCo's Elong Elong Energy Hub access point to the Project's main access point (approximately 3 ha).
Restricted development area	Land within the development footprint where key environmental constraints were identified and disturbance will be avoided wherever possible (approximately 200 ha), except for that required for the provision of fencing, access, and electrical reticulation (e.g. private internal access roads and creek crossings).
Proposed access point to the Project	The development footprint will be accessed by all construction and operation traffic via Dapper Road, utilising an existing property access location. There will be a separate access point for the construction accommodation facility north of the main access point along Dapper Road. There will also be two emergency egress points: • Tallawonga Road (north-west corner of the Project area), utilising an existing driveway • mid-way along Tallawonga Road, utilising an existing property access location The intersection of the development footprint at Sandy Creek Road can also be utilised as an additional emergency egress location if required.
Public road crossing	An intersection is proposed between internal tracks and Sandy Creek Road to allow construction and operational traffic and cable crossings between the eastern and western portions of the development footprint. The intersection will be used only for crossing traffic east to west or vice versa within the development footprint. Site security will be maintained to prevent public access to the development footprint from Sandy Creek Road.
Project site	General term to describe the site if the context requires. Project site is synonymous with study area.

2 Strategic context

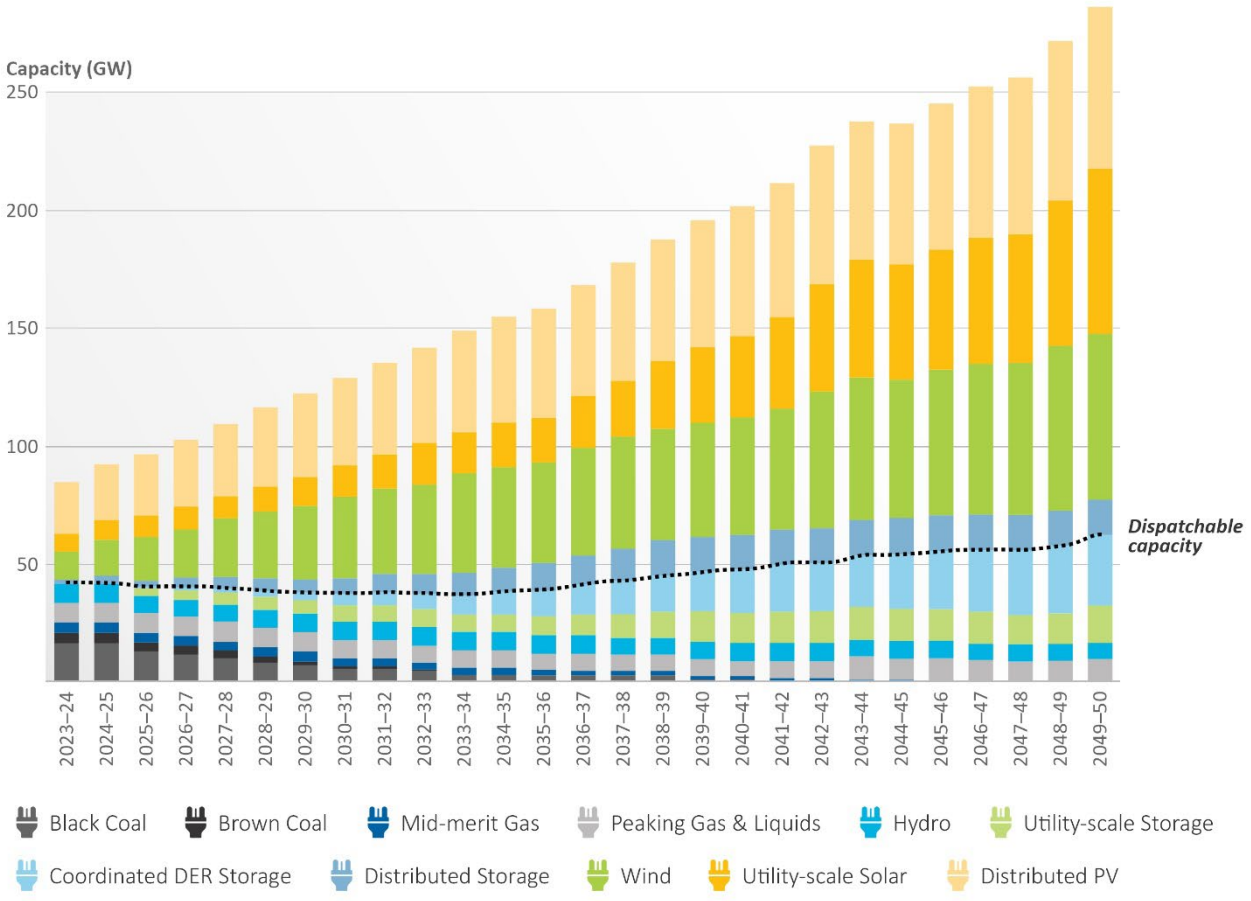
2.1 Introduction

The strategic context for the Project takes into consideration State and local strategic planning frameworks, State and Commonwealth energy policy context and land-uses in the region, including nearby renewable energy developments.

2.2 Project need

NEM is a wholesale spot market for selling electricity and a transmission grid for transporting electricity to customers. The NEM is undergoing an unprecedented transformation in the way electricity is generated and consumed in eastern and south-eastern Australia. As Australia moves towards a net zero emissions future, coal fired and other fossil fuels generation is being replaced by renewables, energy storage and other forms of firming capacity. Additionally, increased electrification of transport, industry, office, and homes, replacing gas, petrol and other fuels, will require the NEM to double its current capacity by 2050 (AEMO 2022a).

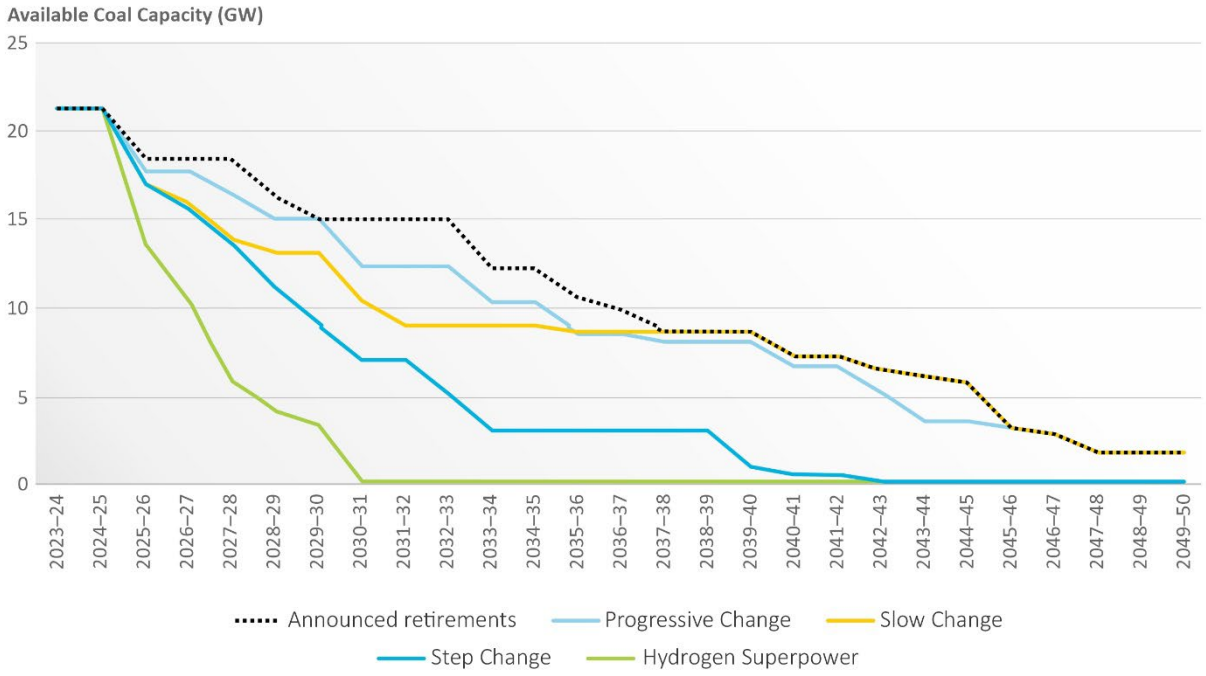
The NEM experienced record levels of renewable energy generation in 2022, with wind and solar accounting for approximately 24.8% of total electricity generation (AER 2023). This growth is expected to increase into the future, with 26–50 GW of large-scale wind and solar capacity forecast to come online over the next 20 years (AER 2021). AEMO predicted transformation of the NEM's energy mix through a Step Change scenario to 2050 (AEMO 2022b is shown in Figure 2.1).



Source: 2022 Integrated System Plan (AEMO 2022b)

Figure 2.1 Forecast NEM capacity to 2050, Step change scenario

AEMO estimates NSW will see its coal-fired electricity generation reduced to zero by 2040, with Australia's last coal-fired power stations in Queensland going offline in 2043. The expected decrease in coal-fired generation as forecast by AEMO under a variety of scenarios, the most likely of which, the 'step change' scenario, is shown in Figure 2.2. Liddel coal-fired power station closed in April 2023, and Eraring power station is set to close in 2027 (AFR 2023), six years ahead of that originally forecast (NSW Government 2022b). Vales Point power station will close in 2028 and Bayswater and Mt Piper power stations in the early to mid-2030s.



Source: AEMO 2022

Figure 2.2 AEMO's forecasts for national coal retirements under various scenarios

The NSW Government has an objective to achieve net zero greenhouse gas emissions by 2050. It also has an objective to deliver a 70% reduction in greenhouse gas emissions by 2035 compared to 2005 levels, as legislated by the Climate Change (Net Zero Future) Act 2023.

In light of this, if the NSW Government is to maintain a reliable energy supply to its residential customers and industry, as well as meet its ambitious climate change, it is critical that large renewable projects, such as this project, can proceed in a timely fashion.

Given that the renewable energy generation needs to be developed prior to coal plant retirement, there is an urgent need for this development in the coming two to five years. The recent combination of the unavailability of coal generators due to outages and lack of coal supply, the war in Ukraine pushing up gas prices, and seasonal cold weather have caused a major uplift in forward electricity prices in NSW (along with other NEM states, such as Queensland). Forward prices have more than doubled in response and raised the potential for a supply squeeze and even load shedding. This highlights the need for investment in large scale renewables capacity and storage in the NEM in the short term, such as this Project, to help bring these prices down.

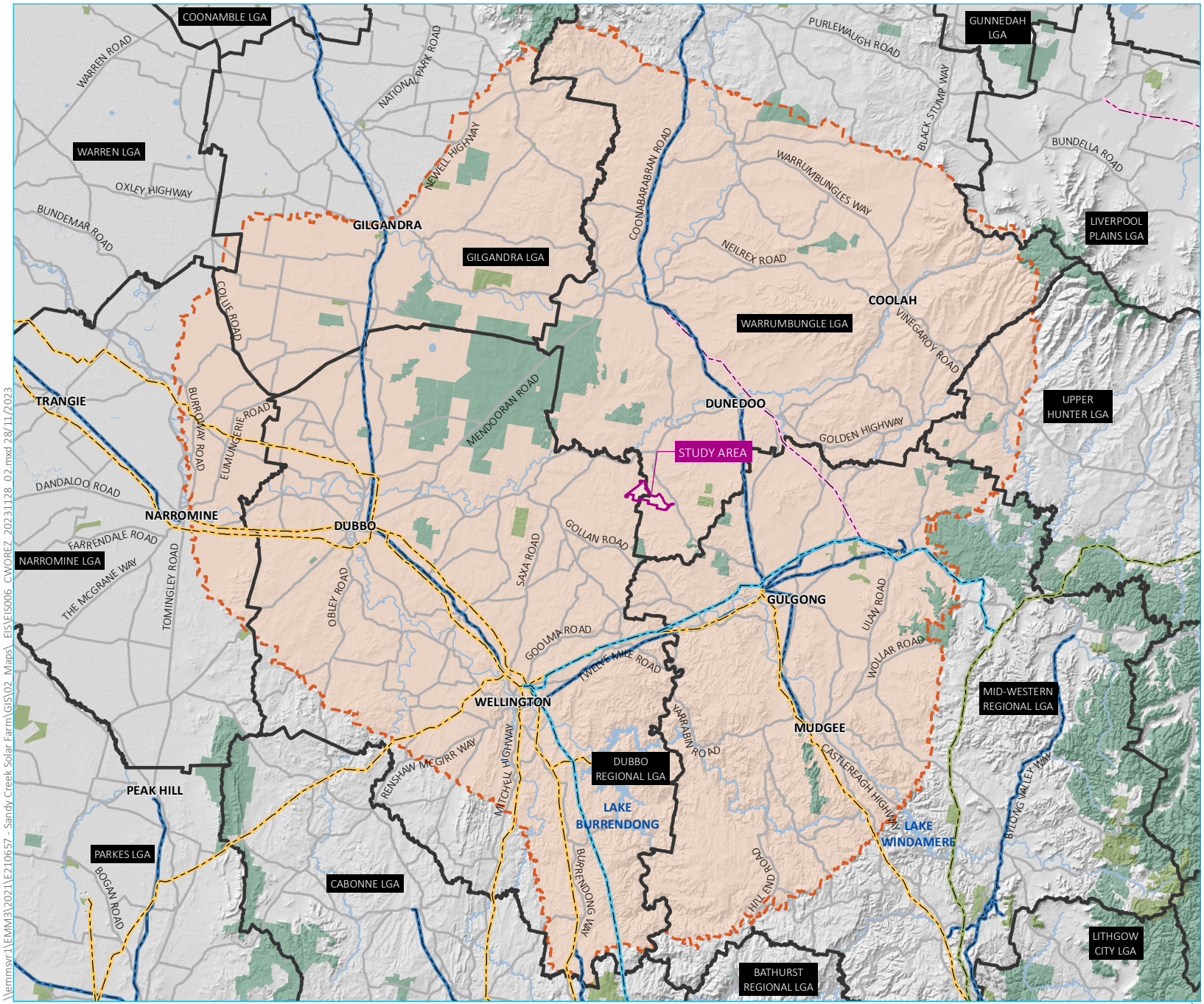
A range of studies and reviews have confirmed the need for sustainable renewable energy generation and storage projects. In particular, the *Independent Review into the Future Security of the National Electricity Market 2017* (Finke et al. 2017), commissioned by the Commonwealth Government (and agreed by the Council of Australian Governments (COAG) Energy Council), identifies solar and batteries as playing a critical role to support grid reliability when deployed at scale. It further recognises these energy sources as a critical enabler of greenhouse gas emissions reductions.

The NSW *Electricity Infrastructure Roadmap* (CEA 2020), NSW *Electricity Strategy* (CEA 2019) and *Energy Infrastructure Investment Act* 2020 provide the foundations for the establishment of REZs in NSW. The 2022 Integrated Systems Plan (ISP) (AEMO 2022) supports the objectives of these policies and legislation and provides guidance for both the public and private sector regarding investments needed to improve the security, affordability, and reliability of the NEM.

In November 2021 the CWO REZ became the first REZ to be formally declared. Primarily situated in the Dubbo Regional, Mid-Western Regional, Gilgandra, and Warrumbungle LGAs (see Figure 2.3), the REZ is expected to provide up to approximately 6 GW of network capacity by 2038 with 4.5 GW anticipated by the late 2020s (EnergyCo 2023).

Energy generated within the REZ will be directed to the NEM via the planned CWO REZ Transmission Project (SSI-48323210), which will connect the regions of Sydney, Newcastle, and the Hunter Valley, potentially via the Queensland-NSW Interconnector which may direct 1 GW of power north from the REZ to Queensland (EnergyCo 2023a).

The Project will deliver 700 MW of much needed renewable energy supply into NSW, and due to its location within the CWO REZ, suitable infrastructure is being planned in the distribution of renewable energy generation to the NEM.



KEY

- Study area
- Central West Orana renewable energy zone

Electricity network (voltage)

- 33 kV
- 66 kV
- 132 kV
- 330 kV
- 500 kV

Existing environment

- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Local government area

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Source: EMM (2023); ABS (2021); DFSI (2020, 2021); GA (2011)

The CWO REZ

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 2.3

EMM
creating opportunities

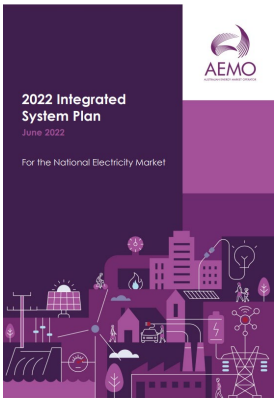
2.3 Relevant plans and policies

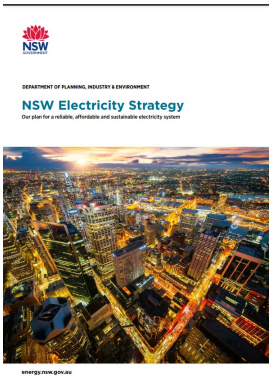
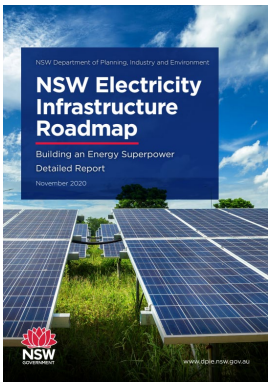
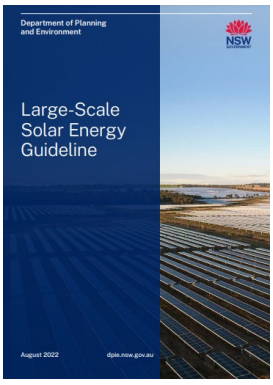
A variety of objectives have been specified by both the NSW and the Commonwealth Government relating to emissions reductions. In particular, the NSW Government has committed to reducing carbon emissions by 70% based on 2005 levels by 2035 and both the State and Federal governments have pledged to achieve net zero emissions by 2050.

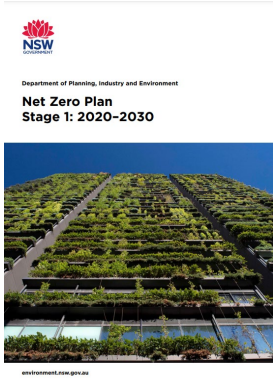
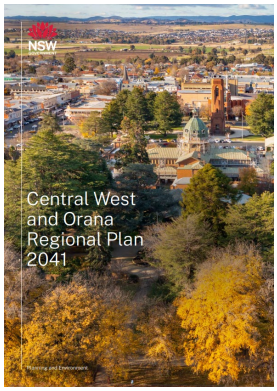
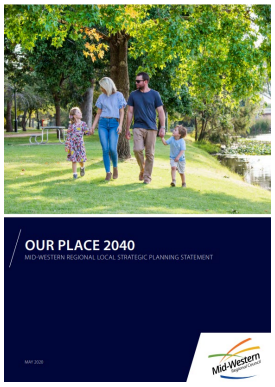
Further commitments and objectives are laid out in detail in a variety of legislation and key strategic planning frameworks. The Project aligns with many of these objectives, as it will contribute to the continued growth of renewable energy generation and storage capacity in the CWO REZ. Key objectives from relevant plans and polices that the Project will contribute towards are listed in Table 2.1.

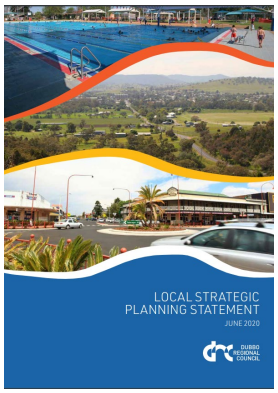
Table 2.1 Alignment with key strategic planning frameworks

Plan, policy or strategy	Description	Alignment with strategic framework
International context		
The Paris Agreement	*The Paris Agreement* is a legally binding international treaty on climate change adopted by 196 parties in 2015. As a signatory to the agreement, the Australian Government has committed to reduce greenhouse gas emissions by 26%–28% on 2005 levels by 2030.	The Project will contribute to meeting Australia's commitments under *the Paris Agreement* by providing an alternative energy source to energy sourced from fossil fuels, thereby reducing the NEM's annual greenhouse gas emissions.
National context		
Australia's Long-Term Emissions Reduction Plan 	Australia's Long-Term Emissions Reduction Plan (Commonwealth Government 2021) (ALERP) was released by the Commonwealth Government in October 2021. ALERP provides a pathway for Australia to meet its obligations under the Paris Agreement's global goals, including limiting warming to "well below 2°C", and reaching global net zero emissions. ALERP focusses on the implementation of lower cost low emissions technologies, accelerating their deployment at scale, and positioning the economy to take advantage of new and traditional markets. It supports existing industries and workers to realise these benefits.	The Project will directly contribute to the implementation of proven emissions reduction technology that will stimulate the local economy, create jobs, and incrementally reduce the price of electricity.

Plan, policy or strategy	Description	Alignment with strategic framework
Large-scale Renewable Energy Target	The Australian Government Clean Energy Regulator administers the *Large-scale Renewable Energy Target* which incentivises investment in renewable energy power such as wind and solar farms. The *Large-scale Renewable Energy Target* of 33,000 gigawatt hours of additional renewable electricity generation was met at the end of January 2021 (Clean Energy Regulator 2021). The annual target will remain at 33,000 gigawatt hours until the scheme ends in 2030. Notwithstanding, the Clean Energy Regulator expects that large-scale renewable generation could reach up to 40,000 gigawatt hours in 2021.	The solar farm component of the Project will have an indicative capacity of around 700 MW and include a BESS of up to 700 MW for a - hour duration, which will make significant contributions towards meeting the Large-scale Renewable Energy Target in future years. In addition, the BESS will be able to store renewable energy to increase market efficiency and enable greater penetration of renewables in the electricity grid.
Integrated System Plan 2022 	The *Integrated Systems Plan 2022* (ISP 2022) prepared by the AEMO is a: "Comprehensive roadmap for the National Electricity Market. It draws on extensive stakeholder engagement and power system expertise to develop a roadmap that optimises consumer benefits through a transition period of great complexity and uncertainty." REZ's are identified in the ISP 2022 as areas that "co-ordinate network and renewable investment. These zones have the potential to foster a more holistic approach to regional employment, economic opportunity and community participation" AEMO 2022).	The CWO REZ is identified within the 2022 ISP. The CWO REZ transmission link, to which the Project will connect, is identified as an "actionable ISP project", critical to address cost, security, and reliability issues.
Net Zero 2050 	In October 2021, The Australian government released its *Long-Term Emissions Reduction Plan* to achieve net zero emissions by 2050. The Plan aims at reaching a net zero economy through a technology-based approach, whilst protecting relevant industries, regions, and jobs. It is part of an overarching strategy for emission reduction, based on a technology-led approach which includes a Technology Investment Roadmap and its Low Emissions Technology Statements.	The Project will directly contribute to the implementation of proven emissions reduction technology that will stimulate the local economy, create jobs, and incrementally reduce the price of electricity. The CWO REZ, where the Project is located, is also identified in the plan as critical in replacing retiring coal fired generators in NSW.

Plan, policy or strategy	Description	Alignment with strategic framework
State context		
NSW Electricity Strategy (2019) 	The NSW Electricity Strategy (DPIE 2019a) is the NSW Government's plan for a reliable, affordable, and sustainable electricity future that supports a growing economy and sets out an approach to respond to emerging challenges. The Strategy recognises that where variable generators are unable to satisfy demand, other technologies that can provide electricity on demand (such as storage) are required. Principle 1 of the NSW Electricity Strategy acknowledges renewables, firmed by dispatchable technologies, are the lowest cost form of reliable electricity generation and calls upon investment into these technologies to reduce electricity prices and ensure network reliability.	The Project contributes to Principle 1 of the NSW Electricity Strategy by investing and growing in proven emission reduction technologies that grow the economy, create new jobs or reduce the cost of living.
NSW Electricity Infrastructure Investment Roadmap (DPIE 2020) 	The NSW Electricity Infrastructure Roadmap and its implementing legislation the Electricity Infrastructure Investment Act 2020 (NSW), builds on the framework set out by the NSW Electricity Strategy (DPIE 2019a) and sets out a rationale for the policies and programs that are specifically designed to attract and secure that large-scale investment in new electricity infrastructure. The NSW Electricity Infrastructure Roadmap (DPIE 2020a) coordinates investment in transmission, generation, storage and firming infrastructure as ageing coal-fired generation plants retire. The roadmap includes actions that will deliver "whole-of system" benefits. The roadmap sets out a plan to deliver the state's first five REZs in the Central-West Orana, New England, South-West, Hunter-Central Coast, and Illawarra regions.	The Project is within the CWO REZ and is ideally placed to contribute to the success of the roadmap.
Revised Large-Scale Solar Energy Guideline (DPE 2022e) 	The *Large-Scale Solar Energy Guideline* (DPE 2022e) provides the community, industry, applicants, and regulators with guidance on the planning framework for the assessment of large-scale solar projects and identifies the key planning considerations relevant to solar energy development in NSW. It is noted that this guideline was released in August 2022, and therefore the earlier version of these guidelines (DPIE 2018) is referred to in the SEARs for this Project.	Site selection and impact assessment considerations detailed in the guideline have been, and will continue to be, used to inform the Project design.

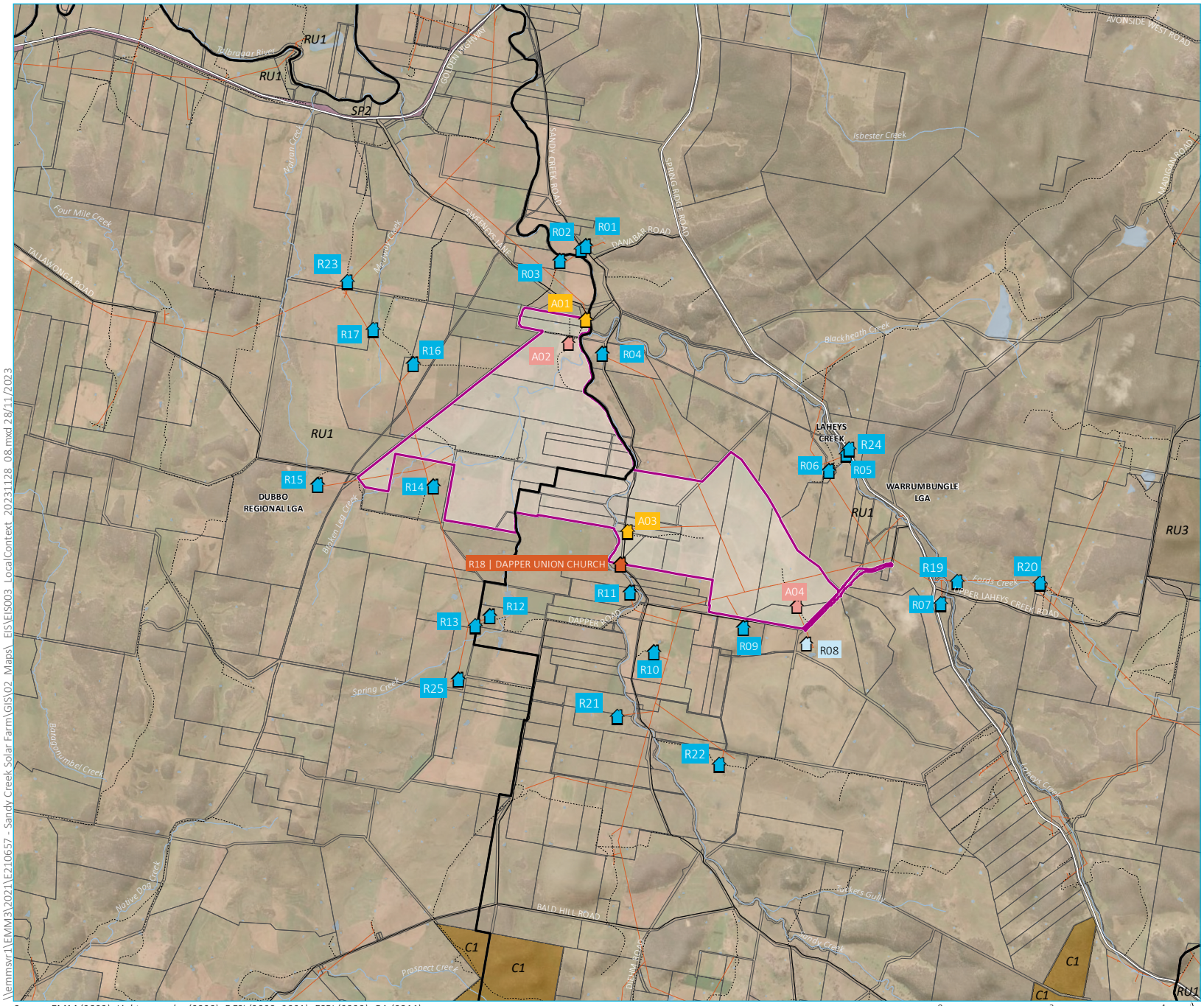
Plan, policy or strategy	Description	Alignment with strategic framework
Net Zero Plan Stage 1: 2020-2030 (DPIE 2020) 	The *Net Zero Plan Stage 1 2020–2030* (DPIE 2020) outlines the NSW Government's plan to grow the economy and create jobs while helping the state to deliver a 35% cut in emissions compared to 2005 levels.	The Project contributes to Priority 1 of the Plan: "drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living." The CWO REZ is also identified in the Plan as critical in replacing retiring coal fired generators in NSW.
Local and regional context		
Central West and Orana Regional Plan 2041 (DPE 2022h) 	The *Central West and Orana Regional Plan 2041* is the five-year update to *the Central West and Orana Regional Plan 2036.* The plan covers three LGAs relevant to the Project – Dubbo, Narromine, and Warrumbungle Shire LGAs. The aim of the plan is to "guide land use planning decisions in the region by the NSW Government, councils and others to the year 2041". The Regional Plan notes: *The region's resilient and rapidly diversifying economy is on the cusp of unprecedented opportunity presented by major investments in the Inland Rail, Parkes Special Activation Precinct and the Central–West Orana Renewable Energy Zone (REZ) …* *The future of energy production is renewable; the region's vast open spaces and higher altitude tablelands make it well suited for increased wind power generation, large-scale solar energy, bioenergy generation and pumped hydro. (p 5)*	The Project is aligned with key objectives of the Regional Plan, in particular, *Objective 2: Support the State's transition to Net Zero by 2050 and deliver the Central–West Orana Renewable Energy Zone.*
Mid-Western Regional Council Local Strategic Planning Statement 	The Mid-Western Regional Council Local Strategic Planning Statement (LSPS) – Our Place 2040 – sets the 20-year vision for the Mid-Western Regional LGA. It sets short, medium, and long-term actions, based on community engagement and consultation, to implement the strategic directions and objectives articulated in the Regional Plan. Theme 3 – Building a strong local economy – sets out Planning Priority 7: Supporting the attraction and retention of a diverse range of businesses and industries. A specific land use action under Planning Priority 7 is: *Consider renewable energy development in appropriate areas that avoids impacts on the scenic rural landscape and preserves valuable agricultural land. (p27)*	The Project is aligned with this Planning Priority as the Project area has been selected after a rigorous environmental constraints analysis, resulting in impacts being avoided.

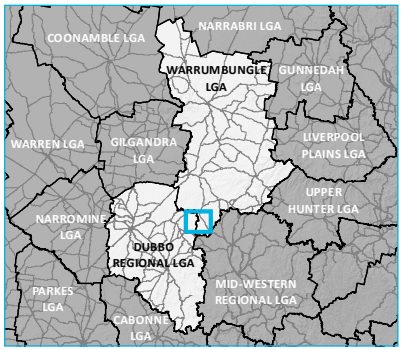
Plan, policy or strategy	Description	Alignment with strategic framework
Dubbo Local Strategic Planning Statement (Dubbo Planning Statement) (Dubbo Regional Council 2020) 	Dubbo Planning Statement provides a 20-year vision for the future growth within the Dubbo Regional LGA. The Dubbo Planning Statement identifies 20 planning priorities for land use planning in the LGA over the next 20 years. Planning Priority 3: Promote Renewable Energy Production includes the following actions: "Collaborate with State agencies and key landowners to deliver key infrastructure projects" and "Utilise the Department's Large-Scale Energy Guideline to advise proponents on the optimum location of new renewable industries". Planning Priority 19: Create An Energy, Water and Waste Efficient City outlines *"Renewable energy is a growth industry as we need to reduce reliance on non-renewable energy sources. Council will look for opportunities to reduce reliance on non-renewable energy".* Planning Priority 19 includes the following actions: • Action 19.4: Encourage development which aligns with the United Nations Sustainable Development Goals • Action 19.5: Encourage low-carbon and green energy initiatives in future development such as adaptive building designs, precinct-level car parking strategies and energy-efficient, water efficient and energy generating precinct design	The Project will contribute to Planning Priority 3 by providing opportunities during this EIS for council, agencies, and key landholders to collaboratively engage and assist in refining this key infrastructure Project. Through engagement of this EIS, the Project will directly contribute to Planning Priority 19 of the Dubbo Planning Statement by providing renewable energy to the Australian Energy Market, which will reduce reliance on non-renewable energy. The Project aligns with Action 19.4, as it considered to align with the United Nations Sustainable Development Goals "*Goal 7: Affordable and Clean Energy and Goal 13: Climate Actions goals"*. The Project is a low-carbon and green energy initiative and aligns with Action 19.5.
Warrumbungle Shire Local Planning Strategic Statement (Warrumbungle Planning Statement) (Warrumbungle Shire Council 2019) 	The Warrumbungle Planning Statement identifies the main priorities and aspirations for future land use within the local government area and establishes objectives and strategies to achieve those objectives. Planning Priority 5 of the Warrumbungle Planning Statement is to support agricultural lands for future growth and resilience. Planning Priority 6 of the Warrumbungle Planning Statement is to support economic development for future growth and resilience.	The Project will contribute to Planning Priority 5 of the *Local Strategic Planning Statement* as it has been sited to minimise impacts on productive agricultural land and visual amenity, where practicable. Additionally, agrisolar practices such as sheep grazing amongst solar panels can be undertaken to minimise agricultural productivity impacts. An extensive site selection process was undertaken to identify a suitable location for the Project that is consistent with Priority 5, as discussed in Section 6.6 and Section 6.7 of this EIS.

2.4 Site suitability

The study area (including the local access roads) is within the LGAs of Warrumbungle Shire Council and Dubbo Regional Council. The study area (approximately 1,716 ha) comprises the maximum area considered for the Project based on the extent of land where LSBP holds landholder agreements and the area of potential impact for road upgrades. The local context is shown in Figure 2.4.

Photograph 2.1 presents an example of the landscape within the study area.





KEY

- Study area
- Dwelling associated with the project
- Dwelling not associated with the project
- Unoccupied structure associated with the project (shed or yard)
- Unoccupied structure not associated with the project (shed or yard)
- Dapper Union Church

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Existing transmission easement
- Waterbody
- Cadastral boundary
- Local government area

Land zoning

- C1 | National Parks and Nature Reserves
- RU1 | Primary Production
- RU3 | Forestry
- SP2 | Classified road

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

0 2 4 km

GDA 1994 MGA Zone 55

N

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Local context

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 2.4

EMM
creating opportunities

Photograph 2.1 Example of landscape within the western portion of the study area

The study area was selected due to a combination of its physical characteristics, minimal environmental constraints, and proximity to the proposed Elong Elong Energy Hub (one of two proposed energy hubs EnergyCo is establishing to connect within the CWO REZ). More broadly, the study area is within the CWO REZ, meaning it is ideally placed to contribute to the objectives of the CWO REZ and can assist in meeting the energy generation and storage requirements of the NEM as the NEM transitions away from dependence on fossil fuels. The proximity of the site to the Elong Elong hub confirms the selection of the site as being in-line with Government policies and strategies on Renewable Energy development regions.

Potential environmental impacts from the Project, particularly biodiversity; land use and soils; Aboriginal cultural heritage; historic heritage; visual amenity; and water resources in the site and surrounds have been key considerations throughout the design and development of this EIS, and the Project has been sited to avoid and minimise potential adverse impacts.

In summary, the study area location was selected and is considered highly suitable for the Project due to:

- high Solar Irradiance
- proximity to the proposed Elong Elong Energy Hub (with capacity to export energy into the grid)
- location within the CWO REZ
- limited biophysical strategic agricultural land within the study area
- high degree of historical land clearing and absence of high value native vegetation
- zoned RU1 which is a prescribed zone where electricity generating works are a permissible land-use and the environmental and planning constraints can be effectively managed
- suitable vehicular access from the Golden Highway and Sandy Creek Road
- adequate development footprint size

- minimal topography constraints
- low flood risk
- landholder willingness to enter into legal agreements
- isolated nature of the surrounding valley and low number of receivers relative to the size of the Project
- suitable distance from major townships (approximately 25 km)
- largely avoids areas of high biodiversity value.

2.5 Key features of the study area and surrounds

Key features of the study area, site and surrounding area are described in Table 2.2.

Table 2.2 Key features of the study area and surrounds

Aspect	Description
LGA	The study area (including the access roads) is within the LGAs of Warrumbungle Shire Council and Dubbo Regional Council. • The Warrumbungle Shire Council LGA comprises: – Approximately 12,380 km^2 in central-western NSW. – Major towns include Baradine, Binnaway, Coolah, Coonabarabran, Dunedoo and Mendooran. – The landscape ranges from extensive plains to undulating hills, from the high basaltic plateau of the Coolah Tops in the east to the rugged mountainous peaks of extinct volcanoes in Warrumbungle National Park, west of Coonabarabran. – An important local feature is Siding Springs Observatory, located 25 km from Coonabarabran. This is a major optical telescope and research facility for astronomy. – The economy of the LGA is mostly based on agriculture plus a strong reliance on tourism. • The Dubbo Regional Council LGA comprises: – Approximately 7,536 km^2 in central-western NSW. – The city of Dubbo is a major regional centre with a second major town in Wellington plus many smaller villages and towns including Ballimore, Bodangora, Brocklehurst, Dripstone, Elong Elong, Euchareena, Eumungerie, Geurie, Minore, Mogriguy, Mumbil, Stuart Town and Wongarbon. – Dubbo has a significant facility in Taronga Western Plains Zoo plus a regional airport. – The landscape comprises flat to gently undulating alluvial systems, including alluvial plains. – The LGA has a diversified economic base which includes health, retail, education, government services, tourism, manufacturing, construction, agriculture, business services, and transport.
Land zoning	The study area is zoned RU1 Primary Production under *Warrumbungle Local Environmental Plan 2013* (Warrumbungle LEP) and *Dubbo Regional Local Environmental Plan 2022* (Dubbo LEP). Further detail on land use and zoning is provided in Section 3.2.2
Nearby townships	The nearest population centre is the township of Dunedoo, which has a population of 1,097 (ABS 2021a), approximately 25 km to north-east of the site. Other nearby population centres in the vicinity of the study area include Dubbo (population 40.578) approximately 61 km west; Gulgong (population 2,680) approximately 32 km south; Coolah (population 1,262) approximately 40 km north; and Mudgee (population 12,563) approximately 57 km south of the site (ABS 2021a).

Aspect	Description
Topography, landscape and natural features	The landscape of the study area is situated on a shallow valley floor within the Sandy Creek catchment and generally drains north to the Talbragar River. The site is largely flat, featuring a gently undulating topography ranging between 380 m to 440 m above sea level (asl). It is intersected by several creeks and is dominated by a sub-humid climate. The study area contains various hydrological features within and around its boundaries, their locations having important implications for the current assessment. The study area is situated between two major rivers: the Talbragar and Cudgegong Rivers. Talbragar River is located approximately 5 km to the north of the study area and is an east to west flowing river, while the Cudgegong River is situated over 15 km to the south. A system of northwards flowing creeks are situated between the two rivers. Two major creeks are relevant to the study area: Sandy Creek and Laheys Creek (ERM 2010: 27). Sandy Creek (5th order) borders the study area in the northeast and bisects the southern half of the study area running in a north-south alignment. Broken Leg Creek (4th order) is a tributary to Sandy Creek which crosses the central portion of the study area before joining it to the north. Several ephemeral 1st, 2nd, and 3rd order (Strahler order) streams and/or creeks within the study area serve as tributaries to both Sandy Creek and Broken Leg Creek, such as Spring Creek (3rd order) in the southwestern perimeter.
Land use	Land use within the study area is currently and historically farming (cropping and grazing). Further detail on land use and zoning is provided in Section 3.2.2.
Land ownership	The study area extends (wholly or partly) over 25 freehold land parcels, and two landowners. Additionally, there are several Crown roads and Crown waterways located within the study area.. LSbp has obtained binding options to lease over all 25 freehold parcels (refer to Appendix B).
Sensitive receptors	Residences and farm structures are dotted across the landscape. There are two associated residences within the study area (A01 and A03), though only A01 is an occupied residence, and two associated unoccupied structures (sheds and yards) (A02 and A04). There are 23 non-associated residences within 4 km of the development footprint.
Nearby protected areas	The nearest national parks to the study area are Goulburn River National Park, approximately 115 km to the south-east, and Yarrobil National Park, approximately 17 km to the south-west. The Goonoo State Conservation Area is located approximately 27 km to the west of the study area; Goodiman State Conservation Area is located approximately 10 km east; Yarrobil National Park is approximately 13 km south-east; and Dapper Nature Reserve is approximately 7 km to the south.
Nearby infrastructure	Portions of the study area include 11 kV and 12.7 kV overhead transmission lines (Figure 2.3). Siding Spring Observatory, near Coonabarabran, has an associated Dark Sky Planning Region – generally defined as an area within 200 km of the observatory - which aims to preserve good observing conditions for the observatory. The Dark Sky Planning Region includes the study area. Clause 5.14 of the Dubbo Regional Council and Warrumbungle Shire Council local environmental plans sets out the matters that must be considered when assessing development to protect observing conditions at the Siding Spring Observatory and minimise light pollution. The Dark Sky Planning Guideline (DPE 2016) provides guidance on matters to be considered.
Key risks or hazards for the Project	Key risks and hazards considered during design development are: • The study area is not located within a flood planning area as identified by the relevant LEPs. However, this is likely due to lack of any previous flooding investigations or modelling, rather than an absence of flood risk. The site is anticipated to be subject to minor overland flooding, as well as more concentrated flows along Sandy Creek, Broken Leg Creek, Spring Creek, and smaller unnamed drainage lines that traverse the site. A hydrology assessment of the study area was undertaken, and the Project was designed to avoid flood prone areas. • The study area is mapped as vegetation category 2 under NSW Rural Fire Service bush fire prone land (BFPL) mapping. BFPL is an area of land that can support a bush fire or is likely to be subject to bush fire attack, as designated on a bush fire prone land map. BFPL Vegetation Category 2 represents lower risk vegetation parcels such as grasslands, scrublands, open woodlands, and mallee. A bushfire assessment report (BAR) was undertaken to inform this EIS.
Site access	The study area is accessed via the Golden Highway which runs from Belford to Dubbo. The local roads providing direct access to the site (Spring Ridge Road and Dapper Road) are through roads and predominantly provide access to rural properties.

2.5.1 Nearby receptors

There are four Project associated dwellings / unoccupied structures (namely A01–A04) located within the study area, two of which are classified as unoccupied structures (i.e. sheds or yards), 23 non-associated dwellings, and one unoccupied structure (R08) within a 4 km buffer of the study area. Dapper Union Church is also represented as R18. All receptors are outlined in Table 2.3 and shown in Figure 2.4.

Table 2.3 Nearby receptors to the study area

Receptor ID	Further detail	Location
A01	Dwelling associated with the Project	Within the study area
A02	Unoccupied structure (i.e. shed) associated with Project	Within the study area
A03	Unoccupied dwelling associated with the Project	Within the study area
A04	Unoccupied structure (i.e. shed) associated with Project	Within the study area
R01	Dwelling not associated with the Project	Within 4 km of the study area
R02	Dwelling not associated with the Project	Within 4 km of the study area
R03	Dwelling not associated with the Project	Within 4 km of the study area
R04	Dwelling not associated with the Project	Within 4 km of the study area
R05	Dwelling not associated with the Project	Within 4 km of the study area
R06	Dwelling not associated with the Project	Within 4 km of the study area
R07	Dwelling not associated with the Project	Within 4 km of the study area
R08	Unoccupied structure not associated with Project	Within 2 km of the study area
R09	Dwelling not associated with the Project	Within 4 km of the study area
R10	Dwelling not associated with the Project	Within 4 km of the study area
R11	Dwelling not associated with the Project	Within 4 km of the study area
R12	Dwelling not associated with the Project	Within 4 km of the study area
R13	Dwelling not associated with the Project	Within 4 km of the study area
R14	Dwelling not associated with the Project	Within 4 km of the study area
R15	Dwelling not associated with the Project	Within 4 km of the study area
R16	Dwelling not associated with the Project	Within 4 km of the study area
R17	Dwelling not associated with the	Within 4 km of the study area
R18	Dapper Union Church	Within 2 km of the study area
R19	Dwelling not associated with the Project	Within 4 km of the study area
R20	Dwelling not associated with the Project	Within 4 km of the study area
R21	Dwelling not associated with the Project	Within 4 km of the study area
R22	Dwelling not associated with the Project	Within 4 km of the study area

Receptor ID	Further detail	Location
R23	Dwelling not associated with the Project	Within 4 km of the study area
R24	Dwelling not associated with the Project	Within 4 km of the study area
R25	Dwelling not associated with the Project	Within 4 km of the study area

2.5.2 Nearby development

As required by the *Cumulative Impact Assessment Guideline for State Significant Projects* (DPIE 2022b), relevant future projects that may potentially generate cumulative impacts with the Project have been identified through a search of the NSW Major Projects Planning Portal and local government websites.

Many renewable energy projects have been proposed in the region since the announcement of the CWO REZ in 2021. Proposed, approved, construction and operational phase developments in the vicinity of the study area are largely, but not entirely, renewable energy projects within the CWO REZ. Developments within 60 km of the Project are shown in Figure 2.5. These developments are also listed in Table 2.4. The greatest potential for cumulative impacts is likely to be during construction.

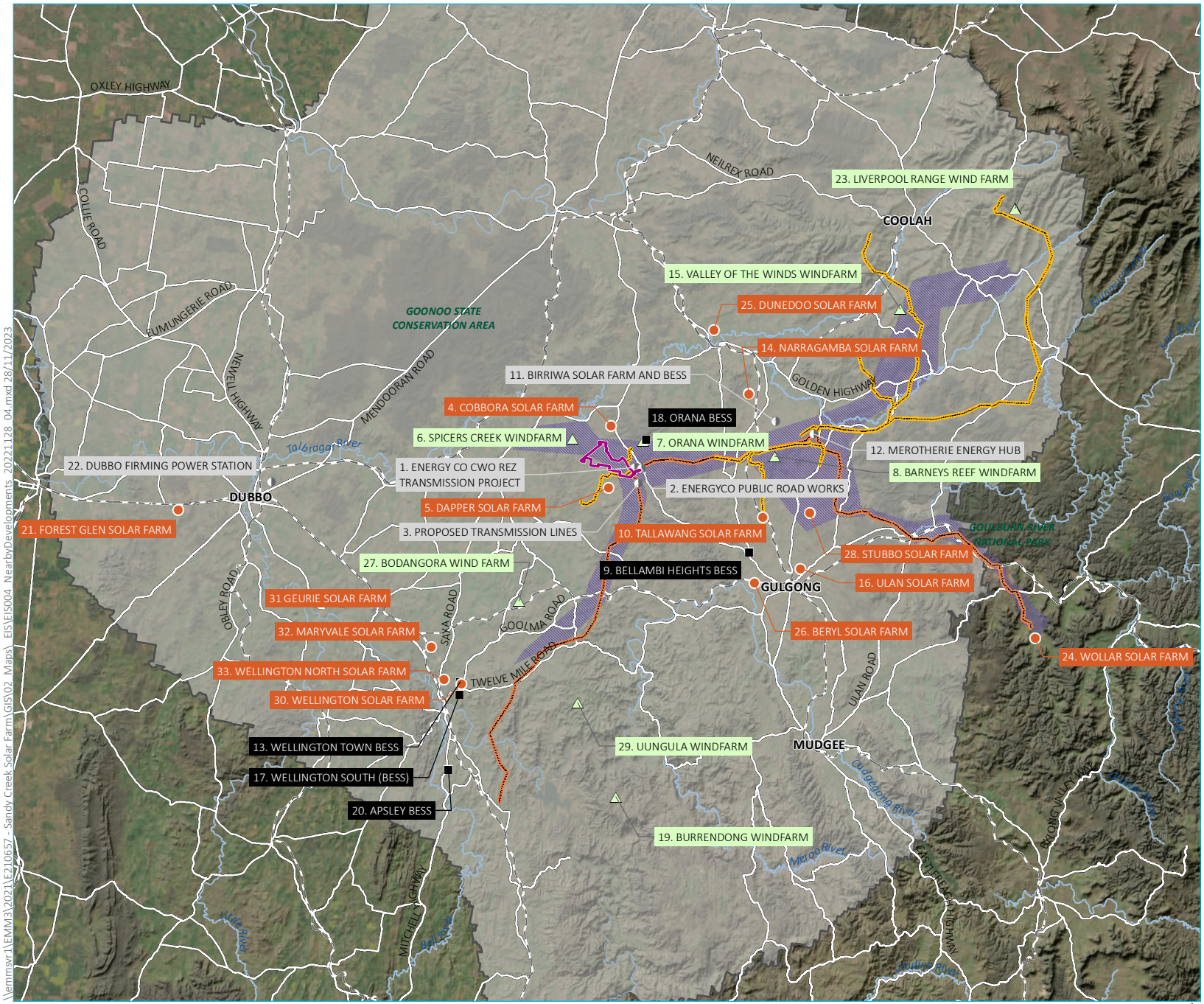
It is possible that construction of several projects could occur simultaneously and overlap with construction of the Project, although there are a range of uncertainties associated with the timing of approval and subsequent construction of projects that will influence cumulative impacts. Cumulative impacts are assessed in Section 6.17.

Table 2.4 Renewable energy projects within CWO REZ

Project name	Approximate distance from study area (km)	Development phase and NSW planning portal status (where relevant)
CWO REZ – related projects		
1 – EnergyCo Central-West Orana Renewable Energy Zone Transmission project (Elong Elong Energy Hub)	0 (adjacent)	Response to submissions phase
2 - EnergyCo public road works	1	Pre-REF (Review of Environmental Factors) EnergyCo information (not in public domain)
3 - EnergyCo Central-West Orana Renewable Energy Zone Transmission project (proposed transmission lines)	0 (adjacent and beyond)	Scoping/pre-EIS Scoping Report
4 -Cobbora Solar Farm	0 (adjacent)	Prepare EIS
5 - Dapper Solar Farm	0 (adjacent)	Prepare EIS
6 - Spicers Creek Windfarm	0 (adjacent)	Under assessment
7 - Orana Windfarm	2	Prepare EIS
8 – Barneys Reef Windfarm	20	Prepare EIS
9 - Bellambi Heights BESS	22	Under assessment
10 - Tallawang Solar Farm	23	Response to submissions
11 - Birriwa Solar Farm and BESS	25	Under assessment

Project name	Approximate distance from study area (km)	Development phase and NSW planning portal status (where relevant)
12 – EnergyCo Central-West Orana Renewable Energy Zone Transmission project (Merothie Energy Hub)	26	Response to submissions
13 - Wellington Town BESS	30	Prepare EIS
14 - Narragamba Solar Farm	30	Prepare EIS
15 - Valley of the Winds Windfarm	36	Under assessment
16 - Ulan Solar Farm	37	Prepare EIS
17 – Wellington South battery energy storage system (BESS)	40	Approved
18 - Orana BESS	40	Approved
19 - Burrendong Windfarm	44	Response to submissions
20 – Apsley BESS	50	Approved
21 - Forest Glen solar farm	60	Approved
22 – Dubbo firming power station	47	Under assessment
23 - Liverpool Range wind farm	56	Approved, modification under assessment
25 - Dunedoo Solar Farm	24	Approved
26 - Beryl Solar farm	25	Operational
27 - Bodangora Wind Farm	25	Operational
28 - Stubbo Solar Farm	26	Construction started Q2 2023
29 - Uungula Windfarm	35	Enabling road works commenced
30 - Wellington Solar Farm	40	Operational
31 – Geurie solar farm	40	Approved
32 - Maryvale Solar Farm	40	Approved
33 - Wellington North Solar Farm	41	Construction commenced Q1 2023

Note: Distances are approximate. Distances sourced from EnergyCo (2023b)



Source: EMM (2023); DPIE (2023); Lightsource BP (2021); ABS (2021); DFSI (2020); GA (2011)

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Nearby developments

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 2.5

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2.6 Identified site constraints

2.6.1 Preliminary desktop constraints analysis

In February and March 2022, key environmental constraint mapping was workshopped with the Project team showing areas to prioritise avoidance and minimisation. These areas were informed by both desktop analysis and field survey results. Key areas that were considered assisted in informing preliminary design layouts and include the following:

- biodiversity (terrestrial and aquatic)
- Aboriginal and historic heritage
- surface water and flooding
- bushfire.

2.6.2 Detailed constraints analyses

A number of environmental assessments have been undertaken to support this EIS (Chapter 6). The outcomes of these assessments have been used to refine the development footprint further to avoid potential environmental impacts wherever possible. In instances where potential impacts cannot be avoided, the Project has been refined to minimise environmental impacts. These refinements include design and procedural measures.

A summary of the key environmental constraints considered as part of the Project refinement process is outlined in Table 2.5.

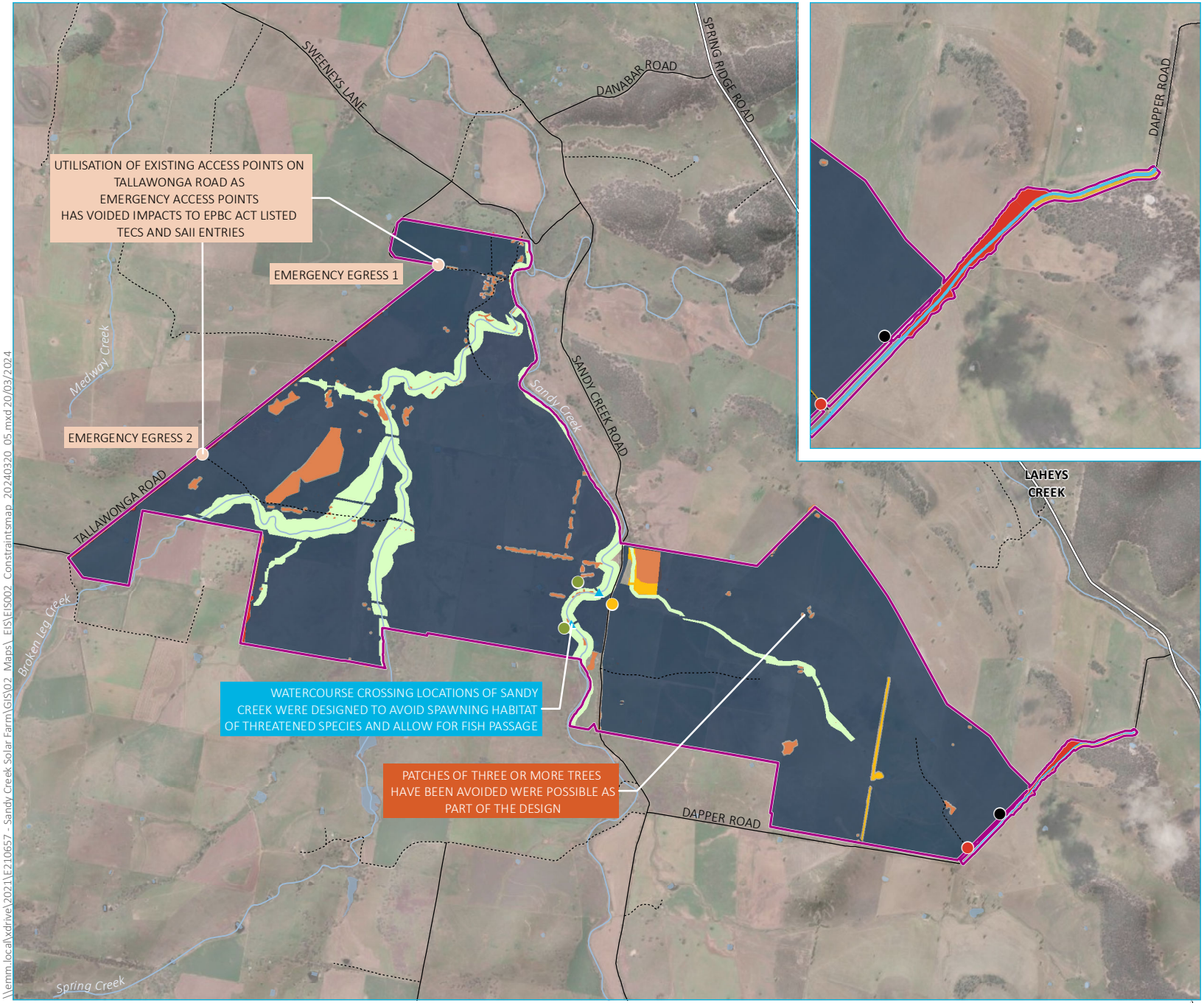
Table 2.5 Matters considered during Project refinement

Aspect	Matters considered during Project refinement
Biodiversity	A range of measures to avoid and minimise impacts to vegetation were considered during the Project refinement process, resulting in avoidance of large areas where there are significant biodiversity values. A key design principle within the Project refinement process has been to maximise the placement of Project infrastructure in cleared and cultivated areas and, wherever possible, limit impacts to areas of native vegetation with lower biodiversity or habitat values. A summary of the avoidance and minimisation process is outlined below.

Aspect	Matters considered during Project refinement
	Item 1 33.03 ha of TEC woodland has been identified in the study area. 3.54 ha are proposed to be impacted. Therefore 29.49 ha of these TEC woodland areas have been avoided, which is approximately 89.29% of all woodland areas identified within the study area. These areas are shown in Figure 2.6. Native woodland identified as SAII entities in the study area include Box Gum Woodland and Fuzzy Box Woodland. It also includes some areas of Box Gum Woodland DNG. 39.49 ha of SAII woodland and DNG vegetation has been identified across the study area. 2.94 ha are proposed to be impacted. The development footprint has avoided 36.55 ha of these SAII areas, which is approximately 92.56% of all the SAII areas identified within the study area. Native woodland patches containing Grey Box Woodland, which is a TEC though not an SAII, will also primarily be avoided. 10.52 ha of Grey Box Woodland has been identified within the study area. 1.5 ha of this woodland will be impacted. The larger woodland patches containing these communities have primarily been avoided, with generally only scattered patches of less than three trees within 50 m of each other impacted by the design, plus minor impacts to the edges of EPBC listed Grey Box Woodland for the security fence along Tallawonga Road, and the road upgrades along Dapper Road. Therefore, 9.02 ha of these Grey Box Woodland areas have been avoided, which is approximately 86.75% of all the Grey Box Woodland areas identified within the study area. Note that the impacts along Dapper Road impact higher quality vegetation. This is required for essential road upgrades and cannot be avoided.
	Item 2 Utilisation of the existing access points on Tallawonga Road as emergency access points, which avoids impacts to EPBC Act listed TECs and SAII entries, as shown in Figure 2.6.
	Item 3 Two paddock areas comprising moderate condition DNG that aligns with the Box Gum Woodland BC Act listed TEC and known habitat for the Pine Donkey Orchid have been excluded from development footprint. This grassland is a an SAII entity.These paddocks are ideally suited to solar development based on topography and proximity to the existing powerline connection. These paddocks were included in earlier iterations of the Project design, however, were excluded based on findings from the ecology assessment. An additional 10 m avoidance buffer has been applied to the edges of these DNG areas. This design refinement has avoided 16.08 ha of moderate condition DNG that aligns with the Box Gum Woodland BC Act listed TEC, provides habitat for the Pine Donkey Orchid, and is also a SAII entity.
	Item 4 The Project design avoids all 12 records of Pine Donkey Orchid from the impact footprint. It also provides additional 10 m avoidance buffers outside of the Pine Donkey Orchid habitat to ensure there are no indirect impacts.
	Item 5 Riparian areas. The avoidance of ephemeral watercourses involved moving PV panels away from certain sections of the watercourses and riparian protection zones that were originally considered for development. These areas were initially considered for development to maximise the generation capacity, since the first order watercourses in these sections are dry most of the time and in most cases do not contain wetland or riparian vegetation (derived native grassland not noticeably differentiated from surrounding grassland). Some impacts are still present, such as access roads and small sections of solar panels. However, the impact footprint does minimise disturbance to existing watercourses and associated riparian corridors by minimising the number of new watercourse crossings required.
	Item 6 Patches of three or more trees have been avoided were possible as part of the design.
	Item 7 By avoiding trees and tree patches where possible, Project design avoids 262 of the 291 (272 mapped hollow bearing trees plus 19 mapped scattered trees with hollows) (approximately 94%) hollow bearing trees recorded in the study area.

Aspect	Matters considered during Project refinement
	Item 8 PV modules will be supported on ground-mounted frames consisting of vertical posts (piles) and horizontal rails (tracking tubes). Where ground conditions allow, rows of piles will be driven or cemented into the ground, with the supporting racking framework mounted on top, therefore minimising the degree of ground disturbance (where possible) required over other construction methods that involve concrete foundations.
Aquatic ecology	Watercourse crossings of Sandy Creek were designed to avoid spawning habitat of threatened species and allow for fish passage, as shown in Figure 2.6. Additionally, Project design included riparian protection zones and management of riparian protection zones that will improve overall riparian vegetation cover.
Aboriginal heritage	Project refinements considered the potential impacts to cultural heritage sites. Placement of PV panels has considered items of higher cultural value (e.g. scarred trees). The development footprint was created after undertaking field surveys and test pitting, which did not discover significant finds. While 20 sites will be impacted by the Project, most of these sites are artefact scatters that will be salvaged prior to the commencement of construction.
Historical heritage	There are no listed heritage items within the Project area. Some items of low-level local historic significance from early settlement times were found. There will be minor impacts to the identified archaeological heritage, including the remains of an historic hut and the 'Leaholme' house. There will be no impacts to the historical heritage sites near the Project area, including the yet to be heritage listed Dapper Union Church on Sandy Creek Road, a shearing shed, and a sandstone brick well, which are not heritage listed.
Land, soil and erosion	LSbp has refined the development footprint to minimise impacts on agricultural land wherever possible. The Project does not preclude the ability for the land to be utilised for agriculture during operations and for the land to be returned to its current agricultural use after closure and decommissioning.
Visual	Visual amenity has been an important consideration in optimising the solar array design and the siting of the BESS, substations, and ancillary structures. Detailed concept and pre-feasibility studies considering siting and infrastructure arrangements were developed. The Project design has been adjusted to reduce impacts on the landscape and visual amenity. Actions taken to reduce visual impacts include: • using the undulating topography and existing vegetation along roadways to shield views of Project elements • retaining existing trees where possible to maintain existing screening • moving the solar array infrastructure away from Dapper Road.
Noise and vibration	Several locations were considered for noise-generating infrastructure (including the substation and BESS), with the concept design showing these infrastructure components placed as far as practicable from nearby residences. The detailed design will also consider the location of residences and noise predictions made for the Project.
Traffic and transport	The proposed access route was selected as it only requires minor upgrades to Dapper Road. The upgrades will improve public safety and accessibility for residents using that route.
Water	The development footprint has been refined to avoid third order streams and to minimise the number of creek crossings required as part of the Project's internal access tracks. Flood modelling outputs resulted in refinements being applied to the location of solar panels. The majority of first and second order watercourses within the development footprint have reasonably undefined channels. Nonetheless, the placement of Project infrastructure within the development footprint will avoid first and second order streams wherever possible. LSbp has avoided locating critical infrastructure in major flow paths to avoid creating significant flood impacts.
Hazards and risks	The BESS will be designed so separation distances between BESS sub-units meet relevant standards. The site layout also allows for adequate separation distance to surrounding land uses (i.e. agricultural operations) and includes fencing to assist in limiting community exposure to electromagnetic fields (EMF).

Aspect	Matters considered during Project refinement
Bushfire	The conceptual site layout is designed to meet the aims and objectives of the *Planning for Bush Fire Protection* (PBP) (RFS 2019) guideline and to comply with the *Rural Fires Act 1997*, as applicable.
Social	The site selection process considered proximity to local and regional centres and the availability of local businesses, accommodation services, and a local labour force.
Economic	The Project considered the impact to the area's accommodation and flow-on effects that would arise if workers utilised commercial accommodation during Project construction. To avoid negative economic impacts such as reduced tourism, an on-site accommodation strategy was developed for the Project.



Study area

Impact footprint

- Development footprint
- Road upgrade corridor

Identified constraint

- Very high ecology constraint - including EPBC listed vegetation (also aligning with BC Act TEC and SAII entity)
- High ecology constraint– including BC listed vegetation and SAII entities, areas with threatened species, moderate condition derived native grassland (that align with TEC and category two land
- Moderate ecology constraint – including single scattered trees in exotic areas, category two land, riparian areas, moderate condition derived native grassland (that does not align with TEC)
- Riparian buffer

Access location

- Primary site access
- Site access (internal)
- Emergency egress
- Accommodation facility access
- Sandy Creek Road crossing
- Watercourse crossing

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Source: EMM (2024); Lightsource bp (2023); DFSI (2020, 2021)

0 1 2 km

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Identified site constraints

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 2.6

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2.7 Feasible alternatives to the Project

2.7.1 Do-nothing scenario

A do-nothing option would avoid the residual environmental and social impacts outlined in this EIS; however, it would also prohibit potential Project benefits, including:

- NSW consumers would not be able to take advantage of the proposed low-cost renewable energy generation system able to deliver reliable renewable energy to the grid
- associated landowners would not be able to diversify their land-uses and realise the benefits that would accrue to them under the landowner agreements with LSbp
- opportunities for Project-related regional employment (and associated regional spend) would not be realised, including the 350 FTE jobs during the peak construction
- direct and indirect benefits to the local and regional economy, including opportunities for local businesses and suppliers, improvements to public infrastructure and population growth
- diversification of local revenue streams
- community groups would not receive community benefits from the Project
- Dapper Road would not be upgraded
- the Project would not contribute to meeting the objective of the CWO REZ, namely, to encourage the development of renewable energy projects and to assist in achievement of State and Commonwealth renewable energy targets and greenhouse gas reductions
- increased energy security.

2.7.2 Alternatives considered

i Design and layout

The design and layout of solar farms requires careful planning to ensure maximum generating capacity and the ability to efficiently deliver energy to the grid. The Project design is influenced over a period as greater knowledge of constraints is gained, and as changes to technologies are realised and implemented.

As detailed in Section 2.6, several iterations to the Project layout and development footprint have been made in response to site characteristics, constructability and the constraints which have been identified through the environmental studies undertaken in the preparation of this EIS.

The design changes have sought to provide maximum flexibility regarding solar array locations. However, as the EIS progressed, and constraints and values of the land were identified, the layout has been refined to avoid or minimise environmental impacts while seeking to maximise generating capacity.

Design iterations throughout the assessment process include:

- avoiding the highest value agricultural land (i.e. with a land and soil capability (LCS) class of 2) within the site and considering the continued use of the site post-construction for agricultural activities
- selection of 'portrait' orientation for PV panels (as opposed to 'landscape' orientation) – to minimise footprint impact

- BESS design considerations, e.g. centralised or decentralised, whether the Project was to include a BESS or exclude the BESS, etc. (as applicable)
- widening Spring Ridge Road and Dapper Road to 8.7 m instead of creating passing lanes
- siting of key infrastructure components to minimise hazard and bushfire risks, and in areas less visible from neighbouring properties
- selection of PV tracking system to maximise the yield of the solar farm and reduce the overall capacity of solar needed to meet emissions and net zero targets.

ii Location

The most important considerations in the selection of a solar project location is the potential generating capacity of the land and efficient access to the grid. The ability to access to the site from the classified road network to import construction materials is another important consideration.

The Project location was the subject of planning and environmental constraints analyses, which identified the key risks and constraints to the Project based on preliminary design considerations, the planning and assessment framework and the environment both within and surrounding the Project investigation area. The results of these analyses informed the basis for subsequent surveys and assessment and confirmed the suitability of this location for the proposed development.

Several alternate locations were considered in the screening process. None of these locations had all the attributes of this location and were not considered viable from technical, economic, social and/or environmental standpoints.

2.8 Agreements with other parties

2.8.1 Landowners

LSbp has entered into lease agreements with the two associated landowners.

LSbp has not entered into any agreements with associated or non-associated landowners in relation to mitigation of Project impacts, as the impacts of the Project are not significant enough to warrant such an agreement.

2.8.2 Landowner consent to making the development application

Written consent has been received to submit the development application from the following landowners:

- NSW Crown Lands
- Warrumbungle Shire Council
- the 25 freehold lots outlined in Table 3.1 (associated with the two landowners).

3 Project description

3.1 Introduction

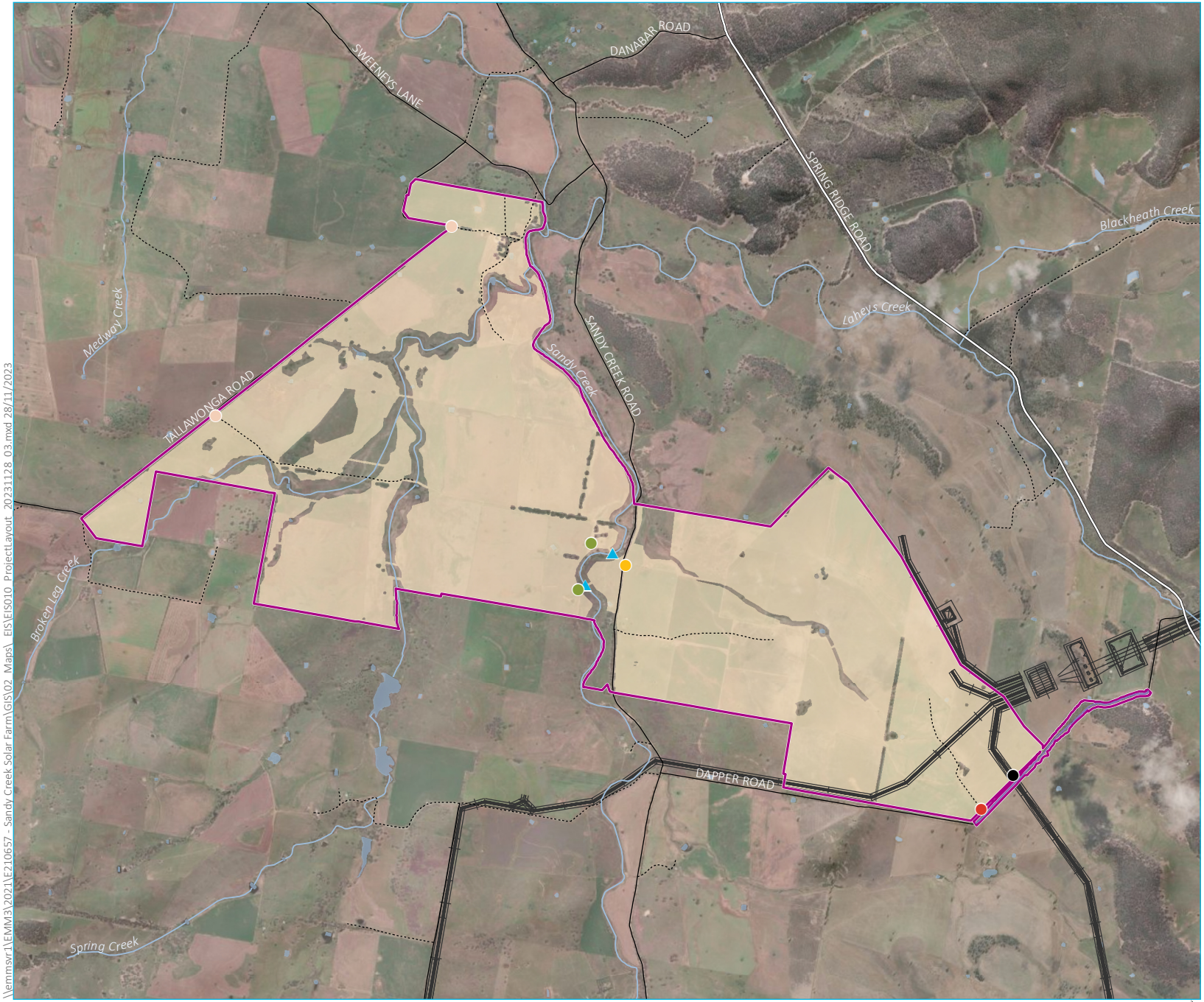
The Project involves the development, construction and operation of a solar PV electricity generation facility and associated BESS.

The Project will have a targeted electricity generating capacity of up to 700 MW (AC). It will also have a targeted storage capacity of up to 2,800 MW (700 MW for 4 hours). The final number of PV panels will be dependent on detailed design, availability, and commercial considerations at the time of construction. The electricity generated onsite will contribute to the national electricity grid (with an export limit of 700 MW) via the proposed Elong Elong Energy Hub being developed by EnergyCo, adjacent to the Project's eastern extent.

The Project's development footprint is shown in Figure 3.1 and will be accessed via the Golden Highway, Spring Ridge Road, and Dapper Road. The Project will also include the upgrade of a portion of Dapper Road between the proposed access of Elong Elong Energy Hub and the Project's primary site access point on Dapper Road. This is referred to as the road upgrade corridor in Figure 3.1.

From the Project's primary site access point, private internal access roads will be used to traverse the development footprint. The internal access roads will intersect Sandy Creek Road to allow construction and operational traffic to traverse between the east and west components of the development footprint. No access will be provided to the site from Sandy Creek Road under normal operations, and proposedcrossing allows egress from the west site to the east site only.

Further discussion on the impact footprint is provided in Section 3.2.2.



KEY

- Study area
- Development footprint
- Road upgrade corridor

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Site feature

- Primary site access
- Site access (internal)
- Emergency egress
- Accommodation site access
- Sandy Creek Road crossing
- Sandy Creek bridge crossing
- Central-West Orana REZ transmission infrastructure. (Simplified; subject to separate approval (SSI-48323210))

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Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011)

0 1 2 km

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Project's development footprint

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 3.1

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3.2 Study area

3.2.1 Key features

As outlined in Section 2.4, the study area covers approximately 1,713 ha, is within the LGAs of Warrumbungle Shire Council and Dubbo Regional Council and was selected due to a combination of its physical characteristics, minimal environmental constraints, and proximity to the Elong Elong Energy Hub.

The study area is approximately 25 km south-west of the township of Dunedoo, in the Central West of NSW and accessed via the Golden Highway, Spring Ridge Road and Dapper Road (Figure 3.1).

The study area extends (wholly or partly) over 25 freehold land parcels. A schedule of lands for the study area is provided in Table 3.1 and shown in Figure 3.2.

The study area is zoned RU1 Primary Production under the Warrumbungle LEP and Dubbo LEP. Both Warrumbungle LEP and Dubbo LEP list the objectives of RU1 zoned land as:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- to encourage diversity in primary industry enterprises and systems appropriate for the area
- to minimise the fragmentation and alienation of resource lands
- to minimise conflict between land uses within this zone and land uses within adjoining zones.

Dubbo LEP lists one additional objective:

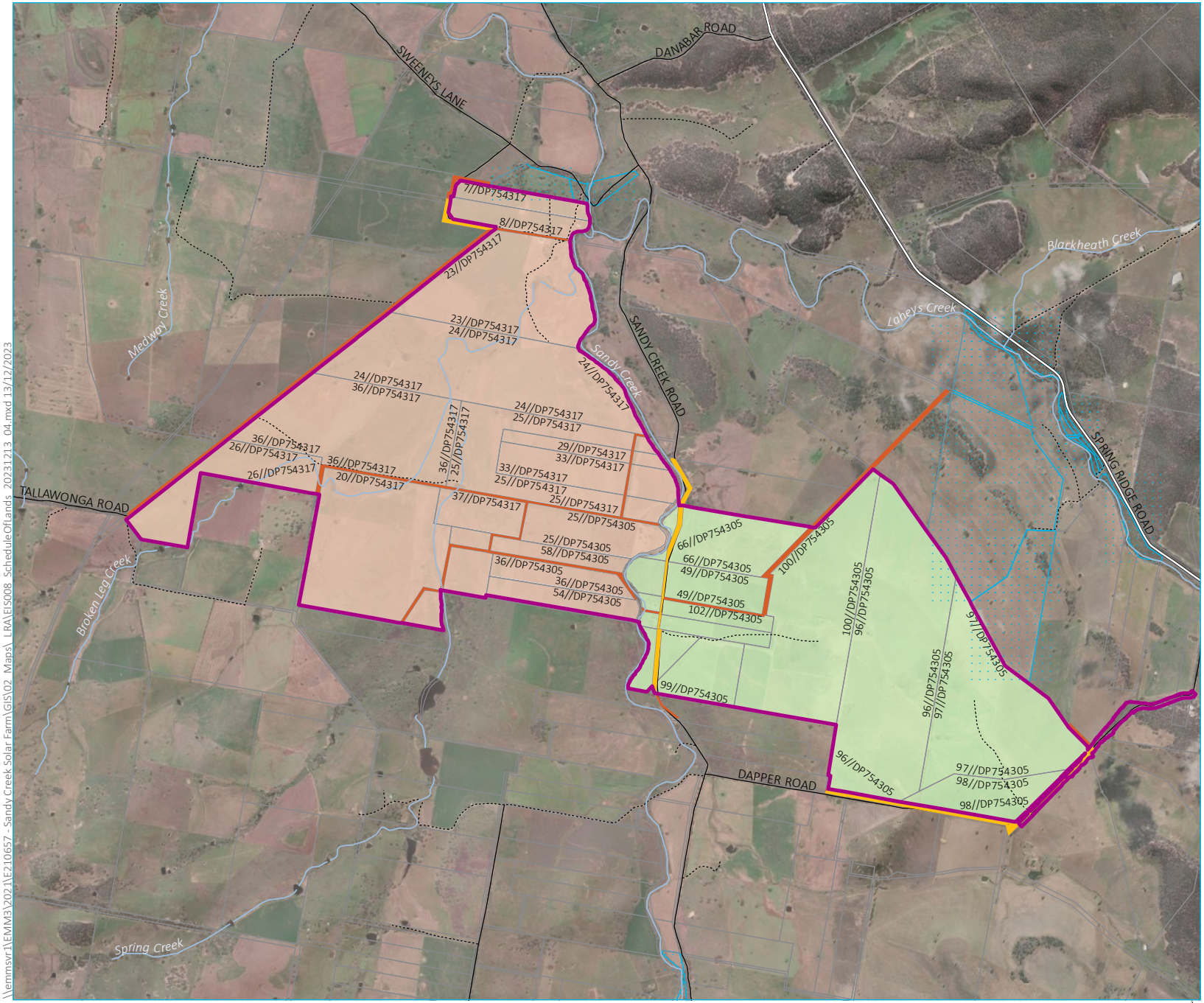
- to encourage a range of development for the purposes of tourism that supports the agricultural industry.

The study area is currently, and has historically, been used for farming (cropping and grazing) (refer to Figure 3.3).

Table 3.1 Cadastral lots intersecting with the study area

Lot number	DP
Associated landowner 1	
49	754305
55	754305
65	754305
66	754305
96	745305
97	754305
98	754305
99	754305
100	754305
102	754305

Lot number	DP
Associated landowner 2	
25	754305
36	754305
38	754305
54	754305
58	754305
7	754317
8	754317
20	754317
23	754317
24	754317
25	754317
26	754317
29	754317
33	754317
36	754317
37	754317
66	754317
Crown land	
25	754305
29	754305
36	754305
37	754305
58	754305
102	754305



Study area
Lot boundary
Crown land
Freehold lot landowner
Associated landowner 1
Associated landowner 2
Road authority
Crown road
Local government authority road
Existing environment
Major road
Minor road
Vehicular track
Watercourse/drainage line

Source: EMM (2023); Lightsource bp (2021); DFSI (2020, 2021, 2023); ESRI (2022)

0 500 1,000 1,500 m
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Schedule of lands within the study area

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Environmental Impact Statement
Figure 3.2

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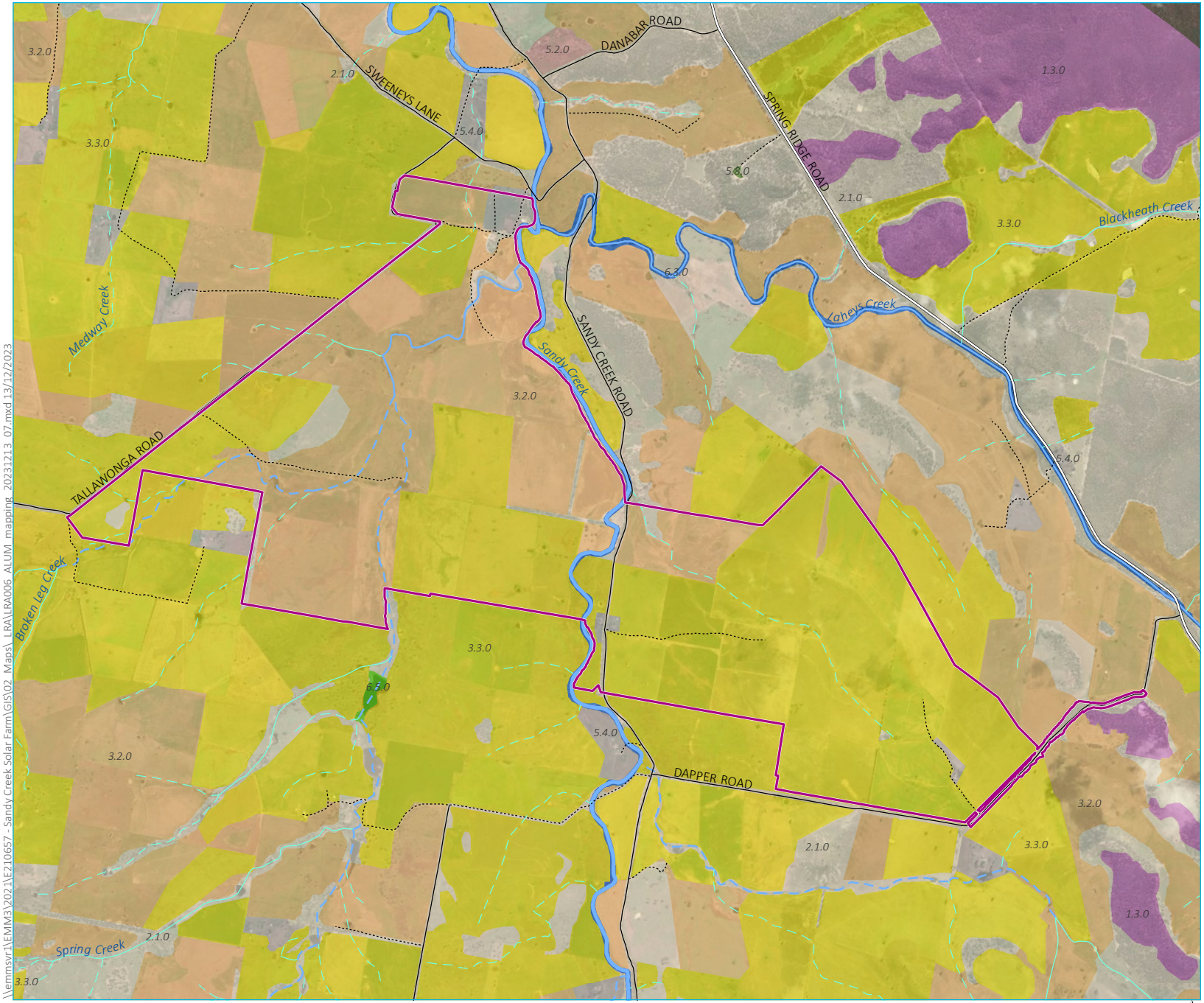

Study area

Existing environment

- Major road
- Minor road
- Vehicular track

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order

Land use mapping (secondary)

- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 5.2.0 Intensive animal production
- 5.4.0 Residential and farm infrastructure
- 5.8.0 Mining
- 6.3.0 River
- 6.5.0 Marsh/wetland

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011); LUAL (2022)

0 1 2 km

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Australian Land Use and Management (ALUM) classification mapping

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Figure 3.3

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3.2.2 Crown land

The Project site contains several Crown roads and one Crown waterway. Some of the Crown roads within the study area which intersect the development footprint can be kept, while others will require closing to make way for infrastructure. LSbp will consult with DPE in relation to Crown roads within the study area. As per the *Crown Land Management Act* 2016, Crown roads within the study area may require a Section 5.21 licence to authorise the use or occupation of the Crown roads.

Sandy Creek, a Crown waterway, flows through the study area. Two watercourse bridge crossings are proposed from Lot 36, DP754305, across Sandy Creek, to Lot 49, DP754305. LSbp will follow the *Construction on Foreshore Crown land and Waterways* (2020) guidelines to obtain a licence prior to constructing watercourse bridge crossings across Sandy Creek.

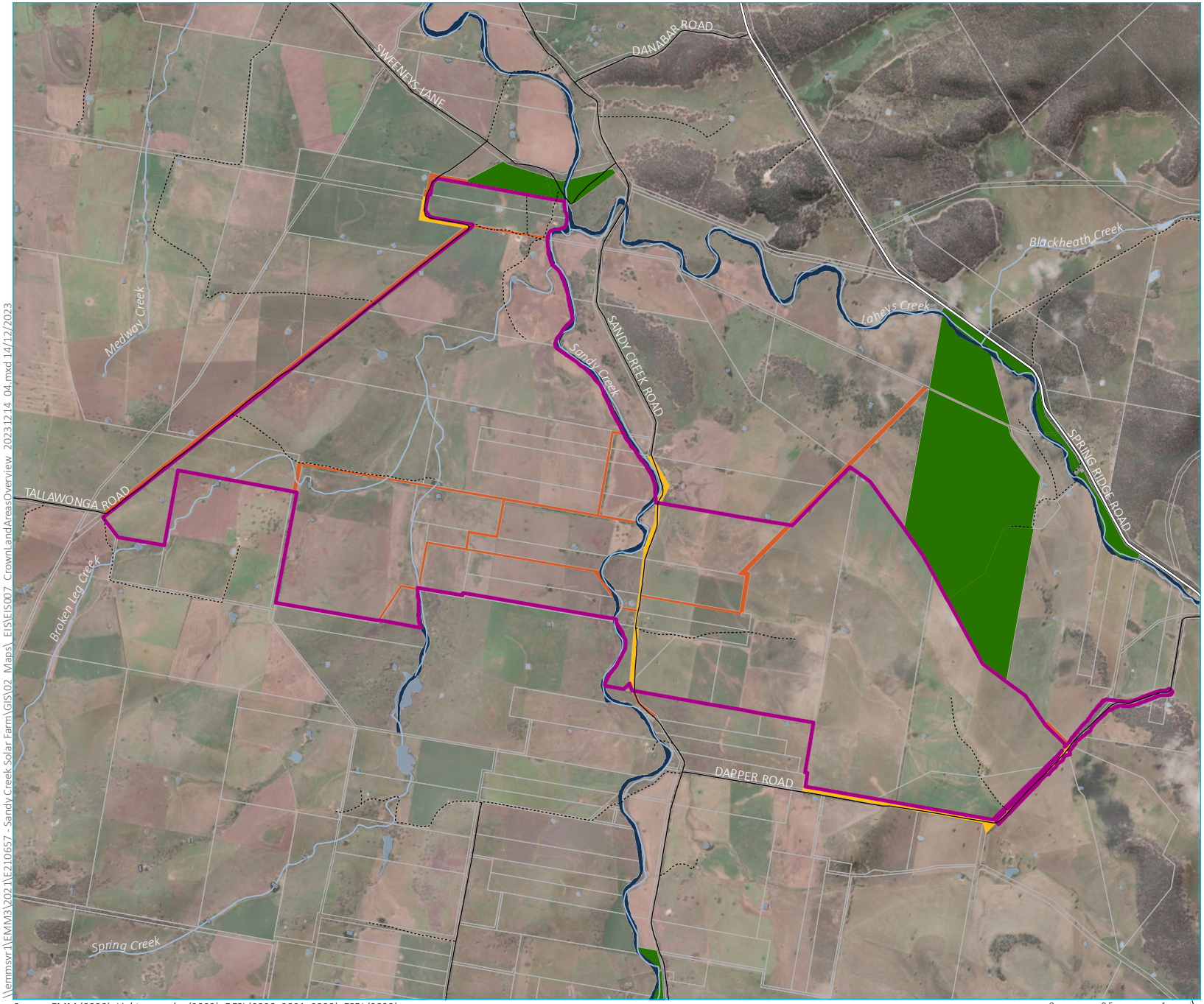
There are no Crown reserves within the study area, though Crown reserves are located immediately adjacent the northern tip of the study area and immediately adjacent to a portion of the eastern section of the study area. These reserves will not be impacted by the Project. There are no travelling stock routes within the study area or in the vicinity of the study area. Table 3.2 below shows all lot/DPs in the study area which include or are adjacent Crown roads and/or waterways.

LSbp is proposing to receive consent for Tallawonga Road, Dapper Road and Sandy Creek Road, as well as the internal roads detailed here in Table 3.2 below. At a later date, LSbp will apply to close the internal roads only and have nominated this as the proposed action in the table below.

Table 3.2 Land containing or adjacent to Crown Roads and waterways

Lot	DP	Crown roads/waterways	Proposed action
8	DP754317	1 Crown road	Close
8	DP754317	Sandy Creek	50 m buffer zone
23	DP754317	1 Crown road	Keep open
23	DP754317	Sandy Creek	50 m buffer zone
24	DP754317	Sandy Creek	50 m buffer zone
25	DP754317	1 Crown road	Close
25	DP754317	Sandy Creek	50 m buffer zone
29	DP754317	1 Crown road	Close
29	DP754317	Sandy Creek	50 m buffer zone
33	DP754317	1 Crown road	Close
33	DP754317	Sandy Creek	50 m buffer zone
20	DP754317	5 Crown roads	Close
37	DP754317	3 Crown roads	Close
66	DP754317	2 Crown roads	Close
38	DP754305	2 Crown roads	Close
36	DP754305	2 Crown roads	Close

Lot	DP	Crown roads/waterways	Proposed action
36	DP754305	Sandy Creek	50 m buffer zone
54	DP754305	1 Crown road	Close
58	DP754305	1 Crown road	Close
58	DP754305	Sandy Creek	50 m buffer zone
25	DP754305	1 Crown road	Close
25	DP754305	Sandy Creek	50 m buffer zone
66	DP754305	1 Crown road	Close
66	DP754305	Sandy Creek	50 m buffer zone
49	DP754305	2 Crown roads	Close
49	DP754305	Sandy Creek	50 m buffer zone
102	DP754305	2 Crown roads	Close
102	DP754305	Sandy Creek	50 m buffer zone
55	DP754305	Sandy Creek	50 m buffer zone
65	DP754305	Sandy Creek	50 m buffer zone
100	DP754305	1 Crown road	Close



Study area

Lot boundary
- Cadastral boundary
- Crown waterway
- Crown reserve or other land

Road authority
- Crown road
- Local government authority road

Existing environment
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021, 2023); ESRI (2022)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

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Overview of Crown Land parcels

Sandy Creek Solar Farm
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Figure 3.4

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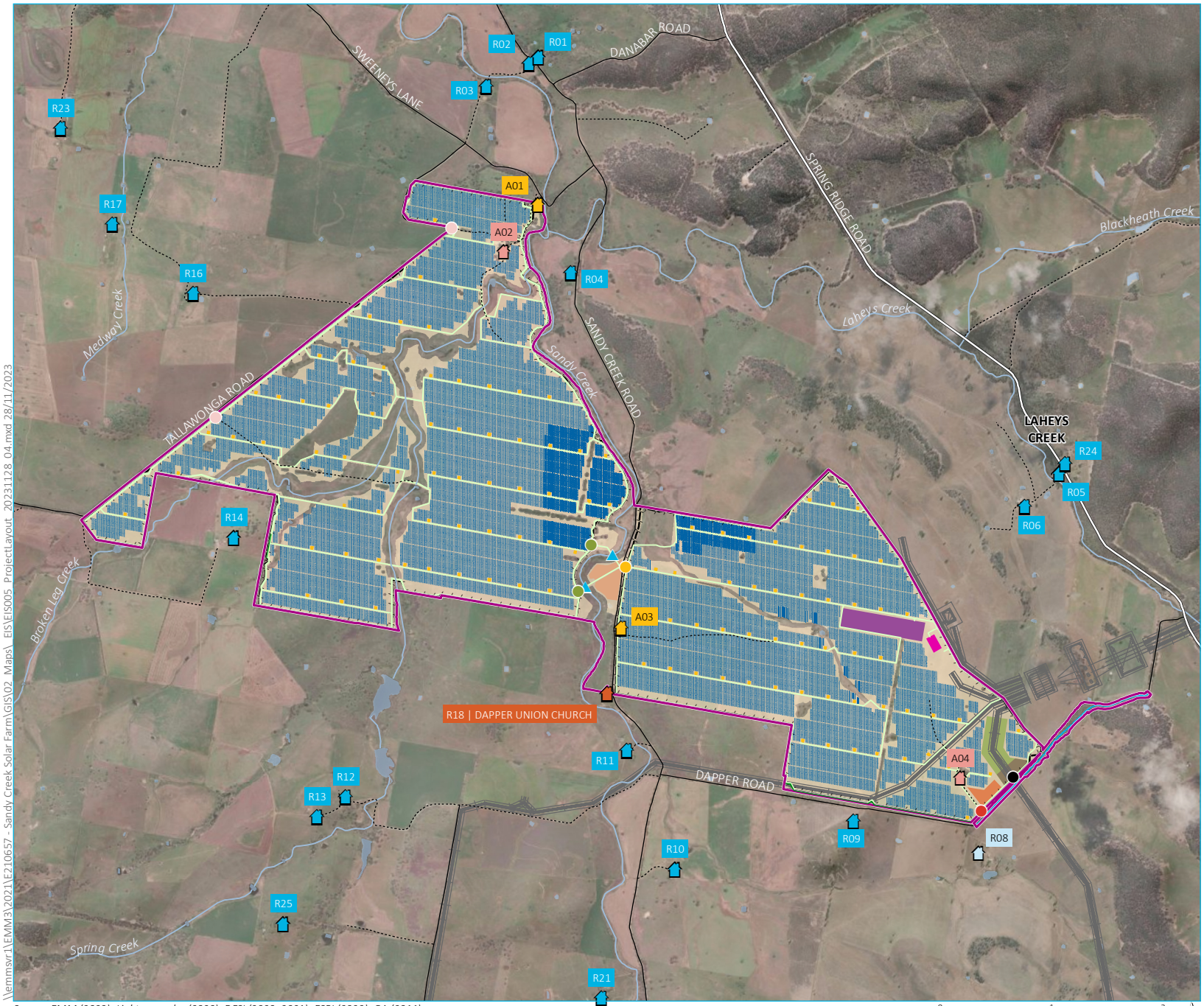
3.3 Project overview

3.3.1 Key elements

The key elements of the Project are described in Table 3.3 below and illustrated in Figure 3.5.



KEY

- Study area
- Dapper Union Church
- Dwelling associated with the project
- Dwelling not associated with the project
- Unoccupied structure associated with the project (shed or yard)
- Unoccupied structure not associated with the project (shed or yard)
- Development footprint
- Road upgrade corridor

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Site feature

- Primary site access
- Site access (internal)
- Emergency egress
- Accommodation site access
- Sandy Creek Road crossing
- Sandy Creek bridge crossing
- Internal access track
- Central-West Orana REZ transmission infrastructure. (Simplified; subject to separate approval (SSI-48323210))
- Security fence
- APZ buffer
- Substation
- Accommodation facility
- Temporary construction compound and operation and maintenance facility
- Secondary temporary construction compound
- Parking area
- Inverter / BESS Option A: DC-Coupled BESS (decentralised)
- BESS Option B: AC-Coupled BESS (centralised)
- Native vegetation screening
- Solar panel array

Key elements of the project

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 55

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Sandy Creek Solar Farm
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Figure 3.5

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Table 3.3 Key elements of the Project

Project element	Summary
Proposed capacity (AC)	Solar generation capacity of up to 700 MWAC. BESS generation capacity of up to 700 MWAC. Storage capacity of up to 2,800 MW (4 hours).
Key infrastructure	Key infrastructure is shown in Figure 3.5 and comprises: • development footprint, including: – a network of approximately 1.5 million PV panels and associated mounting infrastructure with a generating capacity of up to 700 MW (AC) – a DC coupled or AC coupled BESS with 700 MW capacity for 4 hours – skid mounted power conversion units (distributed across the site) containing: ▪ two inverters ▪ one MV transformer – electrical substation containing: ▪ 33/330 kV high voltage (HV) transformer ▪ 330 kV HV switchyard and control room ▪ lighting protection masts – buried and secured MV electrical cables and conduits across the site – two high voltage transmission lines running approx. 1 km to the proposed new 330 kV Elong Elong Hub (EnergyCo/ACEREZ scope) – ancillary infrastructure, including: ▪ a temporary workforce accommodation facility located within the development footprint with a separate access point on Dapper Road ▪ parking facilities ▪ internal access roads and electrical cable trenching, including crossings of both Broken Leg and Spring creek and their tributaries ▪ two internal access road bridge crossings over Sandy Creek, and two separate cable crossings of Sandy Creek ▪ perimeter or partial perimeter access road, designated asset protection zone and security fencing ▪ a communication tower ▪ temporary construction compounds, laydown areas and an operation and maintenance facility ▪ primary access point for heavy and light vehicles ▪ emergency egress points to the surrounding road network ▪ lighting, CCTV system ▪ security fencing ▪ landscaping • road upgrade corridor (i.e. area of direct impact for public road upgrade works along a portion of Dapper Road) • construction footprint of the public road crossing of Sandy Creek Road (i.e. proposed intersection between internal access tracks and the public road to allow for construction and operational traffic and cable crossings between the east and west of the development footprint).
Footprint size	• The study area covers approximately 1,713 ha • The impact footprint covers approximately 1,489 ha (Figure 3.1) and includes the combined area of: – the development footprint, which covers approximately 1,486 ha – the road upgrade corridor, which covers approximately 3 ha.

Project element	Summary
Location	Approximately 25 km south-west of the township of Dunedoo, in the Central West of NSW. The site is located within the CWO REZ.
Land use and zoning	The entire site is zoned RU1 – Primary Production under the Warrumbungle LEP and the Dubbo LEP. The site is currently and has historically been used for farming (cropping and grazing). There is some Crown land within the site, largely associated with road reserves. The Project includes closure of existing Crown Roads within the study area.
Site access	The site will be accessed via the Golden Highway, Spring Ridge Road, and Dapper Road.
Project schedule	The construction duration will be 22-28 months, commencing Q2 2026 (excluding road upgrades).
Construction hours	• 7:00 am to 6:00 pm Monday to Friday • 8:00 am to 1:00 pm Saturday • no works on Sundays or public holidays. LSbp understands the following construction activities may be undertaken outside these hours without the approval of the Secretary: • activities that are inaudible at non-associated residences • the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons • emergency work to avoid the loss of life, property and/or material harm to the environment.
Construction staging and duration	• Stage 1: site establishment (approximately 3 months) • Stage 2: civil, mechanical, and electrical works plus delivery of construction materials and infrastructure (approximately 14 months) • Stage 3: commissioning and testing (approximately 12 months). The three stages of the Project are anticipated to have significant overlap, with the entire construction and commissioning program likely to take between 22 and 28 months.
Project life	The Project has a life expectancy of approximately 40 years.
Operation hours	The Project will be operated, 24 hours per day, 7 days per week, 365 days per year.
Employment	The average construction workforce throughout the 28-month construction period will be approximately 245 FTE jobs. During the peak construction period, a workforce of approximately 350 FTE will be required on site. The Project will directly employ up to 10 FTE during the operation phase.
Workforce accommodation	If a temporary workforce accommodation facility is required, the facility will be located within the development footprint. The accommodation facility footprint is approximately 12 ha located in the south-east section of the development footprint and will include the following components: • capacity for 350 personnel • one separate access point (for personnel and services) located on Dapper Road, north of the primary site access point • parking for 200 vehicles, including buses • access to services such as 11kV-33kV distribution network, town water and sewerage or suitable alternatives • static water supply (above ground storage steel or concrete tank) with minimum of 50,000 L • 65 mm Storz outlet connections suitable for firefighting purposes • fire hydrant(s) • fire hose reel system.

3.3.2 Impact footprint

The impact footprint sits within the study area (discussed further in Section 3.3) and is the maximum extent of ground disturbing works associated with the construction and operation of the Project. During preparation of the

EIS, the development footprint was refined to consider any key identified environmental constraints, outcomes of stakeholder and community engagement, and design of Project infrastructure with the objective of developing an efficient Project that avoids and minimises environmental impacts. It has therefore been reduced in size from what was originally considered in response to the outcomes of environmental assessments and constraints identification.

The impact footprint is shown in Figure 3.1 and comprises:

- the development footprint (area to be developed within land where LSbp hold landowner agreements)
- road upgrade corridor (area of direct impact for public road upgrade works along the access route)
- construction footprint of the public road crossing of Sandy Creek Road to allow construction and operational traffic and cable crossings between the eastern and western portions of the development footprint.

3.4 Physical layout and design

The final Project layout is subject to detailed design. Aspects of the Project (including siting of Project elements and construction methodology) are subject to change during the detailed design of the Project; however, all infrastructure will remain within the development footprint identified in Figure 3.1. This EIS is based on consideration of reasonable worse case environmental impacts to allow flexibility in design and construction methodology within the development footprint.

3.4.1 Project components

i PV panels

The PV panels will be installed in a series of rows aligned in a north-south direction and spaced approximately 5–7 m apart. The PV panels will be mounted onto a single axis tracker (SAT) system. The SAT system is designed to track the movement of the sun so the panels constantly move to align towards the sun. They are also designed to minimise the shadow cast from one solar panel to an adjacent solar panel. To do this, the panels will begin to rotate back to horizontal as the sun lowers toward the horizon. When the sun is rising or setting, the panels will be in a horizontal position with the potential to reflect sunlight in the opposite direction. This means there is potential for glare west of the solar arrays in the morning, and east of the arrays in the evening (impacts relating to glint and glare are assessed in Section 8 of the LVIA and Section 6.7 of this EIS).

An example of PV panel rows utilising single axis tracking technology is provided in Photograph 3.1.

Photograph 3.1 Example of a PV panel row with single axis tracker

The PV panels and the associated SATs will be supported on ground-mounted frames consisting of vertical posts (piles) and horizontal rails (tracking tubes). Rows of piles will be driven or cemented into the ground, depending on the geotechnical conditions, and the supporting racking framework will be mounted on top. Pre-drilling and/or cementing of foundations will be avoided where geotechnical conditions allow.

The height of the PV panels at their maximum tilt angle (typically up to 60 degrees) will be up to 4 m and typically around 2.2 m. Additional site-specific clearance of approximately 400 mm may be required to avoid flooding risk or to improve access for sheep to graze underneath the PV panels. If installed at this height, the leading edge of each PV module may be up to 1.2 m from the ground.

The modules will be configured in a portrait orientation, to maximise the area of ground available. PV modules will be installed in accordance with the relevant Australian Standards including AS 5033.

LSbp will seek to maximise the generation capacity of the Project. The final generation capacity will be subject to detailed design in consideration of the capacity of the grid to receive the electricity, and to the number of PV panels able to fit into the impact footprint, once all environmental constraints have been determined.

ii Electrical collection and conversion system

a Inverters

The PV panels will be connected to inverters via underground cabling. Inverters will convert DC to AC and then step the current up to MV.

Contingent on procurement, approximately one inverter and transformer assembly are required for every 5 MWAC of installed capacity. These assemblies will be positioned within or adjacent to each block of modules. Inverter and transformer assemblies can be mounted on a steel platform (skid) or slab at ground level and will typically occupy an area of 0.003 ha – equal to a 40 ft shipping container (12 m x 2.4 m).

Cables will be buried and covered to a depth that meets Australian standards. Where cables are buried in the same trench, a minimum calculated separation will be maintained to ensure compliance with thermal constraints.

Additional space around each inverter will be left to accommodate the DC coupled BESS option.

b Control room

The entire facility will be controlled remotely via a supervisory control and data acquisition (SCADA) system housed in the control room. The control room will be approximately 8 m wide, 12 m long and up to 6 m high and located within the area designated for temporary construction compound and operation and maintenance facilities.

The control room will be mounted on concrete hardstand or skid and will be raised above the mapped 1 in 100-year flood event.

iii Battery energy storage system (BESS)

The BESS will have a capacity of up to 700 MW/2,800 MWh (4 hours). The BESS will draw and store energy from the grid and/or from the Sandy Creek Solar Farm during off-peak periods. This energy will be dispatched back into the grid during peak periods, thereby improving grid reliability and network stability.

Two options are being considered for the configuration of the BESS. Option A is a centralised BESS (AC-coupled) located adjacent to the substation. Option B is a decentralised option (DC-coupled), comprising approximately 114 energy storage units located across the development footprint. Both BESS options are shown in Figure 3.6 for context and detailed further in this section. However, this EIS and respective technical assessments have assessed the impacts of both BESS options combined.

KEY

- Study area
- Road upgrade corridor

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Site feature

- Primary site access
- Site access (internal)
- Emergency egress
- Accommodation site access
- Sandy Creek Road crossing
- Sandy Creek bridge crossing
- Central-West Orana REZ Transmission infrastructure. (Simplified; subject to separate approval (SSI-48323210))
- Security fence
- Inverter / BESS Option A: DC-Coupled BESS (decentralised)
- BESS Option B: AC-Coupled BESS (centralised)
- Native vegetation screening
- Development footprint

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Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011)

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BESS Options (AC and DC) design layouts

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a BESS Option A (AC-coupled)

It is likely BESS Option A (AC-coupled) would use lithium-ion batteries (the final battery system is to be confirmed). Batteries will be stored in fully enclosed shipping or modular containers, mounted on concrete pads (refer to Photograph 3.2). Subject to final design and equipment selection, each battery bank will be approximately 13 m long, 3 m wide and 3 m high, similar to a typical 40-foot (ft) shipping container (or two 20 ft shipping containers). The battery banks will be placed in rows and will be separated by a gravel surface. The proposed layout for the AC-coupled BESS is outlined in Figure 3.7.

The height of footings for the battery storage containers will be raised above the mapped 1 in 100-year flood event.

Photograph 3.2 Example of containerised batteries

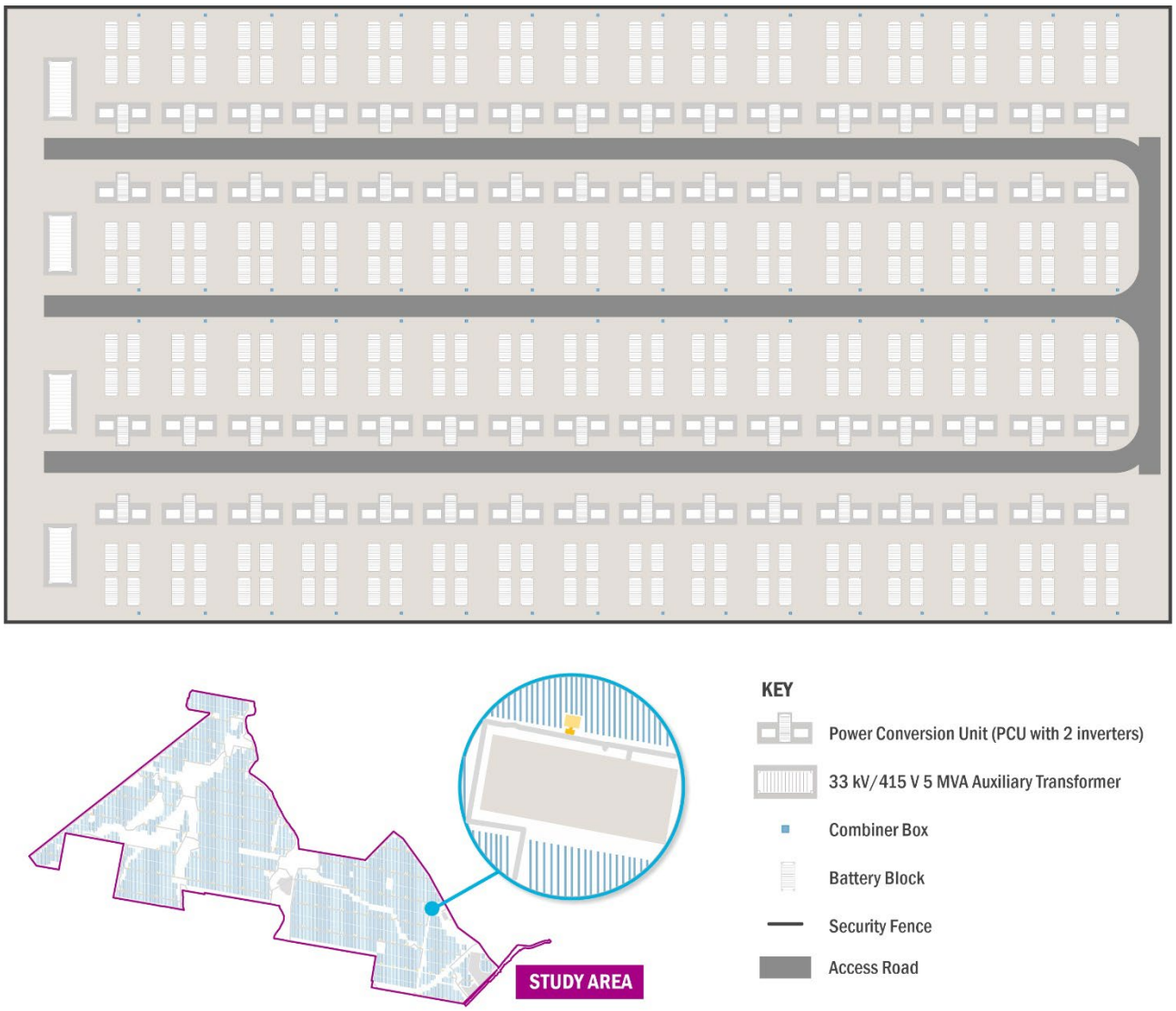


Figure 3.7 Option A BESS (AC-coupled) indicative layout

b BESS Option B (DC-coupled)

The DC-coupled BESS option will involve having smaller BESS units at each inverter location. The dimensions for each BESS pad will be approximately 27 m long by 25 m wide and will include the following components (indicative layout shown in Figure 3.8):

- one PCU which contains two inverters
- up to eight 20 ft BESS containers
- up to eight DC converters.

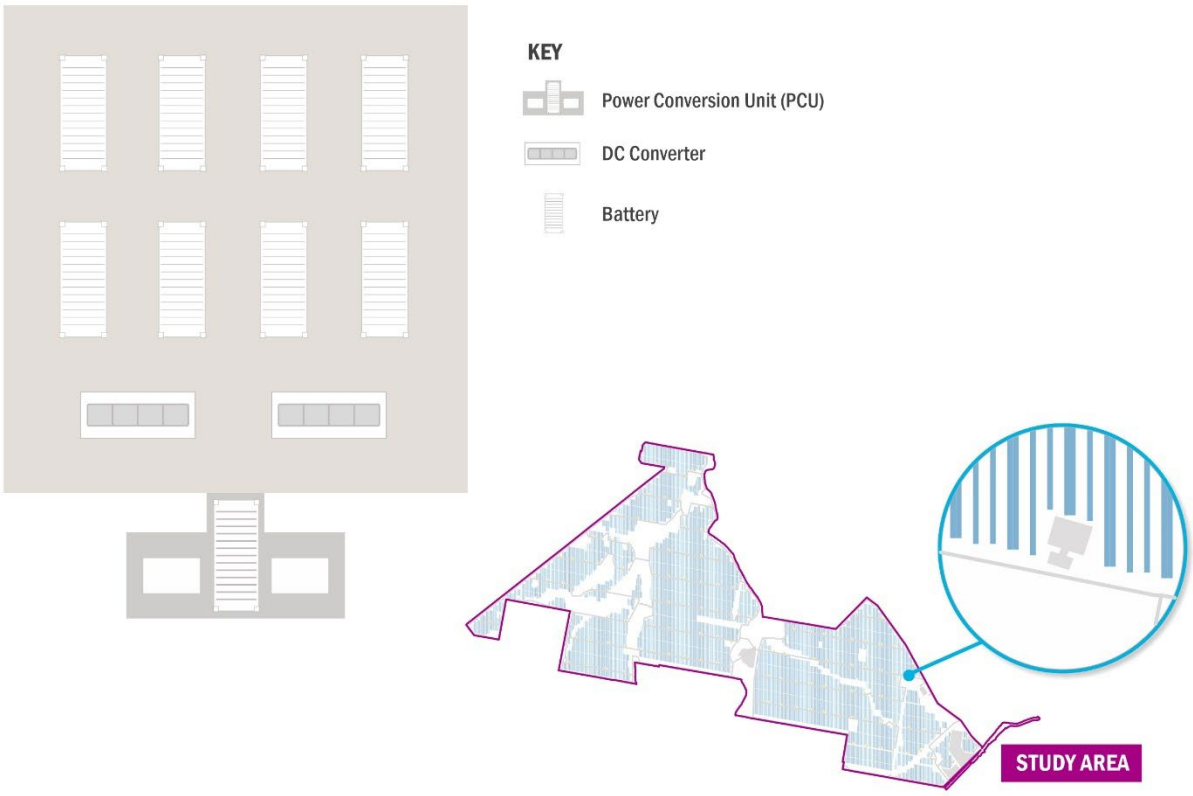


Figure 3.8 Option B BESS (DC-coupled) indicative layout

iv Substation

Power generated onsite will be fed into the proposed 330 kV Elong Elong hub via the onsite substation. The substation is required to transform MV to HV, and vice versa. The substation will have a capacity of 33 kV/330 kV and will have a footprint of approximately 80 m wide, 140 m long and up to 15 m high.

The substation will be mounted on concrete hardstand or skid and will be raised above natural ground levels, if required, to achieve a minimum 1% AEP flood immunity with freeboard.

The substation will likely consist of an indoor switch room to house MV circuit breakers, and an outdoor switch yard to house the transformer(s), gantries, and associated infrastructure.

v Supporting infrastructure

In addition to infrastructure described above, the Project will also require supporting infrastructure detailed below.

a Temporary construction compounds

During construction (and again during decommissioning), temporary, secured, gravelled compounds will be used for storage of plant, equipment, waste material, construction site office and amenities, and laydown areas for equipment delivery and material handling. One of these areas will then be converted to an area to facilitate operation and maintenance during operation.

b Parking

During construction, parking will be available in the temporary construction compound areas. The parking area will be gravelled and will have capacity for 40 heavy vehicles.

During operations, carparking will be near the operations and maintenance building. The carparking area will be gravelled and will have capacity for eight light vehicles.

The temporary workforce accommodation facility will have its own separate area for parking.

c Security, lighting, fencing and landscaping

The Project site will be secured with chain mesh fencing approximately 2.2 m to 3.0 m high and a locked access gate. Motion-detected tower-mounted security lights and security cameras (closed circuit television (CCTV)) will be installed in key locations across the site.

All lighting will be positioned to minimise light spill to nearby residents and will only be activated for security purposes.

d Firefighting infrastructure

Firefighting infrastructure will comply with the PBP guideline and will include, but not be limited to, a dedicated water tank, fire-fighting equipment, and an asset protection zone around infrastructure.

Firefighting infrastructure is detailed in Section 6.12.

vi Connection to the grid

Power generated by the Project will be transmitted via a new 330 kV overhead transmission line from the Project substation to the proposed EnergyCo Elong Elong Energy Hub switchyard. Elong Elong Energy Hub will be adjacent to the study area.

vii Accommodation facility

The proposed temporary workforce accommodation facility will house up to 350 workers and will comprise prefabricated demountable units which will be delivered to the Project site. Proposed accommodation facility layout is shown in Plate 3.1. Example facility infrastructure is shown in Plate 3.2 and Plate 3.3. The approximate 12 ha accommodation facility footprint will be within the south-eastern portion of the Project site, within the development footprint. The accommodation facility infrastructure will include:

- temporary housing for up to 350 personnel
- communal kitchen facilities
- dining room facilities
- lavatory facilities
- laundry facilities
- BBQ facilities
- recreational facilities
- medical facility

- one access point (for personnel and services) located on Dapper Road, which will be separate to, and north of, the primary access point
- parking for 200 vehicles, including buses
- access to services such as 11kV-22kV distribution network, town water and sewerage (or suitable alternatives)
- static water supply (above ground storage, steel or concrete tank) with minimum of 50,000 L
- 65 mm Storz outlet connections suitable for firefighting purposes
- fire hydrant(s)
- fire hose reel system.

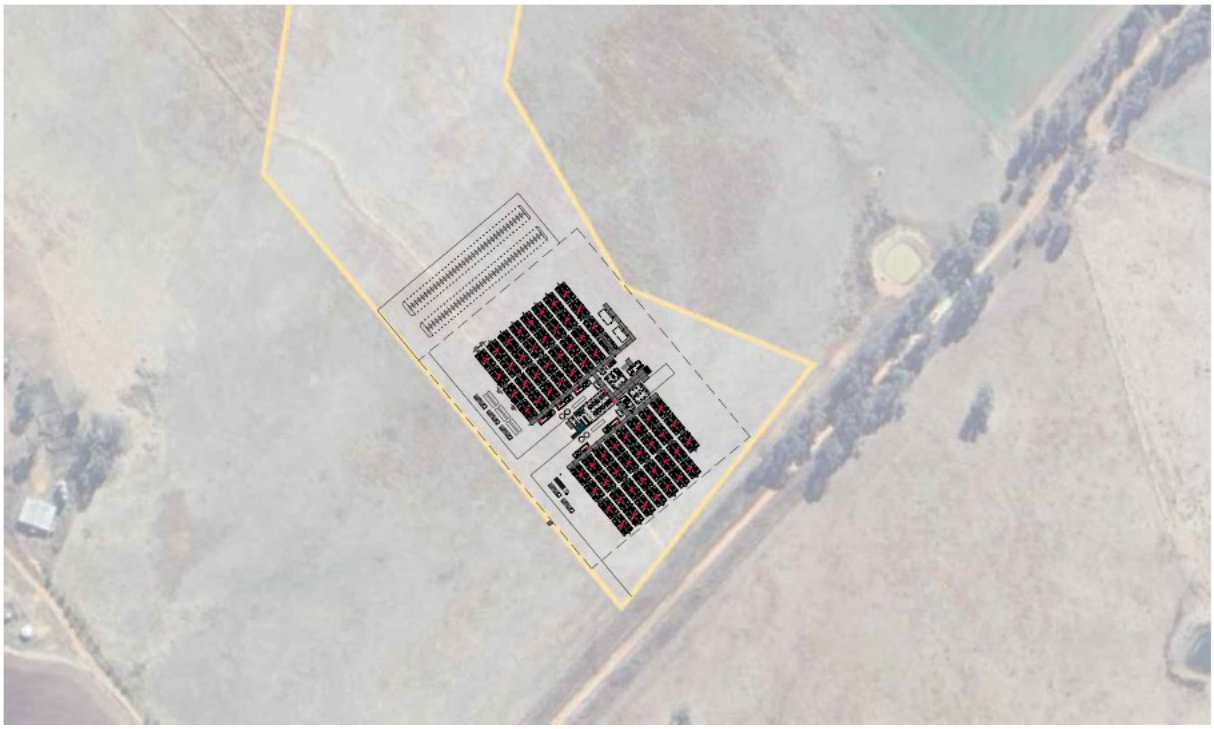


Plate 3.1 Proposed accommodation facility layout (indicative layout only)

Plate 3.2 **Example accommodation facility infrastructure**

Plate 3.3 **Example accommodation facility infrastructure**

3.4.2 Project access

i Primary access route and access

The primary vehicle access route for all heavy vehicles and most light vehicles will be via the Golden Highway, Spring Ridge Road, and Dapper Road (refer to Figure 3.9). Light vehicles may also access the site from the south via Spring Ridge Road.

The development footprint will be accessed by all construction and operational traffic via Dapper Road, utilising an existing property access location which will require upgrades. There will be a separate access point along Dapper Road for the temporary workforce accommodation facility.

There will also be two emergency egress points at the following locations:

- Tallawonga Road (north-west corner of the Project area), utilising an existing driveway
- mid-way along Tallawonga Road, utilising an existing property access location.

The site is split along Sandy Creek Road, thereforea dedicated crossing between the two sites will be established on Sandy Creek Road. These egress points will facilitate traffic between the two sections of the Project site, but will not be used as a means of accessing the site from Sandy Creek Road. The crossing will double as additional emergency egress points.

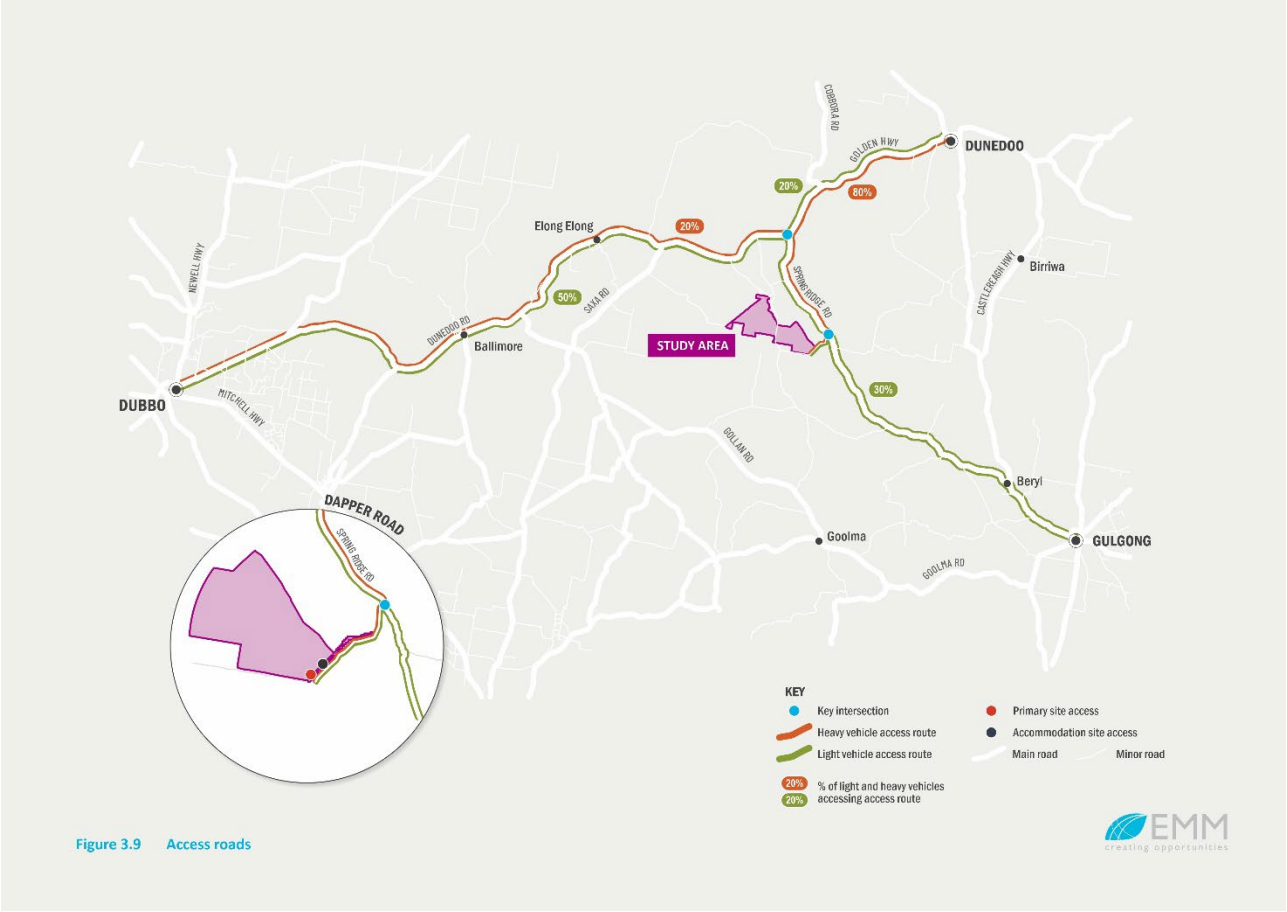


Figure 3.9 Access roads

Figure 3.9 Proposed access routes

ii Internal access roads

Internal access roads will be constructed to facilitate access to the remainder of the development footprint. Internal access roads will be approximately 4 m to 6 m in wide. An internal perimeter access road will be located around the perimeter of the development footprint where feasible and will form part of a 10 m asset protection zone that will surround site infrastructure. One public road crossing will be utilised on Sandy Creek Road to allow Project-related vehicles to move across public road corridors and between parcels of land that form part of the development footprint.

iii Internal waterway crossings

Waterway crossings will be required to facilitate vehicle movements and cable crossings within the development footprint. It is anticipated that the following will be required:

- For Sandy Creek (identified as a 5th order stream) - two vehicle crossings and one above-ground cable crossing. It is proposed that bridge design for both crossings span the width of surface water, where the width of the water surface will consider the most frequent flow events. Additionally, the design will maximise the deck-span so that it is centred over the water surface to avoid abutments/piers too close to the water's edge.

- For Broken Leg and Spring Creek (2nd and 3rd order streams respectively) – it is proposed that there will be a combination of the following crossings within the development footprint where they intersect these watercourses:

  - six all-weather crossings (it is noted that only two box/round culvert crossings would be constructed downstream of where Broken Leg Creek and Spring Creek intersect – this is to ensure fish passage along this area of the development footprint)

  - eight dry fords

  The exact locations of these waterway crossings will be confirmed during detailed design and will be in accordance with the following guidelines:

- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge 2003)

- *Policy and guidelines for fish habitat conservation and management* (DPI 2013) – Section 3.2.4.2 and 4.2.2

- Typical industry design guideline – AUSTROADS - *Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures* (Austroads 2018)

- Fisheries NSW *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI 2003).

3.4.3 Road upgrades

The existing road width measurements, future traffic volumes (baseline + Project) and compliance for each road portion along the proposed access route are shown in Table 3.4, assuming an onsite temporary workforce accommodation facility is provided for the Project.

Table 3.4 Future (baseline + Project) daily traffic volumes and design standards compliance

Road	Description of road	Average future daily movements (baseline + Project)	Approximate future road width	Austroads or ARRB standard in accordance with daily traffic volume	Will meet relevant standard?
Golden Highway (west of Spring Ridge Road)	State road between Dubbo (west) and merging with New England Highway near Newcastle (east)	1,456 (1,405 + 51)	9.5 m sealed	9 m sealed	Yes
Spring Ridge Road (section north of Dapper Road)	Local road between Golden Highway (north) to Dapper Road (south)	149 (50 + 99)	5 m to 5.5 m sealed with up to 2 m unsealed shoulder on both sides, totalling up to 9.5 m wide carriageway	Minimum 3.7 m wide seal and 8.7 m wide total carriageway including unsealed shoulders	Yes
Spring Ridge Road (section south of Dapper Road)	Local road between Dapper Road (north) and joining Goolma Road, south-west of Gulgong	68 (50 + 18)	5 m to 5.5 m sealed with up to 2 m unsealed shoulder on both sides, totalling up to 9.5 m wide carriageway	Minimum 3.7 m wide seal and 8.7 m wide total carriageway including unsealed shoulders	Yes
Dapper Road	Local road between Spring Ridge Road (east) and Bald Hill Road (south-west) joining Goolma Road near Gulgong (south-east)	Less than 127 vehicles (10 + 117)	5.5 m to 6 m unsealed*	Minimum 5.5 m unsealed	Yes

Note *As Dapper Road is an unsealed road in a rural area carrying less than 150 vehicles a day, the ARRB standard will be used to guide the appropriate road width. All other roads use the Austroads standard.

As presented in Table 3.4, the proposed access routes for the Project meet the minimum compliance criteria from Austroads and Australian Road Research Board (ARRB) guidelines for the existing traffic volumes.

The Project's construction traffic volumes are expected to have a minimal impact on the Golden Highway.

Spring Ridge Road, between the Golden Highway and Dapper Road, will require localised upgrade works to accommodate the Project's construction traffic and enable construction vehicles to safely pass each other and other local traffic.

While the width of Dapper Road complies with ARRB guidelines, Dapper Road will be upgraded to two lanes (unsealed) from Spring Ridge Road to the site access to allow heavy vehicles to pass each other. A minimum carriageway width of 9 m (unsealed) will be provided by LSbp between Elong Elong Energy Hub and the site access, to comply with this requirement. This upgrade reflected in this EIS and included as the road upgrade corridor.

The road upgrade corridor utilises existing roads, tracks and maintained road shoulders to the extent practicable to minimise the amount of vegetation clearing and surface disturbance required. In particular, the conceptual road upgrade design sought to minimise the clearance of native vegetation as much as possible, with approximately 1.49 ha of native vegetation proposed to be cleared to facilitate the access road upgrade (this area also considers indirect impacts).

Potential cumulative impacts associated with multiple projects in the vicinity of the Project may contribute to higher peak traffic volumes on Spring Ridge Road and Dapper Road. This requires further consideration as part of a coordinated approach to assessment with EnergyCo and the proponents of other projects in the locality that are proposing to use these local roads during construction.

3.4.4 Riparian protection zones

Establishment of the Project's development footprint has the potential to encroach on riparian vegetation. The guiding document *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update)* (DPI 2013) contains information on appropriate riparian protection zones to be established for developments. For Spring Creek and Broken Leg Creek, a 40 m riparian protection zone will be applied, and for Sandy Creek a 50 m riparian protection zone will be created and managed as demonstrated in Figure 3.10.

Implementation of the reparation protection zones suggested is considered appropriate to protect existing riparian vegetation and aquatic ecosystems, as they will extend well beyond any existing remnant vegetation.

The proposed riparian protection zones represent a balanced approach between protecting the existing environment, enhancing and promoting healthy riparian corridors, maximising development potential of the land, and managing potential bushfire fuel loads within these areas.

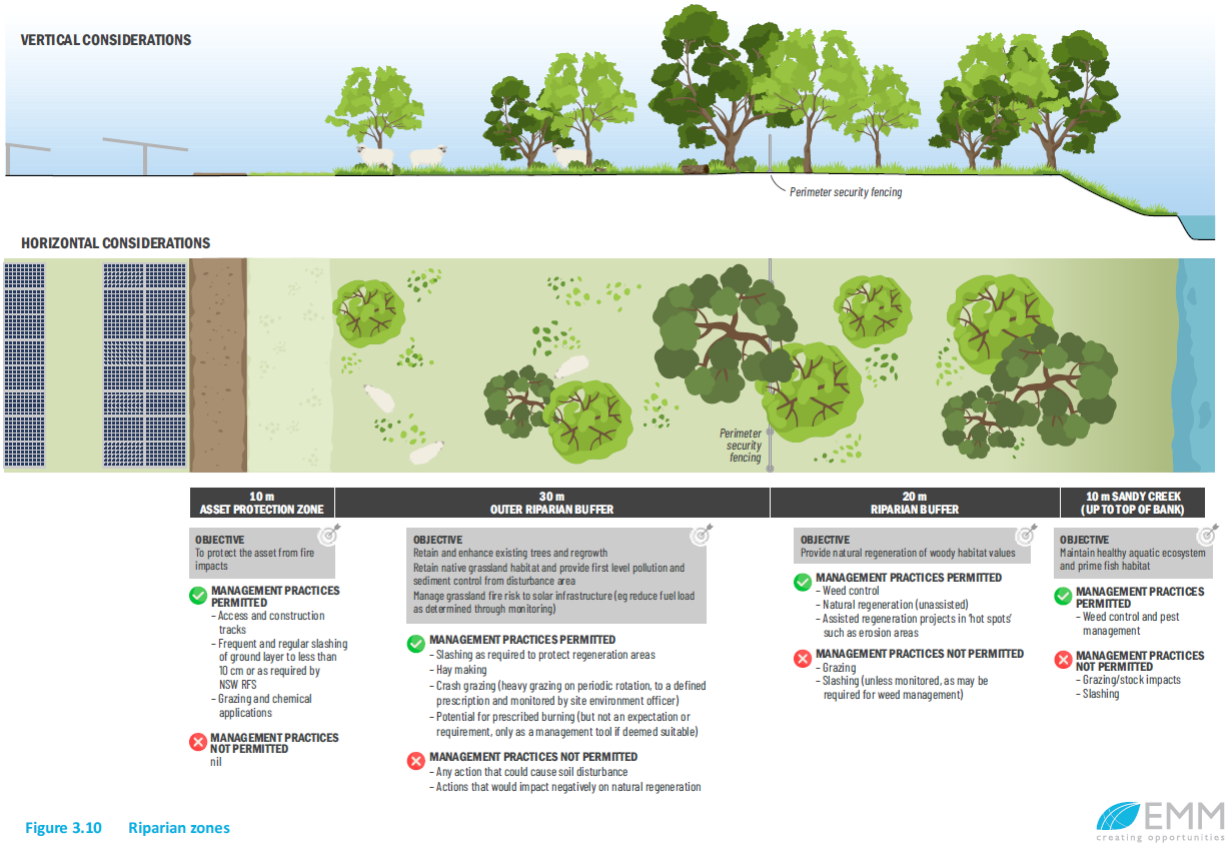


Figure 3.10 Riparian zones

Figure 3.10 Proposed riparian protection zone management for Sandy Creek

3.4.5 Water source

The estimated water demand for construction of the Project is approximately 70 megalitres (ML) per year (ML/year), or 165 ML over the 22-28 month construction period. The majority of this water will be required for dust suppression, with other minor uses including site amenities, fire protection, and washing of construction equipment and plant. During construction of the Project, non-potable water will be sourced via multiple groundwater bores including some existing licensed bores on the property. Additional bores are yet to be constructed but will be located within the development footprint, targeting the regional porous rock aquifer.

Estimated ongoing operational water usage for the Project is 37 ML/year, over 40 years. Most of this water will be required for livestock consumption, washing of PV modules, plus other minor uses including permanent site amenities, fire protection, and washing of equipment and plant. During the operational phase, water will continue to be sourced from onsite bores and trucked to site from a commercial water supply as the primary source if required.

Further information about water source and demand is provided in Section 6.10 and in Appendix O.

3.4.6 Wastewater

Site runoff during construction will be captured in settlement ponds. Ablution wastewater generated on site during construction will be collected periodically for offsite disposal by a licenced waste contractor, as there is no sewer access at the site.

Further information about wastewater management is provided in Section 6.10.

3.4.7 Telecommunications

Telecommunication utilities are not available at the Project site. As such, the cellular network will be used during construction. During operations, connection to telecommunications will be via optical fibre expected to be installed along transmission lines, with cellular backup.

3.4.8 Electricity

Access to electricity during construction will be via the local distribution network, backed up by diesel generation where required.

Electricity generated by the Project during operation will be used for most activities, except for maintaining the inverters and transformers during the night which will involve a small amount of auxiliary load being supplied from the grid.

3.5 Activities during construction

Prior to commencement of construction, LSbp will ensure that all pre-construction conditions of consent are met, including securing the necessary secondary permits.

Construction of the Project will be undertaken in three distinct stages over a period of approximately 22-28 months:

- Stage 1: site establishment (approximately 3 months)
- Stage 2: civil, mechanical, and electrical works plus delivery of construction materials and infrastructure (approximately 14 months)
- Stage 3: commissioning and testing (approximately 12 months).

The three stages of the Project are anticipated to have significant overlap.

3.5.1 Stage 1: site establishment

The key objective of stage 1 is to prepare the Project site for receipt of construction materials and infrastructure. This will largely involve removal of non-required infrastructure, grading of the site and upgrading the road network. Due to the development footprint's relatively flat terrain and predominantly cleared landscape, limited site preparation and civil works will be required. Key activities during this stage include:

- site access road upgrade (Dapper Road) and primary site access to the development footprint:
  - widen road formation to 6 m (as part of the road upgrade corridor)
  - compact and gravel road
- construct water crossings over Sandy Creek and Broken Leg Creek
- remove internal fencing
- relocation of one Project-related house to a location agreed with the landowners
- scrub, grade and minor cut/fill as required to prepare the site surface
- establish two temporary construction compound and maintenance facilities, comprising a site office, containers for storage and parking areas
- survey to confirm infrastructure positioning
- geotechnical investigations to confirm foundation requirements for infrastructure, as applicable
- install Project perimeter fencing
- establish temporary workforce accommodation facility
- install internal access roads.

Note, the first deliveries of construction materials and infrastructure may occur towards the end of this stage.

3.5.2 Stage 2: civil/mechanical/electrical works and deliveries

The key objectives of stage 2 are to undertake civil/mechanical/electrical works and to receive delivery of construction materials and infrastructure.

Construction material and infrastructure, including the BESS and substation, will be transported to theProject site via road. It is anticipated that most construction material and infrastructure will be delivered using up to 36 m B--double trucks, except for the components of the substation which will require over size over mass (OSOM) vehicles.

The following construction material and infrastructure will be delivered to site:

- solar panels, piles, tracker mounting structures and frames
- electrical equipment and infrastructure including cabling, inverters, transformers, switchgear and onsite substation

- construction buildings,permanent buildings and associated infrastructure
- earthworks and lifting machinery and equipment.

Key activities during the civil/mechanical/electrical works stage are outlined below:

- drive piles into the ground to support solar panel mounting structure
- assemble tracker frames and solar panels on top of the piles
- install underground cabling between solar panels and inverters, and to the onsite substation
- prepare foundations for inverter blocks, switchyard and management hub structures
- install combiner boxes, inverters, onsite substation, switchgear and BESS
- construct permanent operations and maintenance (O&M) facilities
- construct transmission infrastructure between the Project's electrical switchyard and the existing overhead transmission line (EnergyCo/ACEREZ scope)
- install external and internal security fencing and CCTV.

3.5.3 Stage 3: commissioning and testing

The key objective of stage 3 is to ensure all elements of the development are properly installed. This phase includes decommissioning the workforce accommodation facilities, cold commissioning, hot commissioning, and testing of the power plant. This stage includes testing of all equipment and circuits including inverters, cabling, tracker systems, earthing, SCADA, and grid-compliance testing according to the transmission network operator and the AEMO requirements.

3.5.4 Construction plant and equipment

The types and quantities of construction equipment will depend on the design and works sequencing by the engineering, procurement and construction (EPC) contractor. However, an indicative list of equipment types and quantities typically used onsite during the construction of a solar farm is outlined in Table 3.5.

Table 3.5 Indicative construction equipment

Stage	Equipment	Quantity
Stage 1 site establishment		
Site establishment and civil works	Asphalt paver	1
	Dozer	1
	Grader	1
	Dump truck	5+
	Roller	1
	Delivery trucks	20+

Stage	Equipment	Quantity
	Water truck	1
	Excavator	1
	Compactor	1
	Bobcat	1
	Generator	1
	Mobile crane/telehandler	1
Establishment of on-site temporary workforce accommodation facility	2.5-5 kW air conditioner inverter	350
	7.1 kW air conditioner inverter	17
	Kitchen exhaust fans	2
	Reefer/chiller	4
Stage 2 - civil/mechanical/electrical works and deliveries		
Piling and foundations	Pneumatic pile driving rig	5
	Concrete truck	1
	Excavator	5
	Bobcat	5
	Mobile crane/telehandler	5
Assembly of all equipment	Pneumatic wrench	50+
	Powered hand tools	50+
	Truck	1
	Mobile crane 130 T	1
	Compressor	1
	Generator	1
	Mobile crane / telehandler	1
Underground cabling	Loader	10
	trencher	10
	Cable trenching and laying equipment	10

3.5.5 Construction vehicles

Traffic during the peak construction month is expected to reach 60 light vehicle movements and 57 heavy vehicle movements (including shuttle buses), for a total of 117 vehicular movements per day (a movement is defined as a vehicle travelling from one place to another, excluding the return journey). While approval is sought for an accommodation facility as part of the Project, these traffic volumes are those anticipated without the facility in place and are therefore conservative. As described further in Section 6.9.4, with the accommodation facility in place these total daily movements are expected to be approximately halved, to around 118 movements.

During both the AM and PM peak hour of the peak construction month, 20 light vehicle movements and 11 heavy vehicle movements (including shuttle buses) will occur, for a total of 31 vehicle movements in each peak hour, as shown in Figure 3.11.

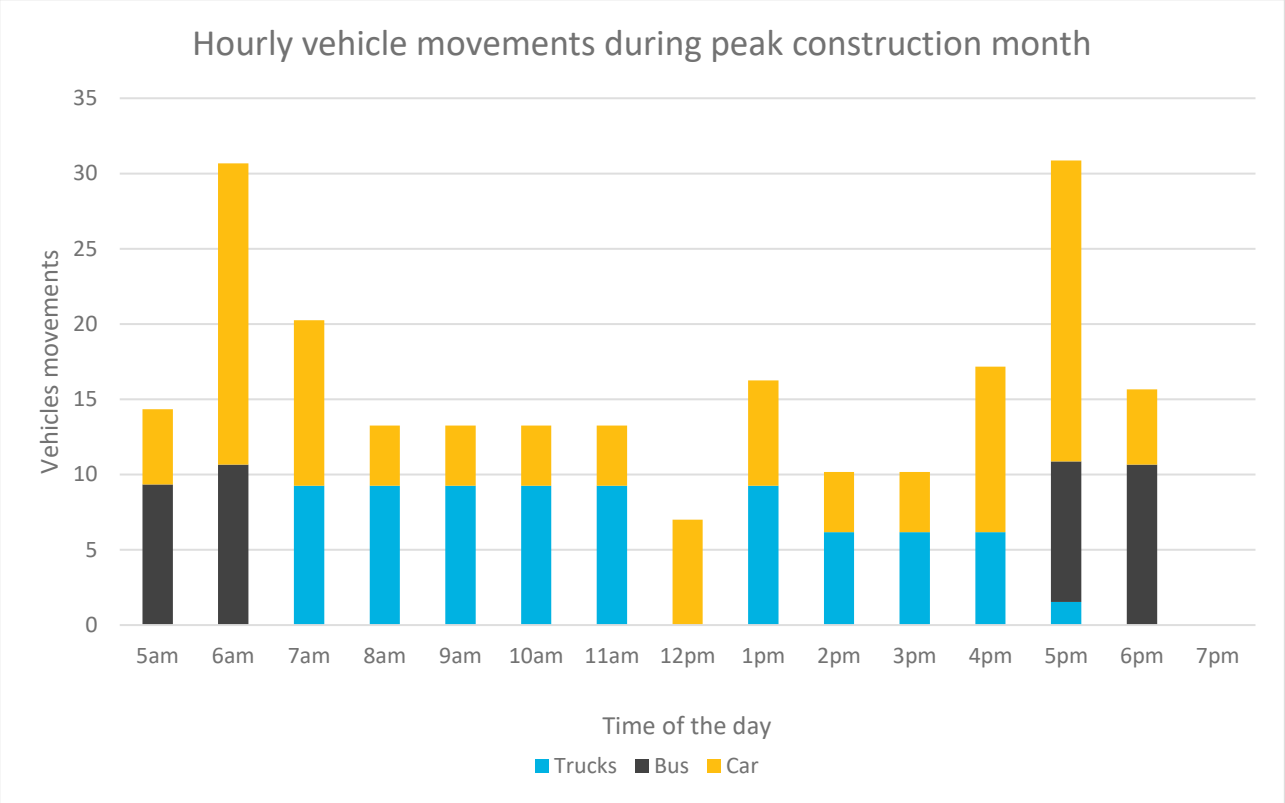


Figure 3.11 Vehicle movements during peak construction month

3.5.6 Construction vehicle haulage routes

Construction materials and infrastructure are anticipated to be transported to the study area via road from either:

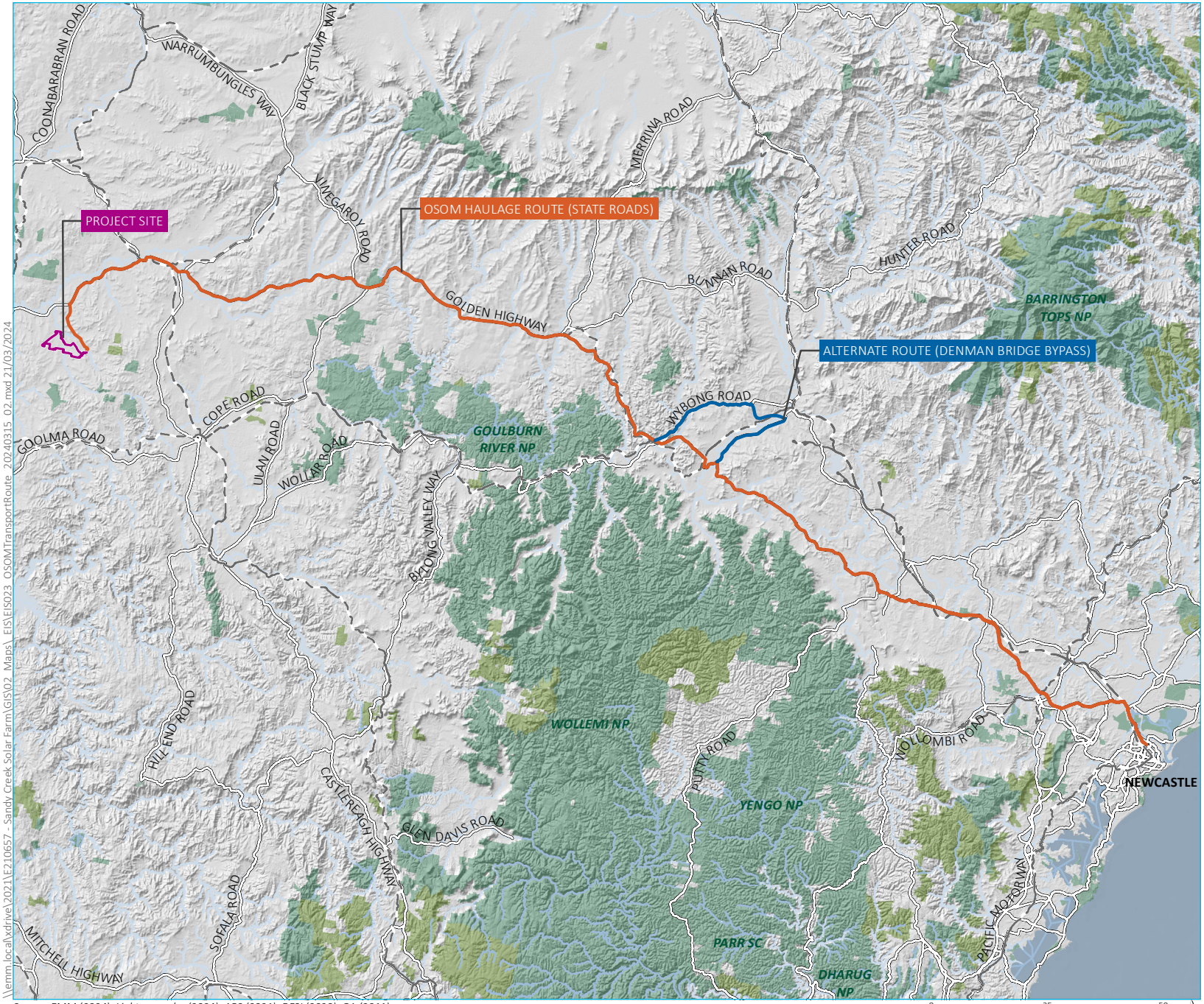
- Port of Newcastle (via the New England Highway, John Renshaw Drive, Hunter Expressway, and the Golden Highway)
- Port of Sydney (via the M1 Motorway to the Hunter Expressway, then via the same route as deliveries from Newcastle).

The likely haulage route and associated delivery method for various infrastructure components are described in Table 3.6. The OSOM haulage route is shown in Figure 3.12.

It is estimated that 50% of the construction workforce will reside in the Project's accommodation facility located within the development footprint. The remaining 50% are anticipated to travel from their homes in Gulgong, Mudgee, Dunedoo, Dubbo, and surrounds. This allocation will be determined once all accommodation options are available and following further consultation with communities about the preferred location of temporary workforce accommodation facilities.

Table 3.6 Indicative haulage routes

Infrastructure	Source location	Delivery method	Delivery route
Transformers	Newcastle (delivered	Drop Deck float (OSOM) under permit	Newcastle Berth then Golden Highway, then Spring Ridge Road, then Dapper Road
Switchgear, PV modules, tracker and BESS components and inverters	Overseas	Ship to Sydney port. Deconsolidated, loaded onto A-double and B-double trucks (up to 36 m) from Sydney/Newcastle region.	M1 Motorway, Hunter Expressway, New England Highway, Golden Highway, Spring Ridge Road, then Dapper Road
BESS	Overseas	Ship to Sydney port. A-double and B-double trucks (up to 36 m) from Sydney port.	M1 Motorway, Hunter Expressway, New England Highway, Golden Highway, Spring Ridge Road, then Dapper Road
Cables and other equipment	Melbourne, Sydney or overseas	A-double and B-double trucks (up to 36 m).	M1 Motorway, Hunter Expressway, New England Highway, Golden Highway, Spring Ridge Road, then Dapper Road



\\emm.local\xdrive\2021\E210657 - Sandy Creek Solar Farm\GIS\02_Maps_EIS\EIS023_OSOMTransportRoute_20240315_02.mxd 21/03/2024

Source: EMM (2024); Lightsource bp (2024); ABS (2021); DFSI (2020); GA (2011)

OSOM transport route

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 3.12

EMM
creating opportunities

3.6 Activities during operation

The key activities during the operation phase will comprise:

- operation of the solar arrays and BESS
- maintenance of all electrical and mechanical equipment, including tracker system, low voltage/medium voltage cabling, PV modules, switchgear, BESS, and communication systems
- management of vegetation, weeds, and pests
- fence and access road management
- landscaping
- panel cleaning, repair and replacement
- site security.

The option to graze sheep on portions of the development footprint will be available during operations.

The Project will operate 24 hours per day, 7 days per week, 365 days per year.

3.7 Activities during decommissioning and rehabilitation

LSbp is considering two options once the Project reaches the end of its investment and operational life. One option is Project infrastructure will be decommissioned, and the site returned to its pre-existing land use, or other land use in consultation with the landholder, as far as practicable. The other option is Project infrastructure will remain at the Projectsite and will be repowered to produce energy for another 40 years. Assuming the first option proceeds, key activities during the decommissioning and rehabilitation phase will comprise:

- removal of all above ground infrastructure except for:
    - overhead transmission line
    - access road including water crossings (if requested by the landholders at the time of decommissioning)
    - onsite water crossings (if requested by the landholders at the time of decommissioning)
    - internal access tracks (if requested by the landholders at the time of decommissioning)
- recycling of infrastructure components as much as practicable
- soil sampling (and soil rehabilitation if required)
- revegetation in consultation with landholders.

Underground cabling may remain in-situ to avoid unnecessary ground disturbance, subject to landholder agreement.

A decommissioning and rehabilitation plan will be prepared in consultation with landholders and regulators. The plan will outline the:

- rehabilitation objectives

- proposed method for removal of infrastructure
- disposal options for infrastructure after removal
- performance criteria for rehabilitation, including soil quality
- timelines and responsibilities for implementation of this plan.

3.8 Workforce

3.8.1 Construction

The average construction workforce over the 22–28-month construction period will be 245 people FTE, peaking at up to 350 FTE during the peak construction period.

During the construction phase, the Project will include a temporary workforce accommodation facility, located within the south-east portion of the development footprint. The facility will have capacity to accommodate up to 350 workers.

3.8.2 Operations

Throughout operations, it is anticipated that a workforce of up to 10 people FTE will be required.

3.9 Schedule

The indicative timing of each delivery phase is outlined in Table 3.7. The timing and duration of each stage will be confirmed once the preferred EPC contractor is selected. This will occur after Project determination has been received and during the contracting and detail design stage of the Project.

Table 3.7 Indicative Project schedule

Phase	Approximate duration	Approximate timing
Development assessment approval	2 years	2024
Construction	22–28 months	2026–2028
Operation	40 years	2028-2068
Decommissioning and rehabilitation	1 year	2068–2069

4 Statutory context

4.1 Introduction

This chapter identifies key relevant statutory requirements for the Project having regard to the EP&A Act and EP&A Regulation, and other relevant NSW and Commonwealth legislation and environmental planning instruments.

This section addresses:

- power to grant approval (i.e. approval pathway)
- permissibility
- other approvals
- pre-conditions to exercising the power to grant approval
- mandatory matters for consideration.

Relevant statutory requirements are considered in detail in the assessment sections of this EIS (Chapter 6) and supporting technical reports in Appendix G to Appendix T.

This chapter identifies the statutory requirements relevant to the characterisation, assessment, and evaluation of the Project. All relevant statutory requirements, including administrative requirements relevant to the Project are provided in Appendix D.

4.2 The NSW environmental planning and assessment framework

The EP&A Act defines the statutory framework for environmental assessment and planning approvals in NSW. The EP&A Act is administered by the Minister, statutory authorities, and local councils.

The Project fits within the definition of 'development' as provided in section 1.5 of the EP&A Act and consequently Part 4 of the EP&A Act sets out the provisions for the carrying out of development and the consent requirements.

The EP&A Act and related statutory instruments also provide definitions for various types of development and the approval pathways which apply.

4.3 Characterisation

The Project is characterised as 'electricity generating works'.

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) defines electricity generating works as:

> ***electricity generating works*** means a building or place used for the following purposes, but does not include a solar energy system—
>
> (a) making or generating electricity, or
>
> (b) electricity storage.

The Project is not characterised as a 'solar energy system' as this is limited to photovoltaic electricity generating systems used for the primary purpose of generating electricity for use on the same (or adjoining) land.

4.4 Approval pathway

The Project is declared to be SSD by State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). Section 2.6(1) of the Planning Systems SEPP states:

> (1) Development is declared to be State significant development for the purposes of the Act if -
>
> (a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and
>
> (b) the development is specified in Schedule 1 or 2.

The Project meets the requirements of section 2.6(1)(a) as it is not permissible without development consent. The Project also meets section 2.6(1)(b), as it is 'electricity generating works' which have an estimated development costof more than $30 million as specified in Schedule 1 of the Planning Systems SEPP. Therefore, the Project meets the requirements of section 2.6(1) and is SSD that requires development consent, in accordance with Part 4, Division 4.7 of the EP&A Act.

The indicative determination timeline is shown in Figure 4.1.

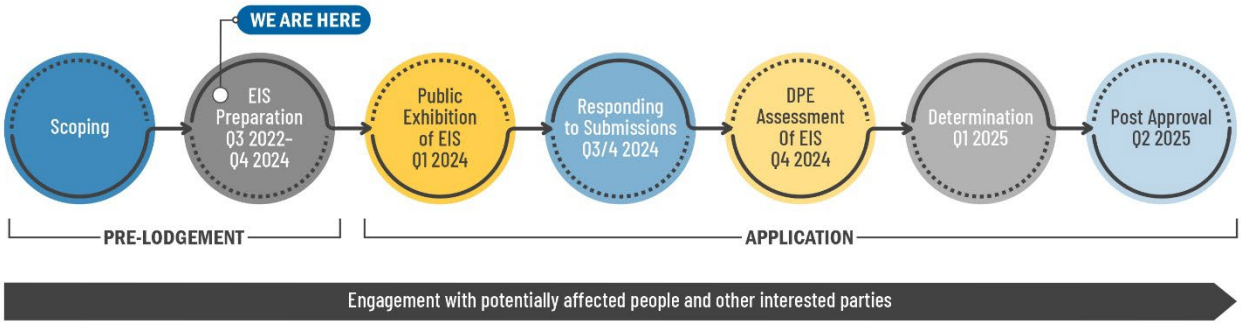


Figure 4.1 Indicative planning approval timeframes

4.5 Permissibility

Section 2.36(1)(b) of the Transport and Infrastructure SEPP relevantly states:

> (1) Development for the purpose of electricity generating works may be carried out by any person with consent on the following land—
>
> (a) in the case of electricity generating works comprising a building or place used for the purpose of making or generating electricity using waves, tides or aquatic thermal as the relevant fuel source—on any land,
>
> (b) in any other case—any land in a prescribed rural, industrial or special use zone.

As the Project falls within two LGAs – Dubbo Regional Council and Warrumbungle Shire Council,both the Dubbo LEP and the Warrumbungle LEP apply. Under both instruments, the land is zoned RU1 Primary Production. RU1 is a prescribed zone for the purpose of section 2.36 of the Transport and Infrastructure SEPP.

Therefore, the Project is permissible with development consent.

4.6 Consent authority

Under Section 4.5(a) of the EP&A Act, the Minister is the consent authority for SSD if the Independent Planning Commission (IPC) has not been declared to be the consent authority for the development by an environmental planning instrument.

Pursuant to section 2.7(1) of the Planning Systems SEPP, the IPC is the consent authority for the following types of SSD (unless the application to carry out the development is made by or on behalf of a public authority or the development is declared to be State significant infrastructure related development, neither of which is the case for the Project):

(a) development in respect of which the Council of the area in which the development is to be carried out has duly made a submission by way of objection under the mandatory requirements for community participation in Schedule 1 to the Act,

(b) development in respect of which at least 50 submissions (other than from a council) have duly been made by way of objection under the mandatory requirements for community participation in Schedule 1 to the Act,

(c) development the subject of a development application made by a person who has disclosed a reportable political donation under section 10.4 to the Act in connection with the development application.

4.7 Other approvals

This section identifies other approvals that are required to carry out the Project and explains why they are required. These approvals are outlined in Table 4.1 and have been grouped into the following categories:

- consistent approvals, which are approvals that cannot be refused and are required to be issued consistently under Section 4.42 of the EP&A Act if the Project is approved
- Commonwealth Government approvals
- other approvals, which are approvals that are not expressly integrated into the SSD application process
- approvals not required, which are approvals that would be required if the Project was not SSD as per Section 4.41 of the EP&A Act.

Table 4.1 Approvals and licences required

Approval	Requirement
Consistent approvals	
An environment protection licence (EPL) under Part 3 of the NSW *Protection of the Environment Operations Act 1997* (POEO Act)	The generation of electricity from solar power is not defined as a scheduled activity in Schedule 1 of the POEO Act and therefore an EPL is not required.
An approval under Section 138 of the NSW *Roads Act 1993* (Roads Act)	Approval will be required under section 138 of the Roads Act for any works in, on or over a public road. This will include the access road upgrade on Dapper Road and the public road crossing on Sandy Creek Road. Approval will be required from Warrumbungle Shire Council.

Approval	Requirement
Commonwealth approvals	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Following completion of targeted surveys across the Project site, an EPBC Act referral was submitted to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). This considered if there are potentially significant impacts to Matters of National Environmental Significance (MNES), including to threatened species and communities, and therefore whether the Project is considered to be a 'controlled action'. The Project was determined not to be a controlled action, therefore, approval under the EPBC Act will not be required.
Native Title Act 1993	The Commonwealth *Native Title Act 1993* recognises and protects native title rights in Australia. The act allows a native title determination application (native title claim) to be made for land or waters where native title has not been validly extinguished, for example, extinguished by the grant of freehold title to land. Claimants whose native title claims have been registered have the right to negotiate about some future acts, including mining and granting of a mining lease over the land covered by their native title claim. Where a native title claim is not registered, a development can proceed through mediation and determination processes, though claimants will not be able to participate in future act negotiations. There are currently no native title determinations over the Project site.
Other NSW approvals	
NSW *Conveyancing Act 1919*	The development footprint will require a separate lease from the owners of the affected land. Lease of a solar farm site is treated as a lease of premises, regardless of whether the lease will be for more or less than 25 years. The plan defining 'premises' (being the development footprint) will not constitute a 'current plan' within the meaning of Section 7A of the NSW *Conveyancing Act 1919* and therefore will not require subdivision consent under section 23G of the Act.
NSW *Crown Land Management Act 2016*	Several Crown roads have been identified within the study area, as shown in Figure 3.4. Crown roads within the development footprint and road upgrade corridor will require closing or an application for tenure, which will be undertaken in consultation with NSW Crown Lands in parallel with the assessment process for the Project (refer also to Table 3.2)
Approvals not required	
A permit under the NSW *Fisheries Management Act 1994* (Fisheries Management Act) to block fish passage or dredge or carry out reclamation work on water land	A permit under the Fisheries Management Act to block fish passage or dredge or carry out reclamation work on water land will not be required pursuant to Section 4.41 of the EP&A Act. The Project may require work in water land to facilitate the upgrade of road crossings or establish new crossings of watercourses within the Project site. These works will be undertaken in accordance with NSW DPI *Policies and Guidelines on Fish-Friendly Waterway Crossings* (undated), *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013), and NSW *Guidelines for Controlled Activities*.
A heritage impact permit under Section 139 of the *Heritage Act 1977* (Heritage Act)	An approval under Part 4, or an excavation permit under Section 139, of the Heritage Act will not be required pursuant to Section 4.41 of the EP&A Act as there are no listed items within the development footprint.

Approval	Requirement
An Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act 1974* (NPW Act)	An Aboriginal heritage impact permit under Section 90 of the NPW Act will not be required pursuant to Section 4.41 of the EP&A Act. There is potential for Aboriginal sites to occur within the Project site. Any Aboriginal heritage sites identified within the Project site will be avoided as far as practicable through the design process, and any potential impacts to Aboriginal heritage values will be subject to management measures commensurate with their assessed significance. As the Project is classed as SSD, an Aboriginal heritage impact permit (AHIP) is therefore not required to permit harm to Aboriginal objects associated with an approved project. Instead, an approved management plan would manage relevant Aboriginal cultural heritage values. An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed post determination (and pre-construction) in consultation with DPE, registered Aboriginal parties (RAPs) and Heritage NSW and will detail the management and mitigation of known Aboriginal sites along with unanticipated finds procedures, and training and reporting protocols.
A bushfire safety authority under Section 100B of the NSW *Rural Fires Act 1997* (Rural Fires Act)	A bushfire safety authority under Section 100B of the Rural Fires Act will not be required pursuant to Section 4.41 of the EP&A Act (refer to Section 6.12).
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 of the *Water Management Act 2000* (Water Management 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 of the Water Management Act will not be required pursuant to Section 4.41 of the EP&A Act. The Project will involve works within 40 m of a watercourse. Therefore, a Controlled Activity Approval under Section 91 of the WM Act would have been required for the Project, if not for Section 4.41 of the EP&A Act.

4.8 Pre-conditions to approvals

Pre-conditions for the consent authority in exercising the power to grant approval for the Project are provided in Table 4.2.

Table 4.2 Pre-conditions to being able to grant approval for the Project

Statutory reference	Pre-condition	Relevance	Section in EIS
State Environmental Planning Policy (Resilience and Hazards) 2021, Section 4.6(1) (contamination and remediation to be considered in determining development application)	A consent authority must not consent to the carrying out of any development on land unless: a) it has considered whether the land is contaminated, and b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.	The Project involves a change of use from agricultural use to electrical generating works. Agricultural activities have occurred on and near the development footprint; however, no potentially contaminative locations have been identified to date. An assessment of land use and soils has been conducted as part of the EIS.	Section 4

Statutory reference	Pre-condition	Relevance	Section in EIS
State Environmental Planning Policy (Transport and Infrastructure) 2021, section 2.48(2)	Before determining a development application (or an application for modification of a consent) for development to which this clause applies, the consent authority must— a) give written notice to the electricity supply authority for the area in which the development is to be carried out, inviting comments about potential safety risks, and b) take into consideration any response to the notice that is received within 21 days after the notice is given.	Project involves works within and adjacent to easements for electricity purposes.	Chapter 5
State Environmental Planning Policy (Transport and Infrastructure) 2021, section 2.119(2))	The consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that— a) where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of— i) the design of the vehicular access to the land, or ii) the emission of smoke or dust from the development, or iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road	Proposed access to the Project site via local roads off the Golden Highway, a classified road.	Section 6.9
Warrumbungle LEP, Clause 6.4 (Groundwater vulnerability)	(4) Development consent must not be granted to development on land to which this clause unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	A small part of the study area is identified as 'groundwater vulnerable' on the Warrumbungle LEP groundwater vulnerability map. However, groundwater is not anticipated to be impacted by the project. Further, the mapped area generally reflects Sandy Creek, and riparian protection zones have been included in the Project design to avoid impacts in these riparian areas.	Section 6.10 and Appendix O

Statutory reference	Pre-condition	Relevance	Section in EIS
Dubbo LEP, Clause 7.5 (Groundwater vulnerability)	(4) Development consent must not be granted to development on land to which this clause unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if a significant adverse environmental; impact cannot be avoided—the development is designed, sited and will be managed to minimise that impact. .	A small part of the study area is identified as 'groundwater vulnerable' on the Dubbo LEP groundwater vulnerability map. However, groundwater is not anticipated to be impacted by the project. Further, the mapped area generally reflects Sandy Creek, and riparian protection zones have been included in the Project design to avoid impacts in these riparian areas.	Section 6.10 and Appendix O

4.9 Mandatory considerations

The mandatory conditions that must be satisfied before the consent authority may grant approval for the Project are listed in Table 4.3.

Table 4.3 Mandatory considerations for the Project

Statutory document	Section reference	Mandatory consideration	Section in EIS
Considerations under the EP&A Act and EP&A Regulation			
NSW *Environmental Planning and Assessment Act 1979*	Section 1.3	Relevant objects of the Act	Section 7.4
	Section 4.15(1)	Matters for consideration – general In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:	
		(a) the provisions of— (i) any relevant environmental planning instruments, and … (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), That apply to the land to which the development application relates.	See below
		(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Chapter 6
		(c) the suitability of the site for the development.	Section 2.4
		(e) the public interest.	Chapter 7

Statutory document	Section reference	Mandatory consideration	Section in EIS
Environmental Planning and Assessment Regulation 2021	Section 24	(1) A development application must— (a) be in the approved form, and (b) contain all of the information and documents required by: (i) the approved form, and (ii) the Act of this Regulation, and (c) be submitted on the NSW planning portal.	This EIS will be submitted via the NSW planning portal and has been prepared in the approved form.
	Section 190	(1) An environmental impact statement must contain the following information –	
		(a) the name, address and professional qualifications of the person who prepared the statement,	Certification page
		(b) the name and address of the responsible person,	Table 1.1
		(c) the address of the land— (i) to which the development application relates, or (ii) on which the activity or infrastructure to which the statement relates will be carried out,	Table 3.1
		(d) a description of the development, activity or infrastructure,	Chapter 3
		(e) an assessment by the person who prepared the statement of the environmental impact of the development, activity or infrastructure, dealing with the matters referred to in this Division.	This table
		(2) The person preparing the statement must have regard to—	
		(a) for State significant development—the *State Significant Development Guidelines*	The EIS has been prepared in accordance with the *State significant development guidelines – preparing an environmental impact statement* (DPIE 2021a).
		(3) An environmental impact statement must also contain a declaration by the person who prepared the statement of the following—	
		(a) the statement has been prepared in accordance with this Division, and	Certification page
		(b) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure, and	
		(c) the information contained in the statement is not false or misleading.	
	Section 192	(1) An environmental impact statement must contain the following –	
		(a) a summary of the environmental impact statement,	Executive summary
		(b) a statement of the objectives of the development, activity or infrastructure,	Section 1.3
		(c) an analysis of feasible alternatives to the carrying out of the development, activity or infrastructure, considering its objectives, including the consequences of not carrying out the development, activity or infrastructure,	Section 2.7

Statutory document	Section reference	Mandatory consideration	Section in EIS
		(d) an analysis of the development, activity or infrastructure, including—	
		(i) a full description of the development, activity or infrastructure, and	Chapter 3
		(ii) a general description of the environment likely to be affected by the development, activity or infrastructure and a detailed description of the aspects of the environment that are likely to be significantly affected, and	Section 2.5 Chapter 6
		(iii) the likely impact on the environment of the development, activity or infrastructure, and	Chapter 6 and Appendix G
		(iv) a full description of the measures to mitigate adverse effects of the development, activity or infrastructure on the environment, and	Appendix F
		(v) a list of the approvals that must be obtained under another Act or law before the development, activity or infrastructure may lawfully be carried out,	Table 4.1
		(e) a compilation, in a single section of the environmental impact statement, of the measures referred to in paragraph (d)(iv),	Appendix F
		(f) the reasons justifying the carrying out of the development, activity or infrastructure, considering biophysical, economic and social factors, including the principles of ecologically sustainable development set out in Section 193.	Chapter 7
Mandatory relevant considerations under EPIs			
State Environmental Planning Policy (Resilience and Hazards) 2021	Section 3.7	Consideration must be given to current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development.	Section 6.11
State Environmental Planning Policy (Resilience and Hazards) 2021	Section 4.6(1)	Whether the land is contaminated.	Section 6.6
	Section 4.6(2)	Change of land use from agriculture requires consideration of a preliminary investigation report.	Section 6.9
State Environmental Planning Policy (Transport and Infrastructure) 2021	Section 2.45(2))	Any response from relevant electricity supply authority.	Section 4.3
	Section 2.122(4)(b)	• Any submission from TfNSW. • Accessibility of the site. • Any potential traffic safety, road congestion or parking implications.	Section 6.9
Warrumbungle Local Environmental Plan 2013	Land Use Table	Objectives and land uses for RU1 zone.	Section 3.2.1
	Part 4	Principal development standards.	Chapter 4
	Part 6	Additional local provisions.	Chapter 4
Dubbo Regional Local Environmental Plan 2022	Land Use Table	Objectives and land uses for RU1 zone.	Section 3.2
	Part 4	Principal development standards.	Chapter 4
	Part 7	Additional local provisions.	Chapter 4

Statutory document	Section reference	Mandatory consideration	Section in EIS
Considerations under other legislation			
NSW *Biodiversity Conservation Act 2016*	Section 7.14	(2) The Minister for Planning, when determining in accordance with the NSW *Environmental Planning and Assessment Act 1979* any such application, is to take into consideration under that Act the likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report. The Minister for Planning may (but is not required to) further consider under that Act the likely impact of the proposed development on biodiversity values.	Section 6.2, Section 6.3, Appendix G

5 Engagement

5.1 Introduction

This chapter provides a summary of the communication and engagement undertaken and feedback received about the Project, as part of preparing the EIS. It outlines the communication approach,objectives,engagement tools used,and activities undertaken, to proactively provide information and collect sufficient representative feedback and comment on the Project.

This chapter provides an overview of the identified Project stakeholders and a summary of the community views about the Project, including the key issues and themes raised. A summary of issues raised and where they have been considered and addressed is included in Appendix E.

Included in this chapter are details about proposed future communication and engagement activities to be undertaken if the Project is approved.

5.2 Regulatory requirements and guidelines for engagement

The stakeholder and community engagement program developed and implemented for the Project was informed by Project-specific SEARs and state government regulatory requirements and guidelines for undertaking engagement, as part of preparing an EIS, including:

- *Community Participation Plan* (CCP) (DPE 2019)
- *Undertaking Engagement Guidelines for State Significant Projects* (DPE 2022c)
- *State Significant Development Guidelines, Appendix B State Significant Development Guidelines – Preparing an Environmental Impact Statement*(DPE 2022a)
- *Large-Scale Solar Energy Guideline and Landscape and Visual Impact Assessment Technical Supplement*, (DPE 2022f) (See Section 6.7, for details about the VIA-specific engagement)
- *Social Impact Assessment Guideline for State Significant Projects* (DPE 2022d) (See Section 6.13 of this report, for details about the social impact assessment (SIA)-specific engagement program, including engagement tools, activities and outcomes)
- *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (OEH 2005) (See Section 6.4 of the EIS)
- *First Nations Guidelines – Increasing Central-West Orana Income and Employment Opportunities from Electricity Infrastructure Projects* (OECC 2022) (See Sections 6.13 and 6.14 of the EIS.).

Table 5.1 provides an overview of the *Undertaking Engagement Guidelines for State Significant Projects* (DPE 2022c) requirements and details the sections of the EIS or other documentation, where compliance is demonstrated.

Table 5.1 Compliance overview – *Undertaking engagement guidelines for State Significant Projects*

#	Guidance for proponents	Requirements	Demonstrated compliance
1	Engagement strategy	• Consider the International Association of Public Participation's (IAP2) Core Values and Spectrum of Public Participation (i.e. inform, consult, involve, collaborate).	• The stakeholder mapping and analysis undertaken included identifying the levels of engagement to be implemented (see Section 5.4). This informed the communication and engagement tools selected and activities undertaken (see Sections 5.5). • The Sandy Creek Solar Farm Community and Stakeholder Engagement Plan references the relevant government regulations and guidelines for engagement. This includes IAP's Core Values and Spectrum of Public Participation.
2	Plan early	• Start planning engagement in the formation or scoping phase.	• Planning commenced in early 2021, as part of preparing for the scoping phase. • The Sandy Creek Solar Farm Scoping Report (EMM 2022), included a stakeholder engagement plan/ strategy.
		• Identify people and groups who may have an interest in or be affected by the Project. • Consider the level of influence participants can have on elements of the Project.	• Interested and affected parties and other Project stakeholders were identified early in detail and were included in the Sandy Creek Solar Farm Scoping Report (EMM 2022). • The scoping report included the anticipated levels of interest and influence of each stakeholder identified. • An updated refined stakeholder list and analysis are included in Section 5.4.
		• Consider activities that will be appropriate, proportionate, effective and practical to support robust and rigorous engagement.	• The Sandy Creek Solar Farm Scoping Report (EMM 2022) included the stakeholder engagement plan, which outlined the engagement tools and activities planned to be implemented.
3	Engage as early as possible	• Engage during the scoping phase or earlier.	• Project-specific stakeholder engagement has been undertaken since early 2021, during the scoping phase. • The engagement tools and activities implemented are included in the Sandy Creek Solar Farm Scoping Report (EMM 2022).
		• The scoping report must include an early indication of community views and details of the engagement that will be carried out during the EIS.	• The Sandy Creek Solar Farm Scoping Report (EMM 2022), provided outcomes of the early engagement program, including initial key stakeholder and community views about the Project. • The scoping report also included the anticipated engagement activities to be implemented during the EIS phase.
4	Ensure engagement is effective	• Show how stakeholders were provided the information they need to understand the Project and its impacts and, were given the opportunity to participate in a meaningful way.	• As outlined in Section 5.5, a wide range of communication tools were used and activities undertaken to ensure Project information was accessible and there were several ways to engage directly and in meaningfully with the Project team.
		• Show how feedback was considered and influenced the Project.	• Appendix E, outlines the key issues raised and where they have been addressed in the EIS.
5	Ensure engagement is proportionate to the scale and impact of the Project	• Show how the scale and likely impacts, geographical reach, number of activities and stages of engagement, were used to prevent consultation fatigue and keep engagement meaningful.	• Section 5.5 provides details of the engagement tools and activities implemented. This included targeted communication and engagement with the most affected landowners and briefing federal, state and local government elected representatives and Dubbo Regional, Warrumbungle Shire and Mid-Western Regional Councils. • To help minimise consultation fatigue, LSbp participated in local community events and EnergyCo's community information sessions.

#	Guidance for proponents	Requirements	Demonstrated compliance
6	Be innovative	• Use multiple channels for engagement.	• As described in Section 5.5, traditional hard copy and digital communication materials were developed and proactively distributed to affected and interested parties. This included via post, email, phone, and in-person. • A Project web page was established and updated. • A dedicated Project phone line and email were established and staffed.
7	Be open and transparent to what can be influenced	• Explain outcomes of any early planning and engagement undertaken. • Identify Project elements that can be influenced by the community during the EIS.	• Sandy Creek Solar Farm Scoping Report (EMM 2022). • Appendix E outlines the key issues raised and where they have been addressed in the EIS.
8	Implement DPE's Community Participation Plan objectives	• The engagement program must be open and inclusive, easy to access, relevant/ tailored, timely and meaningful.	• Detailed adjacent and nearby stakeholder mapping was undertaken, including along the transport routes (see Section 5.4). • The engagement program included multiple two-way communication channels. • LSbp proactively reached out to engage with affected and interested stakeholders in a range of ways as part of developing the Project and preparing the EIS. • See Section 5.5 for details about the tools used and activities implemented, including timings. • These approaches ensured key stakeholders and the community had easy access to Project information, could engage meaningfully with the Project team and provide comment and feedback on the Project, in timely ways.

5.3 Community and Stakeholder Engagement Plan

During the scoping of the phase of the Project, a Community and Stakeholder Engagement Plan (CSEP) was prepared, which was updated for the EIS phase of the Project. The CSEP will be updated again if the Project is approved to proceed.

5.3.1 Communication and engagement objectives

The objectives of EIS-phase CSEP included ensuring:

- high levels of awareness and understanding of the Project (i.e. purposed, scope, timeframes and key benefits) and the EIS technical studies and approvals process amongpotentially affected and/or interested Project stakeholders
- that those potentially affected and/or interested in the Project have the opportunity to provide their local knowledge and feedback during preparation of this EIS
- feedback received is considered, particularly in relation to impact identification and developing mitigation and management measures
- key stakeholder and community enquiries, complaints and requests for information are responded to in a timely manner.

5.3.2 Communication and engagement approach

The approach to communication and engagement was cognisant of the regulatory requirements and guidelines as outlined in Section 5.2. The approach to communication and engagement involved:

- seeking to engage as early as possible and communicate proactively as the impact assessment process progressed
- being open and transparent when providing informing and engaging with all stakeholders
- providing as much information as possible to enable meaningful dialogue about the Project and its potential impacts
- actively listening to concerns raised and demonstrating how concerns have been addressed.

During preparation of this EIS, LSbp was aware of stakeholders being approached by multiple proponents planning and developing renewable energy projects within the CWO REZ, and EnergyCo as part of proposed new high-voltage transmission line infrastructure. To help minimise key stakeholder consultation fatigue and imposts on their time, LSbp participated in EnergyCo's information sessions, and attended the annual Dunedoo Show twice.

5.4 Key stakeholders

Project stakeholders and potentially affected community members were identified in the Scoping Phase by undertaking desktop research and developing a comprehensive landowner map, including along the key transport routes to Dunedoo in the north-east, and Gulgong in the south-east.

The stakeholder list was expanded in response to feedback received as part SIA stakeholder interviews and other stakeholder feedback. The NSW State Government election held in March 2023 involved some changes to elected representatives and ministers.

The identified Project stakeholders have been assessed and classified according to the how impacted they may be by the Project and their levels of interest/ influence on Project development, design and approval processes and outcomes. Table 5.2 shows the assessment criteria and stakeholder classifications.

Table 5.2 Stakeholder assessment criteria and classifications

Criteria	Classification			
	Level 1	Level 2	Level 3	Level 4
Project impacts on the stakeholder	High impact	Low impact	High impact	Low impact
Stakeholder levels of interest in/ influence on the Project development and design and approval processes and outcomes	Very High interest and/or influence	High interest and/or influence	moderate interest and/or influence	Low interest and/or influence

Table 5.3 provides an overview of key stakeholders and the level of engagement implemented, as part of the Project, based on the International Association of Public Participation's (IAP2) Spectrum of Engagement.

Table 5.3 Stakeholder classifications and engagement levels

Classification	Stakeholder Groups	Details	IAP2 Spectrum of Engagement Level
1	Regulatory – Federal Government Departments and Agencies	• Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Inform Consult Involve
1	Regulatory – State Government Departments and Agencies	• Department of Planning and Environment (DPE) (currently known as Department of Planning, Housing and Infrastructure (DPHI))	Inform Consult Involve
1	State Government Departments and Agencies	• DPE Divisions (now under DEECCW): – Biodiversity, Conservation, Science Directorate (now known as DEECCW Environment and Heritage) – Heritage NSW (now known as DEECCW Environment and Heritage) – DPE Water (now known as DEECCW Water) • Transport for NSW • EnergyCo • Environment Protection Authority (EPA) • Department of Primary Industries • Rural Fire Service • Fire and Rescue NSW • SafeWork NSW	Inform Consult
1	Federal Government Minister	• Hon. Chris Bowen, Minister for Climate Change and Energy	Inform Consult

Classification	Stakeholder Groups	Details	IAP2 Spectrum of Engagement Level
1	State Government Ministers	• Hon. Penny Sharpe, Minister for the Environment, Minister for Energy, Minister for Heritage, Minister for Climate Change • Hon. Jo Haylen, Minister for Transport • Hon. Jenny Aitchison, Minister for Regional Transport and Roads • Hon.Tara Moriarty, Minister for Regional NSW *NB State Government Election held 25 March 2023.* *Former Ministers:* • Matt Kean, Former Minister for Energy and Environment • Rob Stokes, Former Minister for Infrastructure, the Minister for Cities, and the Minister for Active Transport • James Griffin, Former Minister for Environment and Heritage • Sam Farraway, Former Minister for Regional Transport and Roads • Paul O'Toole, Minister for Planning and Public Spaces, Minister for Transport and Main Roads	Inform Consult
1	Local Government Officers	• Dubbo Regional Council • Warrumbungle Shire Council	Inform Consult Involve
2		• Mid-Western Regional Council	Inform
2	Elected Representatives	*Federal Government:* • Hon. Mark Coulton MP, Member for Parkes *State Government:* • Dugald Saunders MP, Member for Dubbo *Local Government:* • Dubbo Regional Council: Councillor (Cr) Matthew Dickerson, Mayor and Cr Richard Ivey, Deputy Mayor and Crs • Warrumbungle Shire Council: Cr Ambrose Doolan, Mayor	Inform Consult
1	Traditional Landowners	• Registered Aboriginal Parties (9) • CWO REZ First Nations Working Group (EnergyCo convened)	Inform Consult Collaborate
1	Landowners Within the Project Area	• Host landowners (2)	Inform Consult Collaborate
1	Adjacent Landowners	• Landowners directly adjacent and within 2km of the Project site (17)	Inform Consult
1	Nearby Landowners	Landowners potentially impacted by changed visual amenity (18)	Inform Consult
1	Transport Route Stakeholders	• Landowners along the transport route (65): Sandy Creek Road, Dapper Road, Spring Ridge Road, Golden Highway	Inform Consult
		• Road users/ motorists • Transport service providers: Sid Fogg's Coachlines	Inform

Classification	Stakeholder Groups	Details	IAP2 Spectrum of Engagement Level
2	Local Emergency Services	• Gulgong Rural Fire Service • Gulgong Fire and Rescue • Gulgong Ambulance Station • NSW Police service operations in Gulgong and Dunnedoo	Inform Consult
2	Community Interest Groups	• Dundedoo District Development Group • Central West Cycle Trail Inc (CWC Trail Inc) • Gulgong Bowling and Sporting Club • Gulgong Mens Shed • CWA Gulgong	Inform Consult
2	Peak Business Organisations	• Gulgong Chamber of Commerce • Dubbo Chamber of Commerce • Mudgee Chamber of Commerce – Mudgee Business • NSW Farmers Federation – Dunedoo Branch	Inform Consult
2	CWO REZ Working Group (EnergyCo convened)	• Dubbo Regional Council, Warrumbungle Shire Council, Mid-Western Regional Council • Business Mudgee • NSW Farmers Mudgee • Central West Environment Council • Mudgee District Environment Group & Watershed Landcare • RE-Alliance • Community Representatives (5)	Inform Consult Collaborate
4	Broader Community	• Dubbo • Gulgong • Dunedoo • Tallawang • Beryl • Elong Elong • Cobbora	Inform
2	Nearby Project Proponents	• Dapper Solar Farm • EnergyCo - CWO REZ transmission line • Spicers Creek Wind Farm • Tallawang Solar Farm • Merriwa Solar Farm • Birriwa Solar and Battery Project	Inform Consult
2	Media - Print/Online Media:	• Dubbo Daily Liberal • Mudgee Guardian and Gulgong Advertiser • Coonabarabran Times • Gulgong Gossip • Dunedoo District Diary	Inform

Figure 5.1 shows the landowners adjacent to and nearby the Project site and landowners along main transport routes.

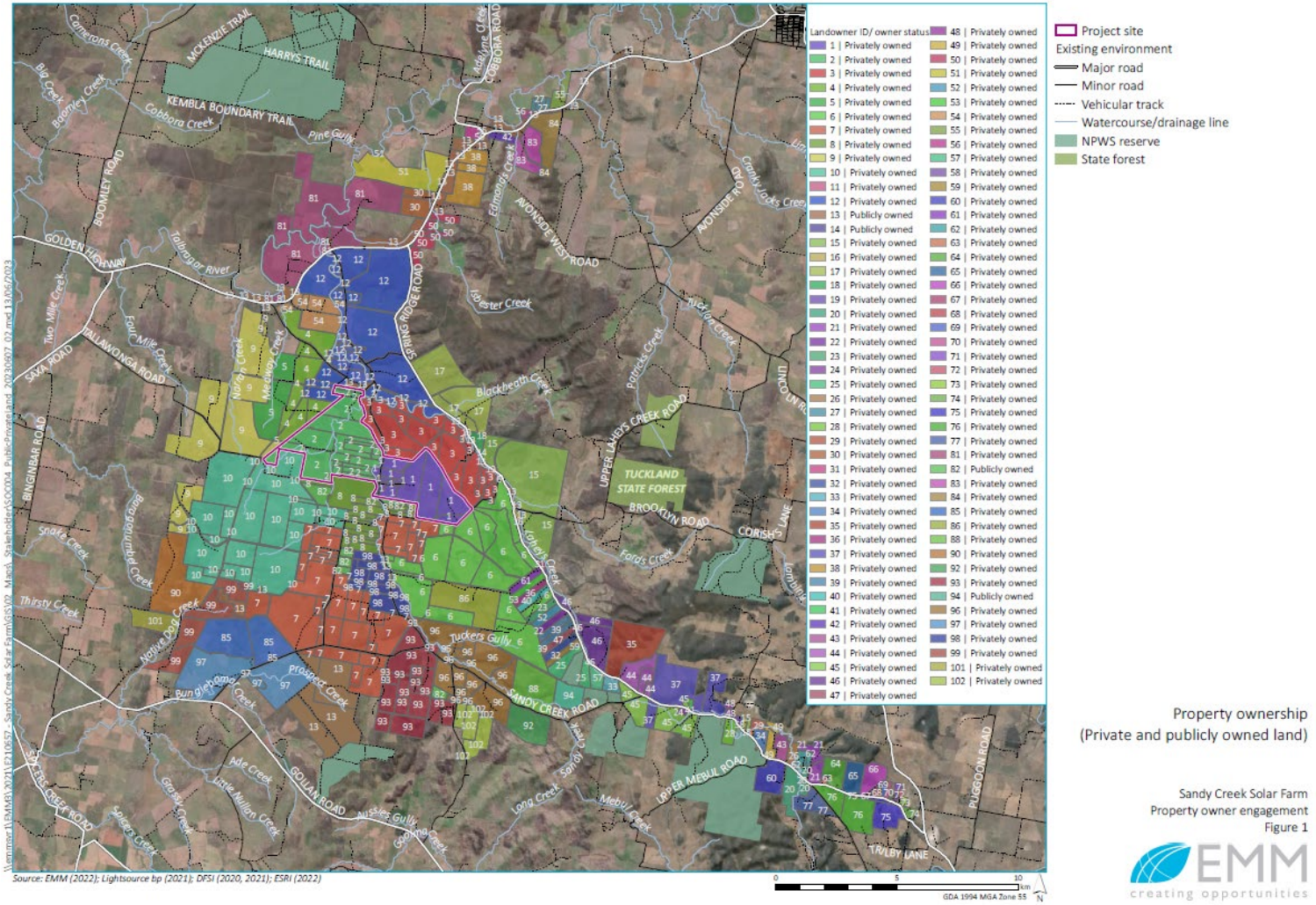


Figure 5.1 Landowner map

5.5 Engagement tools and activities

Table 5.4 provides an overview of the engagement tools used and key activities undertaken, which provided multiple ways for key stakeholders and the community to readily access Project information, engage meaningfully with the Project team, and provide comment and feedback on the Project.

Table 5.4 Engagement tools and activities

Tool	Description	Timing	Target stakeholder groups
Project website and email 	• A Project page on LSbp's website provided general information and updates, Project overview factsheet, Frequently Asked Question responses, maps, key assessment and approvals documentation and a feedback form. https://lightsourcebp.com/au/project/sandy-creek-solar-farm/	Ongoing since November 2021	All stakeholders
	• A dedicated Project email facilitated two-way communication. E: sandycreeksolar@lightsourcebp.com • This included proactively sending Project correspondence / updates and receiving and responding to stakeholder enquiries.	Ongoing since November 2021	All stakeholders
Freecall phone line 	• A freecall phone line facilitated two-way communication. P: 1300 873 575.	Ongoing since November 2021	All stakeholders
Letters/ Correspondence and community information sheets 	• Letters were sent via registered addressed post to introduce the Project, provide updates, proactively offer briefings, request land access for field teams and in response to stakeholder issues raised.	Ongoing since November 2021	Elected Representatives Host, Adjacent and Nearby Landowners
	• Two community Information sheets were distributed via post with landowner letters and published on the Project webpage. • This information sheets were used to introduce the Project and provided updated information about the SEARs and field team activities.	#1 – January 2021 #2 – September 2022	All stakeholders
In-person and online briefing/ meetings 	• Proactive and targeted in-person and online Project briefings and meetings facilitated two-way communication (i.e. to introduce the Project and provide updates). • These included PowerPoint presentations. • Some meetings were convened in response to stakeholder issues raised.	Ongoing since November 2021	Government Departments/ Agencies Elected Representatives Host, Adjacent and Nearby Landowners Other high-interest stakeholders

Tool	Description	Timing	Target stakeholder groups
Community information sessions and advertising 	• One online community information session was convened, which included a PowerPoint presentation. • Two in-person community information sessions were held in Dunedoo and Gulgong.	31 January 2022 5 February 2022	All stakeholders
	• Two in-person community information sessions were held in Dunedoo to provide early advice about the findings and impact mitigation measures included in the EIS. • This included display boards and detailed Frequently Asked Questions handouts about key EIS topics.	26 and 27 October 2023	
	• Local newspaper advertisement placements about the January/ February 2022 in-person and online Community Information Sessions: Dubbo Daily Liberal, Mudgee Guardian and Gulgong Advertiser and Coonabarabran Times.	20, 27 and 28 January 2022	All stakeholders
	• Local newspaper advertisement placements about the October 2023 in-person Community Information Sessions: Dubbo Daily Liberal and Mudgee Guardian.	13 and 20 October 2023	All stakeholders
Local events 	• LSbp had a stall at two annual Dunedoo Show events.	February 2022 and 2023	All stakeholders
	• LSbp participated in EnergyCo information sessions held in Dunedoo and Wellington.	8 March 2022	All stakeholders

Over the life of the Project, all engagement events and key stakeholder and community interactions, and feedback received, were documented in the Project's stakeholder database.

5.6 Early engagement

Table 5.5 provides an overview of early engagement activities undertaken as part of selecting the Project site and during the scoping phase of the Project. This included a blend of targeted stakeholder engagement, affected and high-interest stakeholder consultation, and broader community consultation.

Table 5.5 Early engagement activities

Timing	Details
Early 2018	• LSbp commenced planning and approvals for a separate solar farm in the region (Wellington Solar Farm) and started building a local presence in the area.
Quarter (Q) 1 – Q3 2021	• Site selection for Sandy Creek Solar Farm progressed and detailed landowner negotiations took place. • Key stakeholder briefings convened, including with Elected Representatives, local Councils and State government agencies.
Q4 2021	• Project communication channels established (i.e. website, email and phone line). • Project introduction communication materials distributed including: – community information sheet #1, distributed to approximately 80 landowners within 2 km of the Project area and along the main transport route (i.e. Spring Ridge Road south, including Lahey's Creek Road towards Gulgong and Spring Ridge Road north/the Golden Highway east towards Dunedoo). It was also published on the Project website. – print newspaper advertisements in local newspapers – information about the sessions published on the Project website.

Timing	Details
Q1 2022	• Two in-person community information sessions held in Dunedoo and Gulgong. • One online community information session convened. • Hosted an information stall/sessions: – stall at the annual Dunedoo Regional Show – desk at EnergyCo's community information sessions, held in Dunedoo and Wellington.
Q2 2022	• Scoping Report submitted to DPE (April 2022). • SEARs issued (May 2022).

i Engagement outcomes

Across all stakeholder groups, the key issues raised during the Scoping Phase of the Project included:

- visual amenity impacts, including glint and glare
- construction traffic impacts (i.e. roads and safety)
- land use and loss of agricultural land
- workforce and local hire
- land rehabilitation post-Project
- insurance impacts on neighbours
- bushfire and emergency risk
- cumulative impacts of developments within the CWO REZ.

These key issues raised during the scoping phase were then captured in the scope of work in the following technical assessments for the EIS phase to ensure they were identified and assessed, including:

- The LVIA included an assessment of potential impacts relating to glint and glare
- The traffic impact assessment (TIA) scope assessed construction traffic impacts (including road widths for safety)
- The land and rehabilitation assessment (LRA) included an agricultural impact assessment and rehabilitation strategy
- The bushfire assessment report (BAR) and preliminary hazards assessment scope ensured bushfire and emergency risk were assessed.
- Cumulative impacts were included in all technical assessment scope of works.

5.6.2 EIS engagement activities

As part of EIS preparation, the engagement program continued to be a blend of targeted stakeholder engagement. This included proactively providing Project information to affected and high-interest stakeholders including Government departments and agencies; relevant government ministers; local elected representatives; affected and nearby landowners and residents, and responding to issues raised.

Project information was distributed to the wider community and two rounds of community information sessions were held.Figure 5.2 provides an overview of EIS engagement activities from early engagement up until November 2023 with the following key groups:

- Government departments and agencies - which included proactive correspondence and in-person and online Project briefings and meetings.
- Elected representatives - LSbp engaged regularly with the local Federal, State, and local Government Elected Representatives to advise them about Project progress and share correspondence being sent by the Project to their constituents, for their awareness.
- Adjacent and nearby landowners and residents (including along local transport routes) - this included proactively providing Project information via registered addressed and regular mail, phone, and email. Over the life of the Project the nearby landowner list was expanded, as more information became available about the local community. Landowners on the southern side of the Project were identified as high-interest stakeholders.
- Broader community – this included when enquiries were received from local residents, plus interactions with the broader community, including residents, a local business and nearby solar farm applicant.

Further detail is provided for all engagement activities in Appendix E. This includes Government departments and agencies, Elected Representatives, adjacent and nearby landowners, local business groups and the broader community.

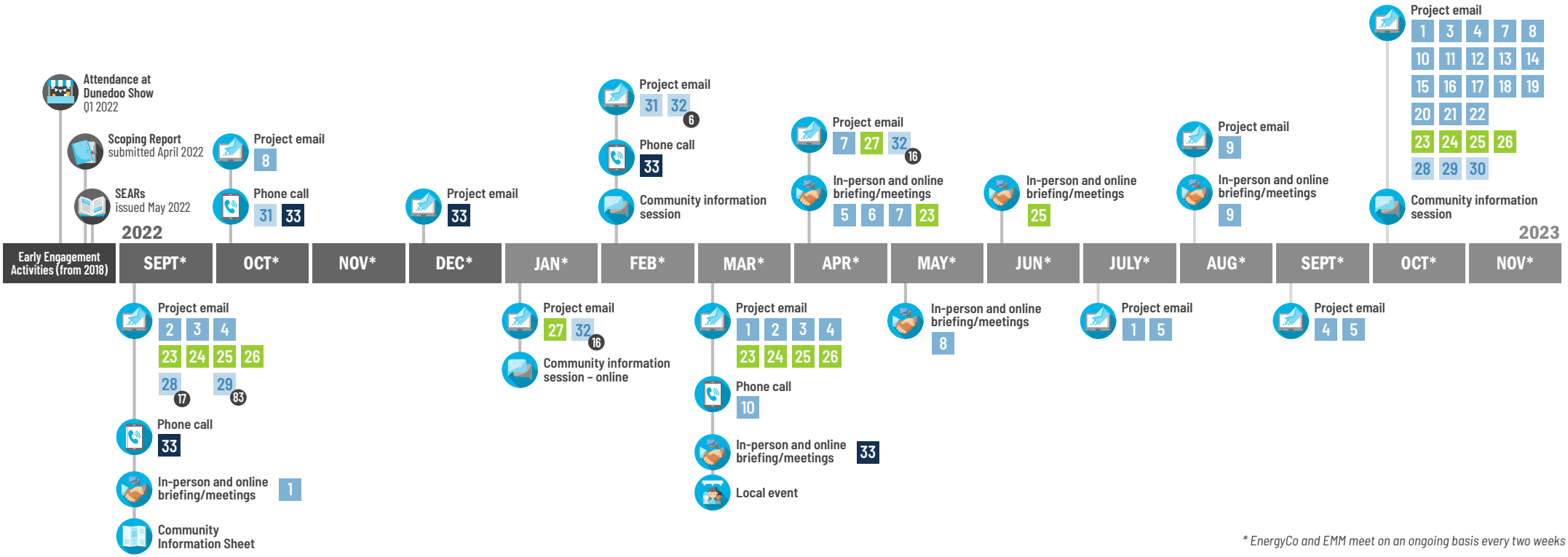
i Community information sessions

During the EIS phase of the Project, two in-person community information sessions were held on Thursday 26 and Friday 27 October 2023, prior to EISlodgment with DPHI. Information about Project design and layout and key findings of the environmental, social, and economic assessments undertaken to prepare this EIS were provided at the sessions. This included advice about proposed mitigation and management measures for identified impacts.

A total of 20 stakeholders attended the sessions, which largely comprised adjacent and nearby landowners, a Warrumbungle Shire Councillor, a member of the NSW Farmers Association (Dunedoo Branch) and a Dundedoo Show Society representative. Key topics raised included:

- biodiversity impacts and potential biodiversity protection measures (i.e. saving the seeds of trees to be removed and sending them to Greening Australia's seed bank and mapping the DNA of the trees)
- potential bushfire risks, including toxic fumes and potential impacts on the capacity of the local Rural Fire Service (RFS)
- changed land use and loss of agricultural land and the potential for sheep grazing on the Project site
- potential land value impacts
- construction and operational traffic impacts (i.e. road safety at key intersections on the Golden Highway, road closures, and oversized vehicles on local roads)
- cumulative impacts on biodiversity and agricultural productivity
- local services and workforce availability
- waste and water management

- visual amenity and changing nature of the general local amenity
- amenity, including potential temperature impacts (i.e. heat island effect)
- potential impacts to Project infrastructure during local flood and wet weather events
- potential impacts on landowner public liability insurance costs
- planned decommissioning logistical arrangements
- suggestions for local community benefit funding (e.g. Dunedoo Show Society, Men's Shed, the Lions Club's Art Unlimited event and a community bus).



* *EnergyCo and EMM meet on an ongoing basis every two weeks*

GOVERNMENT DEPARTMENTS AND AGENCIES

1 *Biodiversity, Conservation and Science Directorate* 2 *Minister for Transport and Roads* 3 *Minister for Environment and Heritage* 4 *Minister for Planning and Environment* 5 *NSW Department of Fisheries*
6 *EnergyCo-convened Central -West Orana Community Reference Group* 7 *Warrumbungle Shire Executive team* 8 *Dubbo Regional Council Officers* 9 *NSW Department of Planning and Environment* 10 *NSW Rural Fire Service*
11 *NSW Heritage (North West Division)* 12 *NSW Environment Protection Authority* 13 *NSW Department of Primary Industries* 14 *Department of Regional NSW, Mining, Exploration and Geoscience* 15 *Mid-Western Regional Council Officers*
16 *Minister for Planning and Public Spaces* 17 *Minister for Energy* 18 *Commonwealth Department of Climate Change, Energy, the Environment and Water* 19 *Minister for Climate Change* 20 *Minister for Regional Transport and Roads*
21 *Minister for Regional NSW* 22 *Minister for Environment and Water*

ELECTED REPRESENTATIVES

23 *Federal Member for Parkes* 24 *State Member for Dubbo* 25 *Mayor and Councillors - Dubbo Regional Council* 26 *Mayor and Councillors - Warrumbungle Shire Council* 27 *State Member for Dubbo*

ADJACENT AND NEARBY LANDOWNER AND RESIDENT ENGAGEMENT

28 *Adjacent landowners within 2 km of the Project area* 29 *Adjacent and nearby landowners* 30 *Registered Aboriginal Parties* 31 *Resident* 32 *Landowners*

BROADER COMMUNITY

33 *Response to community enquiry*

KEY

(16) *Number of residents in contact*

Figure 5.2 Overview of EIS engagement activities

EMM creating opportunities

ii Community views

Table 5.6 provides an overview of the key issues raised by each stakeholder group and where these have been addressed in the EIS.

Table 5.6 Community views

Stakeholder group	Level of Project interest	Geographical extent of Project interest[1]	Issues raised	Addressed in EIS	Issues beyond the Project scope
Elected Representatives	Medium	State, regional and local government areas	Cumulative impacts during construction, including on local: • waste management capacity • traffic conditions • social services • accommodation availability and affordability.	• Section 6.9 – Traffic • Section 6.13 – Social • Section 6.14 – Economic • Section 6.15 – Waste Management • Section 6.17 – Cumulative Impacts	Cumulative CWO REZ impacts.
Elected Representatives	Medium	State, regional and local government areas	Land use changes and loss of agricultural land.	• Section 6.6 – Land and Rehabilitation	None
Elected Representatives	Medium	Local government area	Preference for a construction workforce accommodation camp in Dunedoo.	• Section 6.13 – Social	Cumulative CWO REZ impacts.
Elected Representatives	Medium - High	Local government area	Local employment.	• Section 6.13 – Social • Section 6.14 – Economic	None
Department of Planning and Environment	Medium	State government area	Construction workforce accommodation.	• Section 6.13 – Social • Section 6.14 – Economic	
Transport for NSW	Medium	State government area	Discussed Project related intersections.	Section 6.9 - Traffic	None
DPI Fisheries	Medium	State government area	Buffer zone requirements and interactions with bushfire zones.	• Section 6.12 – Bushfire	None
Council officers	Medium - High	Local government area	Preference to locate workforce accommodation camp in Dunedoo.	• Section 6.17 – Cumulative Impacts	None
Council officers	Medium	Local government area	Project-specific cumulative impacts.	• Section 6.17 – Cumulative Impacts	Cumulative CWO REZ impacts.
Host Landowners (i.e. within the Project area)	High	Immediate	Negotiated agreements in place.	• N/A	None

[1] Note: local ≤ 5 km from the site, regional = 5–100 km from the site, state ≥ 100 km from the site.

Stakeholder group	Level of Project interest	Geographical extent of Project interest[1]	Issues raised	Addressed in EIS	Issues beyond the Project scope
Adjacent and Neighbouring Landowners	High	Local government area	Impacts on prime agricultural land.	• Section 6.6 – Land and Rehabilitation	None
Adjacent and Neighbouring Landowners	High	Local government area	Land value impacts.	• Economic Impact Assessment – Chapter 6.14	None
Adjacent and Neighbouring Landowners	High	Local government area	Visual amenity impacts (i.e. heat, reflection, glint and glare).	• Section 6.7 – Visual Amenity	None
Adjacent and Neighbouring Landowners	High	Local government area	Changed lifestyle.	• Section 6.13– Social	None
Adjacent and Neighbouring Landowners	Medium	Local government area	Bushfire risk and associated insurance cost impacts.	• Section 6.11 – Hazards and Risks • Section 6.12 – Bushfire	None
Adjacent and Neighbouring Landowners	Medium	Local government area	Increased traffic and road safety concerns.	• Section 6.9 – Traffic	Cumulative CWO REZ impacts.
Adjacent and Neighbouring Landowners	Medium	Local government area	Workforce accommodation location.	• Section 6.13 – Social • Section 6.14 – Economic	None
Broader Community	Low	Local government area	Connectivity to grid and transmission line placement.	• Project Description	Location of future transmissio n line/s
Broader Community	Low	Local government area	Contracting opportunity enquiry.	• Section 6.13 – Social • Section 6.14 – Economic	None

5.7 Summary of key stakeholder feedback received and outcomes

Table 5.7 provides a summary of key stakeholder and community feedback received about the Project.

Appendix E provides an overview of where the key issues raised have been addressed in the EIS.

Stakeholder and community views about the Project have been understood through the ongoing consultation and engagement activities described in this chapter and feedback received about the SEARs. Sections 6.4 and 6.13 of this EIS provide details of engagement outcomes of the social and Aboriginal heritage impact assessments.

Feedback from stakeholders and the broader community has been varied and includes both positive and negative views on a range of topics.

Table 5.7 Stakeholder feedback

#	Stakeholder group	Details	Key issues raised	Where addressed in the EIS and key outcomes (where applicable)
1	Elected Representatives	Federal Government State Government Local Government • Dubbo Regional Council • Warrumbungle Shire Council	• Cumulative impacts (e.g. local waste management capacity, traffic conditions, social services and demand for accommodation). • Preference to locate workforce accommodation camp in Dunedoo. • Land use change and loss of agricultural land. • Local employment.	• Section 6.17 – cumulative impacts • Section 6.6 – land and rehabilitation • The location of the workforce accommodation facility has been an issue raised by several stakeholders and considered during the development of the EIS. The Project considered several cumulative impacts to the local area that would arise if workers utilised commercial accommodation during Project construction. To avoid some of these cumulative impacts such as construction traffic, and negative economic impacts such as reduced tourism, an on-site accommodation strategy was developed for the Project.

#	Stakeholder group	Details	Key issues raised	Where addressed in the EIS and key outcomes (where applicable)
2	State Government Department and Agency Officers	• Departments of: • Planning and Environment • Fisheries • Biodiversity, Conservation and Science • Fire and Rescue • EnergyCo	• Preference to locate workforce accommodation camp in Dunedoo. • Discussion about fisheries buffer zone requirements and interactions with bushfire zones. • Land category assessment.	• The location of the workforce accommodation facility has been an issue raised by several stakeholders and considered during the development of this EIS. The Project considered several cumulative impacts to the local area that would arise if workers utilised commercial accommodation during Project construction. To avoid some of these cumulative impacts such as construction traffic and negative economic impacts such as reduced tourism, an on-site accommodation strategy was developed for the Project. • Through consultation with Department of fisheries, appropriate buffer zones were developed with the Project's technical specialists with the aim to protect existing riparian vegetation and aquatic ecosystems and will extend well beyond any existing remnant vegetation. The proposed buffer zones represent a balanced approach between protecting the existing environment, enhancing and promoting healthy riparian corridors, maximising development potential of the land and managing potential bushfire fuel loads within these areas.

#	Stakeholder group	Details	Key issues raised	Where addressed in the EIS and key outcomes (where applicable)
				• To give greater certainty for the design principle of utilising the low condition derived native grassland and exotic/ripped/pasture improved and cropped areas, a category one land assessment and application was undertaken by EMM in August 2022. This was sent to the Biodiversity Conservation Department (BCD) for review and endorsement on 26 August 2022. A site inspection with the BCD was undertaken on 2 September 2022. Subsequentlythe first version of the assessment was endorsed by the BCD on 13 September 2022. This assessment classified all exotic/ripped/pasture improved and cropped areas and low condition derived native grassland as Category one land. All woodland and riparian areas with buffers were categorised as category two land.
3	Council Officers	• Dubbo Regional Council • Warrumbungle Shire Council	• Preference to locate workforce accommodation camp in Dunedoo. • Cumulative impact assessment and management strategies need to be improved across the REZ.	• The location of the workforce accommodation facility has been an issue raised by several stakeholders and considered during development of this EIS. The Project considered several cumulative impacts to local area that would arise if workers utilised commercial accommodation during Project construction. To avoid some of these cumulative impacts, such as construction traffic and negative economic impacts such as reduced tourism, an on-site accommodation strategy was developed for the Project.

#	Stakeholder group	Details	Key issues raised	Where addressed in the EIS and key outcomes (where applicable)
4	Adjacent and Neighbouring Landowners	12 landowners	• Conflict with prime agricultural land use. • Property value impacts • Visual and other amenity impacts (i.e. heat reflection, glint and glare). • Lifestyle change. • Bushfire risk and increased insurance costs. • Increased traffic and road safety. • Location of workforce accommodation camp. • Community benefits differ among project proponents, causing tension and anxiety.	• Section 6.6 – Land rehabilitation • Section 6.7 – Visual • Section 6.9 Traffic and transport • Section 6.12 – Bushfire • Section 6.13 – Social
5	Community	Wider community in Dunedoo and surrounds.	• Enquiries about: – Proximity of site to their property – Transmission line location and grid connection arrangements – Local construction contracting opportunities. • Concern about handling of financial benefits and the need to support community initiatives.	• Section 3.4 – Physical layout and design • LSbp will contribute to community enhancement, training and education through the REZ access fees to a sum of $2,300 per MW per year, or $1.61 million per year. • LSbp is finalising a Neighbourhood Benefit Scheme to ensure those residents living closest to the Project can share in its financial benefit.

5.8 Proposed future engagement

Engagement with key stakeholders will continue throughout the EIS exhibition period and next phases of the assessment process, including with state government agencies, Warrumbungle Shire Council and Dubbo Regional Council as part of addressing comments received about the EIS and preparing a Response to Submissions Report.

There will be ongoing consultation with adjacent and nearby landowners and residents. This will include providing updates about the assessment process and continuing to monitor and manage Project communication channels (i.e. phone line, email and web page).

If development consent is granted for the Project, LSbp will continue ongoing consultation activities with stakeholders, including adjacent and nearby landowners and residents and wider community members during construction and operation of the Project.

Key engagement and consultation activities to be undertaken beyond determination of the Project will include:

- ongoing regular local stakeholder briefings and meetings, including with Warrumbungle Shire and Dubbo Shire Councils and TfNSW
- providing progress updates and community notifications on the Project web page
- maintaining the Project's communication channels.

5.8.1 Community Benefit Sharing / Funding

LSbp is proposing to enter into a voluntary planning agreement (VPA) with Warrumbungle Shire and Dubbo Regional Councils.

LSbp will contribute to community enhancement, training, and education through the REZ access fees to a sum of $2,300 per MW per year, or $1.61 million per year.

LSbp is finalising a neighbourhood benefit scheme.

6 Assessment of impacts

6.1 Overview

The Scoping Report for Sandy Creek Solar Farm was submitted in March 2022. Based on this assessment, SEARs identified several key matters for assessment, as outlined in Table 6.1. These matters have been assessed as 'matters requiring detailed assessment'.

Where relevant, technical reports have been prepared and appended (refer to Appendix G to Appendix T).

A summary of mitigation and management measures is included in Appendix F.

Table 6.1 Matters requiring detailed assessment

Matter requiring detailed assessment	Where addressed in EIS
Biodiversity - terrestrial	Section 6.2
Biodiversity - aquatic	Section 6.3
Aboriginal heritage	Section 6.4
Historical heritage	Section 6.5
Land and rehabilitation	Section 6.6
Visual	Section 6.7
Noise and vibration	Section 6.8
Traffic and transport	Section 6.9
Water	Section 6.10
Hazards and risk	Section 6.11
Bushfire	Section 6.12
Social	Section 6.13
Economic	Section 6.14
Waste management	Section 6.15
Air quality	Section 6.16
Cumulative impacts	Section 6.17

6.2 Biodiversity – terrestrial

6.2.1 Introduction

A biodiversity development assessment report (BDAR) was prepared for the Project by EMM (2023) and is provided in Appendix G. The BDAR assesses potential direct, indirect, residual, and prescribed impacts of the Project on biodiversity in accordance with the Biodiversity Assessment Method (BAM); documents implemented strategies to avoid and/or minimise Project impacts on biodiversity; provides environmental safeguards to mitigate biodiversity impacts; calculates the residual credit requirement; and addresses biodiversity related Project SEARs.

6.2.2 Existing environment

i Landscape features

The study area is within the NSW South Western Slopes Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Talbragar Valley IBRA subregion. The study area lies exclusively within the Goonoo Slopes (Mitchell) Landscape.

The study area and impact footprint are primarily comprised of paddocks at various stages of cropping and grazing. Some paddocks are currently cropped and contain little vegetation other than the planted crop species, while other paddocks contain native derived grassland or improved pasture and are being used to graze cattle. The quality of the habitat present in each paddock is largely representative of the recent land use history and cropping cycle.

There are no areas of outstanding biodiversity value within the study area, as declared by the NSW Minister for Energy and Environment.

There are no areas of geological significance within the study area, nor in the surrounding locale.

ii Rivers, streams, estuaries, and wetlands

The study area is within the Macquarie-Bogan River catchment. Several named creeks occur within the study area in addition to multiple unnamed first and second order streams. Named creeks within the study area include Sandy Creek (5th order), Spring Creek, and Broken Leg Creek. In total, the study area contains seven 1st order water courses, one 2nd order water course, four 3rd order watercourses, one 4th order watercourse and one 5th order watercourse, which flow in a northerly direction into the Talbragar River, located approximately 6.5 km from the study area.

The aquatic habitat within these creeks in the study area occurs as slow-flowing creeks with no rocky habitat or substrate to provide refuge for aquatic species. Whilst the creeks provide limited aquatic habitat to aquatic species, these creek lines have been highly altered and are disconnected by man-made roads and dams.

The locality does not contain any nationally important wetlands or Ramsar wetlands. Sandy Creek is classified as Class 1 key fish habitat while both Spring Creek and Broken Leg Creek are classed as Class 3 minimal key fish habitat. Aquatic biodiversity is discussed further in Section 6.3.

iii Native vegetation

Vegetation within the study area is highly disturbed, having been historically cleared for grazing and cropping. Fragmented patches of woodland trees still exist within the study area; however, in most cases, the paddocks have been completely cleared of trees, with some paddocks containing only one or two small to moderate sized trees. Areas of native and exotic plantings are also present within the study area, primarily on fenced boundaries.

A total of 232 species (147 native and 85 exotic) were recorded during field surveys within the study area.

a Plant community types

Six Plant Community Types (PCTs) occur within the study area, as described in Table 6.2 and shown in Figure 6.1.

Table 6.2 Plant Community Types present within the study area

Plant community type	Vegetation form	Extent within study area (ha)
PCT 81 - Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion	Woodland	10.52
	Derived native grassland	39.41
PCT 201 – Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Woodland	10.21
	Derived native grassland	289.41
PCT 266 – White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Woodland	6.60
	Derived native grassland	109.74
PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Woodland	1.94
	Derived native grassland	2.50
PCT 468 – Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	Woodland	2.09
PCT 599 –Blakely's Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Woodland	5.70
	Derived native grassland	134.55
Planted native vegetation	n/a	2.69
Exotic	n/a	1,082.67
Total vegetated area (ha)		**1,698.03**

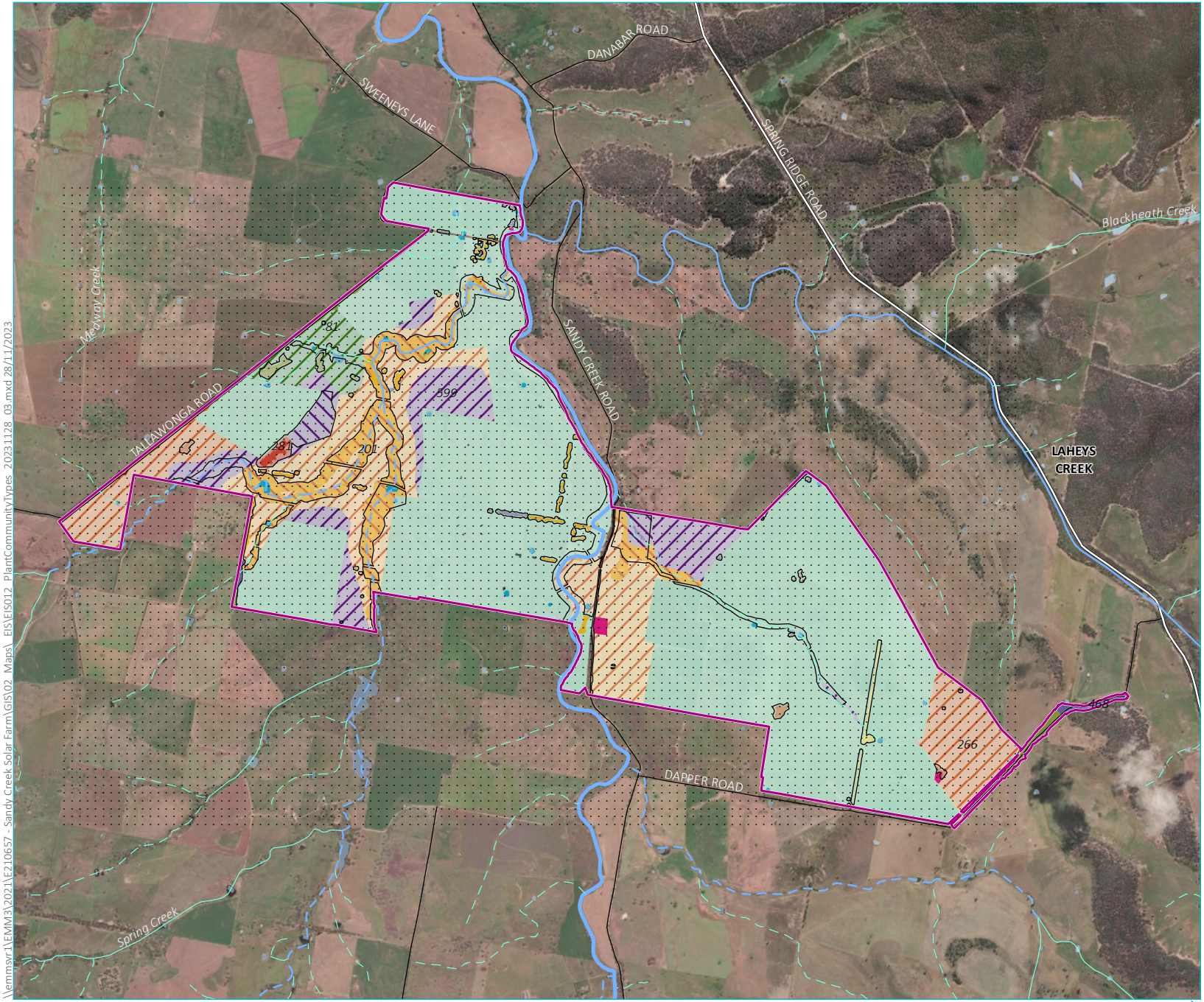
Each PCT is represented by multiple vegetation zones mapped and/or entered into the credit calculator to determine vegetation integrity scores. Vegetation zones and scores are summarised in Table 6.3.

Table 6.3 Vegetation zone summary

PCT ID	PCT name	Vegetation zone	Condition	Extent in solar farm impact footprint (direct impacts only) (ha)	Extent in Dapper Rd impact footprint (direct and indirect impacts (ha)	Area avoided (ha)	Vegetation integrity score
81	Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	1	Woodland_High	0.89	0.50	6.41	89.4
		2	Woodland_Low	0.11	-	2.61	25.1
		3	DNG_Low	34.27	-	N/A	NA category one land
201	Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	4	Woodland_Low	0.68	-	9.53	63.0
		5	DNG_Moderate	13.45	-	79.85	31.9
		6	DNG[1]_Low	79.63	-	N/A	NA category one land
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	7	Woodland_High	0.66	0.22	3.68	79.4
		8	Woodland_Low	0.01	-	2.03	54.1
		9	DNG_Low	107.30	0.48	N/A	NA category one land
		18	Planted	0.26	-	2.43	Combined with zone 8
599	Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	10	Woodland_High	0.07	0.02	2.20	89.7
		11	Woodland_Low	0.22	-	3.19	42.7
		12	DNG_Moderate	0.90	-	16.08	48.3
		13	DNG_Low	110.03	-	N/A	NA category one land

PCT ID	PCT name	Vegetation zone	Condition	Extent in solar farm impact footprint (direct impacts only) (ha)	Extent in Dapper Rd impact footprint (direct and indirect impacts (ha)	Area avoided (ha)	Vegetation integrity score
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	14	Woodland_High	-	-	1.94	Category 2 land which will be avoided
		15	DNG_Low	-	-	2.50	Category 2 land which will be avoided
468	Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	16	Woodland_High	-	0.74	1.35	65.3
NA	Exotic grassland	17	Exotic	1,028	-	N/A	NA category one land
NA	NA	19	Planted exotic vegetation	0.80	-	N/A	-
-	-	-	Cleared (urban/dams)	5.71	-	N/A	-
			Total	**1,484.92**	**1.97**	**133.80**	**-**

Note: 1. Derived native grassland



KEY

Study area

Development footprint

Existing environment

Major road

Minor road

Waterbody

Strahler stream order

1st order

2nd order

3rd order

4th order

5th order

Plant community type

81 | Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion

High

Low

DNG low

201 | Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Low

DNG moderate

DNG low

266 | White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

High

Low

DNG low

281 | Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Low

DNG low

468 | Narrow-leaved Ironbark - Black Cypress Pine +/- Blakelys Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)

High

599 | Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion

High

Low

DNG moderate

DNG low

Other landtype

Scattered tree

Planted (native)

Waterbody (dam)

Cleared (urban)

Exotic land

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 55

N

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Plant community types within the study area

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.1

EMM
creating opportunities

iv Threatened Ecological Communities

Four PCTs identified within the study area align with TECs listed under the NSW BC Act within at least one vegetation zone. Two PCT's identified within the study area align with TECs listed under the Commonwealth EPBC Act within at least one vegetation zone.

All the vegetation zones associated with the EPBC Act-listed Box Gum Woodland and Inland Grey Box Woodland also conform to the BC Act listing for Box Gum Woodland; however, the converse is not true. That is, only a subset of vegetation zones conforming to the BC Act listing for Box Gum Woodland and Inland Grey Box Woodland also meet condition criteria for listing under the EPBC Act.

A summary of vegetation zones within the impact footprint that align with the BC Act and/or EPBC Act criteria for the Box Gum Woodland critically endangered ecological community (CEEC), Western/Inland Grey Box Woodland endangered ecological community (EEC) and Fuzzy Box Woodland EEC is provided in Table 6.4.

Additionally, the 'White Box Yellow Box Blakely's Red Gum Woodland' and 'Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions' are candidate Serious and Irreversible Impact (SAII) entities with regards to the Project, based on information from the Threatened Biodiversity Data Collection. SAII assessments were completed as part of the BDAR (see Appendix G) and are summarised in Section 6.2.4.

Table 6.4 Threatened Ecological Communities recorded in the impact footprint

Threatened Ecological Community	EPBC Act	BC Act	Associated PCTs and vegetation zones	Extent in impact footprint (ha)
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia - **Woodland**	E[1]		PCT 81: zone 1	1.39
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions – Talbragar Valley - **Woodland**		E	PCT 81: zone 1 and zone 2	1.50
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland - **Woodland**	CE[2]		PCT 266 zone 7 PCT 599 zone 10	0.98
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions - **Woodland**		CE	PCT 266 zone 7 PCT 599 zone 10,11,12	1.20
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – **Derived Native Grassland**		CE	PCT 599 zone 12	0.90
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions - **Woodland**		E	PCT 201 zone 4	0.68

Notes

1. E = Endangered
2. CE = Critically Endangered

v Hollow bearing and scattered tree assessment

Hollow bearing trees provide potential habitat for various hollow dependent species such as bats, possums, gliders, owls, parrots, raptors, reptiles, and some frogs. Scattered trees identified as Class 1 are considered to have negligible biodiversity value and no further assessment or offset is required for these trees. Tree classes are discussed in Attachment B of Appendix G.

Within the study area, four Class 1 trees, 31 Class 3 trees, and 291 hollow bearing trees were identified, as shown in Figure 6.2. The impact footprint avoids approximately 94% (255) of hollow bearing trees in the study area.

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Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

Scattered and hollow bearing trees within the study area

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.2

EMM
creating opportunities

vi Threatened terrestrial species

The development footprint and the road upgrade corridor along Dapper Road are within the same IBRA subregion, comprising the same Mitchell landscape types and similar habitat features. Therefore, this section addresses both components collectively as one continuous area when assessing habitat and planning targeted surveys.

Habitat assessment surveys within the study area determined that isolated patches of areas of moderate condition derived native grassland (DNG) and high condition woodland required targeted flora survey in accordance with the BAM.

30 species of flora and fauna were considered to have the potential of occurring within the study area and their presence was assessed through targeted surveys. Only one candidate species, the Pine Donkey Orchid (*Diuris tricolor*) was found to be present within the study area. Two additional species, Spotted Harrier (*Circus assimilis*) and Speckled Warbler (*Chthonicola 109agittate*), were recorded during diurnal bird surveys or incidentally and EnergyCo recorded two species, Squirrel Glider (*Petaurus norfolcensis*) and Silky Swainson-pea (*Swainsona sericea*) at the Dapper Road/Spring Ridge Road intersection, which is outside but near the study area.

6.2.3 Avoidance and minimisation through design

The BDAR was carried out in parallel with, and has informed the evolution of, the Project design. As part of consultation with landowners and associated technical assessments, the original design of the Project has been reduced and refined to areas with lower biodiversity values where possible. This process has ensured the avoidance of environmental constraints where possible, including impacts on TECs, threatened species habitat, and riparian areas. Additionally, an ecological constraints map was developed to inform the iterative design process and minimise ecological impacts.

The resulting key avoidance and minimisation measures that have been implemented by LSbp in relation to terrestrial biodiversity are summarised in Table 6.5.

Table 6.5 Avoidance and minimisation measures

Item	Description of avoidance and minimisation measure
1	Most of the woodland has been avoided, recognising that the native woodland identified in the study area aligns with Box Gum Woodland, and Fuzzy Box Woodland, which are all SAII entities. Native woodland patches containing Grey Box Woodland, which is a TEC though not a SAII, will also primarily be avoided. The larger woodland patches containing these communities have primarily been avoided, with generally only scattered patches of less than three trees within 50 m of each other impacted by the design. Note that the impacts along Dapper Road impact higher quality vegetation. This is required for essential road upgrades and cannot be avoided.
2	Utilisation of the existing site access points on Tallawonga Road as emergency access, which avoids impacts to EPBC Act listed TECs and SAII entries.
3	Two paddock areas that comprised moderate condition DNG that aligns with the Box Gum Woodland BC Act TEC and known habitat for the Pine Donkey Orchid have been excluded from the impact footprint. These paddocks are ideally suited to solar development based on topography and position within the study area. These paddocks were included in earlier iterations of the Project design; however, were excluded based on findings from the biodiversity assessment. An additional 10 m avoidance buffer has been applied to the edges of these DNG areas.
4	The Project design avoids all 12 records of Pine Donkey Orchid from the impact footprint. It also provides additional 10 m avoidance buffers outside of the Pine Donkey Orchid habitat to ensure there are no indirect impacts.

Item	Description of avoidance and minimisation measure
5	The avoidance of ephemeral watercourses involved moving solar array panels out of certain sections of watercourses and riparian protection zones that were originally considered for development. These areas were initially considered for development to maximise the generation capacity, since the first order watercourses in these sections are dry most of the time and in most cases do not contain wetland or riparian vegetation (derived native grassland not noticeably differentiated from surrounding grassland). Some impacts are still present, such as access roads and small sections of solar panels. The development footprint does, however, minimise disturbance to existing watercourses and associated riparian corridors by minimising the number of new watercourse crossings required.
6	Patches of three or more trees have been avoided where possible as part of the design.
7	By avoiding trees and tree patches where possible, the Project design avoids 255 of 272 (approximately 94%) hollow bearing trees recorded in the study area.
8	The PV modules will be supported on ground-mounted frames consisting of vertical posts (piles) and horizontal rails (tracking tubes). Rows of piles will be driven or screwed into the ground, with the supporting racking framework mounted on top, therefore minimising the degree of ground disturbance required over other construction methods that involve concrete foundations.

6.2.4 Potential impacts

i Overview

The potential impacts of the Project on biodiversity are:

- direct clearing of some category 2 land including SAII entities and TECs for the construction of the Project (further details are provided below in Section 6.42iia). This will result in direct impacts (including indirect impacts) to the following:
  - 2.26 ha of Box Gum Woodland TEC which is a SAII entity
  - 0.68 ha of Fuzzy Box Woodland TEC which is a SAII entity
  - 1.5 ha of Grey Box Woodland TEC which is not a SAII entity
- uncertain impacts from shading of native understorey vegetation by a network of PV panels
- temporary impacts caused by the establishment of construction laydown areas
- indirect impacts where the Project interfaces with, and potentially interacts with, retained vegetation and habitat (Dapper Road only). The indirect impacts have been delineated as a 3 m buffer either side of the Dapper Road upgrades. The Dapper Road upgrades are a 13 m direct impact area which is 6.5 m either side of the road centreline. Therefore, impacts are a 6.5 m+6.5 m direct impact, plus a 3 m+3 m indirect impact (therefore, the total direct/indirect impact corridor width for Dapper Road is 19 m wide)
- increased noise, vibration and dust levels, potentially resulting in disturbance of fauna species, and consequent abandonment of habitat or changes in behaviour (including breeding behaviour)
- increase in weeds and pathogens, resulting in degradation of retained native vegetation and habitat
- increase in predatory and pest animal species, resulting in increased predation and competition and a consequent reduction in populations
- potential inadvertent disturbance of retained habitats
- removal of habitat resources for threatened fauna

- displacement of threatened fauna
- runoff, scouring, erosion and sedimentation impacts to retained native vegetation and watercourses.
- the impacts that have potential to affect habitat for MNES entities include:
    - clearing of 2.9 ha of native woodland vegetation classified as category 2 land
    - clearing of 14.63 ha of derived native grassland classified as category 2 land
    - clearing of approximately 29 hollow-bearing trees recorded in the impact footprint.

An EPBC act referral determined the impact to EPBC Act listed TECs White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland; and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia will be insignificant.

ii Direct impacts

a Impacts on native vegetation requiring offsetting

The Project will impact 19.42 ha of native vegetation, which is approximately 1.3% of the Project site. This small portion of native vegetation in the impact footprint is consistent with the historic agriculture use.

A credit requirement was assessed for biodiversity impacts within the development footprint and along the Dapper Road upgrade corridor. In relation to vegetation clearing, the assessment assumes complete loss of vegetation integrity values (i.e. setting composition, structure and function scores for all areas of direct impact to zero in estimating future vegetation integrity following the construction of the Project). A total of 470 credits are required to offset the residual impacts on native vegetation (including native PCTs, scattered trees and ecosystem credit species). A summary of the impacts requiring offsetting include:

- 1.5 ha of PCT 81 Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, comprising:
    - 1.39 ha of woodland high condition
    - 0.11 ha of woodland low condition
- 14.81 ha of PCT 201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, comprising:
    - 13.45 ha of DNG moderate condition
    - 0.68 ha of woodland low condition
    - 0.68 DNG low condition
- 1.15 ha of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, comprising:
    - 0.88 ha of woodland high condition
    - 0.01 ha of woodland low condition
    - 0.27 ha of planted vegetation (best fit)

- 0.74 ha of PCT 468 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo), comprising:
    - 0.74 ha of woodland high condition
- 1.22 ha of PCT 599 Blakely's Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion, comprising:
    - 0.10 ha of woodland low condition
    - 0.22 ha of woodland low condition
    - 0.90 ha DNG moderate condition.

b Impacts on scattered trees requiring offsetting

31 scattered trees require a total of 28 credits, comprising:

- seven trees with hollows and two without in PCT 81
- five trees with hollows and three without in PCT 201
- two trees with hollows and five without in PCT 266
- six trees with hollows and four without in PCT 599.

c Impacts on MNES

Potential impacts to each MNES entity have been assessed and the residual impacts (after the implementation of avoidance and mitigation measures) have been assessed via the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DCCEEW 2013) to determine if the Project is likely to have a significant impact on MNES. Further details are provided in Section 8.4 of Appendix G.

The significant impact assessments are provided in Appendix G, and concluded that the Project has the potential to result in a significant impact to two MNES:

- Box Gum Woodland
- Grey Box Woodland.

However, on 8 March 2024, DCCEEW determined the Project will not significantly impact either of the MNES.

d Impacts not requiring offsetting

All residual impacts for the Project will require offsets.

iii Indirect impacts

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

- increased noise, vibration, and dust levels, resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour)
- increase in weeds and pathogens, resulting in degradation of retained native vegetation and habitat

- increase in predatory and pest animal species, resulting in increased predation and competition and a consequent reduction in populations
- potential inadvertent disturbance of retained habitats
- removal of habitat resources for threatened fauna
- displacement of threatened fauna
- runoff, scouring, erosion, and sedimentation impacts to retained native vegetation and watercourses.

Indirect impacts related to the Dapper Road upgrades have been calculated as 100% vegetation loss in the BAM Calculator. These indirect impacts have been calculated as an additional 3m buffer either side of the direct impacts due to vegetation clearing for the road, i.e. 3 m indirect impact + 6.5 m direct impact either side of the road centreline.

Offsets have not been calculated for the indirect impact within the development footprint due to the following reasons:

- The two highest condition patches of Box Gum Woodland TEC that are being avoided by the design have been given an additional 10 m avoidance buffer. Therefore, due to buffers, there will be no indirect impacts on these two patches (noting that a security fence with a 6m buffer does intersect with the edge of one patch).
- The two areas of Pine Donkey Orchid habitat are being avoided by the Project design and have been given an additional 10 m avoidance buffer around the edges of the vegetation patches where they were found. Therefore, no indirect impacts on these two areas and within these buffers are anticipated (noting that a security fence with a 10 m buffer does intersect with the edge of one patch, which is approximately 200 m from the Pine Donkey Orchid records).
- All other vegetation within the study area is within highly disturbed grassland and exotic grassland, the majority of which has been endorsed as category 1 land.

Mitigation measures are proposed to minimise the potential for indirect impacts to occur, as described in Table 6.6.

6.2.5 Biodiversity offset strategy

The Project will require ecosystem credits to be retired to offset the predicted impacts on biodiversity. No species credits are required. The credit obligation includes:

- 470 ecosystem credits to offset impacts to 19.42 ha of native vegetation
- 28 ecosystem credits to offset impacts to 31 scattered trees.

Impacts on 1,434.42 ha of category one land does not require offsetting under the NSW Biodiversity Offset Scheme (BOS).

LSbp will offset the residual impacts on biodiversity via conservation mechanisms established under the NSW BOS. LSbp's preferred approach to offsetting residual impacts of the Project is through purchasing credits from the market. The second preference is through payment to the Biodiversity Conservation Trust Fund (BCF).

6.2.6 Mitigation measures

In addition to the offsets under the BOS and impact avoidance where possible, management and mitigation measures in Table 6.6 will be implemented to further minimise Project impacts to biodiversity.

Table 6.6 Mitigation measures to address residual biodiversity impacts

Reference	Mitigation measure	Timing
E01	Options to further minimise impacts during construction and operation of the Project will be explored and implemented where possible. This includes: • minimising removal of hollow-bearing trees within the approved impact footprint • minimising removal of tree resources and native vegetation along the Dapper Road upgrade corridor.	PC
E02	Exclusion zones around the woodland areas will be established and retained and construction contractors informed not to disturb or enter areas outside the impact footprint. All workers to be made aware of ecologically sensitive areas and the need to avoid impacts. This includes adjacent native vegetation.	PC, C, O, CR
E03	A site plan will be included in a Construction Environmental Management Plan (CEMP) and will include: • the extent of approved impact • any relevant sensitive areas for avoidance • stockpile, material laydown areas, and site compounds. The site plan is to be placed in an accessible location to be viewed by all site personnel (site office for example).	PC
E04	All occurrences of threatened flora will be identified on the site plan and delineated in the field as 'no-go' zones. All contractors will be provided with an environmental induction prior to starting work on site, which includes communications about sensitive areas and no-go zones.	PC, C
E05	The construction laydown areas will be rehabilitated following completion of construction works if they are not required for operational purposes and will include removal of any materials brought into site such as gravel.	C
E06	The CEMP and any operational management plan will include provisions for the appropriate management of the 10 m indirect impact area, including: • protocols for bushfire asset management • management of weeds and run-off into adjacent off-Project areas.	PC, C
E07	Sediment controls will be implemented during construction in accordance with a sediment and erosion control plan, including installation of fencing and sediments traps in any areas where works will occur in proximity to low lying vegetation or streams.	PC, C
E08	The Construction Traffic Management Plan (CTMP) will include construction speed limits to minimise risk of vehicle strike during construction phase of the Project when there is expected to be an increase in traffic movements.	C

Reference	Mitigation measure	Timing
E09	Pre-clearance inspection will be conducted by a suitably qualified ecologist to: • inspect hollows prior to tree clearing • seed collection of native species prior to tree clearing are to be removed by a qualified seed collector/native nursery professional/bush regenerator. This seed can be propagated for use in any revegetation projects within the study area. Additionally, seed storage for future usage will also be investigated • inspect existing farm structures prior to removal • remove any individuals if found • relocate animals to suitable habitat within the locality • any animals injured during clearing works should be taken to a veterinarian or wildlife clinic.	PC
E10	Nest boxes or equivalent will be installed in remnant woodland within the study area. As a priority, removed hollows will be retained to re-installed on remnant trees within the site. Where this is not possible, nest boxes can be used. These will be installed at a rate of 1:1 for each hollow removed. A hollow bearing tree replacement plan will be prepared to guide the replacement of hollows throughout the life of the Project. Additionally, any remnant woody vegetation that is cleared is to be relocated to woodland exclusion zones within the study area to provide habitat for fauna, where possible. Any remnant woody vegetation that is not able to be relocated will be mulched and re-used on site.	C
E11	A Biodiversity Management Plan (BMP) will be implemented for retained vegetation adjacent to the impact footprint that includes (but is not limited to): • protocols to control and manage weeds that may be exacerbated, spread or otherwise affected by the construction and operation of the Project • protocols to monitor the vegetation condition and habitat values of any such retained vegetation • provisions for corrective actions should a decline in vegetation or habitat condition be detected.	PC, C, O CR
E12	The Biodiversity Management Plan (BMP) will include prescriptions for the protection and ongoing management of the habitat of retained occurrences of Pine Donkey Orchid surrounded by the approved impact footprint.	PC, C, O CR
E13	Weeds will be removed prior to vegetation clearing. Weeds will be stockpiled appropriately prior to removal from the study area to avoid the spread of seed and other propagules. Weed hygiene protocols will be implemented prior to entering the study area. This includes wash-down procedures to all plant and machinery.	PC, C, O CR
E14	Dust levels will be monitored, and suppression strategies implemented where required, such as wetting down dirt roads or reducing vehicle speeds.	C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.2.7 Conclusion

The biodiversity surveys have been carried out in parallel with, and have informed the evolution of, the Project layout and design. This process has ensured the avoidance and minimisation of biodiversity constraints as far as practicable.

The Project will impact 19.42 ha of native vegetation, including some areas of TEC's. With a total impact footprint of 1,489 ha, the area of native vegetation being cleared by the Project represents 1.3% of the impact footprint. This small portion of native vegetation in the impact footprint is consistent with the historic use of the site for agriculture.

The BDAR also considered impacts on species and ecological communities listed under the EPBC Act. The Project is will not result in a significant impact to Box Gum Woodland and Grey Box Woodland.

The Project requires a total of 470 ecosystem credits to compensate for impacts on native PCTs, scattered trees and ecosystem credit species, which will be compensated through the implementation of the BOS.

6.3 Biodiversity – aquatic

6.3.1 Introduction

An aquatic ecology impact assessment (AEIA) report was prepared by Aquatic Ecology Services (2023) and is attached as Appendix H. The AEIA assesses the Project as per the requirements of the SEARs and the aquatic ecology related Project elements. The assessment involved a combination of desktop studies and field surveys; identification of environmental receptors and potential impacts; and identification of impacts and mitigation measures for riparian vegetation, key fish habitat, fish passage, water quality, threatened species and residual impacts.

6.3.2 Existing environment

The existing environment was assessed using desktop assessment and field surveys.

The desktop assessment identified the likelihood of threatened aquatic habitat, communities, species, or populations that could occur within the Sandy Creek catchment, including Sandy Creek, Broken Leg Creek and Spring Creek. However, the desktop assessment relied on limited information on the current occurrence and condition of aquatic and riparian habitat in the Sandy Creek catchment outside of publicly available satellite imagery.

The field survey detailed site conditions, eDNA sampling, drone survey, habitat assessment and the key fish habitat.

i Desktop and field survey habitat assessment

The study area has a pastoral history and as such is largely cleared of woody vegetation and features blocks of pasture-improved and cultivated grasslands. There are three creeks in the study area - Sandy Creek, and its tributaries, Broken Leg Creek and Spring Creek, as shown in Figure 6.2 in Section 6.2.2. The remnant woody vegetation is mostly confined to roadside and fence line corridors with diffusely canopied woodland patches retained within some paddocks. Very few trees are visible along creek lines in aerial imagery (Photograph 6.1).

The Sandy Creek riparian zone was dominated by exotic pasture grasses, with Typha (*Typha orientalis*) growing in dense stands in the wetted areas of the creek throughout (Photograph 6.2). Submerged macrophytes were not seen along Sandy Creek. Riparian trees were completely absent from Spring Creek within the Project site.

During field surveys, despite recent rain, there was almost no surface water observed outside of constructed dams on Broken Leg Creek, which were abundant along the length of the creek surveyed (Photograph 6.3). There was evidence of cattle access to the creek and dams, along with several vehicle access tracks and fence lines that intersected the creek. Spring Creek flows directly north from the study area boundary to Broken Leg Creek. There were several large farm dams constructed upstream of the study area boundary, along with one dam within the study area.

Multiple on-stream farm dams on Broken Leg Creek and Spring Creek, and many of the lower order creeks that feed Sandy Creek have altered flow regime and fish passage that would otherwise naturally connect Talbragar River to the upper reaches of the Sandy Creek catchment. The catchment is ephemeral, and flow is likely to occur following rainfall in Sandy Creek but is not likely to occur in Broken Leg Creek and Spring Creek.

Exotic fish including European Carp (*Cyprinus carpio*) and Eastern Gambusia (*Gambusia holbrooki*) were observed in Sandy Creek, and Gambusia were observed in surface waters of Broken Leg Creek and Spring Creek. Their presence is likely to be impacting native fish through competition for resources, benthic disturbance and predation of eggs and larvae.

Recent above average rainfall is likely to have increased hydrological connectivity throughout the greater Macquarie River catchment including the Talbragar River and Sandy Creek. This connectivity has the potential to have facilitated fish movement upstream and promote more habitat for threatened species. Exotic fish species are likely to be taking advantage of the same conditions, and observations of European Carp and Eastern Gambusia in Sandy Creek and its tributaries were recorded. Although several threatened species were mapped to potentially occur, or have habitat potentially occurring in the study area, only Eel-tailed Catfish are known to be present, and the likelihood of other threatened species to be present is considered low.

Habitat for small-bodied species such as Southern Purple-spotted Gudgeon were identified, but pressures (e.g., exotic species, fish passage obstructions and catchment deforestation) coupled with lack of recent records in the catchment and no positive results for eDNA field sampling, suggest they are unlikely to be present.

Spawning habitat for Eel-tailed Catfish was identified along the length of Sandy Creek but was not found in other creeks and it is considered unlikely that the species is present in Broken Leg and Spring Creeks.

Photograph 6.1 **Sparse tree growth along Sandy Creek close to one of the proposed water crossing locations**

Photograph 6.2 Typha growing within Sandy Creek approximately at one of the proposed water crossing locations

Photograph 6.3 Water present in dams along Broken Leg Creek, Photogrammetry January 2023

ii Desktop threatened species assessment

The study area is not within the mapped distribution for any threatened aquatic ecological communities listed under the Fisheries Management (FM) Act. Five fish species classified as threatened under the EPBC Act and the FM Act have predicted occurrence or habitat within or downstream of the study area as shown in Table 6.7. Eel-tailed Catfish (*Tandanus tandanus*) have been identified as occurring in Sandy Creek by the Department of Primary Industries (DPI) Fisheries as part of the SEARs consultation process.

Table 6.7 Threatened species predicted to occur within or downstream of the study area

Scientific Name	Common Name	FM Act Status	EPBC Act Status
Maccullochella macquariensis	Trout Cod	Endangered	Endangered
Maccullochella peelii	Murray Cod	Not Listed	Vulnerable
Galaxias rostratus	Flathead Galaxias	Critically Endangered	Critically Endangered
Macquaria australasica	Macquarie Perch	Endangered	Endangered
Morgunda adspersa	Southern Purple-spotted Gudgeon	Endangered	Not Listed

iii eDNA field survey outcomes

Water samples for eDNA analysis were collected from Spring Creek and Sandy Creek during field surveys to assess the presence of threatened species. For each site, three replicate samples were tested and the results of eDNA analysis are presented in Table 6.8.

Positive results for Eel-tailed catfish were recorded in two of three replicates on Sandy Creek, which concurs with comments provided by DPI fisheries regarding the species' presence. Equivocal result was returned for Eel-tailed Catfish in one sample from Spring Creek, which cannot be confirmed as positive due to low amounts of DNA being found in the sample. While trace amounts of DNA may indicate the species is present in low abundance, it may also arise from sample contamination through the sampling or laboratory screening process (minimised through strict protocols and negative controls), facilitated movement of DNA between waterbodies (i.e. water birds, recreational anglers, water transfers, predator scats), or dispersal from further upstream.

Table 6.8 Results of targeted species eDNA analyses

Scientific Name	Common Name	Sandy Creek	Spring Creek
Maccullochella peelii	Murray Cod	×××	×××
Galaxias rostratus	Flathead Galaxias	×××	×××
Macquaria australasica	Macquarie Perch	×××	×××
Morgunda adspersa	Southern Purple-spotted Gudgeon	×××	×××
Tandanus tandanus	Eel-tailed Catfish	✓✓×	E××

Note: ✓= Positive ×= Negative E=Equivocal

iv Key fish habitat field survey outcomes

Sandy Creek is considered Type 1 sensitive habitat due to the common presence of gravel beds throughout the creek and large woody debris.

Although mapping provided by DPI fisheries shows indicative distribution of Southern Purple-spotted Gudgeon within Broken Leg Creek and Spring Creek, ground-truthing of the mapping during field surveys found that there is insufficient habitat for the species to persist. Therefore, both creeks were categorised as Type 2, as they did not contain expected habitat for threatened species or other sensitive habitats but did contain refugial fish habitat in farm dams.

Due to Sandy Creek being Type 1 sensitive habitat, it was automatically categorised as Class 1. The functionality of the two lower order creeks was poorer, as surface water is likely to only be present in dams and occurs infrequently within the creek after rainfall, and limited sensitive habitat was observed.

6.3.3 Assessment of Impacts

Elements of the Project that have the potential to impact on aquatic ecosystems are outlined below:

- installation of solar panels and potential encroachment on riparian zones
- waterway crossings to facilitate vehicle movement and cable crossings within the development footprint. It is anticipated that the following will be required:
    - Sandy Creek (identified as a 5th order stream) - two crossings at Sandy Creek and one above-ground cable crossing. It is proposed that the bridge design for both crossings will span the width of the water surface, where the width of the water surface will consider the most frequent flow events. Additionally, the design will maximise the deck-span so that it is centred over the water surface to avoid abutments/piers too close to the water's edge
    - Broken Leg (3rd and 4th order watercourse) and Spring Creek (3rd order watercourse) – a combination of crossings within the development footprint are proposed where access tracks intersect these watercourses. Additionally, six all-weather crossings (it is noted that only two box/round culvert crossings would be constructed downstream of where Broken Leg Creek and Spring Creek intersect, is to ensure fish passage along this component of the development footprint).

i Environmental receptors and potential impacts

Impacts to the aquatic ecosystems of the Sandy Creek catchment may occur during the construction and operational phases of the Project. The environmental receptors identified through desktop and field surveys, along with potential impacts are summarised below:

- riparian vegetation
- key fish habitat in Sandy Creek, Broken Leg Creek Creek, and Spring Creek
- water quality within Sandy Creek catchment
- threatened fish species and their habitat within Sandy Creek.

Potential impacts to environmental receptors within the Sandy Creek catchment as a result of proposed works associated with the Project including:

- removal or disturbance of riparian vegetation
- disturbance of sensitive key fish habitat, including disturbance of threatened species habitat

- obstruction or barriers to fish passage
- elevated turbidity and sedimentation associated with bed and bank disturbance
- elevated turbidity and sedimentation associated with catchment disturbance.

ii Riparian vegetation

Riparian vegetation provides shade, organic material, bank stability and instream structural habitat, which can be highly beneficial to native fish throughout their life history. The degradation of riparian vegetation has been identified as a key threatening process (DPI 2005); therefore, it is considered important that any remnant riparian vegetation within the Project Area is protected.

During construction, including all trenching, boring and waterway crossing construction, no remnant riparian trees will be removed. Disturbance of some emergent macrophytes and exotic pasture grasses will be required to establish the two water crossings at Sandy Creek. The impact of this removal is not considered to be significant, given the highly disturbed environment that exists at the proposed site. The avoidance of any remnant riparian trees, and construction of the crossing in a location which is highly disturbed on Sandy Creek is also not considered to require further mitigation measures.

The establishment of the development footprint for the Project has the potential to encroach on riparian vegetation. The guiding document *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update)* (DPI 2013) contains information on appropriate riparian buffers for developments. It is unlikely that the Project will negatively impact riparian vegetation along Broken Leg Creek or Spring Creek, as there is very limited opportunity to degrade the riparian zone to a greater extent than current conditions. Further, for Spring Creek and Broken Leg Creek, a 40 m riparian protection zone will be applied, and for Sandy Creek a 50 m riparian protection zone will be created and managed.

The implementation of the riparian protection zones is considered appropriate to protect existing riparian vegetation and aquatic ecosystems, as they will extend well beyond any existing remnant vegetation. The proposed riparian protection zones represent a balanced approach between protecting the existing environment; enhancing and promoting healthy riparian corridors; maximising development potential of the land; and managing potential bushfire fuel loads within these areas. Further details regarding the management of the riparian protection zone for Sandy Creek is available in Figure 3.10r.

iii Key Fish Habitat

The two proposed Sandy Creek water crossings contain suitable habitat for nest-building by Eel-tailed catfish but are considered to be of lower quality than that found downstream below the confluence with Broken Leg Creek. The availability of spawning habitat at the crossings, and the classification of the creek as Type 1, Class 1 habitat means that the crossing will span the creek as a bridge, following standards set out by DPI (2013) and Fairfull and Witheridge (2002). During field surveys it was established that the water level at the time was likely to represent baseflows through Sandy Creek. Using this wetted width as a guide, the span of the bridge will be designed to avoid placing any infrastructure within the wetted zone. Pylons or abutments will be required for the bridge on the upper bank but will have no impact on the key fish habitat identified at the site, which was under water at the time.

Planning for earthworks associated with water crossings for Sandy Creek will take place during periods of low/no flow periods to minimise disturbance and poor downstream water quality outcomes.

The design and construction of all waterway crossings will follow guidance in DPI (2013) to minimise impacts to key fish habitat. Although the disturbance of the creek within the road crossing footprint will occur during construction, the prevailing poorer quality habitat at the location of the crossings is not considered to be such that its disturbance has the potential to negatively impact fish populations long-term.

iv Fish passage

Waterway crossings (e.g. bridges, causeways, and culverts) can act as barriers to fish passage by creating a physical blockage, a hydrological barrier, or by forming artificial conditions that act as behavioural barriers to fish. In addition to fish passage, the design of a waterway crossing can also impact upon the health of riparian and aquatic vegetation and bed and bank stability. The impact of waterway crossings on fish passage will vary depending on:

- design of the structure
- nature of flow, debris, and sediment movement in the system
- swimming capabilities of resident fish.

The design and construction of all waterway crossings will follow guidance in Fairfull and Witheridge (2003) and Witheridge (2002), which will allow for fish passage once crossings are constructed. Fish passage within Broken Leg Creek and Spring Creek is already compromised by multiple farm dams which alter flow and block upstream fish movement. There is likely to be little impact to those creeks as a result of any trenching or waterway crossing construction, considering that creek beds are likely to be dry during construction.

Sandy Creek, which flows and contains surface water more regularly than other creeks within the study area, has the potential to have fish passage interrupted by in-stream works. Waterway crossings on Sandy Creek will be designed to avoid in-stream structures by placing abutments/pylons outside of the wetted width of Sandy Creek observed during surveys conducted in 2023. The span of the bridge will maintain fish passage by not introducing structures to the main channel and retaining flow and water height.

v Water quality

On-site preparation works and construction of infrastructure will involve ground disturbances which have the potential to increase turbidity and create sedimentation within creeks following rain. Sedimentation of gravel beds has the potential to lower the spawning potential of Eel-tailed Catfish and more generally degrade available habitat for native fish. Similarly, disturbance of creek lines to install underground cable or construct vehicle crossings may lead to erosion of banks and sedimentation during periods of flow.

It is understood that cleaning of solar panels will be done using water only, and not include the use of surfactants or other chemicals and will therefore not cause pollution to waterways during cleaning and maintenance.

vi Threatened Species

A likelihood of occurrence assessment has been completed for each species and the results are available in Appendix B of the AEIA report (Appendix H of this EIS).

In accordance with section 221ZV of the FM Act, an assessment was undertaken to determine whether the Project is likely to significantly impact listed species and populations, which is attached as Appendix C of the AEIA report (Appendix H). Although there is some expected modification to instream habitat associated with the construction of waterway crossings and trenching activities, where mitigation measures are applied, residual impacts on threatened species are likely to be minimal. The design of waterway crossings on Sandy Creek will span the wetted width of the creek that contains gravel beds, which will not interfere with spawning habitat for Eel-tailed Catfish.

6.3.4 Mitigation measures

Table 6.9 summarises the mitigation measures for each impact described above.

Table 6.9 Mitigation measures to address aquatic ecology related impacts

Reference	Mitigation Measures	Timing
BA1	Riparian vegetation mitigation measures are as follows: • The design of all waterway crossings will follow guidelines that reflect the level of protection required for each creek. In addition, riparian protection zone widths and activities allowed within those zones will be in line with the NRAR's *Guidelines for Controlled Activities on waterfront land—Riparian corridors* (NRAR 2018) • During construction, including all trenching, boring and waterway crossing construction, no remnant riparian trees will be removed. • The construction of the crossing on Sandy Creek will be in a location which is highly disturbed as indicatively shown in Figure 8 of the AEIA (Appendix H). • A 40 m riparian protection zone will be applied for Spring Creek and Broken Leg Creek, and a 50 m riparian protection zone will be created and managed for Sandy Creek within the Project area. The riparian protection zones are likely to protect remaining riparian vegetation in the Sandy Creek catchment from being impacted by the construction and operation of the Project through the actions set out in Figure 7 of the AEIA (Appendix H) and Figure 3.10 of this EIS.	PC, C, O
BA2	Additional mitigation measures during waterway crossing construction will include: • Erosion and sediment control measures will be implemented according to the Blue Book (Landcom 2004) during and after construction that limit sedimentation in downstream waterways and receiving waters, whilst allowing for fish passage. These measures will be detailed in the CEMP. • Earthworks associated with waterway crossing construction will only take place during periods of low/no flow periods where possible to minimise disturbance and poor downstream water quality outcomes. Where flow is present, fish passage will be maintained throughout the construction process utilising guidance from DPI (2013). • Planning of earthworks associated with trenching works for Sandy Creek will only take place during periods of low/no flow (dry) periods where possible to eliminate impacts on aquatic fauna. Where flow is present, fish passage will be maintained throughout the construction process utilising guidance from DPI (2013).	C
BA3	Mitigation measures during all other construction activities on the development footprint include: • Development of a Soil and Water Management Plan that includes stormwater management controls, appropriate infrastructure placement on the site and erosion and sediment control. • Storage of stockpiles of fill or excavated material above the potential flood extent.	C,O

Note PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.3.5 Residual impacts

Should mitigation measures provided be implemented, there is likely to be no residual negative impacts on aquatic ecosystems in the Spring Creek, Broken Leg Creek and Sandy Creek catchments.

Whilst on site, informal vehicle crossings of Broken Leg Creek and Spring Creek within the study area were numerous and not necessarily confined to fence lines or graded tracks. The formalisation of access roads and waterway crossings has the potential to reduce the number of locations where each creek is being traversed by vehicles and therefore reduce overall disturbance within those creeks. Where riparian protection zones are introduced and managed, riparian vegetation condition along Sandy Creek is likely to improve and in turn, improve aquatic ecosystem health.

6.3.6 Conclusion

The Project will require vehicle access across the development footprint, which will necessitate the construction of waterway crossings on three creeks (Sandy Creek, Broken Leg and Spring Creek, and up to eight low-level ford crossings). Additionally, to allow for energy transmission across the site, underground cable crossings of Broken Leg and Spring Creeks and an above-ground cable crossing of Sandy Creek are proposed. Field surveys have assisted in classifying each creek in the study area, with management practices and waterway crossing types reflecting the level of protection required. Actions that have been taken to minimise the impact on aquatic ecosystems include:

- design of waterway crossings on Sandy Creek to avoid spawning habitat of threatened species and allow for fish passage
- establishment and management of riparian protection zones that will improve overall riparian vegetation cover
- development of Construction Environment Management Plans and a Soil and Water Management Plan that will minimise on-site erosion during construction of on-site infrastructure and waterway crossings
- timing of earthworks associated with waterway crossing construction or trenching to minimise any impact on fish passage and downstream water quality where possible.

Key Fish Habitat assessments were completed for each of the three creeks within the study area. Utilising key fish habitat classifications, the design of all waterway crossings will follow guidelines that reflect the level of protection required for each creek. In addition, riparian protectionr zone widths and activities allowed within those zones will be in line with the NRAR's *Guidelines for Controlled Activities on waterfront land—Riparian corridors* (NRAR 2018). The riparian protection zone widths nominated support key fish habitat classifications, whilst allowing the Project to maximise the development potential of the study area.

Where all relevant guidelines and policies are followed and management plans are implemented, there is likely to be very little impact on aquatic ecosystems as a result of the Project. Improvements to current aquatic ecosystem conditions across the study area are anticipated in the following areas:

- Formalisation of access roads and waterway crossings across the study area has could reduce the number of vehicle traversing locations in each creek therefore reducing overall disturbance within the creeks.
- Where riparian protection zones are introduced and managed, riparian vegetation condition along Sandy Creek is likely to improve and in turn, improve aquatic ecosystem health.

With the mitigation measure identified in Section 6.3.4 implemented, there is likely to be no residual negative impacts on aquatic ecosystems in the Spring Creek, Broken Leg Creek, and Sandy Creek catchments.

6.4 Aboriginal heritage

6.4.1 Introduction

An Aboriginal cultural heritage assessment (ACHA) was prepared for the Project (EMM 2023a) and is provided in Appendix I. The ACHA investigates and characterises cultural materials, provides management and mitigation measures, and describes consultation undertaken with the local Aboriginal community.

The ACHA was prepared in accordance with the Project's Aboriginal heritage related SEARs (Appendix A), and the following NSW government guidelines:

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

6.4.2 Consultation

i Consultation undertaken

Consultation for the Project was undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a), comprising five stages described in detail in Appendix I. The consultation process identified 51 Aboriginal stakeholders, with nine groups registering an interest in the Project. Four registered Aboriginal party (RAP) site officers attended study area surveys and five RAPs attended test excavations.

A draft version of the ACHA, including all background information, results, draft significance assessment, and draft management recommendations, was issued to all RAPs for review. Four responses were received including three which expressed support/agreement with the draft and one requesting clarification. No other responses were received during the review period. Responses are provided in full in Appendix B.6 of Appendix I.

Table 6.10 provides a summary of the main steps undertaken to conform with Heritage NSW guidelines.

Table 6.10 Summary of Aboriginal consultation for the Project

Consultation stage	Description	Date started	Date completed	Notes
1	Government agency pre-notification	15.12.2021	29.12.2021	Additional details in Appendix B.1 of Appendix I
	Advertisement in *Dubbo Daily Liberal*	18.01.2022		The advertisement is provided in Appendix B.4 of Appendix I
	Notification and registration of potential Aboriginal stakeholders	17.01.2022	04.02.2022	Additional details provided in Appendix B.4 of Appendix I
	Advising Heritage NSW and Dunedoo Local Aboriginal Land Council (DLALC) of RAPs	15.02.2022		Additional details provided in Appendix B.4 of Appendix I

Consultation stage	Description	Date started	Date completed	Notes
2/3	Presentation of (and seeking comment on) information about the proposed Project; proposed survey and test excavation methodologies and gathering information about cultural significance.	25.02.2022	25.03.2022	Additional details provided in Appendix B.5 of Appendix I
	Archaeological survey	07.11.22	18.11.22	Additional details provided in Section 7 of Appendix I
	Test excavation	29.11.22	9.12.22	Additional details provided in Section 8 of Appendix I
	Project update		17.04.23	Additional details provided in Appendix B.5 of Appendix I
4	Review of draft report	13.01.2024	28.02.2024	Additional details provided in Appendix B.6 of Appendix I

6.4.3 Existing environment

The environmental characteristics of an area influenced the way Aboriginal people used the landscape. Understanding these environmental factors assists with predicting where Aboriginal sites are likely to occur. Additionally, natural and cultural (human-made) site formation processes that occur after the deposition of archaeological material influence the way archaeological material is distributed and preserved across a landscape.

i Topography and hydrology

The study area is situated on a shallow valley floor within the Sandy Creek catchment and generally drains north to the Talbragar River. A largely flat site, it features a gently undulating topography ranging between 380 m to 440 m above sea level (asl).

The study area is situated between two major rivers: the Talbragar and Cudgegong Rivers. The Talbragar River is located approximately 5 km to the north of the study area and is an east to west flowing river, while the Cudegong River is situated over 15 km to the south. A system of northwards flowing creeks are situated between the two rivers. Two major creeks are relevant to the study area: Sandy Creek and Laheys Creek.

Sandy Creek flows north into the Talbragar River catchment and is characterised by steeply incised banks, up to 7 m in depth in the upland area in which it commences, which has formed small eroding cliffs in this location. The shallow ‘inside bend’ flats are often accompanied by alluvial deposits, which leaves higher ‘outer bends’ which comprise higher landforms or promontories. ERM (2010) interprets the pattern of erosion as having implications for the presence of Aboriginal heritage. As the inward bends are likely to reflect recently deposited alluvium, they are less likely to contain Aboriginal heritage. Sandy Creek would have been an important resource for past Aboriginal peoples, evident from previously documented cultural material found along its banks.

The outer bends, in comparison, are slowly being eroded into the creek and are more likely to contain Aboriginal sites. In deeper parts of the creek, outcropping of coarse sandstone and conglomerate may be present. The sandstone may have been used to grind axes and therefore contain grinding grooves. The conglomerate rock may include numerous inclusions such as quartz pebbles and mudstone cobbles which could have provided raw material resources utilised for the manufacture of stone artefacts (ERM 2010).

Laheys Creek is an ephemeral, 4th order creek which joins with Sandy Creek immediately east of the most northern section of the study area. Previous studies indicate that the confluence of creeks was often an area of past focused Aboriginal activity.

ii Geology

The primary geology of the region comprises Early to Middle Triassic Napperby Formation (primarily sandstone) with minor areas of Quaternary alluvial deposits associated with Sandy Creek (Meakin et. al 2000). Key rock types within the local vicinity include quartz, siltstone, mudstone, and chert. Outcropping has occurred from natural and human-made erosion processes (EMM 2012).

Topographically, the landscape derives from both extensive basalt flows and quartz sandstones and consequently has very variable soils and vegetation depending on the local rock type or sediment source. The area is characterised by alluvial plains and undulating low hills with variable gently inclined slopes (NPWS 2003).

iii Soils

The study area contains four dominant soil landscapes:

- Ballimore (bm) erosional
- Mebul (me) erosional
- Mitchell Creek (mi) alluvial
- Lahey's Creek (lc) erosional.

All four soil landscapes have moderate potential for buried cultural material due to erodibility and some potential for surface artefact scatters and culturally modified trees. However, while it is likely that mature trees in this area were utilised in the past, their survival is unlikely due to widespread vegetation clearing.

iv Land use and disturbance

Previous land disturbance has a significant impact to the survivability of cultural materials if present. The study area has been subject to widescale vegetation clearing for agricultural purposes. Buildings have also been constructed within the study area, resulting in the complete loss of any surface and sub surface artefacts in these areas.

Furthermore, the establishment of Sandy Creek Road, Tallawonga Road, and Dapper Road would have involved cut and fill activities over a width area of approximately 30 m, likely resulting in the removal of any Aboriginal objects from these areas.

Flooding is common across the landscape and is likely to have disturbed and/or removed topsoil, especially within close proximity to waterways, which disturbs surface and subsurface artefacts, although they have the potential to remain within the landscape.

v Ethno-hisotory

The study area is located on the traditional lands of the Wiradjuri (sometimes called Wiradyuri or Wiiratheri and other variations). The Wiradjuri is the largest Aboriginal language group in NSW and the word means, 'people of the three rivers', which refers to the Macquarie (Wiradjuri name: *Wambool)*, Lachlan (*Kalari*) and Murrumbidgee rivers (NPWS 2003).

The Wiradjuri 'tribe' is located from south of the Murrumbidgee to north of the Lachlan, as far as the upper reaches of the Macquarie River. From the eastern boundary of the Great Dividing Range, the territory of the Wiradjuri extended to the vicinities of the present-day towns of Dunedoo, Wellington, Condobolin, Booligal, Hay, Albury, and Tumbarumba (Tindale 1940). Within the Wiradjuri region, the presence of Aboriginal people has been dated to 40,000 years ago.

vi Archaeological context

The region has been studied extensively for various infrastructure, mining, and industrial activities. Most Aboriginal sites identified in the region date to the Holocene period (10,000 years to present day). On the basis of stone tool technology, the majority of stone artefact assemblages in the area have been relatively dated to the mid to late-Holocene period with the move to smaller tools in what was previously known as the Small Tool Tradition. Subsurface deposit is predominantly confined to the A-Horizon or topsoil which is generally less than 25 cm in depth. These sites are often disturbed, and stratification is often absent or unclear. Although limited radiocarbon and geomorphology evidence has been obtained, it has been suggested that artefacts found in B-Horizon subsoils may have been deposited between 10,000 and 13,000 years ago (early Holocene/terminal Pleistocene).

A review of Heritage NSW's Aboriginal Heritage Information Management System (AHIMS) database identified 208 previously documented sites in the region. These were dominated by varying densities of stone artefacts (~70%), with rarer site types including culturally modified trees, grinding grooves and hearths making up the rest of the sites. Eleven sites were identified within or on the immediate periphery of the study area, though one was excluded as it was found to be over 100 m from the Project's boundary. The sites consist of one culturally modified tree, grinding grooves, and high to low-density artefact scatters or isolated Aboriginal objects.

vii Field investigation

An archaeological field survey was undertaken by two EMM archaeologists with the assistance of four RAP site officers between 7-18 November 2022. The survey comprised eight pedestrian transects completed over eight days, effectively covering approximately 104 ha. High rainfall caused waterlogging and dense vegetation growth in the study area, which limited accessibility and ground visibility. The survey team targeted ground exposures along transects such as outcropping bedrock (where/if present), ploughed fields, vehicle and animal tracks, scalds and sheetwash erosion, and creek banks, all of which provided good ground surface visibility for identifying Aboriginal objects. The extensive survey effort was able to characterise the archaeological landscape despite waterlogging and dense vegetation limitations.

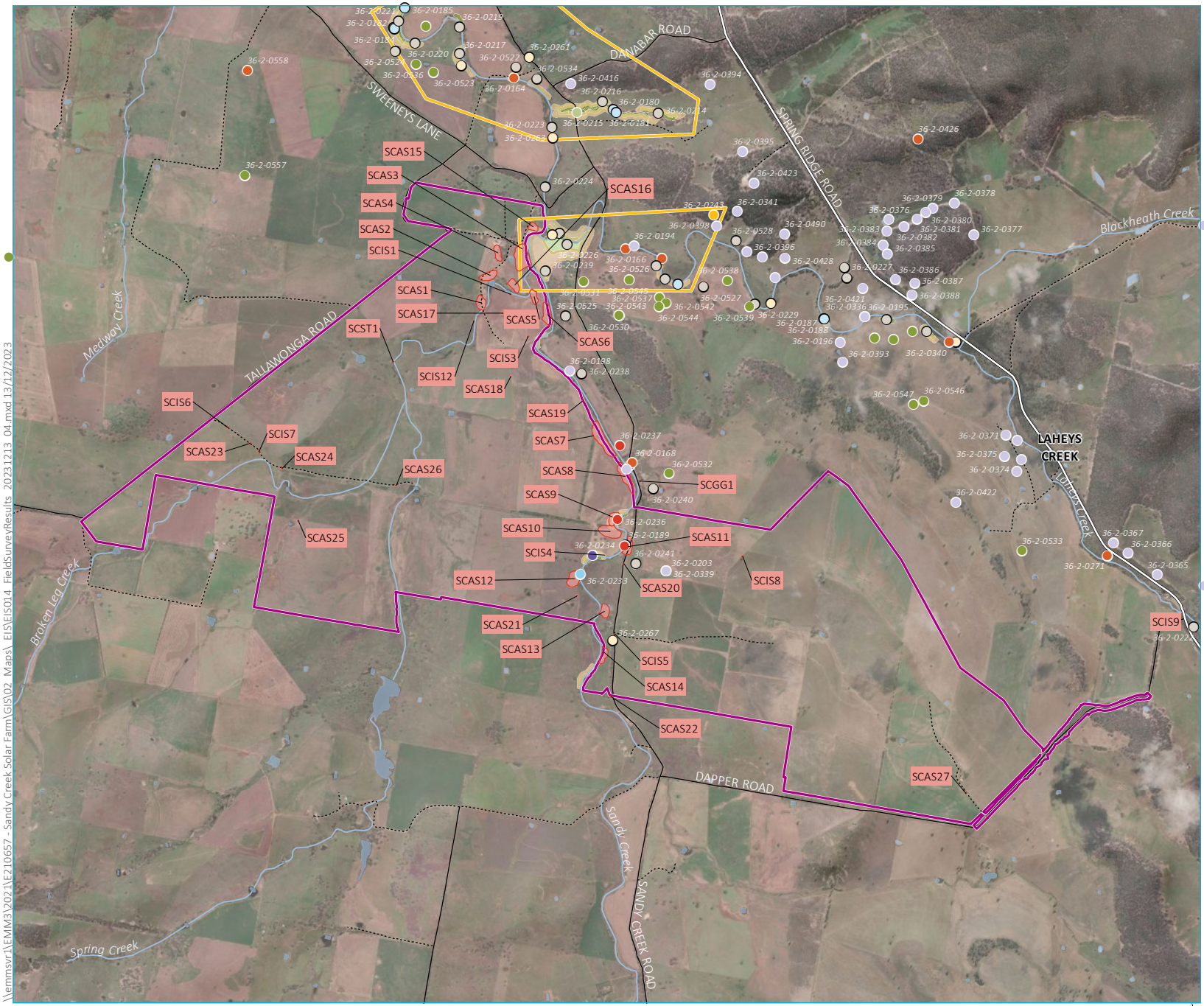
Aboriginal sites were observed to occur on landforms and soils associated with undulating plains, terraces, and banks. The most prevalent site type identified comprised low to medium density stone artefact scatters which were identified on the terraces and banks of Sandy Creek and Broken Leg Creek. Isolated finds and low-density artefact scatters occurred across the study area generally on the undulating plains landform. They were recorded along vehicle tracks where they are likely to have been moved and disturbed from their original context. One potentially culturally modified tree was observed on the banks of Broken Leg Creek. No other site types were recorded.

The survey team identified 38 Aboriginal sites within the study area. Additionally, the RAPs expressed an interest in inspecting an area of exposed sandstone on the eastern side of Sandy Creek, located outside the study area. Two grinding groove sites were previously recorded on AHIMS, #36-2-0167 and #36-2-0168. The RAPs identified another grinding groove site, SC GG1. While these sites are currently located outside the study area, they are rare in the region and appear to reflect an important locale of past use and visitation and have potential to provide chronological and technological information of these activities which is not available from other nearby Aboriginal sites.

The locations of previously identified AHIMS sites within or very near to the study were also inspected during survey to determine if the sites could be relocated and to record their current condition. Of the 10 AHIMS sites within or very near to the study area, two were outside the study area, five were unable to be relocated, and three were relocated. Figure 6.3 shows the results of field survey.

Test excavations generally focussed on the surrounds of Sandy Creek. A total of 97 test pits (0.25m^2) were excavated in transects across landforms of archaeological potential. A total of 118 stone artefacts were recovered with an average density of 4.7/m^2. The highest concentration of stone artefacts occurred at depths of 0—20 cm below the current ground surface. Artefact densities began to diminish below these depths, with few artefacts recovered below 30 cm. Artefacts were primarily found in two locales, both in the northern portion of the study area in test pits closest to Sandy Creek.

The results largely coincide with the available data that such sites vary in artefact density across this landscape, with the majority being low-moderate density artefacts sites.



Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011); LUAL (2022)

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Archaeological field survey results

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.3

EMM
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viii Archaeological resource

Archaeological field survey and test excavations were completed to explore and document Aboriginal objects, sites, and places within the study area, and to align them within the regional context. Overall, the findings were found to largely conform with regional models, which demonstrate the importance of larger creek lines (especially Sandy Creek) to Aboriginal people.

Based on survey results, the following previously recorded places will be combined into new sites (located within the study area):

- AHIMS #36-2-0197 (IF 06-Grinding Bowl, which was originally recorded outside of the study area) will be combined with SC AS8
- AHIMS #36-2-0236 (SAC 33) will be combined with SC AS9
- AHIMS #36-2-0235 (SAC 32) will be combined with SC AS11
- AHIMS #36-2-0233 (SAC 30) will be combined with SC AS12
- AHIMS #36-2-0234 (SAC 31) will be combined with AS28.

Other key findings include:

- a culturally modified scar tree (SC ST1, AHIMS #36-2-0581) was identified by RAPs during the survey
- when combining and ratifying these findings, there are 41 identified sites within the study area.

Artefact scatter SC AS8 has the potential to be part of a more extensive site encompassing SC GG1 and previously recorded grinding groove sites AHIMS #36-2-0167 and AHIMS #36-2-0168 to the east of Sandy Creek (currently outside the study area). This area appears to reflect an important locale of past use and visitation. This site is currently outside the development footprint. If this were to change, further subsurface salvage excavations would need to be undertaken.

Archaeological Landscape C is situated within and immediately north and east of the study area (most northern section). This landscape incorporates 10 Aboriginal sites.

No specific cultural values were identified for the study area. Table 6.11 provides a summary of the significance values for each Aboriginal object and/or site identified. The archaeological resource of the study area is shown in Figure 6.4.

Table 6.11 Significance of Aboriginal objects and/or sites identified

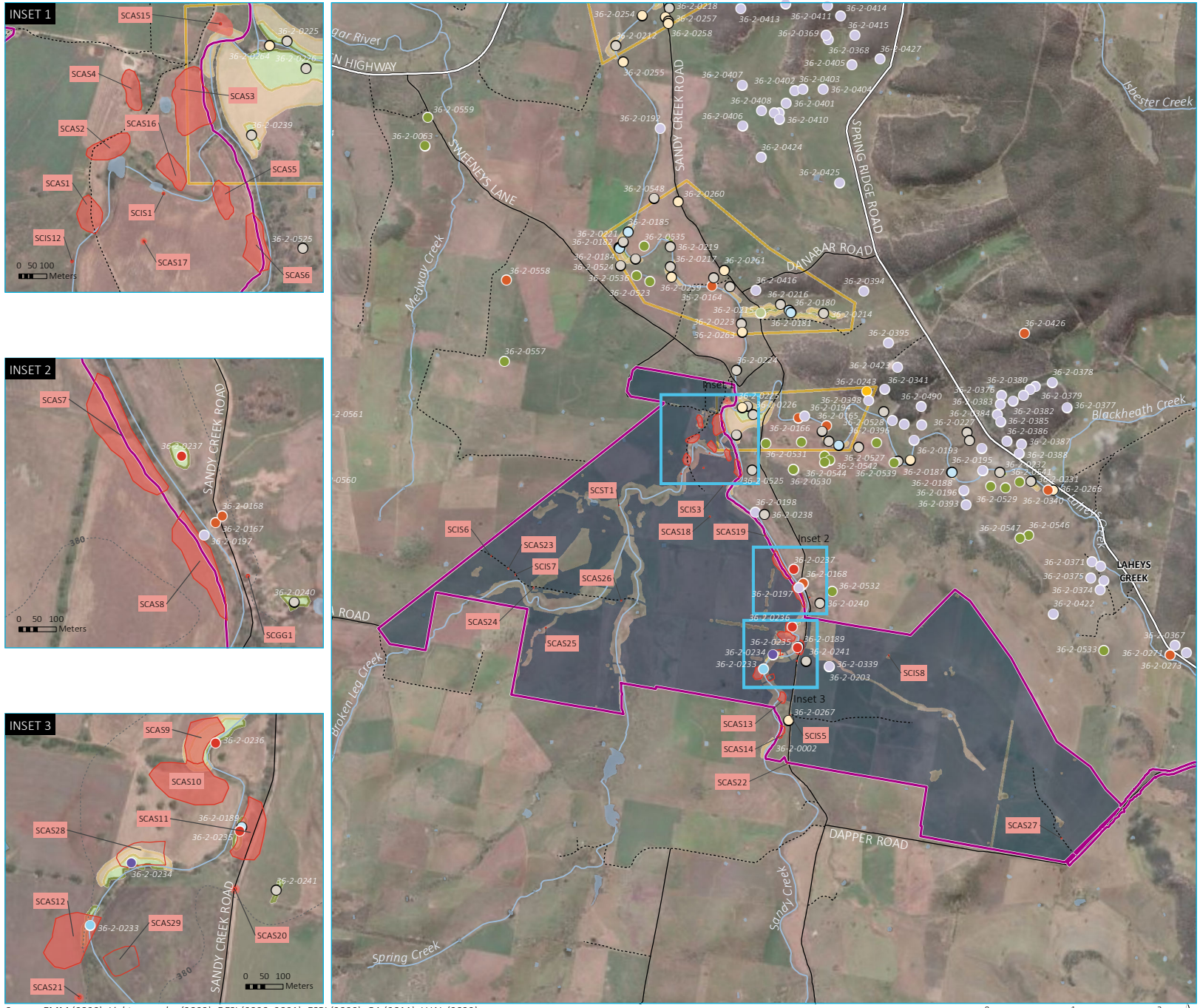
Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
SC AS1	36-2-0583	Artefact scatter	A low-density artefact scatter on a vehicle track adjacent to Broken Leg Creek.	Valid	Low	Low	-	-	Low
SC AS10	36-2-0597	Artefact scatter	A low-density artefact scatter on a terrace and vehicle track approximately 100 m from Sandy Creek.	Valid	Moderate	Low	-	-	Moderate
SC AS11	36-2-0235	High density stone artefact scatter with PAD	A medium density artefact scatter on a significantly water eroded bank on Sandy Creek. Associated with Hearth 13.	Valid	Moderate	Low	-	-	Moderate
SC AS12	36-2-0233	Artefact scatter	A very low-density artefact scatter (2 artefacts) identified on a terrace 40 m west of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS13	36-2-0596	Artefact scatter	A low-density artefact scatter identified on an erosion scald 2 m east of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS14	36-2-0595	Artefact scatter	A medium-density artefact scatter was identified on an erosion scald 20 m from Sandy Creek.	Valid	Moderate	Low	-	-	Moderate
SC AS15	36-2-0594	Artefact scatter	A medium-density artefact scatter was identified near a shed on a vehicle track 60 m from Sandy Creek.	Valid	Moderate	Low	-	-	Moderate
SC AS16	36-2-0593	Artefact scatter	A low-density artefact scatter was identified on an embankment of Broken Leg Creek in a flood exposure.	Valid	Low	Low	-	-	Low
SC AS17	36-2-0592	Artefact scatter	A very-low density artefact scatter was identified on an open plain within 200 m of Broken Leg Creek.	Valid	Low	Low	-	-	Low

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
SC AS18	36-2-0591	Artefact scatter	A very low-density artefact scatter was identified on a plain and vehicle track beside a dam and 110 m west of Broken Leg Creek.	Valid	Low	Low	-	-	Low
SC AS19	36-2-0589	Artefact scatter	A low-density artefact scatter on a vehicle track 5 m west of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS2	45-5-4624	Artefact scatter	A medium-density artefact scatter on and around a vehicle track adjacent to a dam within Broken Leg Creek.	Valid	Moderate	Low	-	-	Moderate
SC AS20	36-2-0588	Artefact scatter	A low-density artefact scatter was identified on a vehicle track 95 m from Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS21	36-2-0585	Artefact scatter	A low-density artefact scatter was identified on an erosion scar 90 m west of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS22	36-2-0586	Artefact scatter	A low-density artefact scatter was identified on an erosion scald next to a road (west) and 125 m north of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS23	36-2-0587	Artefact scatter	A low-density artefact scatter was identified on an open plain 150 m north of Broken Leg Creek.	Valid	Low	Low	-	-	Low
SC AS24	36-2-0584	Artefact scatter	A very low-density artefact scatter was identified on the bank of Broken Leg Creek.	Valid	Low	Low	-	-	Low
SC AS25	36-2-0607	Artefact scatter	A low-density artefact scatter was identified on the bank of a stream line (a tributary of Broken Leg Creek).	Valid	Low	Low	-	-	Low

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
SC AS26	36-2-0606	Artefact scatter	A low-density artefact scatter was identified on the bank of a stream line (a tributary of Broken Leg Creek).	Valid	Low	Low	-	-	Low
SC AS27	36-2-0605	Artefact scatter	A low-density artefact scatter was identified on a vehicle track south-east of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS28	36-2-0234	High density stone artefact scatter with PAD	A low-density artefact scatter located ~15 – 30 m west of Sandy Creek, on a terrace.	Valid	Low	Low	-	-	Low
SC AS29	36-2-0604	Artefact scatter	A low-density artefact scatter along bank of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS3	45-5-4903	Artefact scatter	A low-density artefact scatter identified on a terrace within 100 m of Sandy Creek.	Valid	Low	Low	-	-	Low
SC AS4	45-5-4902	Artefact scatter	A low-density artefact scatter situated on a plain in a cattle grazed paddock and partially includes a vehicle track.	Valid	Low	Low	-	-	Low
SC AS5	36-2-0600	Artefact scatter	A low-density artefact scatter on a terrace adjacent to Broken Leg Creek (~10 m). Artefacts were identified across an area approximately 80 m (l) x 10 m (w).	Valid	Low	Low	-	-	Low
SC AS6	36-2-0599	Artefact scatter	A high-density artefact scatter on the west terrace of Sandy Creek within 50 m, along the property boundary fence line and an adjacent animal track.	Valid	Moderate	Low	-	-	Moderate
SC AS7	36-2-0590	Artefact scatter	A low-density artefact scatter identified on a terrace of Sandy Creek, mainly on the vehicle track that runs adjacent to the creek.	Valid	Low	Low	-	-	Low

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
SC AS8	36-2-0197	Grinding bowl, artefact scatter	Originally recorded as a grinding bowl situated outside of the study area on the banks of Sandy Creek. Associated with a low-density artefact scatter identified on a terrace and vehicle track 30 m from Sandy Creek.	Valid	Moderate	-	-	-	Moderate
SC AS9	36-2-0236	Artefact PAD	Low density artefact scatter and PAD	Valid	Low	Low	-	-	Low
SC ST1	36-2-0581	Culturally modified tree	Measuring 2.4 m in circumference and located on the western bank of Broken Leg Creek. Identified by RAPs as a possible marker.	Tentative	Moderate	Low	-	-	Moderate
SC GG1	36-2-0582	Grinding Grooves	Several grinding grooves identified outside the study area, in association with AHIMS #36-2-0240	Valid	High	High	-	-	High
SC IS1	36-2-0603	Isolated find	A single quartz flake identified 20 m south of Broken Leg Creek and a dam along a cattle track.	Valid	Low	Low	-	-	Low
SC IS2	36-2-0601	Isolated find	A single quartz flake identified beside (10 m) Broken Leg Creek on a cattle track.	Valid	Low	Low	-	-	Low
SC IS3	36-2-0598	Isolated find	A single chert flake identified on an erosion scar 90 m west of Sandy Creek.	Valid	Low	Low	-	-	Low
SC IS5	36-2-0602	Isolated find	A singular chert flake identified on a vehicle track 180 m east of Sandy Creek.	Valid	Low	Low	-	-	Low
SC IS6	36-2-0577	Isolated find	A single chert flake identified on a vehicle track, 340 m north west of Broken Leg Creek.	Valid	Low	Low	-	-	Low
SC IS7	36-2-0578	Isolated find	One crystal quartz flake identified on vehicle track 65 m from Broken Leg Creek.	Valid	Low	Low	-	-	Low

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
SC IS8	36-2-0579	Isolated find	A single quartz flake identified on an erosion scar, 300 m from a tributary of Sandy Creek.	Valid	Low	Low	-	-	Low
SC IS9	36-2-0580	Isolated find	A single chert flake identified on a vehicle track outside of the study area.	Valid	Low	Low	-	-	Low
Sandy Creek Cobbora	36-2-0002	Artefact, grinding grooves	Surface campsite and grinding grooves	Valid	High	High	-	-	High
Hearth 13	36-2-0189	Hearth	Hearth of river stones and conglomerate. 680 x 160 mm in size. Located near Sandy Creek and associated with SC AS11.	Valid	High	Low	-	-	High
IF 12-Small Hammer Stone	36-2-0203	Isolated find	Small hammer stone	Valid	Low	Low	-	-	Low
SAC 34	36-2-0237	Artefacts, PAD	High density artefact scatter and PAD	Valid	Moderate	Low	-	-	Moderate
SAC 38	36-2-0241	Artefact	Artefact scatter	Valid	Low	Low	-	-	Low
ST 18	36-2-0267	Culturally modified tree	A culturally modified tree (scarred oval on a living Eucalypt) on the banks of Sandy Creek. Located outside the study area.	Valid	Moderate	Low	-	-	Moderate



Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011); LUAL (2022)

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Archaeological resource within the study area

Sandy Creek Solar Farm
Environmental impact statement
Figure 6.4

EMM
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6.4.4 Avoidance and minimisation through design

Through ongoing Project refinement, there are 16 sites that will not be impacted by the proposed development footprint (11 within the study area and five outside the study area), including several highly significant sites. Project refinement included avoidance of major creek lines through establishing riparian corridors, within which many of the Aboriginal cultural materials were encountered during field survey for the Project.

6.4.5 Potential impacts

Of the 41 Aboriginal sites within the study area, 30 will be adversely affected by the proposed development activities (11 sites will not be impacted by the Project). Of these 30 sites, 12 will be subject to complete loss, while the remaining 18 sites will be partially impacted by the Project.

Two types of potential impact are considered – direct and indirect. Direct impacts relate to the construction activities and their removal, truncation and/or disturbance of the ground surface. This would include the removal of vegetation, removal or modification of geological outcropping and the removal or disturbance of the upper soil profile. Indirect impacts are the result of both construction and post-construction activities that may result in environmental changes that would affect cultural material within, or near the Project activities. General examples of indirect impact may include the burial of a soil profile resulting in its compression and indirectly damaging buried cultural material, or an increase in dust being blown into a rock shelter and negatively affecting art motifs should they be present.

A summary of potential impacts to Aboriginal sites and objects as a result of the Project is shown in Table 6.12.

Table 6.12 Summary of potential impacts to Aboriginal sites and objects

AHIMS ID	Site name	Overall significance	Type of harm	Location and/or activity causing harm	Degree of harm	Consequence of harm
36-2-0583	SC AS1	Low	Direct	Within the development footprint	Partial	Partial loss of value
45-5-4624	SC AS2	Moderate	Direct	Within the development footprint	Partial	Partial loss of value
45-5-4903	SC AS3	Low	Direct	Within the development footprint	Partial	Partial loss of value
45-5-4902	SC AS4	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0600	SC AS5	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0599	SC AS6	Moderate	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0590	SC AS7	Moderate	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0197	SC AS8	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0236	SC AS9	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0597	SC AS10	Moderate	Direct	Within the development footprint	Partial	Partial loss of value

AHIMS ID	Site name	Overall significance	Type of harm	Location and/or activity causing harm	Degree of harm	Consequence of harm
36-2-0235	SC AS11	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0233	SC AS12	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0596	SC AS13	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0595	SC AS14	Moderate	Nil	Nil	Nil	No loss of value
36-2-0594	SC AS15	Moderate	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0593	SC AS16	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0592	SC AS17	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0591	SC AS18	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0589	SC AS19	Low	Nil	Nil	Nil	No loss of value
36-2-0588	SC AS20	Low	Nil	Nil	Nil	No loss of value
36-2-0585	SC AS21	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0586	SC AS22	Low	Nil	Nil	Nil	No loss of value
36-2-0587	SC AS23	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0584	SC AS24	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0607	SC AS25	Low	Nil	Nil	Nil	No loss of value
36-2-0606	SC AS26	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0605	SC AS27	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0234	SC AS28	Low	Nil	Within the development footprint	Partial	Partial loss of value
36-2-0604	SC AS29	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0603	SC IS1	Low	Nil	Nil	Nil	No loss of value
36-2-0601	SC IS2	Low	Nil	Nil	Nil	No loss of value

AHIMS ID	Site name	Overall significance	Type of harm	Location and/or activity causing harm	Degree of harm	Consequence of harm
36-2-0598	SC IS3	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0602	SC IS5	Low	Nil	Nil	Nil	No loss of value
36-2-0577	SC IS6	Low	Direct	Within the development footprint	Complete	Complete loss of value
36-2-0578	SC IS7	Low	Nil	Within the development footprint	Complete	Complete loss of value
36-2-0579	SC IS8	Low	Nil	Nil	Nil	No loss of value
36-2-0580	SC IS9	Low	Direct	Within the development footprint	Partial	Partial loss of value
36-2-0639	SC IS12	Low	Nil	Nil	Nil	No loss of value
36-2-0581	SC ST1	Moderate	Nil	Nil	Nil	No loss of value
36-2-0582	SC GG1	High	Nil	Nil	Nil	No loss of value – outside the study area
36-2-0267	ST 18	Moderate	Nil	Nil	Nil	No loss of value – outside the study area
36-2-0002	Sandy Creek Cobbora	High	Nil	Nil	Nil	No loss of value – outside the study area
36-2-0241	SAC 38	Low	Direct	Extreme waterlogging from flooding	Complete	Complete loss of value. However, this site has already been disturbed/destroyed due to flooding
36-2-0237	SAC 34	High	Nil	Nil	Nil	No loss of value – outside the study area
36-2-0203	IF 12	Low	Direct	Extreme waterlogging from flooding	Complete	Complete loss of value. However, this site has already been disturbed/destroyed due to flooding
36-2-0189	Hearth 13	High	Nil	Nil	Nil	No loss of value

Note: The type, degree and consequence of harm definitions are based on DECCW's Code of Practise for the Archaeological Investigation of Aboriginal objects in NSW.

While the Project will result in some intergenerational/cumulative loss to material culture, it is considered that there will be numerous cultural heritage benefits. These include the long-term preservation of substantive cultural material that would be protected from future harm, opportunities for Aboriginal participants to work with past cultural materials and be on-Country, a greater understanding of the past and contemporary values in the region, opportunities for heritage interpretation, and both Aboriginal and public outreach.

6.4.6 Management and mitigation measures

Table 6.13 outlines the Project's management and mitigation measures for Aboriginal cultural heritage.

Table 6.13 Management and mitigation measures for Aboriginal cultural heritage

Reference	Mitigation measure	Timing
AH1	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed by a heritage specialist in consultation with the RAPs and Heritage NSW to provide the post-approval framework for managing Aboriginal heritage within the construction area. The contents and guiding principles for the management of identified site types for the ACHMP are presented in Section 9 of Appendix I and will include: • processes, timing, communication methods and Project involvement for maintaining Aboriginal community consultation and participation through the remainder of the Project • inputs and content of a cultural heritage induction package for all construction personnel and subcontractors • descriptions and methods for surface collection of identified isolated objects and stone artefact scatters that would be adversely affected by the Project • descriptions and method for mitigation and/or recovery of grinding grooves and culturally modified trees that would be adversely affected by the Project • delineating and protecting Aboriginal and cultural sites within or in close proximity to the construction area, including clear marking, fencing, surface protection, etc • procedures for managing the unexpected discovery of Aboriginal objects, sites and/or human remains during the Project • procedures for the curation and long-term management of recovered cultural materials • methods of salvage analysis and reporting, including suitable collection and processing of stone artefacts • a monitoring regime for implementing the above measures.	PC, C
AH2	Given the potential complete and/or partial destruction of 30 sites, these will be subject to additional surface salvage recovery (conservation *ex situ*). While the specific methodologies and quantum willd be developed as part of the ACHMP in consultation with the Project team and RAPs, a number of guiding principles should be adopted, including: • a systematic surface collection should be undertaken of the sites (or portion of the sites) to be impacted (by a suitably qualified archaeologist and the RAPs) • the objects (along with those recovered from the test excavation) should be moved to a location decided upon in conversation with the RAPs, outside the impact footprint • post-salvage recording of the updated sites location/s. In the case of the potential complete or partial destruction of any remaining subsurface archaeology (low to moderate significance), no further mitigation measures are recommended. It has been demonstrated that a low density of artefacts would be expected across the construction envelope. It is considered that further investigation of these areas would not alter the significance or current understanding of these cultural deposits.	PC

Reference	Mitigation measure	Timing
AH3	Passive avoidance of Aboriginal sites within the study area not impacted by current development plans that may include but not limited to: • fencing requirements for sites within the study area that won't be impacted and are within 100 m of the impact footprint • cultural heritage site induction for construction team. These recommendations will be incorporated in the ACHMP.	PC, C
AH4	If the Project design were to change such that it will impact the culturally modified tree, an inspection will be undertaken by a qualified arboriculturist of the tentatively identified culturally modified tree, to confirm whether it has formed through anthropogenic or natural processes. The findings of this investigation and subsequent management of the trees confirmed as being culturally modified will be integrated into the ACHMP as required.	PC
AH5	Consultation will be maintained with the RAPs during the finalisation of the assessment process and subsequent stages of the Project where cultural heritage requires management.	PC, C, O
AH6	A copy of the ACHA and all relevant AHIMS site recording forms and information for the Project will be lodged with Heritage NSW and provided to each of the RAPs.	PC

Note: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.4.7 Conclusion

Overall, the Project will result in adverse impacts to 30 identified Aboriginal sites, objects and/or places, as well as various amounts of buried stone or artefactual material. Of these 30 sites, 12 will be subject to complete loss, and 18 will be partially impacted. These sites are all discrete stone artefact scatters and/or deposits and will be salvaged prior to disturbance occurring.

While the Project will result in some loss of cultural materials, the current and proposed impacts of the Project and associated material loss can be considered to have benefits. In the first instance, the investigations of the study area have significantly improved our archaeological and scientific understanding of a previously poorly understood locale. Information on the past peopling and their activities within the Project area have now come to light, as well as an improved understanding of contemporary sites and values. Such information will only be added to and further refined through future stages of Project development. The Project also provides the Aboriginal community with opportunities to undertake heritage interpretation, development of narratives and visual representation of Aboriginal values, stories, and places for the study area– something that is currently lacking from the region. This will improve understanding and public outreach of cultural heritage to the broader community into the future.

6.5 Historic heritage

6.5.1 Introduction

A statement of heritage impact (SoHI) was undertaken by EMM (2023c) for the Project and is provided in Appendix J. The SoHI aimed to investigate and characterise potential historical objects, determine potential impacts to historical heritage by the Project, and to provide management and mitigation measures. The SoHI included field survey and archival research and satisfies SEARs requirements related to historic heritage as set out in Appendix A.

6.5.2 Existing environment

There are no listed heritage items on the National Heritage List, Commonwealth Heritage List, State Heritage Register, NSW s170 Register, the Warrumbungle LEP, or the Dubbo LEP within the study area or in the vicinity of the study area.

Of note, a 2019 local community heritage study undertaken in the Warrumbungle Shire nominated Dapper Union Church (SHI #1390173) for inclusion in the Warrumbungle LEP; however, this has yet to be actioned (PA Duggan Architect and Heritage Consultant 2019). Dapper Union Church, established circa 1910, is located close to the southern boundary of the study area, outside the development footprint.

European settlers reached Mudgee by 1822 and from the 1840s, villages were surveyed and developed in the large squatting runs. By the 1850s, most of the suitable grazing land between Mudgee and the Dubbo plains had been claimed (Former Mudgee Shire Heritage Committee 2004). The Gold Rush of the 1850s boosted the economic growth of the Central Tablelands. In the 1860s, farmers west of the Great Dividing Range were encouraged to take up wheat production (Kass 2001), shifting the economic focus of the region to agriculture, which continues to thrive today.

Within the study area, the western portion of Lots 7 and 8 DP 754317 are in the historical leasehold of the 16,000 acre (6,475 ha) Wooloowoolonly run (also Woolowoolanley, Wooloomoolenley), a pastoral run that primarily focused on sheep. Additionally, there are three surviving homesteads in the study area including Leaholme on Lot 55 from at least the 1940s. Leaholme could potentially include archaeological remains of the original pastoral property.

In total, nine items were identified with potential historic heritage significance within or near the study area during field survey, eight of which have been identified as having local significance. Table 6.14 presents a summary of identified sites and these are represented in Figure 6.1 of Appendix J.

Table 6.14 Summary of historic heritage sites, sensitivity, and significance in/close proximity to the study area

Site ID	Site name	Heritage sensitivity	Significance level
SCSF-HS01	Hut	Low	Local
SCSF-HS02	Shearing Shed	Low	Local
SCSF-HS03	Well	Low	Local
SCSF-HS04	Hut	Low	Local
SCSF-HS05	Silo	Negligible	None
SCSF-HS06	Survey Marker	Low	Local
SCSF-HS07	Workers' Accommodation	Low	Local
SCSF-HS08	Leaholme	Low	Local
SCSF-HS09	Dapper Union Church	Moderate	Local
Cultural Landscape	-	Negligible	None

6.5.3 Potential impacts

As shown in Table 6.13, the assessment determined that structures within the study area associated with homesteads, including huts, a well, a shearing shed, a survey marker, and worker's accommodation, are of local significance.

Potential impacts to historic heritage items are shown in Table 6.15.

Table 6.15 Potential impacts to heritage items

Item	Location	Potential impact
Hut site (SCSF-HS01)	Within development footprint	Potential for direct impacts, as item is located within the development footprint.
Hut site (SCSF-HS02)	Within development footprint	Potential for direct impacts, as item is located within the development footprint.
Well (SCSF-HS03)	Within development footprint	Potential for direct impacts, as item is located within the development footprint.
Hut site (SCSF-HS04)	Partially inside development footprint	Potential for direct impacts, as item is located within the development footprint.
Leaholme (SCSF-HS07)	Within development footprint	As the item is not of heritage significance, there will not be built heritage impacts. However, demolition of the current homestead and proposed development will impact potential archaeological relics and resources found at the Leaholme complex. These resources could provide information about the site at Leaholme prior to 1927 and rural farming practice in the region. However, it is likely that the remains of the earliest phase at Leaholme was destroyed or disturbed with construction of the existing house. Despite this, without knowing the full extent of the location of any former dwellings or associated outbuildings, the proposed solar panels and infrastructure may directly impact archaeological resources related to the earliest pastoral phase of the site.
Dapper Union Church (SCSF-HS09)	Approximately 100 m from the southern boundary of the study area (outside development footprint area)	The site will not be physically impacted by the Project. As the church is surrounded by mature trees, the solar arrays will not be visible from the heritage item. Therefore, no indirect visual impact is identified.

Construction and operation of the Project will result in impacts to heritage values within the study area. There will be a loss of significance of the existing rural agricultural and pastoral landscape, which consists of cleared fields, paddocks, fences, and archaeological sites. The current aesthetic of the valley cut through by a creek, which is one that is recognisable from its early historical phase, will have a low to moderate landscape character impact.

Some historical elements associated with Wooloowoolonly run and the pastoral properties and associated outbuildings that were constructed as part of the farm will be impacted by the Project, including the archaeological remains of Leaholme.

Impacts may also occur to relics associated with the early pastoral phase and other unidentified historical activities that are related to the early colonial use of the study area.

The Project poses a low impact to the heritage significance of the Dapper Union Church associated with changes in the view and setting of the church.

Overall, impacts to historical cultural values are not predicted to be significant, and where loss of value occurs, it can be recorded and mitigated using accepted methods.

6.5.4 Mitigation measures

Residual impacts to historic heritage will be managed through several measures as outlined in Table 6.16.

Table 6.16 Historic heritage mitigation measures

Reference	Mitigation measure	Timing
HH1	Historical Heritage Management Plan An Historical Heritage Management Plan (HHMP) will be developed and incorporated into the Cultural Heritage Management Plan for the Project, which will be integrated into the CEMP. The HHMP will include the mitigation measures described below and will provide processes and procedures in the event that impacts to heritage items become warranted and also contain an unexpected finds procedure.	PC, C
HH2	Archaeological investigation Four sites (SCSF-HS01 - SCSF-HS04) have been identified for potential archaeological test excavation prior to construction, as these sites are currently located inside the development footprint. If the alignment of access tracks and electrical trenching cannot be realigned during the final design phase, a program of archaeological salvage excavation would need to occur. Notification under s146 of the Heritage Act would also need to be made to the NSW Heritage Council. If it is possible to move the alignment, this would be the preferred method of management to retain heritage significance. If it is not possible to move the alignment, the program relies on the final design of the Project and is therefore scheduled at the post approval stage of the Project. The archaeological research design and methodology for test excavation is to be provided in the HHMP.	PC
HH3	Archaeological monitoring Leaholme has been identified in the development footprint and is recommended for archaeological monitoring. If relics are discovered and it is possible to move the development footprint, this would be the preferred method of management to retain heritage significance. If it is not possible to move the development footprint, a program of archaeological salvage excavation would need to occur. Notification under s146 of the Heritage Act would also need to be made to the NSW Heritage Council. The program relies on the final design of the Project and is therefore scheduled at the post approval stage of the Project.	C

Reference	Mitigation measure	Timing
HH4	Archival photography An archival record in the form of digital photography will be prepared to capture the pre-construction state of the landscape; the images will capture fields/paddocks and their relationship to Sandy Creek, the shearing shed, surviving stockyards and ramps, road and tracks, and exotic trees. The record of the photographs, and other data relating to the history of the study area will be provided to Dubbo Regional Council and Warrumbungle Shire Council local studies library (or equivalent) and Gulgong Historical Society. A copy of the archival photographs and related material will be lodged with the Heritage NSW library for access to researchers also. The archival records will be prepared generally in accordance with the following guiding documents: • Photographic recording of heritage items using film or digital capture (Heritage Office 2006) • How to prepare archival records of heritage items (NSW Heritage Office 1998).	PC
HH5	Unexpected finds protocol An unanticipated finds protocol will form part of the HHMP to provide guidance to construction personnel should works uncover objects and fabric that may indicate relics.	PC, C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.5.5 Conclusion

There are no listed items of historical heritage significance in the study area. Nine items of potential local significance have been identified within or near the study area, mostly associated with homesteads including huts, a well, shearing shed and worker accommodation.

Activities associated with the construction and operation of the Project are anticipated to have a low impact on the heritage values identified in the study area, as well as an item of low significance (Dapper Union Church), near the study area. Impacts to the cultural landscape will be low to moderate.

The primary method of retaining heritage values is to avoid impacts. In some situations, such as this one, avoidance may not be possible for hut site SCSF-HS01, hut site SCSF-HS04, well (SCSF-HS03) and Leaholme (SCSF-HS08). In addition, unknown relics may be affected, and the cultural landscape of the valley will be changed. These identified impacts can be managed to reduce the loss of significance. The assessment of heritage impacts arising from the Project and the SoHI have informed the management measures in Table 6.16, which are commensurate with the levels of significance in the study area.

6.6 Land and rehabilitation

6.6.1 Introduction

A Land and rehabilitation assessment (LRA) has been prepared by EMM (2023c) and is attached as Appendix K. The LRA identifies and assesses unavoidable residual impacts to land, soils, and agriculture as a result of the Project and provides recommended mitigation measures and rehabilitation strategies.

The LRA satisfies the requirements of the relevant SEARs provided in Appendix A.

6.6.2 Existing environment

i Soils

The study area is predominantly located on the Ballimore soil landscape with an occurrence of Mebul soil landscape and minor areas of Mitchell Creek and Lahey's soils landscapes (DPIE 2020), as shown in Figure 6.5. Qualities and constraints of the study area's soil landscapes are shown in Table 6.17.

Table 6.17 Study area soil landscapes

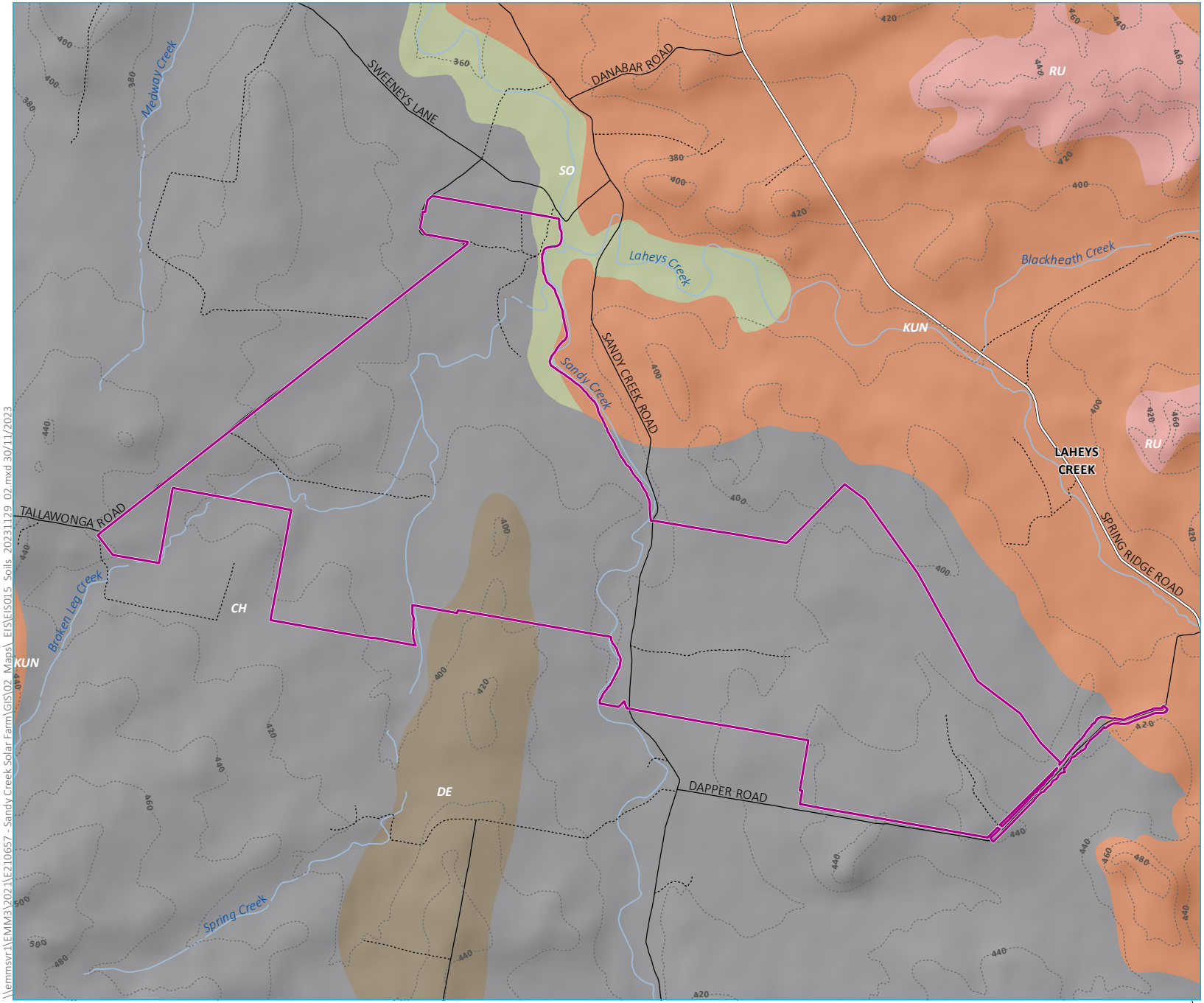
Soil landscape	Topography	Land use	Existing land degradation
Ballimore (bm)	Undulating low hills with elevations from 280–400 m. Slopes are gently inclined (3–6%) with slopes 2000–3000 m long. Local relief varies between 20–40 m. Drainage lines are spaced at 500–1500 m intervals.	Dryland cropping including wheat, canola and oats; improved pasture for grazing of cattle and sheep producing prime lambs and wool. Some areas of unimproved/ volunteer pasture remain. Only rocky ridges or hills retain native forest vegetation.	Moderate sheet erosion and gully erosion; surface soils often structurally degraded under cultivation and heavy stocking. A few areas of severe gully erosion occur and there are isolated patches of salinity in depressions.
Mebul (me)	Undulating low hills ranging from 400–540 m above sea level. Slopes range from 2–15% and from 500–2000 m long with up to 60 m relief.	Dryland cropping; improved pastures.	Minor to moderate sheet erosion in cropping areas; minor gully erosion.
Mitchell Creek (mi)	Alluvial plains and terraces, levees and basins ranging from 280–540 m above sea level with level to slightly undulating (<4%) slopes ranging from 50–500 m long and up to 20 m relief. Streams are often entrenched, forming steep stream banks.	Grazing of improved pasture and native pasture, small areas of dryland cropping.	Active streambank and gully erosion occurs along segments of most creeks.
Lahey's Creek (lc)	Undulating low hills with elevations between 400–520 m. Slopes are gently inclined (3–10%) with slopes 500–1500 m long. Local relief varies between 40–50 m. Drainage lines are spaced 400–1200 m apart.	Grazing on native pastures, with areas of cropping and grazing on improved pastures. Some areas of uncleared native forest.	Moderate sheet erosion and moderate gully erosion common; some areas of severe gully erosion. Surface soils moderately acidic.

Four soil orders of the Australian Soil Classification (ASC) scheme are mapped within the study area, primarily Chromosols with a small area of Dermosols and minor areas of Sodosols and natric Kurosols (Figure 6.5). The study area's ASC soil orders and their characteristics are described in Table 6.18.

Inherent soil fertility is used as a general indication of a soil's capacity to retain and release nutrients and soil water for use by vegetation and is a function of the interrelationship between physical, chemical, and biological components in the soil. The soil fertility within the study area is outlined in Table 6.18.

Table 6.18 Inherent soil fertility and ASC

Inherent soil fertility	ASC	Description
Moderate	Chromosols (CH)	• lower subsoil constraints • topsoils often sandy, with weak structure • can be susceptible to erosion from concentrated flows • generally moderate agricultural potential • moderate chemical fertility and water-holding capacity • can be susceptible to soil acidification and soil structural decline • low to moderate fertility that usually require fertiliser and/or have physical restrictions for arable use.
Moderately high	Dermosols (DE)	• can be dispersive with risk of erosion • generally high agricultural potential • generally good structure with moderate to high chemical fertility and water holding capacity • generally few persistent limitations • high fertility in virgin state, but fertility is significantly reduced after a few years of cultivation
Moderately low	Sodosols (SO)	• typically have low agricultural potential with high sodicity leading to high erodibility, poor structure, and low permeability • low to moderate chemical fertility and can be associated with soil salinity • subsoils often dispersive and prone to gully and tunnel erosion • often hard- setting when dry and prone to crust formation • low fertility which generally only supports vegetation suited to grazing with large inputs of fertiliser required to improve them and make the suitable for arable purposes.
Moderately low	Kurosols-natric (KUn)	• often dispersive and prone to gully and tunnel erosion • generally low agricultural potential • high acidity, low chemical fertility, generally low water holding capacity • can have unusual subsoil chemical features such as high magnesium, sodium and aluminium • frequent sodic conditions • low fertility which generally only supports vegetation suited to grazing with large inputs of fertiliser required to improve them and make the suitable for arable purposes.



Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); GA (2011); DPIE (2022)

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Soil landscapes and modelled ASC mapping

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Figure 6.5

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ii Land and soil capability

The NSW *Land and soil capability assessment scheme, 2nd approximation* (OEH 2012) (LSC Scheme) assesses the inherent physical capacity of the land to sustain a range of land uses (and management practices) in the long term without leading to degradation of soil, land, air, and water resources. The LSC scheme considers the inherent biophysical features of the land and soil, and their associated hazards and limitations, to these land uses. Each hazard is given a rating between 1 (best, highest capability land) and 8 (worst, lowest capability land). The overall LSC class of the land is based on the most limiting feature/hazard. Land suitable for cropping is typically identified as LSC Class 1–3.

The study area is mapped as classes 3 and 5, representing land with high to moderate--low capability for productive use without resulting in land degradation, as shown in Figure 6.6 and Figure 6.7. It should be noted that the overall LSC of the Mitchell Creek soil landscape is mapped as Class 3; however, the provided individual LSC hazards for the soil landscape show the presence of LSC Class 4 hazard for soil structural decline, indicating inconsistency in the application of the LSC scheme in the regional mapping.

The LSC assessment also included individual assessment of each soil investigation site to determine its LSC and limiting factors determined to be present in the study area during soil survey. Soil survey and assessment determined the study area contains LSC classes 3, 4, 5, 6, and 7 (Table 6.19). The majority (56%) of the study area is LSC Class 3, with 957 ha of LSC Class 3 land in the study area. This represents only 0.34% of LSC Class 3 land mapped across the CWO REZ.

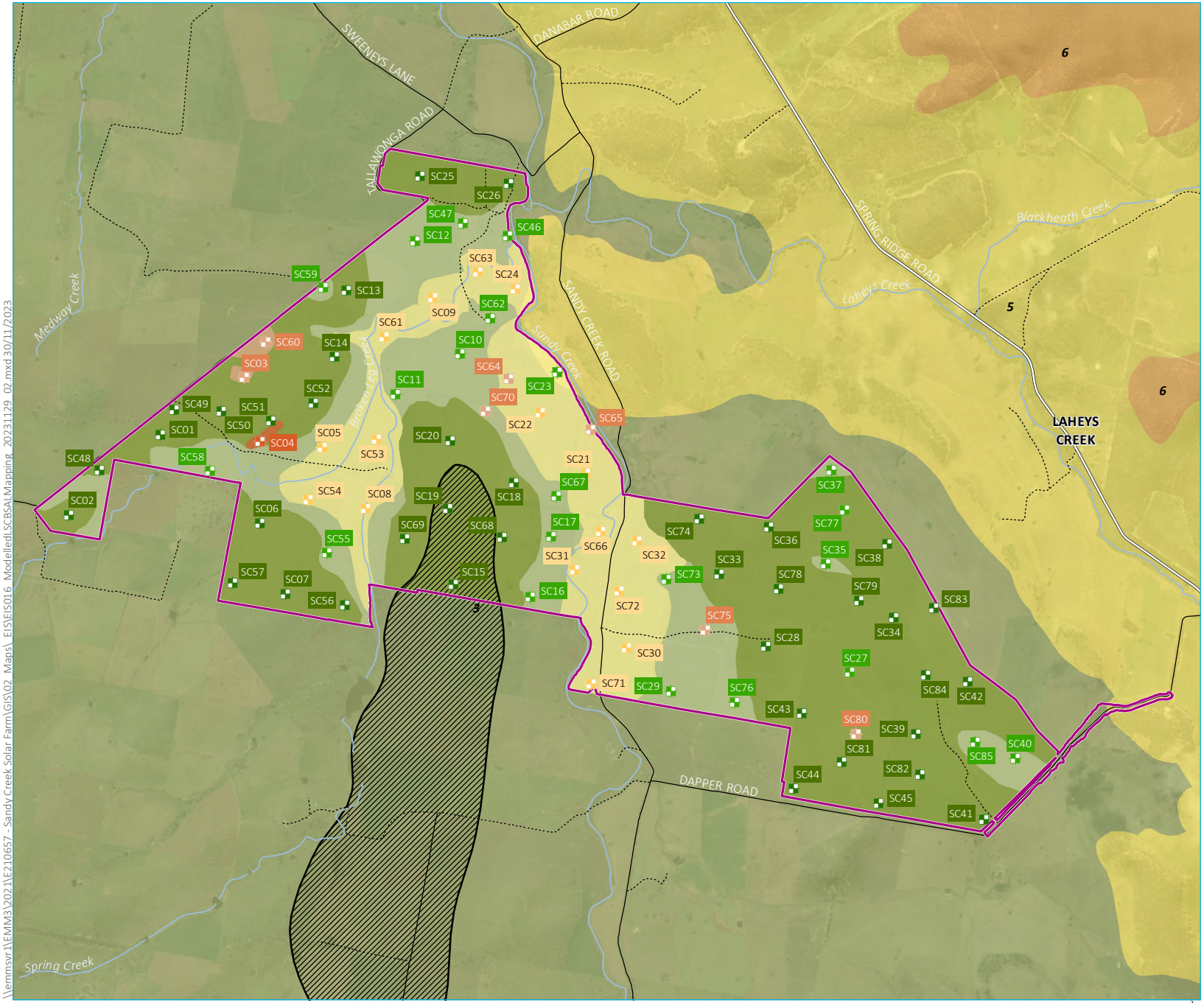
Predominant hazards in the study area include:

- waterlogging
- salinity
- soil acidification.

Table 6.19 Project verified LSC in the study area

LSC Class	Regionally mapped extent (ha)	Project verified extent (ha)	Verified variation (ha)
3	1696.1[1]	957.4	-738.7
4	-	388.3	388.3
5	6.6	346.4	339.8
6	-	7.6	7.6
7	-	3.0	3.0

Notes: 1. This includes the 33.5 ha of LSC Class 3 land associated with the Mitchell Creek soil landscape which appears erroneous and should be LSC Class 4.



Study area
Strategic agricultural land - biophysical
Soil investigation site (by site LSC)
LSC 3
LSC 4
LSC 5
LSC 6
LSC 7
Land and soil capability (LSC)
LSC 3 - Moderate limitations
LSC 4 - Moderate to severe limitations
LSC 5 - Severe limitations
LSC 6 - Very severe limitations
LSC 7 - Extremely severe limitations
Existing environment
Major road
Minor road
Vehicular track
Named watercourse

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

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Modelled LSC and BSAL mapping

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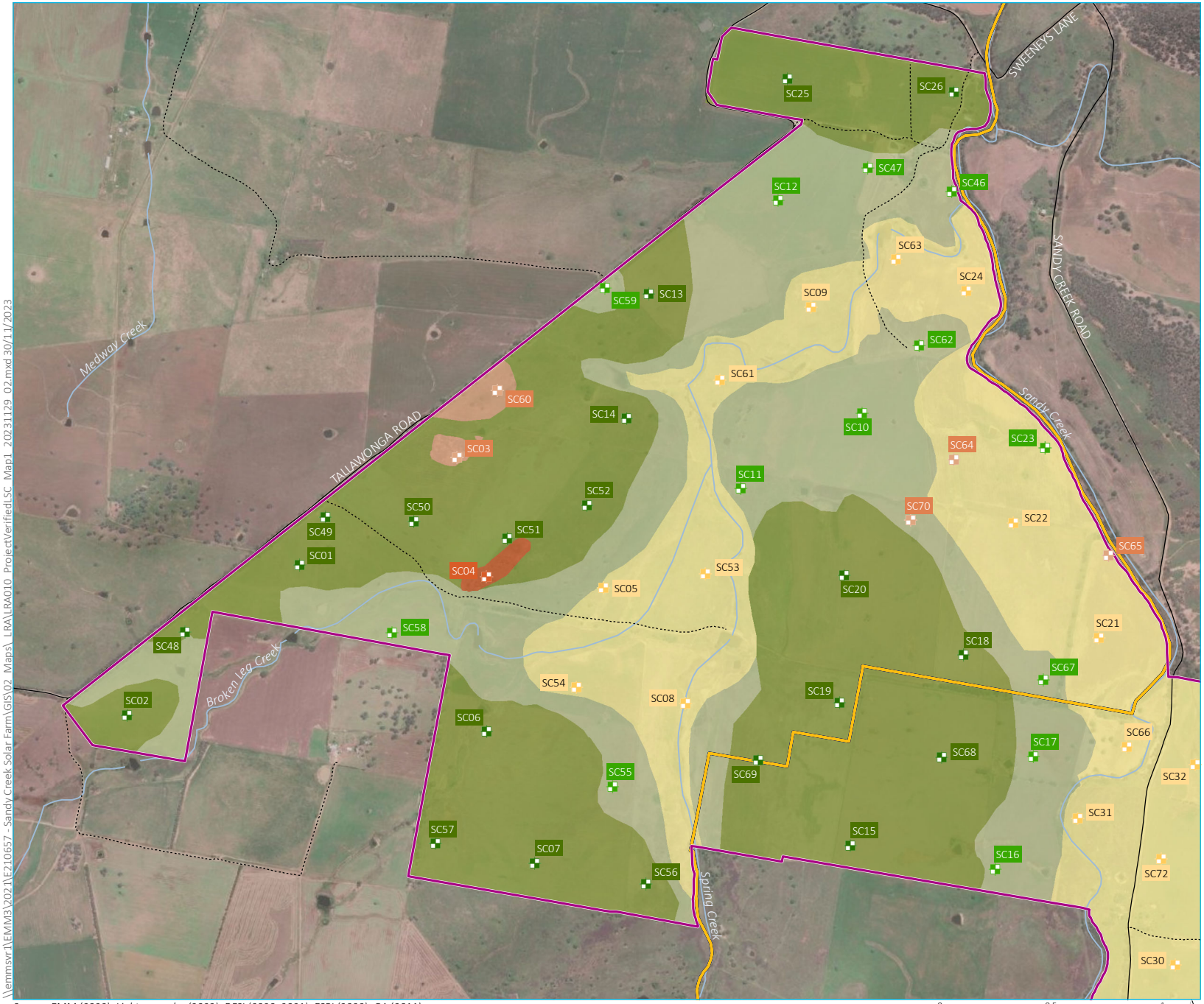

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

GDA 1994 MGA Zone 55

The scale of this map is approximately 1:50,000 when printed at A1 standard size

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Project verified LSC
(map 1 of 2)

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Figure 6.7

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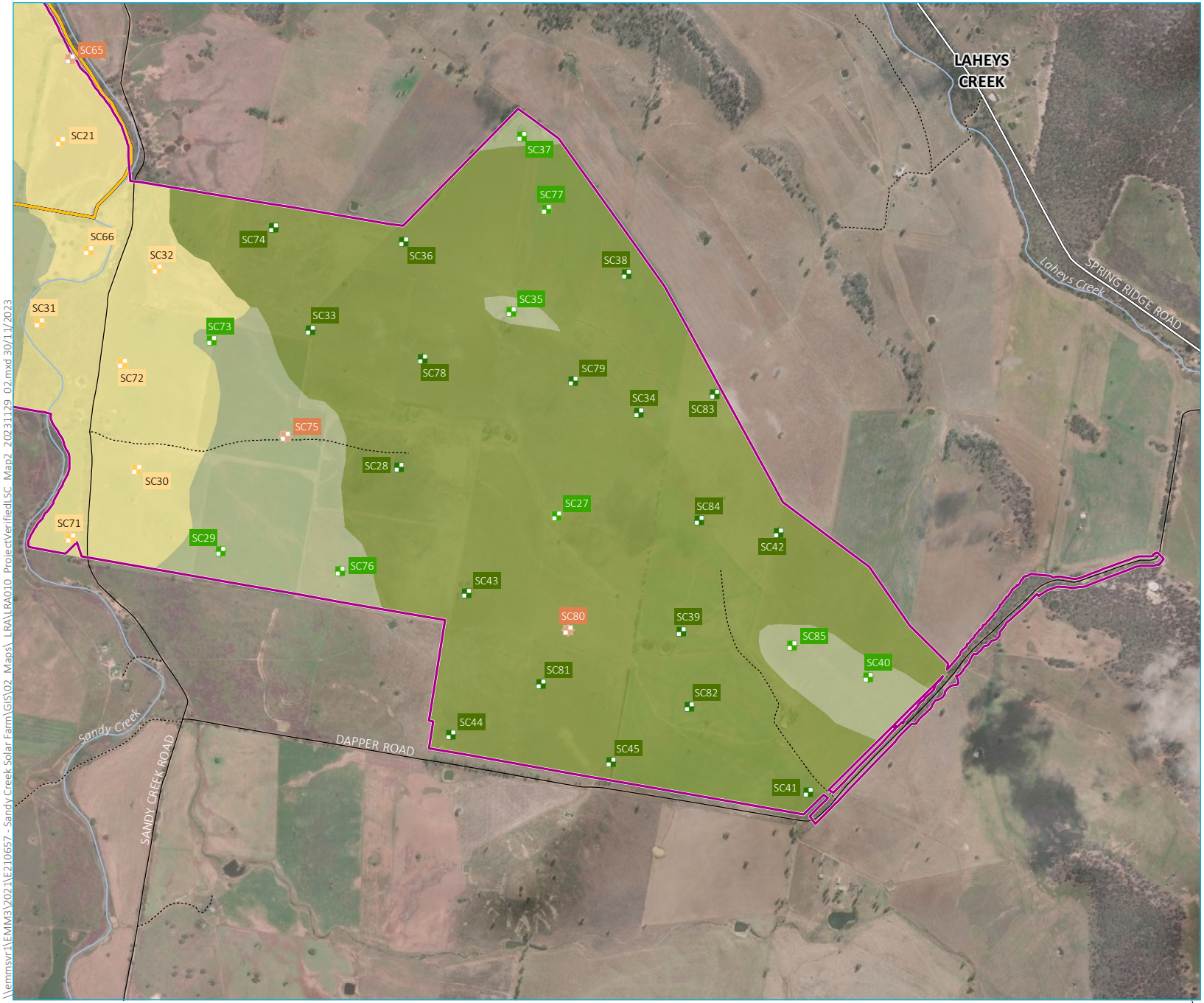

Study area

Existing environment

- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Local government area

Soil investigation site (by site LSC)

- LSC 3
- LSC 4
- LSC 5
- LSC 6

Land and soil capability (LSC)

- LSC 3 - Moderate limitations
- LSC 4 - Moderate to severe limitations
- LSC 5 - Severe limitations

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Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

0 0.5 1 km

N

GDA 1994 MGA Zone 55

The scale of this map is approximately 1:50,000 when printed at A1 standard size

Project verified LSC (map 2 of 2)

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.7

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iii Strategic agricultural land

Strategic agricultural land in NSW is safeguarded through two primary measures - classification as Biophysical Strategic Agricultural Land (BSAL) and the implementation of Critical Industry Clusters (CICs). Additionally, the State Significant Agricultural Land (SSAL) map is currently in draft format and has also been considered.

BSAL is NSW's most valuable farmland with high quality soil and water resources which render the land capable of sustaining high levels of agricultural productivity with minimal management practices (OEH 2013). There is a small area of mapped BSAL present in the central-southern section of the western portion of the study area, associated with the Mebul soil landscape (Figure 6.6). Soil investigation undertaken for the Project indicates those particular areas represent LSC Class 3, discussed further in Section 6.6.3.

CICs are concentrations of highly productive industries within a region that are related to each other, contribute to the identity of that region, and provide significant employment opportunities. The creation of these industry clusters aims to protect this high-quality agricultural land from the impacts of coal seam gas (CSG) and mining activities. The study area does not contain any CICs.

SSAL contains high quality soil and water resources. The mapping program will assist state and local governments to recognise and value agricultural land. The study area is almost entirely mapped as potential SSAL.

iv Agricultural land uses

Of the total 1,713 ha study area, 696.9 ha is cropped or fallow cropping; 963.5 ha is used for grazing (606.7 ha pasture and 356.8 ha of improved/modified pasture); and 7.9 ha of ungrazed land is associated with homestead and farm infrastructure. Crops within the study area include a rotation of wheat, canola, and oats.

It is estimated that the study area ran approximately 400–475 head of trade steers and 75 cows with calves at target stocking rates of four dry sheep equivalent per hectare (DSE/ha) rising to 16 DSE/ha on fallow crop and lowering to two DSE/ha on native pasture in 2022 and 2023. Grazing practices aimed to stock onto a feed on offer of 3000 kilograms of dry matter per hectare (kg DM/Ha) and remove at 750 kg DM/ha with steers sold as Meat Standards Australia (MSA) grass fed at >650 kg.

Land use at the Project level was developed using cropping information provided by the landholders and is shown in Table 6.20.

Table 6.20 Project agricultural land use

Agricultural land use	Locations	Area (ha)
Crop	The Heights	266.5
Improved pasture (Lucerne, Phalaris)	The Heights	275.2
Natural pastures	The Heights	162.9
Fallow crop residue	Dunkeith	430.4
Grazing oats	Dunkeith	81.6
Pasture	Dunkeith	443.8
Ungrazed area	Dunkeith	7.9

v Local production

Local production information was obtained via discussion with Project landholders. Table 6.21 provides indicative cropping yields and farm-gate values for the Project area.

Table 6.21 Indicative cropping yields and farm-gate values

Crop	Typical yield (t/ha)	Price ($/t)
Wheat	4 t/ha	$280/t
Canola	2 t/ha	$650/t
Oats (predominately grazed)	3 t/ha	$180/t

vi Erosion

The erosion potential of soils in the study area is predominantly moderate to high due to the presence of dispersive soils. Assessment of rainfall erosivity indicates erosion hazard will be high for areas of the Project where slopes exceed 15%, which aligns with the assessment of SLCs, indicating a change from moderate (SLC 4) to high erosion (SLC 5) at slopes between 10–16%, with the exception of soil mapping unit (SMU) D (38.5%).

The Project area generally has a very low to low--moderate (SLC 1–3) erosion hazard, though there are areas of steep slopes that will present a high erosion hazard, primarily associated with the incised waterways present on site. These areas are being avoided by the Project as restricted development areas, which reduces areas likely to be subject to higher erosion potential.

6.6.3 Potential impacts

i Construction

Soil disturbance during construction has the potential to result in the following impacts:

- reduction in soil stability and increased susceptibility to erosion due to vegetation removal, flow concentration or soil exposure, especially where the subsoil is sodic and dispersive
- reduction of soil quality, quantity, and associated productivity
- loss of structure and water holding capacity due to mechanical compaction
- reduced topsoil nutrients and biological activity
- loss or degradation of topsoil material viable for use in rehabilitation
- introduction of salinity, sodicity, or other constraints into the topsoil material if soil is inadequately managed.
- Potential construction erosion and sediment control impacts include:
- off-site discharge of sediment and turbid run-off from the erosion of exposed soils particularly dispersive subsoils:
    - degradation of stock drinking water

- infilling of waterway pools
- diversion of waterway flow due to sediment deposition and associated bed and bank erosion

- erosion and subsequent sedimentation of creeks and waterways due to inappropriately designed and constructed creek and watercourse crossings
- mud tracking from vehicles and machinery to public roads
- increased potential for rill and gully erosion due to modification of flow conditions from sheet flow to concentrated flow from constructed landforms (roads, tracks, hardstands) and drains
- increased erosion and subsequent sedimentation due to pavement rutting and pavement degradation from increased light and heavy vehicles traffic on unsealed access roads
- incision and widening of downstream drainage lines due to modification of the run-off hydrograph due to an increase in impermeable surface such as roads, hardstands, roofs and solar arrays
- tunnel erosion under or beside foundations for solar arrays, towers, light poles etc and along cable trenches due to dispersive soils
- dust emissions from unsealed roads, hardstands, and exposed soils.

ii Operation

Impacts to soils during operation are expected to be minimal; however, legacy issues from inappropriate design and construction could include:

- erosion of soil resources due to excessive concentration of flow and inappropriate channel lining and flow energy dissipation
- reduced topsoil nutrient and biological activity due to stockpiling
- tunnel erosion in cable trenches due to inadequately compacted and ameliorated dispersive subsoils
- exposure of dispersive soils in cut and fill batters and excavations
- splash erosion of solar array footings due to inadequate soil surface cover under the arrays.

Potential operational erosion and sediment control impacts include:

- offsite discharge of sediment and turbid run-off from on-going erosion from drainage, landform and infrastructure design not cognisant of dispersive subsoils
- increased maintenance costs for on-going stabilisation of landforms, roads, drains and cable trenches
- operation and maintenance of sediment control structures due to on-going erosion
- tunnel erosion under or beside foundations for solar arrays, towers, light poles, etc. and along cable trenches due to dispersive soils
- dust emissions from unsealed roads, hardstands, and exposed soils.

iii Changes to Project land and soil capability

As described above, assessment of LSC determined the study area is LSC Classes 3 to 7, though predominantly Class 3 (with approximately 56% of the study area identified as LSC Class 3), representing a wide range of capability from high to very low capability for productive use without resulting in land degradation. The lands are currently used for both cropping and cattle grazing with the majority of the area being used for grazing.

Lands where solar arrays and other permanent infrastructure such as the substation, electrical collection systems, switchyard, control room or management hub and roads are proposed will not be able to be used for cropping or cattle grazing once constructed.

While land will not be available for cropping or cattle grazing during the life of the Project, sheep grazing can be undertaken which would lower agricultural productivity impacts. The LSC status of lands subject to infrastructure with a small footprint or temporary disturbances can be maintained or reinstated following appropriate soil management, landform design and rehabilitation. It is expected the LSC status of most of the development footprint will be able to be re-established if the recommended management and mitigation measures are implemented.

iv Agricultural productivity impacts

The study area has an estimated $386,060–$527,638 in annual productivity based on calculated agricultural values for the relevant LGAs and NRM region and estimated maximum and mean local productivity values of $2,098,624 and $1,427,216 respectively. This productivity will be lost as the Project will result in the land being unavailable for the existing cropping and cattle grazing practices. In comparison, cropping in the Central West region is worth a total of $1.937 billion (gross value) and livestock disposal is worth $546 million. Dubbo Regional LGA and Warrumbungle Shire LGA have similar total gross agricultural productivity at $198.7 million and $187.9 million respectively, for a combined total of $386.6 million. Therefore, the study area's annual productivity is less than 1% of Dubbo Regional LGA and Warrumbungle Shire LGA's productivity combined.

Within the study area, there is a significant loss of agricultural land value based on annual productivity and an assumption of the entire study area being developed and unavailable for intensive agriculture such as cropping or cattle grazing. The disruption to productivity will be primarily due to lack of access to the land, as opposed to a reduction of the land capability.

However, the land could be utilised for some agricultural practices during Project operation through the implementation of agri-solar initiatives such as sheep grazing (solar grazing), which is estimated to achieve 75% of existing stocking rates with aspirational targets of 130%. As 963.5 out of 1,668.3 ha (57.75%) of Project land is currently used for grazing, implementing solar grazing could offset a large portion of agricultural productivity impacts with the remaining 704.8 ha of currently cropped land regenerated into grazing pastures. The entire site (less the substation, O&M compound and BESS) will be suitable for grazing.

For example, in NSW's Central West, a four-year farm trial showed improvements in wool quality of sheep grazed amongst solar panels. Farmers also noted wool of solar grazed sheep was free of burrs, dust and generally clean with little contamination (ABC 2022). Additionally, solar grazing is being successfully undertaken at Lightsource bp's Wellington Solar Farm in NSW, a similar LSbp solar project. Tony Inder, farmer at Wellington Solar Farm, stated his solar grazing sheep "produce more wool on the same land" (Williamson 2024). Inder's solar grazing sheep can be seen in Photograph 6.4. A full study on the performance and profitability of the grazing operation is due for completion in May 2024.

It should be noted that the estimation of productivity within the study area is likely inflated by global economic conditions, with commodity and food prices increased to record prices in 2022. Additionally, the local climatic conditions of above average rainfall, whilst limiting planting in some areas, resulted in good yields with record production years in 2021–22 (ABARES 2023a, 2023b). The calculated productivity values are therefore likely to reflect high percentile values of both yield and values compared to long term averages.

Photograph 6.4 Solar grazing at Wellington Solar Farm

Source: Williamson 2024

v Fragmentation and displacement

Once the Project reaches the end of its investment and operational life, Project infrastructure will be decommissioned and the study area returned to its pre--existing land use, namely suitable for grazing and cropping, or another land use as agreed by the Project owner and the landholder at that time. Therefore, the risk of permanently removing agricultural land or industries is negligible.

No agricultural landholdings or enterprises will be fragmented by the Project, which consists of two complete landholdings utilised consistently to the adjacent agricultural enterprises, so fragmentation risk is considered minimal.

The study area accounts for 0.27% and 0.19% of the agricultural land in the Dubbo and Warrumbungle LGAs respectively. If fully removed from agriculture for the life of the Project, the loss of study area agricultural land within Dubbo and Warrumbungle LGAs is insignificant relative to the stock of agricultural land in the region..

vi Biosecurity

Project construction and operation has the potential to increase biosecurity risks through increased weeds and pests. Weeds and pathogens may be introduced through contaminated vehicles, plant, and equipment; wind; and importation of contaminated soil, gravels and other substrates as part of Project construction and operation. The introduction of weeds and pathogens may impact agricultural production in several ways, such as:

- competition with crops, resulting in increased farm-level weed management costs and/or reduced crop quality, value and profit margins
- competition with more desirable pasture/forage species, resulting in reduced livestock (sheep) productivity and profit margins

- creating undesirable harbour for pest animal species (e.g. rabbits), resulting in increased farm-level pest management costs and/or reduced yields due to pest animal grazing pressure on crops
- introduction of crop or livestock diseases, reducing market opportunities, productivity, and profit margins.

The introduction of new weeds and pathogens would compound management effort and costs on any existing weed species in the study area. Pest animals in the region include rabbits, foxes, and feral cats. Rabbits and fox numbers may increase as a result of the Project, with potential impacts on crops (grazing pressure) and livestock (predation) within and surrounding the study area.

vii Impacts to adjacent lands and compatibility

Potential impacts to adjacent lands could include increased presence of biosecurity issues such as weeds and pests, as well as off-site impacts from erosion and sedimentation. Project impacts are anticipated to be limited primarily to the direct study area with minimal impact to adjacent lands.

Good compatibility of the Project with adjacent land -uses during operation and after decommissioning is expected based on zoning as primary production (e.g. agriculture, renewable energy farms) along with the utilisation of mitigation measures in Section 6.6.4.

viii Land use conflict

DPI identified that land use conflicts occur when one land user is perceived to infringe upon the rights, values or amenity of another (DPI 2011). In rural settings, this often occurs between different agricultural enterprises and other primary industries (DPI 2011).

Using the risk ranking matrix provided by DPI as a guide, a land use conflict risk assessment (LUCRA) was developed and is provided in Annexure E of Appendix K. Potential land use conflicts identified as part of this process have been informed by engagement with the Project's near neighbours, surrounding agricultural operations, Project landholders, Dubbo Regional Council, Warrumbungle Shire Council, and the local community.

As part of the preparation of the LUCRA (Annexure E of Appendix K), 27 potential conflicts associated with land use were identified and considered. Under the unmitigated scenario (i.e. without the implementation of the proposed management strategies), the risk ranking matrix identified potential for 14 high-risk conflicts (i.e. those with a risk ranking score of greater than 10). Through implementation of the proposed management strategies described in Annexure E, high-risk conflicts have all reduced to scores below 10 (i.e. no conflicts have been identified as high-risk after the implementation of proposed management strategies).

Performance targets have been proposed to ensure the proposed methods of control identified within the LUCRA continue to be effective at addressing the identified potential conflicts.

6.6.4 Mitigation measures

The mitigation measures summarised in Table 6.22 will be implemented for the Project to manage soil and land impacts.

Table 6.22 Mitigation measures for soil and land resources

Reference	Mitigation measure	Timing
L1	Land and soil capability The Project will implement suitable soil management measures in the Soil and Water Management Plan (SWMP) in accordance with the Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom 2004), Volume 2A and Volume 2C (DECC 2008a, 2008b) to ensure the preservation of soil resources to allow for suitable rehabilitation, minimise erosion and preserve agricultural productivity.	PC, C, O, CR
L2	Agricultural productivity In addition to the maintenance and rehabilitation of pre-Project soil and land capability, impacts to agriculture will be mitigated by the utilisation of agri-solar practices, including: • construct and maintain internal livestock fencing and other required infrastructure • graze sheep between the panels at a rate of at least 75–130% of the usual stocking rate for wool and meat production • undertake monitoring of agri-solar activities and adjust stocking rates to prevent land degradation	O
L3	Once the Project reaches the end of its investment and operational life, the Project infrastructure will be decommissioned and the development footprint returned to its pre-existing land use, namely suitable for cropping or grazing of sheep and cattle, or another land use as agreed by the Project owner and the landholder at that time.	CR
L4	Biosecurity The following controls will be implemented to manage impacts associated with weeds, pathogens and pest species be implemented as part of the CEMP: • hygiene and washdown protocols, including: – prior washdown and inspection of vehicles, plant and machinery prior to entry onto or exit from site – washdown and inspection of vehicles, plant and machinery when moving from on-site areas with known populations of weed and pest species onto other areas with low or no known populations • removal of identified weeds through methods such as herbicide spraying, scalping and hand--pulling • where gravel, crushed rock or other non--soil substrate is required to be imported to site, care will be taken to ensure that the material is free from noxious weed seed • prohibition on the import of soil • 1080 poison baiting programs and ripping of rabbit warrens and fox dens within the study area boundary and any offset areas (if established).	PC, C, O, CR

Reference	Mitigation measure	Timing
L5	Erosion and sediment control Erosion and sediment control measures and site rehabilitation and revegetation practices will be implemented generally in accordance with industry standard practice comprising *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004), Volume 2A and Volume 2C (DECC 2008a, 2008b) and *Best Practice Erosion and Sediment Control* (IECA 2008). <u>Drainage and landform design</u> The location of Project infrastructure should plan to utilise the existing topography where practicable, to avoid major land reshaping during the construction phase and rehabilitation phase as far as possible, and to minimise land disturbance and the alteration of drainage patterns. Some cut to fill will be required for both the battery energy storage system, substation and inverter blocks, limited to small areas. The constructed slopes associated with these areas should consider the guidance of Landcom (2004) as per Appendix K. As dispersive subsoils are present within the development footprint, the drainage and landform design will need to: • avoid concentration of flow and maintain sheet flow conditions, where practicable • avoid where possible excavating drains in dispersive soils and locate roads, hardstands and pads to utilise the natural slope so that water drains away as required • maintain the velocity of flows to suitable rates to prevent erosion • avoid where possible the use of structures that pond water and can cause tunnel erosion such as check dams and channel banks in concentrated flows and benches on cut and fill batters • use back-push diversion banks in lieu of channel banks if it is necessary to divert flow, where possible • ameliorate dispersive soils particularly in cable trenches and fill embankments where there is a high risk of tunnel erosion • use sediment basins (Type D) to capture and allow treatment of turbid runoff to protect downstream receivers.	PC, C, O, CR
L6	Minimising the extent and duration of land disturbance As part of the CEMP, land disturbance processes will be developed to ensure unnecessary land disturbance does not occur, including provision for site inspection by the site Environmental Manager or delegate prior to disturbance to identify any necessary environmental, cultural, drainage and erosion and sediment controls are planned and implemented as required.	

Reference	Mitigation measure	Timing
L7	Promptly stabilising disturbed areas As recommended in minimising the extent and duration of land disturbance, progressive stabilisation and rehabilitation of disturbed areas should be undertaken to minimise erosion and the generation of sediment and turbid runoff. Due to the gentle slope gradients and presence of suitable quality topsoil, bonded fibre matrix hydro-mulches (BFM) are considered appropriate for Project rehabilitation purposes. Topsoil should not be applied to slopes steeper than 1:2 as there is a risk it will slump. For slopes steeper than 1:2, a hydraulically applied growth medium (HGM) is recommended. Ensure that non-water soluble, mineral based, biologically inoculated fertilisers are used in any revegetation works, if required, to not impact on proximal landowners participating in organic or carbon farming initiatives. <u>Maximise sediment retention on site</u> Type D sediment basins are recommended where calculated soil loss exceeds 150 m^3/y from disturbed areas, or where the control of turbidity is required to protect watercourses. Using enhanced erosion control measures, such as trafficable soil stabilising polymers or gravelled hardstand, could reduce soil loss below the threshold of 150 t/y and remove the requirement for a sediment basin. <u>Maintain drainage, erosion and sediment control measures</u> Drainage, erosion and sediment control measures will be implemented at all times until their function is no longer required. Inspections of control measures will be undertaken following rainfall that causes run-off or monthly during dry conditions.	C, O

Reference	Mitigation measure	Timing
L8	Monitor and adjust drainage, erosion and sediment control practices to achieve the desired performance standard It is recommended that a hierarchical ESC planning system be adopted for construction and operation of the Project consisting of an overarching Project-wide erosion and sediment control plan (ESCP) with Progressive ESCPs for all disturbance areas to ensure that the Project's ESCPs are dynamic documents that can and will be modified as site conditions change, or if the adopted control measures fail to achieve the desired treatment standard. The ESCPs are recommended to be prepared and certified by a suitably qualified and experienced professional, such as a Certified Professional in Erosion and Sediment Control (CPESC). If a site inspection or environmental monitoring identifies a significant failure of the adopted drainage, erosion and sediment control measures, a critical evaluation of the failure should be undertaken to determine the cause and appropriate modifications made to the control measures on site and ESCPs amended. <u>Drainage, Erosion and Sediment Control Competence</u> All Project personnel, including contractors, are recommended to have an appropriate level of drainage, erosion and sediment training. <u>Watercourse crossings</u> Any required watercourse crossings should be suitably constructed, including: • install watercourse crossings as early as possible in the construction program • design and construct water course crossings as per the recommendations in *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull, S. and Witheridge, G. 2003) and associated policy and guidelines further described in the Water Resources Assessment (EMM 2023). • ensure watercourse crossing have necessary inlet, outlet, bank and headwall erosion protection.	C
L9	Rehabilitation At the end of the Project life, the development footprint will be rehabilitated to a condition as near as practicable to the condition that existed prior to construction of the Project and in consultation with the landowner.	CR

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.6.5 Rehabilitation strategy

At the end of the Project life, the development footprint will be rehabilitated to a condition as near as practicable to the condition that existed prior to construction of the Project and in consultation with the landowner.

After removal of infrastructure and internal roads, pre-existing landforms will be re-established by pushing any fill material back into the cuts (if required) with suitable management of topsoils and subsoils. Stripped topsoil will be respread over the entire area and then seeded with appropriate grass and legume species.

Subsoil and topsoil stripped and stockpiled during the construction phase will be replaced in reference order to when it was stripped and at similar profile depths such that the pre-Project LSC can be re-established, particularly in areas where hardstands, tracks and sediment basins are removed.

Species for rehabilitation will be cover crops, legumes and pasture species as agreed with the landowner.

6.6.6 Conclusion

Overall, potential Project impacts on soil and land resources during construction and operation are considered minor and can be adequately managed through the implementation of the mitigation measures outlined in Table 6.22. Agricultural productivity impacts could be minimised or negated by implementing agri-solar initiatives such as solar grazing.

6.7 Visual

6.7.1 Introduction

A landscape and visual impact assessment (LVIA) was prepared for the Project by EMM (2023d) to assess visual impacts from the Project and is provided in Appendix L. The LVIA was prepared in accordance with relevant SEARs, guidelines, and policies and in consultation with relevant government agencies.

The LVIA was prepared with reference to techniques and methods outlined in the following publications:

- *Large-Scale Solar Energy Guideline* (2022) (Solar Guideline) (DPE 2022e)
- *Technical Supplement – Landscape and Visual Impact Assessment* (DPE 2022f)
- *Guidelines for Landscape and Visual Impact Assessment Third Edition* (the GLVIA) (LI 2013)
- *The Dark Sky Planning Guideline* (DPE 2016)) (as the Project is approximately 200 km south-east of Siding Spring Observatory, this guideline is applicable).

Methodology, including viewpoint selection, is detailed in Section 3 of Appendix L.

6.7.2 Existing environment

The study area and surrounding properties have historically been used for agricultural purposes. The existing landscape is primarily used for dryland cropping including wheat, canola, and oats, along with grazing pastures to accommodate cattle and sheep. The existing landscape is undulating terrain, and the rural landscape has been cleared of all the vegetation for farming purposes, with the exception of scattered native trees associated with watercourses, drainage lines, roadside vegetation and along properties and fenced boundaries.

Land surrounding the development footprint is characterised by undulating topography. Land within the development footprint generally slopes down from the western and eastern boundaries toward Sandy Creek. From the hills within the development footprint, wooded ridgelines are visible beyond the Project boundary. To the east of the Project site is a ridgeline within the Tuckland State Forest. South of the Project site is Dapper Nature Reserve, and north is Cobbora State Conservation Area.

Existing infrastructure including power poles and rural infrastructure (i.e. sheds and fencing) form a part of the existing landscape character of the area.

The nearest rural community and population centre is the township of Dunedoo, located 25 km north-east of the Project via the Golden Highway. Dunedoo has a population of 1,097 people and comprises of 551 private dwellings (ABS 2021a).

The region hosts several major developments including Ulan Colliery, an operational coal mine. Renewable energy is also a growing land use in the region with several operational projects including Bodangora Wind Farm and Beryl Solar Farm. Two solar projects under construction include Stubbo Solar Farm and Dunedoo Solar Farm.

The Project sits within the Dark Sky Region surrounding the Siding Spring Observatory. Developments within this area are required to apply good lighting design principles that eliminate light spill as per the *Dark Sky Planning Guideline* (DPE 2016).

i Sensitive receptors

a Rural dwellings

Several associated and non-associated residences were identified within and surrounding the study area. In total, there are two associated residences within the study area (A01 and A03) and two associated unoccupied structures (sheds) (A02 and A04). There are also 31 non-associated receptors within 4 km of the study area, including one unoccupied structure (shed) (R08), and Dapper Union Church (R18).

Receptor locations and representative viewpoints considered in the LVIA are shown in Figure 6.8.

b Heritage items

Identified historical heritage sites within the study area include:

- Hut (SCSF-HS01)
- Shearing Shed (SCSF-HS02)
- Well (SCSF-HS03)
- Hut (SCSF-HS04)
- Survey Marker (SCSF-HS06)
- Workers' Accommodation (SCSF-HS07)
- Dapper Union Church – located approximately 100 m from the southern boundary of the study area (solar arrays will not be visible from the heritage item).

Additionally, 41 Aboriginal heritage sites have been identified within the study area, 30 of which are either wholly or partially within the development footprint and therefore will be adversely affected by the Project.

c Landscape character zones

Landscape character zones (LCZs) share broadly homogenous characteristics or spatial qualities. The LVIA identified two LCZs in the landscape surrounding the Project, based on the dominant landform and landscape features. These are:

- Agricultural valleys – characterised by undulating plains dominated by agricultural uses and structures:
  - views are open with trees lining the creeks, roads, and fence lines. Views are contained by the trees within the LCZ
  - the Project is not predicted to impact any key landscape features
  - this LCZ will experience a low-moderate landscape character impact as a result of the Project.
- Bushland – characterised by remnant bushland, typically on hilltops and slopes not suitable for agricultural uses:
  - these areas are wooded with difficult access. Views are limited due to access and tree canopies
  - the Project is not predicted to impact on any key landscape features.
  - this LCZ will experience a low-moderate landscape character impact as a result of the Project.

6.7.3 Avoidance and minimisation through design

Project design has been adjusted to reduce impacts on the landscape and visual amenity. The actions taken to reduce impacts include:

- using the undulating topography and existing vegetation along roadways to shield views of Project elements
- retaining existing trees where possible to maintain screening
- moving solar array infrastructure away from Dapper Road near R09
- location of the BESS, substation, switchyard, and temporary workforce accommodation facility within the eastern array area to minimise visibility.

Additionally, the Project will follow design standards such as AS 4282 *Control of obtrusive effects of outdoor lighting*, *National Light Pollution Guidelines for Wildlife* (DCCEEW 2020), and the *Dark Sky Planning Guideline* (DPE 2016) to minimise light pollution in the night sky.

6.7.4 Potential impacts

i Visual impacts during construction

Construction impacts are considered temporary with the construction period estimated to be 22-28 months. The main temporary visual impacts associated with Project construction include:

- **Traffic and vehicle movements** – vehicle movements will be a daily occurrence during the construction stage of the Project. Vehicle movements expected north and east of the site will travel in either direction from Golden Highway, Spring Ridge Road, and along Dapper Road.

- **Temporary construction compound and maintenance facilities** – a construction compound will be necessary for the construction stage. This will be located at the south-eastern corner of the study area, with access off Dapper Road. The visual impact of the construction compound is expected to be low due to the location only being visible on a short portion of Dapper Road.
- **Installation of solar panels and BESS** – installation of solar panels, BESS and supporting infrastructure is expected to be completed within 14 months.
- **Construction of substation** – the installation of a substation is expected to be completed within 18 months. Visibility to the substation location is limited due to the surrounding topography.
- **Temporary workforce accommodation facility (including parking area)** – the proposed temporary workforce accommodation facility is expected to house up to 350 workers during peak construction and will be located within the development footprint.
- **Dapper Road upgrade works** – machinery movement will potentially be visible from Spring Ridge Road, R05, R06, R08 and R09; however, upgrade works will occur for a short duration.

Motorists travelling along the local road network may experience intermittent views of Project construction activity including vehicles entering the access roads. It is assumed the focus of these motorists will be in line with their direction of travel along the road corridors, minimising their views into the development footprint.

As Project establishment works and construction activities are considered temporary, landscaping and/or other mitigation is not proposed to mitigate visual impacts during the construction stage of the Project.

ii Visual impacts during

a operation Assessed viewpoints

Representative viewpoints were selected from representative receptors and roadways near the study area based on the Project's zone of visual influence (provided in section 6.1 of the LVIA) and site inspection.

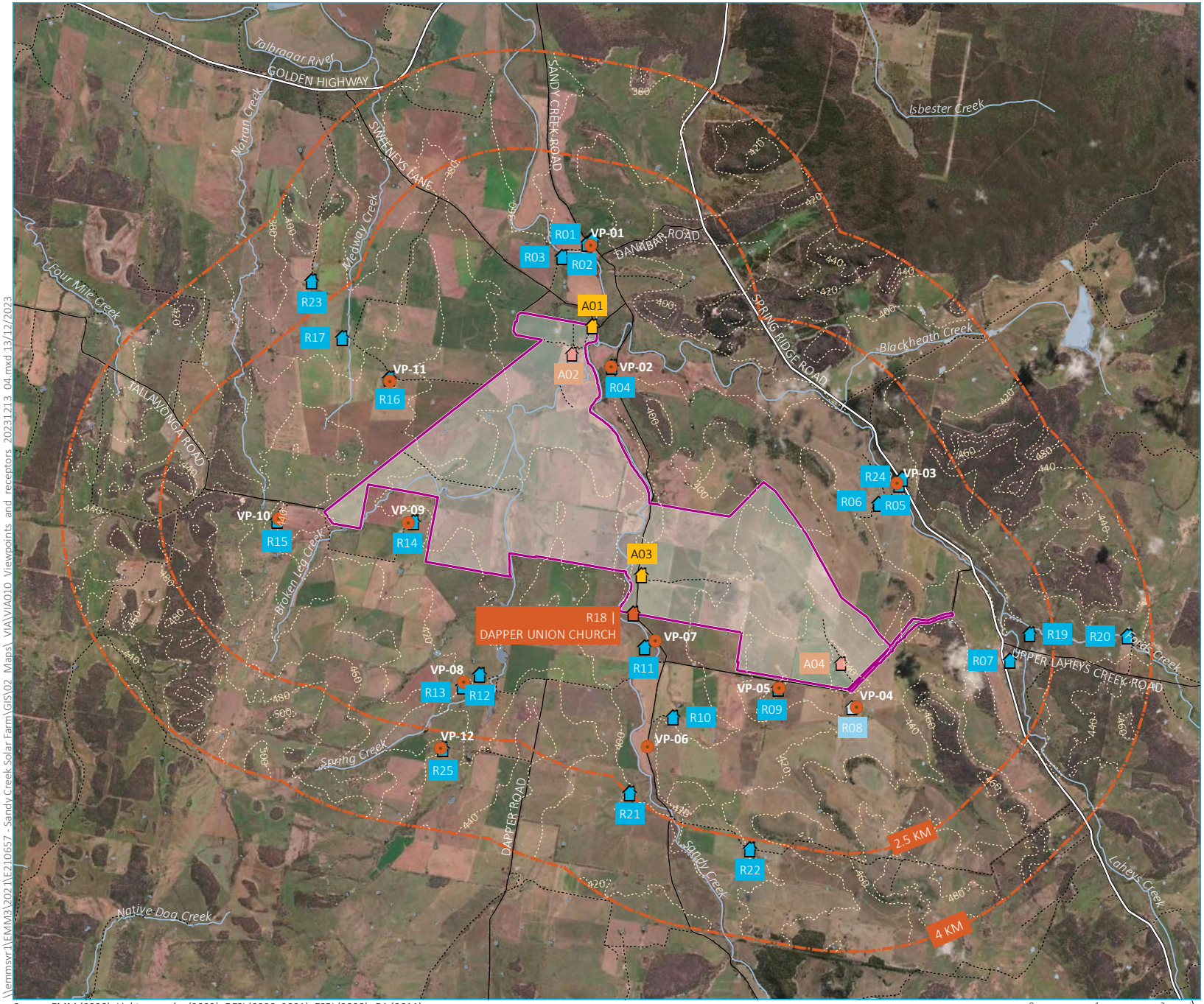
46 representative viewpoints were selected,comprising 33 near residences and 13 along roadways near the study area. Table 6.23 lists the assessed viewpoints and provides the rationale for selection. Viewpoints and receptors are illustrated in Figure 6.8.

Table 6.23 Assessed viewpoints, receptors and rational for selection

Viewpoint location	Viewpoint type(s)	Representative receptors	Distance to development (m)*	Rationale for selection
VP-01	Private, Road	R01, R02, R03, Motorists	1210	This represents the typical view from Sandy Creek Road approaching the Project from the north. There is a cluster of three dwellings in this location with potential views of the Project.
VP-02	Private	R04	275	This is the view from a dwelling. It also represents views from Sandy Creek Road near the Project.
VP-03	Private	R05, R06, R24	1600	This viewpoint represents views from dwellings and the NSW RFS. It also represents views from Spring Ridge Road.
N/A	Private	R07	1850	The site is not visible from this location.

Viewpoint location	Viewpoint type(s)	Representative receptors	Distance to development (m)*	Rationale for selection
VP-04	Private	R08	295	This is the view from an unoccupied structure (shed)/dwelling entitlement near the Project.
VP-05	Private	R09	170	This is the view from a dwelling near the Project. This also represents views from Dapper Road along the south boundary of the Project.
VP-06	Private	R10, R21, Motorists	1840	This viewpoint primarily assesses views from Sandy Creek Road, when approaching the Project from the south. It also represents views from two nearby dwellings.
VP-07	Private, Road	R11, R18, Motorists	400	This viewpoint represents views from Sandy Creek Road south of the Project. It also represents a nearby dwelling and Dapper Union Church building.
VP-08	Private	R12, R13	1750	This viewpoint represents views from two dwellings
VP-09	Private	R14	285	This viewpoint represents views from a dwelling.
VP-10	Private	R15	725	This viewpoint represents views from a dwelling.
VP-11	Private	R16	960	This viewpoint represents views from a dwelling.
N/A	Private	R17	1860	The site is not visible from this location
N/A	Private	R19	2170	The site is not visible from this location
N/A	Private	R22	2705	The site is not visible from the residence at this location.
VP-12	Private	R25	2790	This viewpoint represents views from a dwelling.
N/A	Private	R29	2860	The site is not visible from this location

Notes: * The distances shown in the table are taken from the nearest Project elements.



Study area

Sensitive receptor

- Dwelling associated with the project
- Dwelling not associated with the project
- Unoccupied structure associated with the project (shed or yard)
- Unoccupied structure not associated with the project (shed or yard)
- Dapper Union Church
- LVIA viewpoint location
- Distance band

Existing environment

- Major road
- Minor road
- Vehicular track
- Topographic contour (10 m interval)
- Named watercourse
- Waterbody

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

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Viewpoint locations and receptors

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.8

EMM
creating opportunities

b Visual impacts on receptors

Receptors near the development footprint are likely to have varying degrees of visibility toward the Project. Some will have fragmented views that are broken by existing vegetation, orientation of the dwelling, and/or topography.

There are a total of 25 sensitive receptors within 4 km of the development footprint, with the highest visual impacts likely to be experienced by receptors in closest proximity to the development footprint. A visual assessment of all 25 receptors is provided in Table 6.24.

Table 6.24 Dwellings less than 4 km from the development footprint

Dwelling	Location	Distance to nearest project element (m)	Representative viewpoint	Visual assessment	Recommended mitigation measures
R01	445 Sweeneys Lane Elong Elong	1,280	VP-01	Topography and existing vegetation will likely screen the project infrastructure. There is potential for a **low** visual impact.	No mitigation is necessary.
R02	445 Sweeneys Lane Elong Elong	1,200	VP-01	Existing vegetation will likely screen the project infrastructure. However, there are opportunities for viewing a small portion of the solar elements. There is potential for a **low** visual impact.	No mitigation is necessary.
R03	445 Sweeneys Lane Elong Elong	930	VP-01	Existing vegetation will likely screen the project infrastructure. However, there are opportunities for viewing a small portion of the solar elements. There is potential for a **low** visual impact.	No mitigation is necessary.
R04	Sandy creek	265	VP-02	Topography and existing vegetation will likely screen the project infrastructure. However, there are opportunities for viewing a small portion of the solar elements. There is potential for a **low** visual impact.	No mitigation is necessary.
R05	1006 Spring Ridge Road	1,600	VP-03	Topography and existing vegetation will likely screen the project infrastructure. There is potential for a **low** visual impact.	No mitigation is necessary.
R06	1050 Spring Ridge Road, Cobbora	1,180	VP-03	Topography and existing vegetation will likely screen the project infrastructure. However, there are opportunities for viewing a portion of the solar elements. There is potential for a **low** visual impact.	No mitigation is necessary.
R07	1352 Spring Ridge Road, Dunedoo	1,860	N/A	Topography and existing vegetation screen the project infrastructure. The Project is not visible from this location.	No mitigation is necessary.

Dwelling	Location	Distance to nearest project element (m)	Representative viewpoint	Visual assessment	Recommended mitigation measures
R08	'Talloon' 1485 Sandy Creek Road, Dunedoo	320	VP-04	Topography screens most of the project infrastructure from this location. There is potential for a **low** visual impact.	No mitigation is necessary. However, planting along the project boundary is proposed.
R09	95 Dapper Road	175	VP-05	There is minimal screening of the Project from this location. There is potential for a **high** visual impact.	Planting along the project boundary is proposed.
R10	7 Sandy Creek Road	1,200	VP-06	Topography and existing vegetation will likely screen the project infrastructure. There is potential for a **low** visual impact.	No mitigation is necessary.
R11	1198 Sandy Creek Road, Dunedoo	490	VP-07	Topography and existing vegetation will likely screen the project infrastructure. There is potential for a **low** visual impact.	No mitigation is necessary.
R12	Fairveiw' 1002 Tallawonga Road, Elong Elong	1,550	VP-08	Topography and existing vegetation will likely screen some of the project infrastructure, leaving some portions visible. There is potential for a **low** visual impact.	No mitigation is necessary.
R13	Fairveiw' 1002 Tallawonga Road, Elong Elong	1,770	VP-08	Topography and existing vegetation will likely screen some of the project infrastructure, leaving some portions visible. There is potential for a **low** visual impact.	No mitigation is necessary.
R14	Fairveiw' 1002 Tallawonga Road, Elong Elong	285	VP-09	Topography and existing vegetation will likely screen some of the project infrastructure, leaving some portions visible. There is potential for a **moderate** visual impact.	Planting along the project boundary is proposed.
R15	25 Tallawong Road, Elong Elong	710	VP-10	Topography and existing vegetation will likely screen some of the project infrastructure, leaving some portions visible. There is potential for a **low** visual impact.	No mitigation is necessary.
R16	1131 Tallawong Road, Elong Elong	960	VP-11	Topography and existing vegetation will likely screen some of the project infrastructure, leaving some portions visible. There is potential for a **low** visual impact.	No mitigation is necessary.
R17	Parkvale' 224 Sweenys Lane, Elong Elong	1,860	N/A	Topography and existing vegetation screen the project infrastructure. The Project is not visible from this location.	No mitigation is necessary.

Dwelling	Location	Distance to nearest project element (m)	Representative viewpoint	Visual assessment	Recommended mitigation measures
R18	Dapper Union Church 53 Sandy Creek Road	64	VP-07	Existing vegetation provide screening for some of the project infrastructure, leaving some portions visible. There is potential for a **low** visual impact.	No mitigation is necessary.
R19	Upper Laheys Creek Road	2,150	N/A	Topography and existing vegetation screen the project infrastructure. The Project is not visible from this location.	No mitigation is necessary.
R20	Upper Laheys Creek Road	3,630	N/A	Topography and existing vegetation screen the project infrastructure. The Project is not visible from this location.	No mitigation is necessary.
R21	Sandy Creek Road	2,400	VP-06	Topography screens most of the project infrastructure from this location. There is potential for a **low** visual impact.	No mitigation is necessary.
R22	Sandy Creek Road	2,600	N/A	Topography screens most of the project infrastructure from this location. There is potential for a **low** visual impact.	No mitigation is necessary.
R23	Sweeneys Lane	2,770	N/A	Topography and existing vegetation screen the project infrastructure. The Project is not visible from this location.	No mitigation is necessary.
R24	Spring Ridge Road	1,770	VP-03	Topography and existing vegetation will likely screen the project infrastructure. There is potential for a **low** visual impact.	No mitigation is necessary.
R25	Dapper Road	2,730	VP-12	Topography screens most of the project infrastructure from this location. There is potential for a **low** visual impact.	No mitigation is necessary.

iii Night lighting

a Construction

During the construction period, construction activity is expected to be limited to normal construction hours, therefore, no lighting is anticipated during construction. However, lighting will be needed at the temporary workforce accommodation facility. There may be light visible sporadically from Spring Ridge Road and along Dapper Road, as well as a small amount of light glow associated with the accommodation facility that may be visible from surrounding dwellings.

b Operation

Visual impacts from night lighting will likely be experienced by people who are outside in the landscape. The impact of night lighting is unlikely to be experienced from inside dwellings since internal lights reflect off windows and limit views of the exterior at night. The highest impact is expected to be on people who enjoy the outdoors at night - specifically night-sky enthusiasts, photographers, and star gazers.

Potential light sources include:

- lighting for safety and security on Project infrastructure (i.e. switchyard area and BESS)

- lighting for safety and security on ancillary structures.

However, Project infrastructure has been sited to minimise visibility from existing residences and public viewpoints. It is unlikely that the proposed lighting will create a noticeable impact on the existing nighttime lighting.

As the Project sits within the Dark Sky Region surrounding the Siding Spring Observatory, the detailed design of the Project will include lighting principles as per the requirements of the *Dark Sky Planning Guideline* (DPE 2016).

iv Glint and glare

Sunlight reflecting off the proposed solar infrastructure elements could result in glint and glare impacts. Glint refers to short periods and more intense levels of exposure, while glare refers to sustained or continuous periods of exposure to excessive brightness, but at a reduced level of intensity (Morelli 2014).

The seasonal change of the sun's movements will vary the reflection angles as well. As the sun moves southward in the summer months, the reflection will move northward, and vice versa in the winter months (when the sun is north of the equator).

Solar panels are constructed from a treated glass that is designed to minimise reflection and maximise the amount of light transmitted through the glass to the receptor. Typical treated glass used for solar cells reflects about 4% of the light that hits the cell which is equivalent to a water body (pond or lake) and is considered to be a fairly low amount of reflection.

Glare was analysed according to the Solar Guideline with full results and methods available in section 8.2.2 of the LVIA (refer to Appendix L). Analysis showed potential for glint and glare related impacts at 13 residential receptors and along the roads adjacent to the Project, as summarised in Table 6.25.

Table 6.25 Glare analysis results

Location	Location name assigned by software	Glare from solar arrays			Glare timing (colour of cells indicates type of glare)		
		Green glare (minutes)	Yellow glare (minutes)	Red glare (minutes)	Time of year	Time of day	Max duration of glare per occurrence (minutes)
R01	OP 1	0	0	0			
R02	OP 2	0	0	0			
R03	OP 3	0	0	0			
R04	OP 4	331	0	0	Jul-Aug	5:00pm-6:00pm	3
					Nov-Jan	6:30pm-7:30pm	8
R05	OP 5	384	0	0	Mar-May	5:00pm-6:15pm	3
					Jul-Sep	5:00pm-6:15pm	3
R06	OP 6	339	0	0	Mar-May	5:00pm-6:00pm	3
					Jul-Sep	5:00pm-6:15pm	5
R07	OP 7	120	0	0	Apr-May	5:00pm-5:30pm	3
					Jul-Aug	5:00pm-6:00pm	3

Location	Location name assigned by software	Glare from solar arrays			Glare timing (colour of cells indicates type of glare)		
		Green glare (minutes)	Yellow glare (minutes)	Red glare (minutes)	Time of year	Time of day	Max duration of glare per occurrence (minutes)
R08	OP 8	0	0	0			
R09	OP 9	134	0	0	Jun-Jul	4:45pm-5:30pm	5
R10	OP 10	0	0	0			
R11	OP 11	0	0	0			
R12	OP 12	0	0	0			
R13	OP 13	0	0	0			
R14	OP 14	2895	1951	0	Feb-Oct	5:45am-7:00am	18
					Sep-Dec	5:00am-7:00am	5
					Feb-Mar	5:45am-6:30am	18
					May-Aug	7:00am-8:00am	18
					Sep-Dec	5:30am-6:00am	20
R15	OP 15	2335	139	0	Feb-May	6:00am-7:00am	18
					May-Jul	7:00am-8:00am	20
					Aug-Oct	5:30am-7:00am	18
					Feb	6:00am-6:30am	18
					Jun-Jul	7:00am-8:00am	20
R16	OP 16	1582	300	0	Feb-Mar	5:45am-7:00am	12
					May-Jun	6:15am-7:30am	10
					Sep-Oct	5:00am-7:00am	12
					Nov-Dec	4:45am-5:30am	8
					Mar	5:45am-7:00am	12
					Sep-Oct	5:30am-6:30am	12
R17	OP 17	505	0	0	Feb-Apr	5:30am-7:00am	8
					Dec	4:45am-5:30am	10
R18	OP 18	0	0	0			
R19	OP 19	141	0	0	Apr-May	5:00pm-6:00pm	3
					Jul-Aug	5:00pm-6:00pm	3
R20	OP 20	174	0	0	Apr-May	5:00pm-6:00pm	3
					Jul-Aug	5:00pm-6:00pm	3
R21	OP 21	0	0	0			
R22	OP 22	0	0	0			

Location	Location name assigned by software	Glare from solar arrays			Glare timing (colour of cells indicates type of glare)		
		Green glare (minutes)	Yellow glare (minutes)	Red glare (minutes)	Time of year	Time of day	Max duration of glare per occurrence (minutes)
R23	OP 23	373	0	0	Feb-Mar	5:30am-6:30am	10
					Dec	5:30am-6:30am	10
R24	OP 24	434	0	0	Jan	6:30pm-7:15pm	8
					Mar-Apr	5:00pm-6:30pm	3
					Aug-Oct	5:45pm-6:30pm	5
R25	OP 25	0	0	0			
Spring Ridge Road	ROUTE: Spring Ridge Road	1494	267	0	Feb-Oct	4:45pm-7:00pm	5
					Feb-Mar	6:00pm-7:00pm	5
					Oct	5:45pm-6:30pm	5
Dapper Road	ROUTE: Dapper Road	746	539	0	Apr-Sep	4:45pm-6:00pm	4
					Oct-Mar	6:00pm-7:15pm	3
					Oct-Mar	6:00pm-7:15pm	5
Sandy Creek Road	ROUTE: Sandy Creek Road	1494	267	0	Jan	5:00am-5:30am	3
					Oct-Mar	6:30pm-7:30pm	8
					Apr-Sep	4:45pm-6:00pm	3
					Dec-Jan	4:45am-5:30am	3
					Oct-Mar	6:00pm-7:30pm	10
					Apr-Sep	5:00pm-6:00pm	5
Tallawonga Road	ROUTE: Tallawonga Road	6546	11298	0	Aug-May	4:45am-7:00am	12
					Feb-Nov	5:15am-8:00am	8
					Feb-Nov	5:15am-8:00am	35
					Sep-Mar	5:15am-6:30am	15
Sweeneys Lane	ROUTE: Sweeneys Lane	0	0	0			

Notes:

Green glare – glare is present with only a low potential for temporary after-image or flash blindness

Yellow glare – glare has a moderate potential for temporary after-image or flash blindness

Red glare – glare with high potential for permanent eye damage.

6.7.5 Mitigation measures

Table 6.26 outlines the mitigation measures applicable to landscape character and visual amenity which will be implemented as part of the Project.

Table 6.26 Visual mitigation measures

Reference	Mitigation measure	Timing
V1	Minimise dust during construction.	C
V2	Minimise the number and brightness of lighting used in construction yards, offices, and workforce accommodation facilities.	C
V3	Use light shields on lights to minimise light spill.	C, O
V4	Use non-reflective surface treatments to buildings and structures to minimise reflection.	C, O
V5	Install and maintain landscape screening at R09 and R14	C, O
V6	Maintain existing vegetation along all roadways. Specifically, maintain vegetation along: • Tallawonga Road to screen views and glare • Sandy Creek Road to screen views and glare.	C, O

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.7.6 Conclusion

While the Project design, development footprint, and placement of Project infrastructure have evolved to minimise or avoid visual impacts where possible, development of the Project will result in some changes to the landscape. Visual impacts will likely occur during the construction and operational stages of the Project and the visual landscape will be altered from its current state for the duration of construction and operation of the Project.

Screening landscaping will be planted and maintained to minimise visual impacts where required for two viewpoints, reducing the risk rating from a high to moderate for one receptor (R09) and reducing the risk rating from a moderate to low at the other (R14).

Construction impacts are considered temporary, and therefore are not considered to need any mitigation or screening treatment. Operational impacts are long-term and can be permanent in some instances. Mitigation measures outlined above will be followed to reduce visual impacts resulting from the Project.

6.8 Noise and vibration

6.8.1 Introduction

A noise and vibration impact assessment (NVIA) was prepared by EMM (2023e) and is attached as Appendix M. The NVIA was prepared in accordance with noise and vibration related SEARs (Appendix A) and relevant policy and guidelines, including:

- *NSW Noise Policy for Industry* (NPfI) (EPA 2017)
- *NSW Interim Construction Noise Guideline* (ICNG) (DECC 2009)
- *NSW Road Noise Policy* (RNP) (DECCW 2011)

- *NSW Assessing Vibration – a technical guideline* (AVTG) (DEC 2006)
- *NSW Noise Criteria Guideline* (NCG) (RMS 2015a)
- *NSW Noise Mitigation Guideline* (NMG) (RMS 2015b)
- *Construction noise and vibration guideline* (CNVG) (RMS 2016)
- Australian Standard AS/NZS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors*
- Australian Standard AS2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*
- British Standard BS 6472-2008, *Evaluation of human exposure to vibration in buildings (1-80Hz)*
- British Standard 7385: Part 2-1993 *Evaluation and measurement of vibration in buildings*
- German Standard DIN4150-2016 *Structural vibration Part 3: Effects of vibration on Structures*.

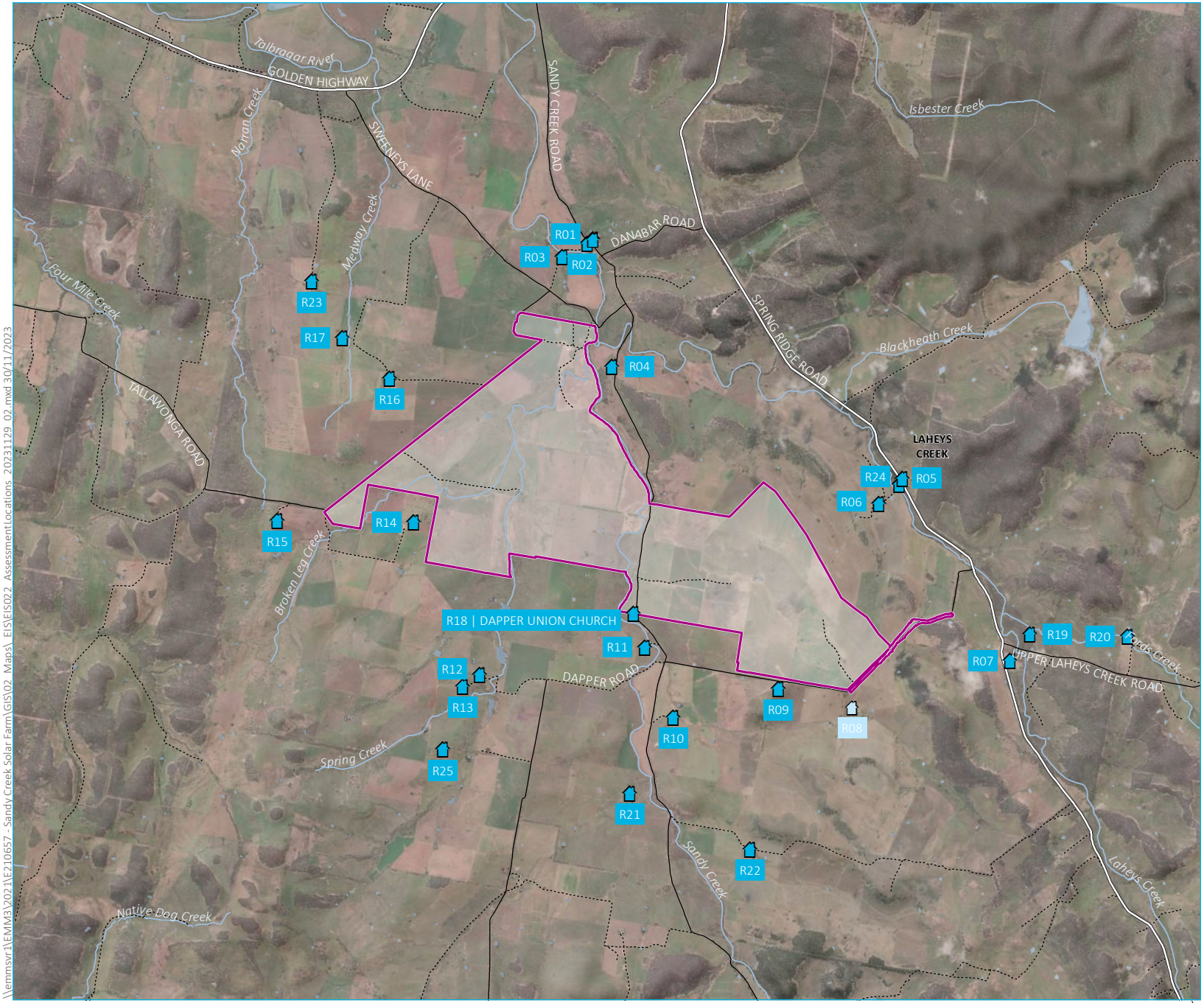
6.8.2 Existing environment

i Ambient noise

Land use in the Project area and surrounds is predominantly agricultural. Given the Project's rural setting, the default minimum rating background levels (RBL) has been assumed in accordance with the NPfI. This minimum RBL has been used to determine the noise management level (NML) and Project noise trigger level (PNTL) for sensitive receiver assessment locations. Minimum RBLs adopted for the Project as per the NPfI (EPA 2017) are 35 decibels (dB) during the day and 30 dB during the evening and night.

ii Assessment locations

A total of 20 nearest noise sensitive receptor locations were included in the NVIA for the purpose of assessing noise and vibration impacts from the Project. 19 receptors are residential dwellings not associated with the Project (non-associated receptors), and one is a place of worship (Dapper Union Church, a non-associated receptor). The closest non-associated residential receptor is R09, approximately 192 m from the development footprint. The place of worship (R18) is the closest non-associated receptor, located approximately 88 m from the development footprint. Assessment locations are shown in Figure 6.9.



Study area

Receptors

- Dwelling not associated with the project
- Unoccupied structure not associated with the project (shed or yard)

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Waterbody

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023); GA (2011)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM3\2021\E210657 - Sandy Creek Solar Farm\GIS\02 Maps\ EIS\EIS022 AssessmentLocations 20231129 02.mxd 30/11/2023

Noise assessment locations

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.9

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6.8.3 Potential impacts

i Construction noise

Construction noise levels were predicted using computer modelling software that calculates total noise levels at each location according to international standards and is in accordance with the ICNG (DECC 2009).

Worst case construction noise scenarios were modelled to represent the greatest potential noise impact during construction. To assess a potential worst-case scenario, the assessment considered the identified plant and equipment as operating continuously over a 15-minute period or greater. The predictions for each receiver location represent the energy-average noise level over a 15-minute period and assumes all plant operating concurrently in each scenario.

Noise modelling predicted levels above the ICNG noise affected NML for standard day construction hours at six receiver locations as follows:

- R04 (+9 dB)
- R08 (+5 dB)
- R09 (+15 dB)
- R11 (+6 dB)
- R14 (+9 dB)
- R18 (+7 dB).

Results for all receiver locations are predicted to comply with the ICNG highly noise affected level of 75 dB.

Where works outside of standard hours are unavoidable, noise will be managed in accordance with the noise limits of the ICNG. Works outside of standard hours would typically require approval from the relevant regulatory authority and be justified with specialist acoustic assessment of the proposed works to be undertaken.

ii Construction vibration

The assessment found construction vibration levels associated with onsite works are highly unlikely to impact any receiver location. The nearest receiver (R09) to the study area is approximately 192 m from the southern boundary. This receiver location is beyond the safe working distances for human response and cosmetic damage for plant.

Exceedance of relevant vibration criteria is not expected at any receiver location.

iii Operational noise

Operational noise was predicted in the same manner as construction noise. Levels presented for each receiver location represent the energy-average noise level over a 15-minute period and assumes all plant operating concurrently under adverse meteorological conditions.

Predictions were assessed for two BESS options that are being considered: a centralised AC-coupled BESS and a DC-coupled BESS. Assessment also considered both BESS options operating concurrently.

Assessment criteria for all non-associated residences are $L_{Aeq,15minute}$ (where $L_{Aeq,\ 15\ min}$ is the equivalent continuous 'A-weighted' sound pressure level over a 15-minute period. The $L_{Aeq,15min}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period), 40 dB day and $L_{Aeq,15minute}$ 35 dB for evening and night periods. The assessment criterion for places of worship is $L_{Aeq,15minute}$ 48 dB (external) when in use.

Compliance is predicted at all receiver locations for all scenarios.

iv Sleep disturbance

Operation of the Project does not result in L_{Amax} (the maximum root mean squared 'A-weighted' sound pressure level (or maximum noise level) received during a measuring interval) events. Therefore, the assessment considered potential sleep disturbance impacts against the screening criterion of $L_{Aeq,15minute}$ 40 dB during night hours.

No exceedances of the noise level event screening criterion have been predicted at any nearby receiver locations.

v Road traffic noise – construction

While construction is expected to occur during the day period only, some movements will be required in the night period (the early morning shoulder period between 6 am and 7am) to get construction staff to site by 7 am Monday to Friday and 8 am on Saturday. Road traffic noise level predictions for peak construction during the day and night period are provided in Table 6.27.

Table 6.27 Predicted road traffic noise levels ($L_{Aeq,period}$ dB)

Road Name	Period	Approximate distance of residence from nearest carriageway	Existing Movements			Existing plus Project movements			Noise level increase due to the Project (dB)
			Light vehicles	Heavy Vehicles	Traffic noise level	Light vehicles	Heavy Vehicles	Traffic noise level	
Spring Ridge Rd	Day	20 m	40	3	51	140	84	57	6
Spring Ridge Rd	Night	20 m	5	0	34	84	31	55	21
Golden Hwy	Day	45 m	1030	260	57	1130	341	58	1
Golden Hwy	Night	45 m	93	22	49	153	53	52	4

Predicted $L_{Aeq,period}$ for existing plus Project traffic movements remain in compliance with assessment criteria of $L_{Aeq,15hour}$ 60 dB for the day period and $L_{aeq,9hour}$ of 55 dB for the night period. The noise level increase for Spring Ridge Road during the night period of +21 dB exceeds the relative increase criteria for residential assessment locations.

It should be noted that despite this traffic being assessed against the night period criterion, most traffic movements on Spring Ridge Road will likely occur during a shoulder period between 6 am and 7 am. Traffic noise impact assessed in this report is based on worst-case movements and is likely to represent the busiest 12 months of construction works. Total movements during the start and end of construction works are expected to be lower than the predictions outlined herein. Ongoing traffic associated with operations is relatively minor compared to construction periods and will mostly be limited to light vehicle movements.

Regarding mitigation strategies for traffic-generating developments on existing roads, the RNP acknowledges there are limited options when developments are not linked to road improvements. Some examples of strategies

include locations of private access roads, regulating times of use, clustering vehicle movements, using 'quiet' vehicles, barriers, and acoustic treatments.

6.8.4 Mitigation measures

During construction, up to six assessment locations are expected to experience noise above relevant NMLs. Operational noise levels are predicted to be below the relevant criteria at all assessment locations, with mitigation measures incorporated into modelling. Road traffic noise is predicted to exceed the night period relative increase criteria on Spring Ridge Road during the construction phase of the Project. Table 6.28 summarises the noise mitigation and management measures to be implemented for the Project.

Table 6.28 Noise and vibration mitigation measures

Reference	Mitigation measure	Timing
N1	Orient directional noise sources, including battery containers and inverters, away from receptors where possible.	PC, C
N2	Remodel operational noise levels when final design has been confirmed prior to construction. Remove BESS locations close to nearest receptors as required to achieve compliance with assessment criteria. Should any exceedance occur, relocate, or re-orientate noise sources away from receivers.	PC, C
N3	Minimise unnecessary metal-on-metal contact.	C
N4	Minimise the need for vehicle reversing as much as practical, for example, by arranging for one-way site traffic routes where possible.	PC, C, O, CR
N5	Ensure site access roads are maintained.	PC, C, O, CR
N6	Ensure potentially noisy plant and equipment is maintained in accordance with manufacturer specifications.	PC, C, O, CR
N7	During the procurement phase, the quietest equipment will be requested/required.	PC, C, O, CR
N8	Minimise unnecessary movement of equipment/material/plant.	PC, C, O, CR
N9	Operate plant and equipment in the quietest and most efficient manner.	PC, C, O, CR
N10	Undertake regular inspections/maintenance of plant and equipment to ensure that all noise reduction devices are operating effectively.	PC, C, O, CR
N11	Construction work to be limited to standard construction hours, including delivery of plant and equipment.	C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.8.5 Conclusion

Construction noise levels are predicted to exceed NMLs at up to six receiver locations, largely in relation to site establishment works and piling, and typically only when works are being undertaken in close proximity to the receiver location. No exceedance of the 'Highly Noise Affected' level is expected. Management and mitigation measures will be implemented as per Table 6.28.

Operational noise will comply with the PNTL at all non-associated receivers with the implementation of mitigation measures listed above.

Road traffic noise will increase with construction of the Project; although, noise will remain in compliance with assessment criteria for arterial and sub-arterial roads under the RNP. However, due to low existing traffic counts on Spring Ridge Road, the predicted relative increase for the night period is greater than the 12 dB limit in the RNP. It should be noted that despite this traffic being assessed against the night period criterion, most traffic movements on Spring Ridge Road will likely occur during a shoulder period between 6 am and 7 am. This relative increase will be temporary during the construction period only, with minimal impact predicted during the operational phase of the Project.

During the detailed design phase of the Project, all plant and equipment will be reviewed to ensure noise levels predicted in the noise assessment can be achieved through selection of plant and equipment; site layout and orientation of equipment; utilisation and operational procedures consistent with the assumptions in the NVIA or a combination of the above measures.

6.9 Traffic and transport

6.9.1 Introduction

A traffic impact assessment (TIA) was prepared for the Project by EMM (2023f) and is provided in Appendix N. The TIA was prepared in accordance with the SEARs as shown in Appendix A.

6.9.2 Existing environment

i Road network

An overview of the road network and traffic characteristics surrounding the Project is shown in Figure 6.10.

Key roads in the vicinity of the Project which form part of the Project's key transport routes include:

- Golden Highway – a state road which starts in Dubbo and merges with the New England Highway near Newcastle. The Golden Highway is a sealed road approximately 6.5–7.0 m wide with sealed shoulders up to 2 m wide on both sides. The Golden Highway has one lane in each direction, and generally runs east-west. The posted speed limit is 100 kilometres per hour (km/h) and it is approved for 26 m B-doubles.

- Spring Ridge Road – a local road from the Golden Highway (north) which joins Goolma Road south-west of Gulgong. Spring Ridge Road is a two-way sealed road without lane markings or a centreline, which generally runs north-west to south-east. It is approximately 5.0–5.5 m wide with an unsealed shoulder up to 2 m wide on both sides. The posted speed limit is 100 km/h and it is approved for general mass limits (GML) 25 m B-doubles (with travel conditions).

- Dapper Road – a local road between Spring Ridge Road and Bald Hill Road. Dapper Road is an unsealed, two-way road without lane markings, which generally runs east-west and north-south. It is approximately 5.5–6.0 m wide with no shoulders. The posted speed limit is 100 km/h (as per the NSW default non-built up area speed limit) and it is approved for 25 m B-doubles (with travel conditions).

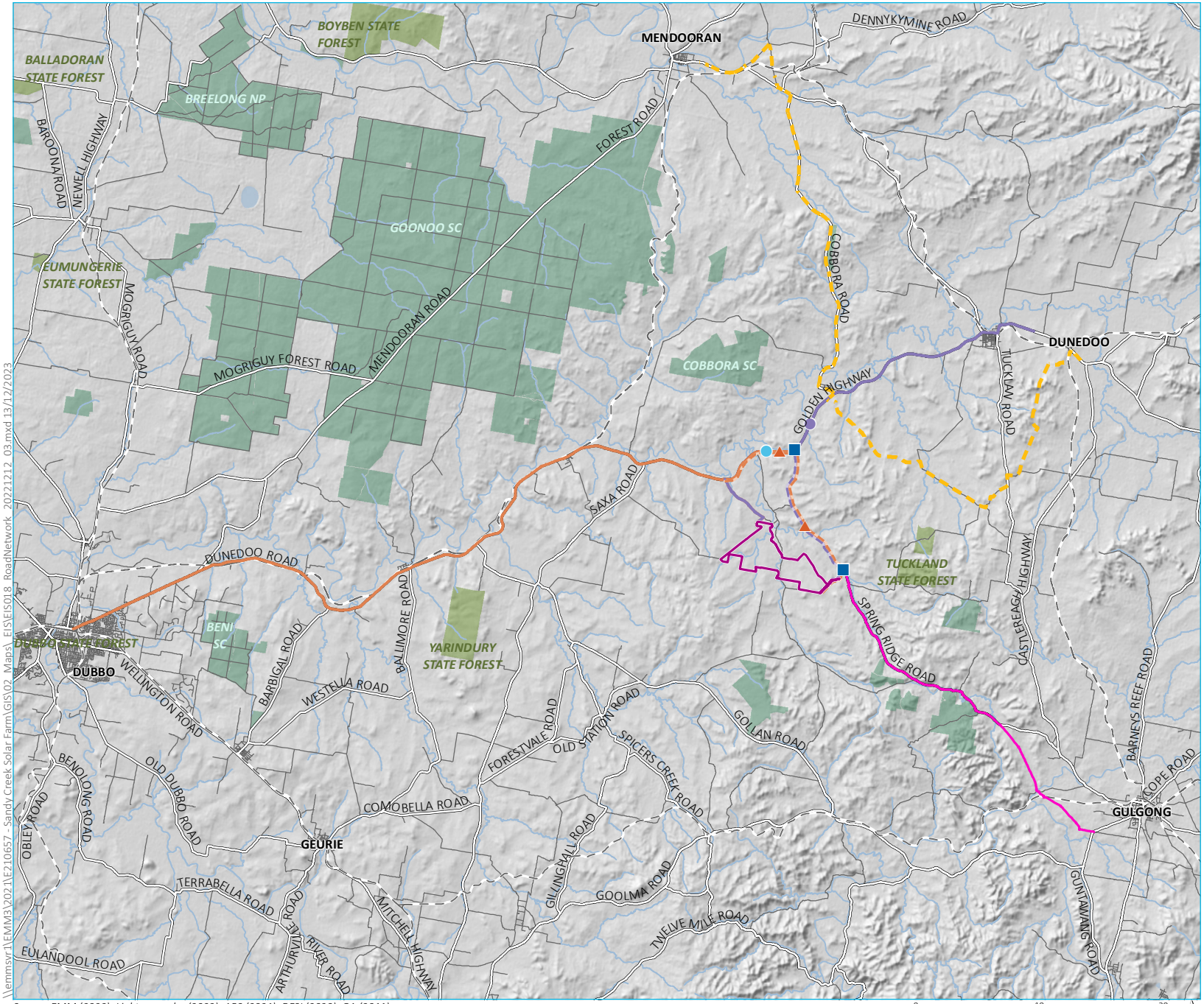
a Key intersections

Key intersections which will be used for Project related traffic during construction and operation include:

- Golden Highway/Spring Ridge Road intersection – a priority control (give-way) intersection approximately 8 km north of the Project site. The intersection has an Austroads auxiliary lane left turn (AUL) and auxiliary

lane right turn (AUR) type turn treatment from the Golden Highway and a one lane approach and departure from Spring Ridge Road. No pedestrian connectivity is provided on any approach.

- Spring Ridge Road/Dapper Road intersection – a priority control (give-way) intersection approximately three km east of the Project site. The intersection has a one lane approach and departure from all directions. No pedestrian connectivity is provided on any approach.



Study area
CWCT Dunedoo-Mendooran via Cobbora

Key intersection
Tube count location

NSW crashes: degree of crash
Moderate Injury
Minor/Other Injury

Transport route
Light and heavy vehicle access route from Dubbo
Light and heavy vehicle access route from Dunedoo
Light vehicle access route (from Gulgong)
Heavy vehicle access route (from Dubbo)
Heavy vehicle access route (from Dunedoo)

Existing environment
Rail line
Major road
Minor road
Named watercourse
Named waterbody
NPWS reserve
State forest

INSET KEY
Major road
Transport route to Newcastle
Central West Orana Renewable Energy Zone

Source: EMM (2023); Lightsource bp (2023); ABS (2021); DFSI (2020); GA (2011)

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Road network and traffic characteristics

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.10

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ii Existing traffic volumes

The Golden Highway/Spring Ridge Road and Spring Ridge Road/Dapper Road intersections were surveyed between 6:00 am to 9:00 am and 3:00 pm to 6:00 pm, 15–17 November 2022.

Survey results indicate the following peak hours:

- Golden Highway/Spring Ridge Road:
  - AM peak hour: 8:00 am to 9:00 am
  - PM peak hour: 3:15 pm to 4:15 pm.
- Spring Ridge Road/Dapper Road:
  - AM peak hour: 6:45 am to 7:45 am
  - PM peak hour: 4:00 pm to 5:00 pm.

As traffic volumes can fluctuate over different weeks, surveyed intersection traffic volumes were adjusted to ensure that the maximum peak hour traffic volumes are properly represented. The same peak hours during a similar time of the week have been used to calculate the adjusted traffic volumes, which are referred to as baseline traffic volumes, and are presented in Figure 6.11

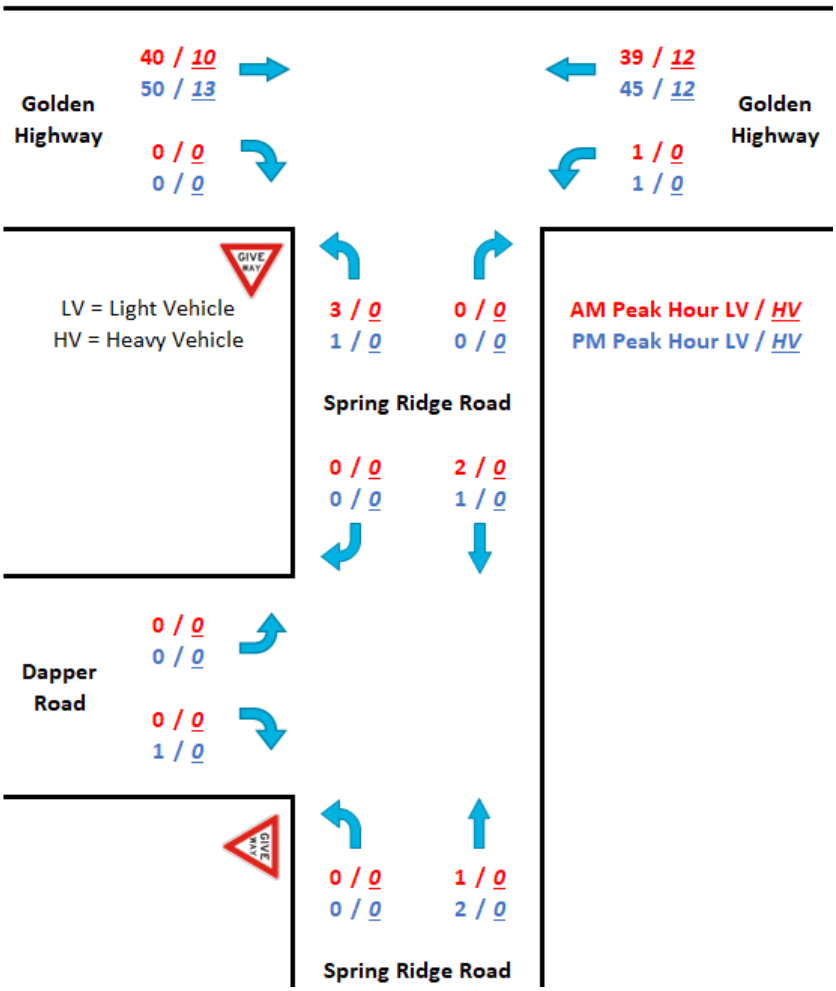


Figure 6.11 Existing AM and PM peak hourly traffic volumes

Additionally, tube count surveys were undertaken on the Golden Highway and Spring Ridge Road for a seven-day period between 21 November and 28 November 2022. Tube count locations are shown in Figure 6.10 and summary results are presented in Table 6.29.

Table 6.29 Tube count results summary

Tube count location	Golden Highway			Spring Ridge Road		
Direction	**Bi-directional**	**Eastbound**	**Westbound**	**Bi-directional**	**Northbound**	**Southbound**
5-day ADT	1,405	691	714	50	23	27
85%ile speed (km/h)	105.4	104.1	106.6	97.1	96.8	99.3
Heavy vehicle % (5-day)	20.28	20.44	20.13	7.92	9.01	6.98

iii Crash analysis

Two crashes were recorded in the vicinity of the Project between 2017 and 2021. Both crashes were on the Golden Highway, near the Golden Highway/Spring Ridge Road intersection (TfNSW 2023).

One crash resulted from a vehicle going off road and into an object, and the other resulted from an out-of-control vehicle due to overtaking. Four persons in total were injured in the crashes. Speeding and/or fatigue were not identified as contributing factors. There were no crashes reported on Spring Ridge Road or Dapper Road.

Overall, these crashes do not indicate any significant road safety deficiencies along the transport routes within the locality.

iv Public transport

There are no public bus services operating in the vicinity of the study area; however, school bus route S137 operates between Dunedoo and schools in Dubbo and Sid Fogg's Coachlines run express services from Newcastle to Dubbo which travel along the Golden Highway.

There are no train stations, railway lines, or rail crossings in the vicinity of the study area.

v Active transport

The Central West Cycling Trail (CWCT)[2] is a cycling trail approximately 400 km long that generally follows quiet tracks, away from main roads. The Dunedoo to Mendooran via Cobbora track is approximately 67 km long and generally extends north south in the north-east of the Project site, as illustrated in Figure 6.10.

There are no pedestrian facilities in the vicinity of the study area due to the area's rural nature.

vi Parking

There are no formal parking facilities in the vicinity of the study area given the rural nature of the area.

[2] https://centralwestcycletrail.com.au/

6.9.3 Project transport routes

All heavy vehicles are expected to arrive and depart north of the Project site along Spring Ridge Road and the Golden Highway. Approximately 20% of the heavy vehicles will travel to/from the Dubbo direction in the west and 80% to/from the Dunedoo and Merriwa direction in the east, including many heavy vehicle movements travelling to or from the Port of Newcastle or Sydney.

Approximately 30% of light vehicles are expected to/from the south along Spring Ridge Road (Mudgee/Gulgong). The remaining 70% of light vehicles are expected to/from the north along Spring Ridge Road. Approximately 50% of the 70% from the north are expected to turn to/from the west (Dubbo) at the Golden Highway/Spring Ridge Road intersection, with the remaining 20% of the 70% to/from the east (Dunedoo/Merriwa).

Where required, shuttle buses are expected to arrive and depart north of the Project site along Spring Ridge Road and the Golden Highway. Approximately 50% of the shuttle buses will travel to/from Dubbo in the west and the other 50% will travel to/from Dunedoo and Merriwa in the east.

OSOM vehicles are expected to utilise the transport route from the Port of Newcastle to the Project site (Figure 3.12).

6.9.4 Project traffic

Traffic generated by the Project will be highest during the construction period and is expected to be negligible during operations.

If a temporary on-site workforce accommodation facility is not provided, daily traffic during the peak construction is expected to reach 60 light vehicles, 20 shuttle buses and 37 other heavy vehicle movements, for a total of 117 daily vehicles (234 daily one-way vehicle movements). However, if an on-site accommodation facility is provided, the total daily traffic movements will be reduced by approximately 50% to 118 daily vehicle movements (i.e. it will significantly reduce the daily site light vehicle movements and shuttle bus traffic, but daily heavy vehicle movements will slightly increase as services to the accommodation facility (food, diesel, water, sewage) will add to truck volumes). During both the AM and PM peak hours of the peak construction month, 20 light vehicle movements and 11 heavy vehicle movements will occur, for a total of 31 vehicle movements in each peak hour. A vehicle movement is defined as a vehicle travelling from one place to another, excluding the return journey.

While approval is sought for an accommodation facility as part of the Project, the traffic impact assessment was conservatively based on the traffic volumes that would be associated with the Project if an accommodation facility was not included; that is a total of 117 daily vehicles (234 daily one-way vehicle movements).

6.9.5 Project site access

The development footprint will be accessed by all construction and operation traffic via Dapper Road, utilising an existing property access location. There will be a separate access point for the temporary workforce accommodation facility north of the main access point, along Dapper Road.

There will also be two emergency egress points:

- Tallawonga Road (north-west corner of the Project area), utilising an existing driveway
- mid-way along Tallawonga Road, utilising an existing property access location.

Additionally, the intersection of the development footprint at Sandy Creek Road can also be utilised as an additional emergency egress location, if required.

6.9.6 Potential impacts

i Intersection performance

The key intersection at Golden Highway/Spring Ridge Road was modelled with SIDRA Intersection 9.0 software, a micro-analytical tool for individual intersections and linked intersection-network modelling using traffic survey data.

SIDRA provides performance indicators including Level of Service (LOS), which is a categorisation of average delay, intended for simple reference. For priority-controlled intersections, the LOS of the worst turning movement is reported. LOS is a good indicator of overall performance for individual intersections.

Degree of saturation (DOS) is the total usage of the intersection expressed as a factor of 1, with 1 representing 100% use/saturation. In practice, target degree of saturation of 0.90 for signals, 0.85 for roundabouts and 0.80 for unsignalised intersections are generally agreed to.

SIDRA results are provided in Appendix I of the TIA. Key findings include:

- during AM and PM, the intersection performs satisfactorily within capacity with LOS A and DOS <0.1 for all scenarios
- overall, the intersection has additional capacity to accommodate traffic generated by the Project.

ii Mid-block capacity analysis

The mid-block level of service on rural and urban roads is assessed based on a vehicle's average travel speed. At low traffic volumes under ideal conditions, drivers can travel at their desired speed without interference. As traffic volumes increase and as roadway, terrain and traffic conditions become less than ideal, drivers are affected by the presence of other vehicles on the road and bunches form in the traffic stream.

Based on baseline traffic data, two-way traffic volumes on the Golden Highway during peak hours are 104-121 vehicles, 21% of which are heavy vehicles. This baseline data indicates the Golden Highway currently operates at a LOS A.

When accounting for baseline plus Project traffic, peak hour volumes increase to 119 vehicles, with 28% heavy vehicles in the AM peak hour and 135 vehicles with 21% heavy vehicles in the PM peak hour, indicating operation at a LOS A level. Therefore, the Golden Highway will be able to efficiently cater for the additional vehicular traffic generated by the Project.

The traffic volumes on Spring Ridge Road and Dapper Road are far less than the Golden Highway. Therefore, the mid-block LOS does not need to be assessed as it will be assumed to be LOS A.

iii Road design standards

Road width design standards for low volume roads are defined by the:

- *Austroads Guide to Road Design Part 3: Geometric Design* (Austroads 2016) for sealed roads
- *Australian Road Research Board Unsealed Roads Best Practice Guide* (ARRB 2020) for unsealed roads.

The proposed access routes for the Project meet the minimum compliance criteria from Austroads and ARRB guidelines for the existing traffic volumes and the Project's construction traffic volumes are expected to have minimal impact on the Golden Highway.

Spring Ridge Road, between the Golden Highway and Dapper Road, will require an ongoing road condition management strategy, including an initial dilapidation survey for the existing road prior to the commencement of Project construction to ensure the Project's construction traffic can safely use the route in combination with existing local traffic.

While the width of Dapper Road complies with the ARRB guidelines, it is recommended that Dapper Road is upgraded to two lanes (unsealed) from Spring Ridge Road to the site access point to allow heavy vehicles to pass each other. A minimum carriageway width of 9 m (unsealed) will be provided by LSbp between Elong Elong Energy Hub and the Project site access to comply with this requirement. According to the CWO REZ Transmission EIS, EnergyCo will be responsible for widening Dapper Road from its intersection with Spring Ridge Road to the Elong Elong Energy Hub entrance (EnergyCo 2023a).

iv Road safety assessment for haulage routes

In accordance with *Austroads Guide to Road Design Part 4A (Unsignalised and Signalised Intersections)* (Austroads 2017), all unsignalised T-intersections need to have clear visibility between the through traffic travelling on the major road and the turning traffic exiting from the minor road so turning traffic can observe gaps, turn safely, and merge with the major road's traffic. This visibility measurement is called sight distance.

a Golden Highway/Spring Ridge Road sight distance

The minimum safe intersection sight distance (SISD) required for a 2.5 second driver reaction time is 300 m.

The sight distances on Spring Ridge Road at the Golden Highway were estimated based on the line of sight. Sight distances to the left (300 m) and to the right (302 m) meet the minimum requirement (300 m) as stipulated in Austroads (2017), therefore, no upgrades are required.

b Spring Ridge Road/Dapper Road sight distance

The minimum SISD required for a 2.5 second driver reaction time is 300 m.

Sight distances on Dapper Road at Spring Ridge Road have been estimated based on the line of sight. Analysis determined sight distances to the left (120 m) and to the right (211 m) do not meet the minimum requirement (300 m) as stipulated in Austroads (2017).

An upgraded intersection design will be provided for this intersection as part of the EnergyCo Elong Elong Energy Hub road improvements, which will rectify the existing sight distance deficiency, such that no further intersection safety improvement will be required for the Project.

v Intersection operation

Intersection operations are assessed from a combination of the peak hourly through and turning traffic movements that occur at each intersection.

In accordance with current design standards (Austroads 2017), the following turn treatments will be required for Project construction traffic:

- Golden Highway/Spring Ridge Road - no change is required for the existing intersection traffic left and right turning movements as the existing AUL and AUR turn treatment layout is better than the basic left turn (BAL) and basic right turn (BAR) requirement and the Project's traffic is expected to have minimal impacts to the intersection.

- Spring Ridge Road/Dapper Road - it is anticipated that Spring Ridge Road/Dapper Road will only require the minimum BAL/BAR treatment (intersection to be upgraded by EnergyCo as part of the Elong Elong Energy Hub road improvements).

vi Impact on public transport, pedestrians, and cyclists

Potential impacts on school buses passing along the Golden Highway will be limited to heavy vehicles only as construction staff travelling in light vehicles will be arriving and departing from the site outside of school bus operating hours. Potential impacts from heavy vehicles will be limited since heavy vehicle movements will be spread throughout the day.

The CWCT overlaps the Golden Highway for a short section of 700 m in the town of Cobbora between Cobbora Road and Avonside West Road. As the Golden Highway forms part of the haulage route to the site, the installation of "Watch for Bicycles" (G9-57) signs to warn motorists of the presence of cyclists has been included as a mitigation measure.

Mitigation measures to limit impacts on school buses and cyclists are presented in Section 6.9.7.

No pedestrian impacts are predicted due to lack of pedestrian facilities in the rural location.

vii Car and bus parking

Car and bus parking will be provided within the development footprint (for both road upgrades and Project construction) for the duration of the road upgrades and the construction period. Locations of parking facilities will be incorporated in the detailed design.

viii Crown land

The study area contains several Crown roads, with some intersecting the development footprint. Some of these Crown roads can be kept, whilst others will require closure to accommodate Project infrastructure. LSbp is consulting with Crown lands in relation to Crown roads within the study area. Proposed closures are listed in Table 3.2.

LSbp submitted landowner's consent from Crown Lands with the SSD application for the Project, as the Project impacts Crown roads. At a later date, LSbp will apply to close most of the Crown roads within the study area.

6.9.7 Mitigation measures

Table 6.30 summarises the Project's mitigation measures to be implemented in relation to traffic and transport.

Table 6.30 Traffic mitigation measures

Reference	Mitigation measure	Timing
TT1	As part of the EnergyCo Elong Elong Energy Hub Road improvements, an upgraded intersection design will be provided for the Spring Ridge Road and Dapper Road intersection to allow for large trucks up to and including OSOM vehicles to access Dapper Road.	PC
TT2	A detailed construction traffic management plan (CTMP) will be developed by the construction contractor in consultation with Warrumbungle Shire Council prior to the commencement of works.	PC
TT3	Road surfaces of unsealed roads for construction access will be adequately watered to mitigate dust generation impacts.	C
TT4	A permit (from the National Heavy Vehicle Regulator) will be obtained to allow OSOM vehicles to use the road network as part of construction.	PC

Reference	Mitigation measure	Timing
TT5	Spring Ridge Road will require a detailed road condition management strategy including an initial road condition dilapidation survey, to ensure that any construction traffic related road damage and other defects are promptly identified and repaired to ensure the road remains safely trafficable by construction traffic from all of the identified energy projects which are using the route in combination with existing local traffic. A coordinated approach between relevant parties will be required to manage the cumulative traffic impacts from all the surrounding projects where construction traffic is using Spring Ridge Road.	PC
TT6	To accommodate the increase in traffic and OSOM turning movements during the construction phase, Dapper Road will be widened between the site access and the Elong Elong Energy Hub access, in accordance with Austroads rural roads design standards. Road widening sections on Dapper Road will be selected based on appropriate sight distances between the sections.	C
TT7	All Project accesses will be upgraded as per Typical Rural Property Access standard to the satisfaction of TfNSW and Warrumbungle Shire Council.	PC
TT8	A decommissioning plan will be prepared prior to decommissioning which will address potential traffic related issues and required management measures at the time (many factors could change during the life of the Project).	CR
TT9	In relation to the CWCT, the following will be implemented: • "Watch for Bicycles" (G9-57) signage will be installed where the CWCT overlaps with the Golden Highway at Cobbora • in consultation with the CWCT committee, a signage plan will be prepared, highlighting the CWCT in the vicinity of the Project • the CWCT routes will be highlighted within the site induction and driver's code of conduct to increase awareness of cyclists' presence in the area.	PC
TT10	Traffic controls will be developed as part of the CTMP for the crossing on Sandy Creek Road prior to construction.	PC

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.9.8 Conclusion

Traffic generated by the Project will be highest during the construction period and is expected to be negligible during the operations phase.

All stages of the traffic assessment were undertaken using a conservative scenario with no accommodation facility on site. Project specific shuttle buses operating to and from the nearest towns (e.g. Dubbo, Dunedoo, Merriwa and Gulgong) and/or an on-site temporary workforce accommodation facility will be provided to minimise daily workforce traffic commuting to and from the Project site each weekday; in particular to mitigate impacts on the road network during peak construction and minimise additional daily traffic using Spring Ridge Road and Dapper Road.

With the implementation of the mitigation measures presented in Table 6.3, the road network is expected to operate at a safe and acceptable level.

6.10 Water

6.10.1 Introduction

EMM prepared a water resources assessment (WRA) for the Project, which considered potential impacts to both surface water and groundwater. The WRA is attached as Appendix O and satisfies water assessment related SEARs detailed in Appendix A.

6.10.2 Existing environment

i Climate

The study area is situated in the temperate zone, characterised by hot, dry summers and cold winters. Maximum temperatures typically exceed 30° Celsius (C) during summer and fall to around 15°C during winter. Minimum temperatures are typically around 16°C during summer and below 5°C in winter. The study area receives approximately 650 mm of annual rainfall on average, and annual potential evapotranspiration (PET) is between 1800 mm and 2000 mm (BOM 2023). Rainfall is typically higher in summer, with a mean monthly rainfall of 60 mm in summer and 45 mm in winter.

Climate change is expected to impact the study area with higher mean, maximum and minimum temperatures; increased autumn rainfall; decreased spring rainfall; increased bushfire risk; increased frequency and severity of drought; and more intense extreme rain events (CSIRO and BoM 2021).

ii Hydrology and water resources

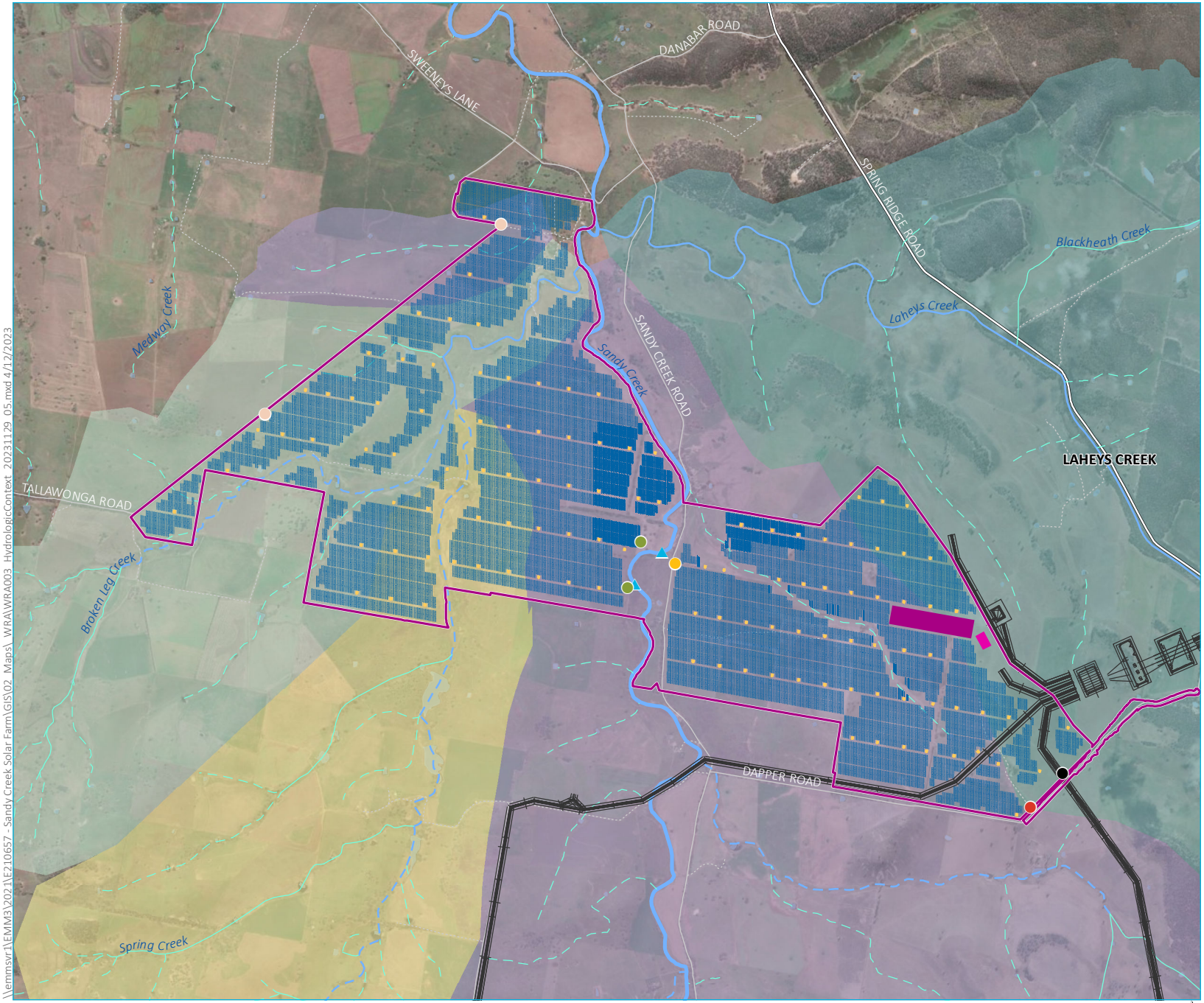
The study area is within the Macquarie-Bogan River Catchment, which covers an area of more than 74,000 km^2 within the Murray-Darling Basin (MDB).

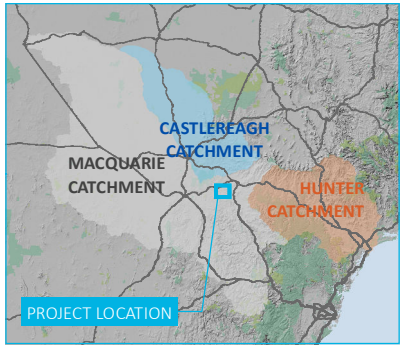
Many of the watercourses within the study area are ephemeral, with Sandy Creek, a fifth order watercourse, having the most reliable annual flow that is supported by both catchment and a baseflow contribution. The reliability of this flow through the study area is relatively unknown; however, regional gauging stations indicate seasonal flow variability. Tributaries of Sandy Creek also intersect the development footprint, including Broken Leg Creek (second order) and Spring Creek (third order) and minor unnamed watercourses. Several small farm dams are located within the development footprint, both on and adjacent to watercourses.

The hydrologic context of the Project is described in Table 6.31 and shown in Figure 6.12.

Table 6.31 Water resources within and in the vicinity of the study area

Feature	Discussion
Sandy Creek	5th order watercourse that transects the development footprint, flowing in a northerly direction before joining the Talbragar River approximately 4.5 km to the north of the site.
Broken Leg Creek	Broken Leg Creek is a 3rd and 4th order watercourse which flows from the south-western extent of the site before joining Sandy Creek on the north-eastern site boundary.
Spring Creek	Spring Creek is a 3rd order creek that flows through the western portion of the development footprint, before joining Broken Leg Creek.
Lahey's Creek	4th order watercourse flows in a westerly direction and generally to the north of the study area before joining Sandy Creek on its right bank at the very northern extent of the study area.
Unnamed watercourses	Minor unnamed 1st and 2nd order watercourses also occur within the development footprint, flowing into Sandy Creek and its tributaries including: • Unnamed tributaries of Broken Leg Creek: B1, B2, B3 and B4. • Unnamed tributaries of Sandy Creek: S1 and S2.
Dams	Several small farm dams are located within the development footprint, both on and adjacent to watercourses which support existing landholder agricultural activities.





INSET KEY

- Major road
- NPWS reserve
- State forest

Water catchment

- Castlereagh
- Hunter
- Macquarie

- Study area

Existing environment

- Major road
- Minor road
- Vehicular track
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order

Site features

- Primary site access
- Site access
- Emergency egress
- Accommodation site access
- Sandy Creek public access
- Watercourse crossing
- Station infrastructure (simplified)
- Substation
- Inverter / BESS Option A: DC-Coupled BESS (decentralised)
- BESS Option B: AC-Coupled BESS (centralised)
- Solar panel array

Watercourse catchment

- Broken Leg Creek
- Laheys Creek
- Sandy Creek
- Spring Creek

Source: EMM (2023); Lightsource bp (2023); OEH (2021); DFSI (2020); ESRI (2023)

0 1 2 km

GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM3\2021\E210657 - Sandy Creek Solar Farm\GIS\02_Maps_WRA\WRA003_HydrologicContext_20231129_05.mxd 4/12/2023

Hydrologic context

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.12

EMM
creating opportunities

iii Geomorphology

Geomorphic characterisation is based on the River Styles Framework, which classifies watercourses based on measurable geomorphic attributes and qualities including river type; fragility; sensitivity to disturbance; condition; rarity; and recovery potential.

The portion of Sandy Creek adjacent to and through the development footprint is generally characterised as a partly confined, bedrock margin-controlled, discontinuous floodplain watercourse with sand as the bed material. It is mapped as being in generally poor condition with low recovery potential.

The portion of Broken Leg Creek that runs through the development footprint is characterised as a laterally unconfined, discontinuous channel with sand as the bed material. It is mapped as being in moderate condition with moderate recovery potential.

The portion of Spring Creek that runs through the development footprint is characterised as a laterally confined, continuous channel, with low sinuosity and a gravel bed. It is mapped as being in moderate condition with moderate recovery potential.

iv Flooding

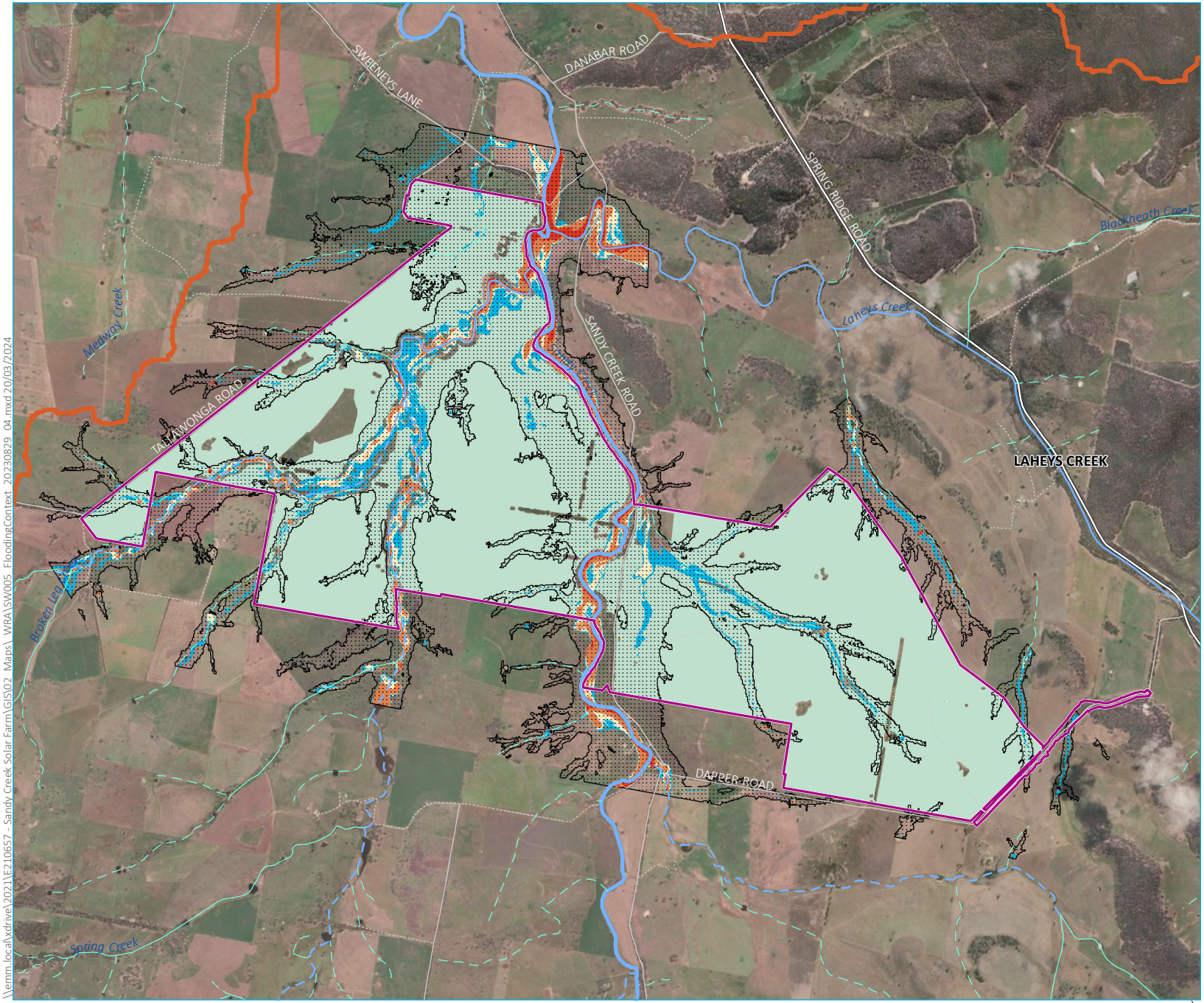
Flood modelling was undertaken for 1% and 5% annual exceedance probability (AEP) events. Modelling also determined areas of existing flood inundation, depths, velocity, and hazard within the study area. The Project's flooding context is shown in Figure 6.13. This included understanding flood behaviour for the broad catchment area of Sandy Creek and its tributaries. This information was used to assist in early Project design development to minimise the potential for flood-related risks and impacts where possible.

The flood study prepared defines flood hazard in terms of vulnerability thresholds described in the Australian Emergency Management Handbook 7 (AEMI 2014). Modelling results show Sandy Creek experiences some of the highest hazard (H) category flow in a 1% AEP event with H5 and H6 predicted. This flow is unsafe for vehicles and people and renders all building types vulnerable to structural damage and/or failure. In-channel velocities within Sandy Creek are predicted to be greater than 2 metres per second (m/s).

Within the eastern portion of the development footprint, the unnamed tributary of Sandy Creek (S1) is predicted to have a hazard rating of H1 and H2 in 1% AEP event, which is generally safe for people and buildings but may be unsafe for small vehicles.

Flooding conditions within watercourses running through the western portion of the development footprint are in the 1% AEP events which include depths between 1 to 1.5 m and velocities of 1 to 1.5 m/s. This results in flow hazards of between H4 and H5 which is unsafe for vehicles and people and renders all building types vulnerable to structural damage. The flood inundation area is limited to riparian corridors and lands directly adjacent to these corridors.

Below the confluence of Spring Creek and Broken Leg Creek, flooding behaviour includes additional flow paths (via eastern overflow/breakout flow paths) directly adjacent to the mainstream flooding, typically associated with the bend of the watercourse. Flooding behaviour within these features are shallow in depth but high in velocity with a predicted hazard rating of H3 to H4. The additional adjacent flow paths along Broken Leg Creek are predicted to be less likely in the 5% AEP compared to the 1% AEP event.



KEY

- Study area
- Model extent
- PMF flood extent
- Development footprint

1% AEP flood depth (m)

- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 1
- > 1

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order

\\emm.local\xdrive\2021\E210657 - Sandy Creek Solar Farm\GIS\02 Maps\ WRA\SW005 FloodingContext 20230829 04.mxd 20/03/2024

Source: EMM (2023); Lightsource bp (2023); OEH (2021); DFSI (2020); ESRI (2023)

0 1 2 km

GDA 1994 MGA Zone 55

N

Flooding context

Sandy Creek Solar Farm
Environment Impact Statement
Figure 6.13

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v Water quality

Regional catchment data from the gauging station on Talbragar River at Elong Elong (Station 421042) between the years of 2010 to 2011 and 2014 to 2015 suggests water quality was generally poor when assessed against water quality parameters including nutrients, turbidity, total suspended solids (TSS), electrical conductivity (EC), dissolved oxygen (DO) and pH.

Within the midlands of the Macquarie-Castlereagh catchment and area specific to the Project, DO, pH, and TSS were generally within the expected ranges; however, salinity and nutrients were elevated.

vi Hydrogeology

The local hydrogeological regime within the study area is presented in Table 6.32. Surface water drainage ceases to flow during dry conditions, indicating that discharge from the Permo-Triassic aquifer is not a major contributor to surface water flows.

Table 6.32 Hydrogeology within the study area

Feature	Period	Discussion
Alluvium	Quaternary	• shallow, unconfined, and temporary groundwater of limited extent • expected to present as a predominantly unsaturated system within the riparian corridor of developed watercourses, such as Sandy Creek • episodically recharged during flooding events, which is then accessed by riparian vegetation opportunistically • groundwater residence time within the alluvium is expected to be relatively short, with ongoing discharge to riparian areas and watercourses
Porous rock	Permo-Triassic	• the underlying porous rock groundwater system, associated with the Gunnedah Basin, is the primary regional water bearing system in the area • assumed to receive the majority of its recharge through direct rainfall in areas where the unit outcrops or subcrops below the shallow alluvial sediments • recharge thought to be low due to massive nature of the rock and low matrix permeability as indicated by the relatively low yielding private nearby landholder bores.
Fractured rock	Not specified	• characterised by metamorphosed sedimentary and volcanic rocks • within the metamorphic basement rocks of the Lachlan Fold Belt • very low permeability and outcrop to the east of the Lahneys Fault located 2 km to the north-east from the Project area

vii Potential groundwater dependant ecosystems

An ecosystem's dependence on groundwater can be variable, ranging from partial and infrequent dependence, that is, seasonal or episodic (facultative), to total continual dependence (entire/obligate).

There is a groundwater dependant ecosystem (GDE) 2.2 km west in Naran Springs. Additionally, a large area of potential high groundwater dependence to the north-west of the Project area is located specifically within and adjacent to Sandy Creek. Ecosystem dependence associated with these plant community types are thought to have a facultative-opportunistic reliance on groundwater, accessing temporary groundwater within shallow alluvial sediments immediately following flooding events.

There are no mapped aquatic GDE ecosystems within or adjacent to the study area. The nearest mapped aquatic ecosystem associated with GDEs is associated with Talbragar Creek which is approximately 6 km downstream.

6.10.3 Water demands, source of supply and wastewater management

i Construction water demands

The estimated water demand for Project construction is approximately 70 megalitres (ML) per year, or 165 ML over the 22-28-month construction period. The majority of this water will be required for dust suppression, with other minor uses including site amenities, fire protection and washing of construction equipment and plant. Additionally, water will be required for the temporary workforce accommodation facility (detailed further in Section 6.10.3ii).

During construction of the Project, non-potable water will be sourced via multiple groundwater bores. The bores are yet to be constructed but will be located within the development footprint, targeting the regional porous rock aquifer at a depth of 150 m. A water options assessment was completed by EMM for the Project and can be found in Annexure B of Appendix O.

Water for construction purposes will also be opportunistically sourced from the following locations to minimise the need for imported water:

- use from existing landholder dams where harvestable rights apply
- reuse from construction sediment basins
- reuse from rainwater tanks collecting runoff from building roofs
- non-potable water from groundwater bores
- potable water is expected to be trucked in from a licensed source under commercial agreement with the primary purpose of water supply to the temporary workforce accommodation facility and construction offices.

ii Accommodation facility and site offices water demands

The estimated water demand to support the temporary workforce accommodation facility for the Project is provided in Table 6.33, and the assumptions for construction offices are provided in Table 6.34.

Table 6.33 Temporary workforce accommodation facility water demands and wastewater loads

Aspect	Number	Details
Maximum workforce numbers for accommodation	350 people	
Assumed construction facility water demand and wastewater load	180 L/p/day	Includes: – kitchen, laundry, and accommodation amenities
Construction period	Up to 28 months	
Total	52.9 ML (63 kL/day)	Assuming 7 days a week average (assuming residents remain throughout week)

Notes: Based on estimates provided by Department of Health (2020)

Table 6.34 Construction offices water demands and wastewater loads

Aspect	Number	Details
Office people	10 people	Assumed allowance
Assumed office water demand and wastewater load	37 L/p/day	Includes: – office kitchen, and toilet, urinal, and hand basin
Construction period	22-28 months	
Total	248.6 kL (0.37 kL/day)	Assuming 6 days a week average (Monday to Saturday construction days)

Notes: Based on estimates provided by NSW Health Department (2001)

The total estimated Project water demand and wastewater load from the temporary workforce accommodation facility and offices is 53 ML over 22-28 months.

Water sourced for the workforce accommodation facility and offices would be from potable sources, stored in portable water storage tanks within the facility. Some non-potable water sources (such as groundwater bores) are appropriate to meet the demands of the facility (such as in toilets); however, this will be confirmed in future stages of Project design. Volumes have been assumed to be from potable water sources which will be trucked in via a commercial water provider. At these rates, water supply would typically consist of one water truck per day.

iii Operational water demands

The estimated ongoing operational water usage for the Project is 37 ML/year, over 40 years. Most of this water will be required for washing of PV modules, with other minor uses including permanent site amenities, fire protection, and washing of plant and equipment.

During the operational phase, water will continue to be trucked to site from a commercial water supply as the primary source.

Water will also be opportunistically sourced from rainwater tanks and potentially from groundwater bores to minimise the need for imported water. Water may also be sourced opportunistically from existing landholder dams in accordance with harvestable rights.

iv Wastewater management

Wastewater management for the workforce accommodation facility and construction offices will be managed on-site via a septic system. The system sizing will be based on estimates provided in Table 6.33 and Table 6.34 along with any other additional loads that may be determined during detailed Project design. The system will collect wastewater (blackwater and greywater) from kitchens, laundry, showers, toilets, and basins for management in a septic collection system.

The septic system will be located at least 40 m away, but preferably 100 m away, from mapped watercourses. The system will be emptied by a licensed contractor and disposed of at a nearby council operated wastewater treatment plant or other appropriately licensed facility.

6.10.4 Water licensing

i Surface water

Stormwater reuse is likely to be undertaken during construction including harvesting and reuse of stormwater runoff from roof areas using rainwater tanks, and extraction and reuse of water from construction sediment basins. These forms of water extraction (or water take) are defined as 'excluded works' under the Water Management (General) Regulation 2018 (WM Regulation) and therefore licensing is not required.

It is proposed to also source water opportunistically during construction and operation from existing landholder dams in accordance with harvestable rights, to further minimise demand for imported water. Licensing of water will not be required provided the total volume of dams used for such purposes is within the maximum harvestable right dam calculator (MHRDC), and otherwise comply with the applicable harvestable rights order.

No other surface water take is proposed. Accordingly, the Project is not expected to have any requirements for surface water licensing.

ii Groundwater

The Project proposes to source/install non-potable water from groundwater bores for construction and operation. During construction, the required water volume has been estimated as approximately 70 ML per year or 165 ML over the 22-28-month construction period. Modelling assumes that peak annual supply would be around 150 ML/year where there is no predicted impact to existing groundwater users, apart from one which is located within the study area and is associated with the Project.

Groundwater would be sourced from the porous rock aquifer within the Gunnedah-Oxley Basin Murray Darling Basin (MDB) Groundwater Source. Additionally, a bore census will be undertaken to confirm if the Cobbora mine exploration bores have been decommissioned, repurposed, or if they could be used for water supply.

The licensees or new users have three ways to secure water in NSW:

- temporary trade – water allocation within the same water source or management area can be traded temporarily from one water account to another.
- permanent trade – water entitlement within a water source or management area can be purchased in perpetuity from a water access licence (WAL) holder.
- controlled allocation orders – allows any individual or company the right to apply for new water access licences in water sources that are not fully committed. Water is sold by auction with floor prices set by DPE Water.

On review of the trading market for the Gunnedah-Oxley Basin MDB Groundwater Source, allocation (temporary) and entitlement (permanent) trading is well established with 156 current WALs and a total share component of 27,142-unit shares (with a unit share typically equal to 1 ML). There has been one temporary and one permanent trade in the 12 months to August 2023 of 137- and 100-unit shares respectively If the Project cannot obtain the required entitlements through a controlled allocation, the Project could purchase water permanently or temporarily on the water market via a water broker, once a zero share WAL has been secured.

To take water from a water source, the user is required to hold a WAL which is linked to an approved water supply work (i.e. a bore, dam or river pump). Such approval authorises the holder to construct and use a specified water supply work at a specified location. If multiple bores are required, then multiple works and use approvals need to be obtained. Due to the Project's designation as an SSD, new water supply works required under the Project can be approved as miscellaneous works, considering that all the necessary assessment work has been completed, as has been the case with this Project.

Bores installed as part of the Project will be subject to approval as miscellaneous works. Existing bores that may be used for the Project will be subject to modified water supply work and use approval.

Potential groundwater take during excavation activities are expected to have an exemption under the WM Regulation as incidental groundwater take of 3 ML or less per year in any water source does not require licensing and it is expected that groundwater take will be under this threshold.

Incidental groundwater inflows into excavations will be monitored, recorded, and reported during construction in accordance with WM Regulation requirements and a WAL and appropriate entitlement obtained in advance within the water year should the 3 ML/year threshold be exceeded.

iii Potable water

As part of the temporary workforce accommodation facility proposed by the Project, potable water will be required to service the various demands of the facility. Potable water can be accessed under commercial arrangement with a water utility but requires cartage from the point of supply to the Project. The point of supply must also be licensed.

The Project proposes to access potable water from Dubbo Regional Council via water cartage as required through the construction period.

6.10.5 Potential impacts

i Construction

a Water quality

Primary risks to water quality during construction include:

- soil erosion and transport of sediment into receiving watercourses if ground disturbance works are unmanaged (discussed in more detail in Chapter 6.6 and Appendix O)
- contamination of surface water due to accidental spillage of materials such as fuel, lubricants, herbicides, and other chemicals used to support construction activities
- contamination of surface water due to poor or ineffective wastewater management practices
- entrainment of sediment, vegetation, plant and equipment, hazardous substances/chemicals, and/or other debris in floodwaters

Overall, potential impacts to water quality during construction are considered minor and manageable with proposed management measures in place.

b Water quantity

During construction there is potential for a temporary increase in site runoff as a result of clearing, earthworks, compaction of soils and installation of impervious surfaces, leading to additional runoff leaving the Project site and impacting downstream properties and receptors.

All temporary works will be designed to account for any short-term changes to catchment areas, runoff potential and flow paths that may be required during construction. Stormwater runoff from buildings will be captured in rainwater tanks for use on site where practicable to minimise demand for imported water, which will also assist in reducing minor increases in runoff from the site.

Potential construction phase impacts to site runoff volumes and rates are considered minor and manageable with implementation of temporary water and soil management measures.

c Flooding

During construction, there is potential for inundation of site works, compounds, storage areas and plant/equipment if these are located within flood prone areas, which could lead to undesirable flooding impacts either offsite or within the development footprint, which could also present a safety hazard to construction workers.

The secondary construction compound (refer to Figure 3.1), located adjacent to the eastern bank of Sandy Creek, is predicted to have a portion of the area inundated by flooding in a 1% AEP event, and a smaller portion of the same area inundated in a 5% AEP event. Management of the use of this flood-impacted portion of the area (approximately 30%) will need to be considered in post approval management plans.

Minor encroachments of the development footprint into the 1% AEP flood extent are shown to occur in several isolated locations; however, flooding is typically shallow (in the order of 0.1 m) and low hazard (H1) in these locations for events up to the 1% AEP.

On this basis there is low potential for adverse flooding impacts either within or downstream of the site for events up to 1% AEP.

d Watercourses and riparian corridors

The primary risk to watercourses and associated riparian corridors during construction relates to direct physical disturbance as significant changes to flow regimes and water quality will be avoided.

The number of required watercourse crossings has been minimised during preliminary design to reduce the potential for watercourse impacts (such as increased flow velocity) and will be further considered during detailed design. Crossing types currently have been considered based on access requirements expected during operations as well as assessment outcomes from the aquatic ecology investigation (further discussed in Section 6.3).

e Groundwater

The Project will require excavation below existing surface levels to establish suitable foundation conditions for infrastructure, and for installation of underground services. However, excavations will be shallow (up to a maximum of a few metres in depth), localised, and groundwater is not expected to be intercepted.

Non-potable water demands for the Project are expected to be serviced from groundwater sourced from the porous rock aquifers local to the study area. A drawdown assessment determined the predicted worst-case scenario for water yield of 150 ML/year is more than capable of supporting the Project's non-potable water demands. A maximum of six existing registered groundwater bores could be impacted with drawdown of up to 3 m. Five of the six bores identified in the zone of drawdown have been categorised as exploration bores, which are otherwise used for monitoring, testing, or cored for geological purposes, and do not have a consumptive use. The sixth bore is located within the study area and could serve as a potential water supply point for the Project as the bore is licenced under basic landowner rights.

Impacts from groundwater drawdown processes on terrestrial GDEs and high priority GDEs within and adjacent to the study area are considered unlikely.

The primary risk to groundwater quality during construction is accidental spillage of wastewater, fuel or other hazardous materials used to support site activities that may infiltrate through soils to groundwater. The study area includes mapped zones of groundwater vulnerability (DLWC 2001).

ii Operation

a Water quality

The primary risks to water quality during operation include:

- soil erosion and transport of sediment into receiving watercourses due to poor site stabilisation and re-establishment of ground cover allowing erosion and mobilisation of sediment
- contamination of groundwater due to discharge of stormwater contaminated with hydrocarbons from substation site
- contamination of surface water due to accidental spillage of materials such as fuel, lubricants, herbicides, and other chemicals used to support construction activities
- contamination of surface water due to poor or ineffective wastewater management practices.

Overall, potential impacts to water quality during operation are considered minor and manageable with proposed management measures in place.

b Water quantity

The potential for surface water impacts downstream of the Project associated with hydrologic changes due to increased runoff rates from PV modules and proposed new impervious surfaces is considered negligible. PV modules will shed runoff directly to the ground, which will be stabilised and vegetated to promote retention and infiltration similar to existing conditions. Overall, the Project is expected to result in no measurable net change to overall site runoff potential, provided stabilisation and revegetation recommendations are implemented.

c Flooding

During operation there is the potential for inundation of PV array areas and permanent infrastructure if these areas are located within flood prone areas. This could also lead to undesirable flooding impacts either offsite or within the development footprint. Flooding conditions may also present a safety hazard for staff or visitors to the site.

Preliminary design has considered flooding constraints and makes appropriate responses in terms of generally avoiding works in areas impacted by mainstream flooding for events up to 1% AEP (Figure 6.13) and in locating flood sensitive infrastructure away from watercourses and their associated floodplains.

Shallow inundation of PV array areas will have negligible impact on broader flooding conditions and potential for adverse flooding impacts due to the minimal obstruction to floodwaters presented by spaced PV panel support posts.

The proposed use of the site is generally compatible with the flood hazard because the majority of the PV array and infrastructure areas and internal access roads are either free of mainstream flooding or subject to flood hazard (H1) that is generally safe for people, vehicles and buildings for events up to the 1% AEP.

d Watercourses and riparian corridors

The primary risk to watercourses and associated riparian corridors during operation relates to direct physical disturbance as significant changes to flow regimes and water quality will be avoided.

e Groundwater

The introduction of impervious surfaces for selected site infrastructure will lead to a very small reduction in the infiltration of stormwater runoff to the underlying soils and recharge of groundwater. However, this will have negligible impact on groundwater levels and availability to existing users (including GDEs).

Groundwater bores may remain in service as a point of the Project's operational non-potable water supply, in case other water sources are not available. It is expected that drawdown impacts will be much less during operation and no existing landowner bores will be impacted.

The primary risk to groundwater quality during operation is accidental spillage of wastewater, fuel or other hazardous materials used to support site activities that may infiltrate through soils to groundwater. The study area includes mapped zones of groundwater vulnerability (DLWC 2001).

6.10.6 Mitigation measures

During preparation of the EIS, the development footprint has been refined to consider identified environmental constraints, outcomes of stakeholder and community engagement, and design of Project infrastructure with the objective of developing an efficient Project that avoids and minimises environmental impacts. From a water perspective this has included considerations associated with:

- minimising disturbance of existing watercourses and associated riparian corridors, and minimising the number of new watercourse crossings required
- minimising development in flood prone areas, and locating sensitive infrastructure (e.g. substation, BESS) in suitable areas compatible with flood risk
- avoiding disturbance of existing registered groundwater bores, and minimising disturbance of mapped GDEs.

A similar approach to low impact design will apply to future design refinement through the detailed design process and into construction.

In addition to minimising impact through design, the mitigation measures in Table 6.35 will be implemented to manage and mitigate potential impacts to surface water and groundwater.

Table 6.35 Water management and mitigation measures

Item	Management/mitigation measure	Timing
Stormwater management		
W1	Develop a SWMP to address temporary and site-specific risks to surface water and groundwater during the construction phase. Key stormwater management principles will include: • appropriate siting of proposed infrastructure within the development footprint, which will minimise (and avoid where possible) disturbance to existing drainage lines and overland flow paths • grading to minimise earthworks and consistent with the existing prevailing grade and landforms and to fall to existing drainage lines, to minimise changes to existing flow paths • provision of surface drainage infrastructure comprising: – diversion of upslope runoff around infrastructure (excluding PV modules) – surface drainage measures as required to control runoff generated within the site, minimise soil erosion potential and direct runoff towards receiving drainage lines. Sheet flow conditions will be maximised, and construction of diversion drains, channels and table drains to be minimised to the extent practicable – suitable treatments, including rock rip rap where appropriate, will be used to armour earthwork batters and site drainage as needed for scour protection and to achieve stable waterways where flow concentrations cannot be avoided – maintain existing flow paths where possible and minimise catchment diversions, with the objective of minimising changes to flow regimes in receiving watercourses • prompt stabilisation of disturbed areas and progressive rehabilitation as early as practicable • maintaining drainage, erosion and sediment control measures • monitoring and adjustment protocols for drainage, erosion and sediment control practices to achieve the desired performance standard • drainage, erosion and sediment control personnel competence • stormwater runoff from buildings will be captured in rainwater tanks for use on site, to minimise demand for imported water • implement procedures for hazardous material storage and spill management as defined in applicable guidelines • maintain spill kits onsite at all times during construction and operation • consider weather preparedness and response planning • identify requirements for monitoring and maintenance of water management and drainage systems.	PC
W2	Specific stormwater management measures for the substation area will include: • diversion of clean runoff away from potentially oil-contaminated areas • bunding of potentially oil-contaminated areas • provision of stormwater treatment device(s) to remove oil/grease, hydrocarbons, and sediment from runoff prior to discharge to the downstream drainage system.	PC

Item	Management/mitigation measure	Timing
W3	The SWMP will be updated to describe required site management and protocols and address ongoing site-specific risks to surface water and groundwater during the operational phase. This will address: • rehabilitation of temporary works and construction disturbance areas not utilised for operations • continuation and maintenance of stabilised and vegetated surfaces, drainage and sediment and erosion control measures that will be retained for operations.	O
Erosion and sediment control		
W4	Implementation of erosion and sediment control measures and site rehabilitation and revegetation in accordance with industry standard practice comprising *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004), Volume 2A and Volume 2C (DECC 2008a, 2008b) and *Best Practice Erosion and Sediment Control* (IECA 2008). The LRA (EMM 2023b) describes a range of proposed measures for adoption. Proposed measures will be considered further and formalised as part of detailed design and will form part of the SWMP.	PC
W5	Progressive Erosion and Sediment Control Plans (PESCP) will be developed for all discrete disturbance areas.	PC
Groundwater management		
W6	Community engagement will be undertaken to notify the Project's intention to abstract groundwater for water supply. This will include the expected impacts and explain the concept of make good provisions if any impacts are to occur outside of the expected natural range.	PC
W7	A bore census will be undertaken to confirm if the Cobbora mine exploration bores have been decommissioned, repurposed, or could be used for water supply. For example, GW804444 is an artesian bore that was tested and could be used by LSbp if it still exists, provided landholder access and usage is negotiated.	PC
W8	Groundwater monitoring will be undertaken in Project water supply bores to ensure impacts are consistent with base case scenarios.	PC
W9	Measure and record pumped volumes to comply with works and use approvals	C, O
W10	Purchase shares during the next controlled allocation order for the Gunnedah-Oxley Basin MDB Groundwater source. If the Project cannot obtain the required entitlements through a controlled allocation, the Project could purchase water permanently or temporarily on the water market via a water broker, once a zero share WAL has been secured.	PC
Flood risk management		
W11	A flood management plan will be developed and implemented to describe required site management and protocols in the event of flood events that could impact construction sites or access, including: • suitable early warning/prediction measures and communication protocols • site preparedness activities and procedures • triggers for closure, evacuation and recovery • emergency response and support.	PC
W12	Construction site planning at detailed design stage will: • consider flood risk and adopt appropriate placement of temporary works, plant, materials and workforce facilities, that gives due consideration to overland flow paths and mainstream flood risk • ensure that temporary works minimise offsite flooding impacts as far as practical.	PC, C
W13	Design and construction of permanent works will: • locate sensitive infrastructure (i.e.. substation, BESS) on high ground above 1% AEP flood levels (or other suitable level of flood immunity as may be determined during detailed design), and avoid or otherwise divert local overland flow paths around infrastructure • ensure finished ground levels are constructed at-grade and not materially higher than existing levels in areas subject to existing mainstream flooding, in order to minimise potential offsite flooding impacts as far as practical.	PC, C

Item	Management/mitigation measure	Timing
W14	The flood management plan will be updated to describe the required site management and protocols in the event of flood events that could impact ongoing operation of the site.	O
Watercourse crossings		
W15	Watercourse crossings will be designed and constructed to: • consider the appropriate level of serviceability and flood immunity required for the Project • consider local hydraulic conditions and minimise scour potential • minimise local flooding impacts • be consistent with relevant guidance comprising Guidelines for watercourse crossings on waterfront land (DPE 2022g) and *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G. 2003).	C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.10.7 Conclusion

Potential water related impacts associated with the Project were assessed, including impacts to:

- surface water quality, quantity, flooding, and impacts to watercourses and riparian corridors
- groundwater levels, quality, and impacts to existing users.

Overall, potential surface water and groundwater impacts during construction and operation are considered minor and can be adequately managed through the implementation of the mitigation measures outlined in Table 6.35.

6.11 Hazards and risk

6.11.1 Introduction

A preliminary hazard analysis (PHA) was prepared for the Project by Sherpa Consulting (Sherpa 2023) and is provided in Appendix P. The PHA identifies possible hazards and risks which may be associated with the Project and details management measures to reduce these hazards and risks to acceptable levels when implemented. The PHA was prepared in accordance with relevant SEARs, codes and guidelines including:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- *Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (DoP 2011a) (HIPAP 6)
- *Assessment Guideline – Multi-level Risk Assessment* (DoP 2011b) (Multi-level Risk Assessment Guideline)
- *Hazardous Industry Planning Advisory Paper No 4* – Risk Criteria for Land Use Safety Planning (DoP 2011c) (HIPAP 4)
- *Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields* (ICNIRP 2010)
- *Hazardous and Offensive Development Application Guidelines Applying SEPP 33* (DoP 2011d).

6.11.2 Preliminary risk screening

A preliminary risk screening was completed for the Project in accordance with Project SEARs. The objective of a preliminary risk screening is to determine whether a development proposal is considered as 'potentially hazardous' or 'potentially offensive' in the context of State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP).

i Potentially offensive development

The Hazardous and Offensive Development Guideline (DoP 2011d) describes how to assess if a proposal is potentially hazardous or offensive. Potentially offensive industry is where, in the absence of safeguards and controls, the Project could 'emit a polluting discharge that could cause a significant level of offence'.

The Project will not cause offensive emissions resulting from dust, odour, surface water run-off or noise during operation and construction, as potential impacts will be mitigated by management measures. Therefore, the Project is not considered to be 'potentially offensive' development.

ii Potentially hazardous development

Development proposals that are classified as 'potentially hazardous' industry must complete a PHA to determine the risk to people, property, and the environment.

The Resilience and Hazards SEPP defines potentially hazardous industry as:

> a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:
>
> (a) to human health, life, or property, or
>
> (b) to the biophysical environment
>
> and includes a hazardous industry and a hazardous storage establishment.

The risk screening process in the Hazardous and Offensive Development Guideline (DoP 2011d) considers the type and quantity of hazardous materials to be stored on site, distance of the storage area to the nearest site boundary, as well as the expected number of transport movements. 'Hazardous materials' are defined within the Hazardous and Offensive Development Guideline as substances that fall within the classification of the Australian Dangerous Goods Code (ADGC) (i.e. have a Dangerous Goods (DG) classification).

Risk screening is undertaken by comparing the storage quantity and the number of road movements of the hazardous materials with the screening threshold specified in the Hazardous and Offensive Development Guideline. The screening threshold presents the quantities which it can be assumed that significant off-site risk is unlikely.

A summary of the expected hazardous materials to be stored and handled on site for the Project, transport movements, and the relevant SEPP screening threshold is presented in Table 6.36. Aside from lithium-ion batteries, these include butane, gasoline, and diesel. These materials will be used during construction only (i.e. will not be stored or used for the operations phase of the Project). None of the relevant screening thresholds will be exceeded.

Table 6.36 Preliminary risk screening summary

Material	DG Class	Category	Storage threshold	Transport threshold		Project storage quantities and applicable SEPP screening	Exceed threshold?
				Movements	Quantities		
Butane	2.1	Flammable gases	10 tonnes or 16 m^3	>500 (annual) >30 (weekly)	2-5 tonnes	Amount to be stored on site (100 L or 0.1 m^3) will not exceed the SEPP screening threshold. Number of movements will not be exceeded based on the amount stored on site	No
Gasoline	3 PG II	Flammable liquids	5 tonnes	>750 (annual) >45 (weekly)	3-10 tonnes	Amount to be stored on site (2,000 L, approximately 1.5 tonnes) will not exceed the SEPP screening threshold. Number of movements will not be exceeded based on the amount stored on site.	No
Diesel	C1	Combustible liquids	N/A	N/A	N/A	If diesel is stored in a separate storage area to gasoline, it is not considered to be potentially hazardous (i.e. no applicable storage screening threshold). If diesel is stored with other flammable liquids (e.g. gasoline), the Applying SEPP 33 guideline requires that it is to be treated as Class 3 PG III as they may contribute fuel to a fire. Amount to be stored (2,000 L, or approximately 1.7 tonnes) will not exceed the SEPP screening threshold for Class 3 PG III (5 tonnes). There is no applicable screening threshold for transportation, excluded from risk screening.	No
BESS battery (Lithium ion)	9	Misc. dangerous goods	N/A	>1000 (annual) >60 (weekly)	No limit	No applicable SEPP screening threshold and excluded from risk screening. Transport movement threshold will not be exceeded. Movements are expected to occur during construction only and minimal during operation and maintenance (e.g. battery replacement).	No

Other materials considered as part of the SEPP risk screening include transformer oil, herbicide, and pesticide. These are not classified as DG and are excluded from the risk screening. Additionally, these materials will not be stored with other flammable materials and are therefore not considered to be potentially hazardous under the SEPP.

Appendix 2 of *Applying SEPP 33* outlines other risk factors for consideration to identify hazards outside the scope of the risk screening method.

A review of these risk factors was completed, and it was noted that the Project would not involve:

- storage or transport of incompatible materials (i.e. hazardous and non-hazardous) - hazardous materials will be stored in dedicated areas and storage protocols in accordance with standards, and guidelines will be followed
- generation of hazardous waste
- possible generation of dusts within confined areas
- type of activities involving the hazardous materials with potential to cause significant off-site impacts
- incompatible, reactive, or unstable materials and process conditions that could lead to uncontrolled reaction or decomposition
- storage or processing operations involving high (or extremely low) temperature and/or pressures
- hazardous materials and processes with known past incidents (or near misses) that resulted in significant off-site impacts at similar BESS developments.

Therefore, preliminary risk screening indicates that the Project is not considered potentially hazardous within the meaning of the Resilience and Hazards SEPP. Nonetheless, a PHA has been completed to comply with Project SEARs (see Section 6.11.3).

6.11.3 Preliminary hazard analysis

Regardless of the outcome of the preliminary risk screening, the SEARs hazards assessment requirements state a BESS PHA and an assessment of hazards and risks for the Project must be undertaken. The objective of these assessments was to identify hazards and assess risks associated with the Project at the planning stage and determine risk acceptability from a land use safety planning perspective.

The PHA involved the following steps:

1. establishment of the study context
2. identification of hazards resulting from operations of the BESS and events with the potential for off-site impact (hazard identification)
3. analysis of the severity of the consequences for the identified events with off-site impact, i.e. fires and explosions (consequence analysis)
4. determination of the level of analysis and risk assessment criteria
5. analysis of the risk of the identified events with off-site impact (risk analysis)
6. assessment of the estimated risks from identified events against risk criteria to determine acceptability (risk assessment).

i Nearest receptors

Eight sensitive receptors are within 1 km of the study area. The nearest sensitive non-associated receptor is approximately 1,380 m from the BESS and substation areas (AC coupled centralised BESS). The nearest sensitive non-associated receptor to the distributed BESS is approximately 400 m from the proposed BESS (DC coupled decentralised BESS).

ii Hazard identification and risk analysis

Hazard Identification (HAZID) aims to identify all reasonably foreseeable hazards and associated events that may arise due to operation of the Project and define relevant controls through a systematic and structured approach, including review of risk assessments for similar projects; review of product specification sheets; literature research of past incidents involving similar BESS systems; review of standards; and consultation and feedback.

A HAZID register is provided in section 5.5 of the PHA (Appendix P) and the findings include:

- identification of 17 hazardous events
- incidents involving the BESS (fire and/or explosion) have the potential for escalation, affecting the entire BESS infrastructure. The PHA reviewed separation distances between the nearest sensitive receptor and proposed infrastructure for both the centralised and de-centralised BESS (nearest to the development footprint boundary) options and identified the following:
    - **Centralised BESS option** - The nearest sensitive receptor (R06) is approximately 1,380 m from the proposed BESS and substation areas
    - **De-centralised BESS option** – The nearest sensitive receptor (R18) is approximately 400 m from the proposed BESS. The next nearest sensitive receptor (R09) is approximately 628 m
- as the Project is situated in a rural area and there is a considerable separation distance to the sensitive receptors, consequences from BESS incidents are not expected to result in significant off-site impacts (serious injury and/or fatality to the public or off-site population)
- incidents not involving the BESS are expected to be localised and are not expected to result in significant off-site impacts.

iii Assessment against risk acceptance criteria

The identified hazards were assessed against HIPAP No. 4 criteria to qualitatively determine the resulting severity and likelihood rating pair using a risk matrix. Acceptance criteria was used to assess the risk to the off-site population.

For each event, the severity rating was qualitatively assigned based on the consequence description identified in the HAZID register using the category scale from AS/NZS 5139. The severity scale was used to assess impact for off-site population. For example, an event with a consequence outcome identified as ‘localised effects’ or ‘effects are not expected to have an off-site impact,’ was assigned an ‘Insignificant’ rating to indicate minimal impact to off-site population.

Likelihood ratings were assigned based on knowledge of historic incidents in the industry and in consultation with LSbp, taking into account the initiating causes and resulting consequences with controls in place. Of the 17 events identified, all were rated as ‘Very low’ risks with the exception of one ‘Medium’ risk event. The Medium risk event is related to an unauthorised person accessing the development footprint, resulting in vandalism/asset damage to the infrastructure, with potential for self-injury during the act. However, controls for this event are well understood and will be implemented accordingly.

All identified events are not expected to have significant off-site impacts. Based on study risk acceptance criteria, the risk profile for the Project is considered to be tolerable. The analysis found the Project is compliant with HIPAP 4 qualitative risk criteria. Qualitative risk results are shown in Table 6.37.

Table 6.37 Qualitative risk assessment results

Hazard	Infrastructure/area	Event	Consequence	Off-site consequence	Significant off-site impact?	Risk analysis (off-site and public impact)		
						Severity	Likelihood	Risk
Electrical	PV modules Solar arrays cable network Electrical conversion systems BESS Substation Transmission line	Exposure to voltage	• Electrocution • Injury and/or fatality to onsite employees • Injury and/or fatality to member of public due to touch and step potential	As the Project site is located in a rural area, no off-site impact is expected to members of the public.	No	Insignificant	Unlikely	Very low
Arc flash	PV modules Solar arrays cable network Electrical conversion systems BESS Substation Transmission line	Arc flash	• Arc blasts and resulting heat, may result in fires and pressure waves • Burns • Exposure to intense light and noise • - Injury and/or fatality to onsite employees	Localised effects, the effects are not expected to have an off-site impact.	No	Insignificant	Unlikely	Very low
Fire	Electrical conversion systems (i.e. inverters, transformers)	Fire on electrical conversion system equipment	• Release of toxic combustion products • Escalation to adjacent infrastructure • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance to the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low

Hazard	Infrastructure/area	Event	Consequence	Off-site consequence	Significant off-site impact?	Risk analysis (off-site and public impact)		
						Severity	Likelihood	Risk
Fire	BESS	BESS fire	• Release of toxic and/or explosive combustion products • Escalation to the entire BESS • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance between the BESS and the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
Fire	Substation	Substation fire	• Release of toxic combustion products • Escalation to adjacent infrastructure • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance from the BESS and substation areas to the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
Fire	BESS substation	Bushfire	• Escalation to adjacent infrastructure • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance between the BESS and the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
Chemical	Chemical storage	Loss of containment of flammable liquids from storage or during handling	• Fire, if ignited. • Injury to onsite employees	Localised effects (minor storage quantity), the effects are not expected to have an off-site impact.	No	Insignificant	Unlikely	Very low
Chemical	Vegetation management and landscaping	Exposure to hazardous material (herbicide/ pesticide)	Irritation/injury for personnel on exposure.	Localised effects, the effects are not expected to have an off-site impact.	No	Insignificant	Unlikely	Very low

Hazard	Infrastructure/area	Event	Consequence	Off-site consequence	Significant off-site impact?	Risk analysis (off-site and public impact)		
						Severity	Likelihood	Risk
Chemical	BESS	Release of battery electrolyte (liquid/ vented gas) from the battery cell	• Release of flammable liquid electrolyte • Vapourisation of liquid electrolyte • Release of vented gas from cells • Fire and/or explosion in battery enclosure • Release of toxic combustion products • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance between the BESS and the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
Chemical	BESS	BESS chiller unit or coolant leak	• Irritation/injury to onsite employee on exposure to leak (e.g. inhalation and skin contact) • Ingress of coolant to battery or other electrical components (battery enclosure) leading to short circuit and fire, resulting in injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance between the BESS and the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
Explosive gas	BESS	Generation of explosive gas	• Fire and/or explosion in battery enclosure • Release of toxic combustion products • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance between the BESS and the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low

Hazard	Infrastructure/area	Event	Consequence	Off-site consequence	Significant off-site impact?	Risk analysis (off-site and public impact)		
						Severity	Likelihood	Risk
Reaction	BESS	Thermal runaway in battery	• Fire in the battery cell and enclosure • Escalation to the entire BESS • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance between the BESS and the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
EMF	PV modules Solar arrays cable network Electrical conversion systems BESS Substation Transmission line	Exposure to electric and magnetic fields	• High level exposure (i.e. exceeding the reference limits) may affect function of the nervous system (i.e. direct stimulation of nerve and muscle tissue and the induction of retinal phosphenes) • Injury to onsite employees	No off-site impact expected. EMF created from the Project will not exceed the ICNIRP reference level for exposure to the general public.	No	Insignificant	Rare	Very low
External factors	BESS substation	Water ingress (e.g. rain, flood)	• Electrical fault/short circuit • Fire • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance from the BESS and substation areas to the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low

Hazard	Infrastructure/area	Event	Consequence	Off-site consequence	Significant off-site impact?	Risk analysis (off-site and public impact)		
						Severity	Likelihood	Risk
External factors	BESS substation	Escalated event from adjacent SSDs (i.e. solar and wind farms, BESS) (e.g. fire, blade throw)	• Fire • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance from the BESS and substation areas to the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low
External factors	PV modules Electrical conversion systems BESS Substation	Vandalism due to unauthorised personnel access and deliberate damage to project infrastructure	• Asset damage • Potential hazard to unauthorised person (e.g. electrocution)	Effects to unauthorised person are expected to be localised and not expected to have an off-site impact. The impact is to a member of public but occurs onsite. For a fire event at the BESS and substation areas, the effects are not expected to have an off-site impact as there is a considerable separation distance to the nearest sensitive receptor.	No	Major	Unlikely	Medium
External factors	BESS substation	Lightning strike	• Fire • Injury and/or fatality to onsite employees	No off-site impact expected as the Project is situated in a rural area and there is a considerable separation distance from the BESS and substation areas to the nearest sensitive receptor.	No	Insignificant	Unlikely	Very low

6.11.4 Mitigation measures

i Electric and magnetic fields

Electric and magnetic fields (EMF) are naturally present in the environment. They are present in the earth's atmosphere as electric fields, while static magnetic fields are created by the earth's core. EMF are also produced wherever electricity or electrical equipment is in use (i.e. household appliances and powerlines). Although adverse health impacts have not been established, the possibility of impact due to EMF exposure can't be ruled out.

The following factors and controls are identified to limit exposure to EMF:

- The design, selection, and procurement of electrical equipment for the Project will comply with relevant international and Australian standards.
- Location selection for Project infrastructure (separation distance to surrounding land uses including neighbouring properties and agricultural operations) and fencing within the Project development footprint boundary will assist to limit the exposure to EMF for the general public.
- Exposure to EMF (specifically magnetic fields) from electrical equipment will be localised and the strength of the field attenuates rapidly with distance. Duration of exposure to EMF for personnel onsite will be transient.

ii Battery energy storage system

A review of NFPA 855 was undertaken to determine the required separation distances between BESS units. As particular BESS units haven't yet been selected, assessment against NFPA 855 was made based on a generic battery system within a 20-foot (6.096 m) container.

The area allocated for the 'BESS compound' (centralised BESS option) is approximately 730 m x 150 m, equivalent to 109,500 m^2 (10.95 ha). The area required for a block of 16 battery units with two PCS and one auxiliary skid is 1,511.25 m^2, inclusive of clearances between the units. To provide the required capacity, approximately 64 blocks will be installed. This will require an area of 96,720 m^2 (9.67 ha), approximately 88% of the area allowed for the 'BESS compound'. The designated land area is determined to be sufficient to accommodate the proposed BESS units. It should be noted that apart from the BESS and associated equipment, no other infrastructure will be located in the 'BESS compound'.

For the distributed BESS option, 114 BESS compounds will be distributed across the Project's development footprint. Each compound will include eight battery units, four DC-DC converters and one PCS. The designated land area for each compound is sufficient to accommodate the proposed configuration, which includes clearances between the units.

The nearest sensitive non-associated receptor to the centralised BESS is approximately 1,380 m away from the BESS and the nearest sensitive non-associated receptor to the distributed BESS is approximately 400 m away. No off-site impact is expected as the BESS will be situated in a rural area with a considerable separation distance to the nearest non-associated receptor.

The following controls will be followed to mitigate BESS hazard risks:

- BESS configurations will follow specified clearances required by the manufacturer and/or applicable standards
- BESS fire protection/suppression system

- equipment and systems will be designed and tested to comply with relevant international and Australian standards
- external firefighting protocol (FRNSW and RFS)
- equipment will be procured from a reputable supplier
- independent owner's engineers' endorsement.

iii Other hazard control measures

The hazard register (Table 5.3 of Appendix P) identifies a range of controls that are required to ensure hazard consequence and/or likelihood is reduced or maintained for the Project. These measures include, but are not limited to, the implementation of the following during subsequent stages of the Project:

- fire management and emergency response plan (FMERP)
- engagement of trained, certified, reputable contractors
- site induction and substation training (high voltage areas)
- compliance with relevant standards, guidelines, and protocols
- design and procurement procedures
- testing and maintenance procedures
- signage and personal protective equipment
- inclusion of asset protection zone (APZ) to be provided for all structures and associated buildings and infrastructure
- appropriate boundaries and fencing.

Table 6.38 summarises the Project's mitigation measures relating to hazard and risk.

Table 6.38 Hazard and risk mitigation measures

Reference	Mitigation measure	Timing
HR01	Equipment and systems will comply with relevant international and Australian standards and guidelines (i.e. AS/NZS 5139, AS 2067)	PC, C, O
HR02	BESS units will be certified to UL 9540A and installed in accordance with manufacturer instructions and required separation distances	C
HR03	A minimum 10 m APZ will be provided for all structures, buildings, and infrastructure associated with the solar farm and a minimum of 11 m APZ between the accommodation facility and grassland	C, O
HR04	LSbp will review investigation reports on the on the 2021 Victorian Big Battery Fire to ensure scenarios (including fire propagation to the topside of the adjacent BESS units) and findings have been considered in designing the Project's BESS.	PC
HR05	LSbp will consult with FRNSW to ensure relevant aspects of fire protection measures have been included in Project design.	PC

Reference	Mitigation measure	Timing
HR06	A fire management and emergency response plan (FMERP) will be developed for the Project.	PC
HR07	Appropriate security fencing, warning signs, and cameras will be installed, and onsite security protocols implemented.	C, O, CR
HR08	BESS fire detection, protection/suppression systems will be installed.	C
HR09	Earthing, a lightning protection mast, and surge protection devices will be installed at the BESS substation.	C
HR10	The PHA will be reviewed and updated once the design has been finalised and a BESS selected, to ensure that aspects considered (i.e. control measures, clearances between BESS units, separation distance) and assessment made in the PHA is still valid.	PC

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.11.5 Conclusion

A PHA was completed to identify hazards and assess risks associated with the proposed operations of the Project at the planning stage to determine risk acceptability from a land use safety planning perspective.

A Level 1 PHA (qualitative) was completed following the methodology specified in HIPAP No. 6 *Hazard Analysis* and the *Multi-Level Risk Assessment* guideline for assessment against the HIPAP No. 4 criteria.

The PHA concluded that:

- for all identified events associated with the proposed operation of the Project, the resulting consequences are not expected to have significant off-site impacts
- the Project meets the HIPAP No. 4 qualitative risk criteria.

Upon any modifications made to the Project's design, specifically the BESS, the PHA should be reviewed and updated as required to ensure that the aspects considered (i.e. control measures, clearances between BESS units, separation distance to sensitive receptors) and assessments made in the PHA is still valid. Similarly, once the Project's design has been finalised and a BESS manufacturer has been selected, the PHA should be revisited and updated as required.

6.12 Bushfire

6.12.1 Introduction

A bushfire strategic study (BSS) was completed by Cool Burn Pty Ltd (Cool Burn 2023) and is provided in Appendix Q. The BSS assesses the risk of bushfire in accordance with relevant legislation and guidelines, including *Planning for Bushfire Protection* (PBP) (NSW RFS 2019).rThe BSS provides protection measures to mitigate potential bushfire impacts to the Project andaddresses bushfire related SEARs as described in Appendix A. The BSS included consultation with the Orana District Rural Fire Service 1 from NSW Central West Region.

6.12.2 Existing environment

The likelihood of a bushfire starting and spreading within a particular landscape can be assessed through consideration of vegetation, terrain, regional fire weather, historic fire occurrence, potential ignition sources, access, and suppression. Bushfire season in the region generally commences1 October and concludes 31 March.

Prevailing weather conditions in the area during bushfire season are north to westerly winds created by consecutive high-pressure systems causing high daytime temperatures. Hot winds are usually very dry with low relative humidity, often dipping below 20%.

Slopes supporting bushfire prone vegetation affect fire behaviour, rate of spread, and intensity. The study area is predominantly located on a lower lying valley and plains. The slopes are generally flat at the macro scale, with potential for some 0–5-degree slopes and short, steeper slopes associated with riparian areas. Vegetation within and surrounding the study area broadly consists of:

- grassy woodland and riparian vegetation associated with Sandy Creek and tributaries
- grassland (native pastures and cropping)
- cleared or partially cleared and managed for agriculture.

The study area and development footprint are mapped as Category 1 and Category 2 bushfire prone land; however, no detailed fire history has been recorded for the study area and it is not documented as a fire path. Modelling shows the study area has a lower fire intensity risk because the managed and modified landscapes lack woody vegetation types, and positioning on lower slopes and plains subsequently avoids steep slopes and fire runs.

Existing access road infrastructure (public and private access roads) across the study area has substantial potential for the purpose of firefighting, suppression, and safe evacuation, which will be increased with future access tracks and creek crossings.

The Project site, including the temporary workforce accommodation facility, is located in the Northwestern and Lower Central West Plains fire districts with a Fire Danger Index (FDI) of 80 and a Grassland Fire Danger Index (GFDI) of 110. The facility is located on lower slopes on a lower lying valley and plains.

6.12.3 Potential impacts

The guideline *Planning for Bush Fire Protection 2019* (NSWRFS 2019) is applicable to all development on bush fire prone land in NSW. As the study area is mapped as Category 1 and Category 2 bushfire prone land, the guideline is applicable. The study area is considered to have 'moderate risk' of bushfire, with the likelihood considered 'possible', but 'unlikely.'

The Project includes a Sandy Creek riparian area with a 50 m buffer at the top of the creek bank, of which 20 m out from the upper creek bank will be targeted as woodland regeneration, and the remaining 30 m managed as derived native grasslands (as existing, managed with assisted grazing). Second order creeks will be managed as existing, to a grassland habitat, protecting remnant trees where present, but with the capacity to manage fuel loads (grazing, mechanical management). This buffer area includes vegetation which could provide fuel for bushfires.

The Project has potential to introduce people who may be unfamiliar to the area for the purpose of project construction and decommissioning. A consistent site access approach will be established and maintained throughout the life of the Project, to help non-locals familiarise themselves with access, particularly for emergency management. Creek crossings are noted as potential pinch points for traffic management.

Alternate access provisions for the Project are provided for Project and emergency services personnel to mitigate the risk of access route obstruction which could negatively impact accessibility and egress in the event of a bushfire.

Emergency services capability will be supported by ensuring access and water volumes are maintained for any bushfire emergency response. As the locality does not have reticulated water supplies, the Project will be serviced by static water supply dedicated for community fire protection.

The Project will result in a reduction of unmanaged bushfire prone grassland vegetation and connectivity to the locality such that adjoining land uses would potentially benefit from an overall reduced bushfire risk and increased capacity for bushfire detection and emergency response.

a Temporary workforce accommodation facility

The area where the temporary workforce accommodation facility is proposed is mapped as bushfire prone and could potentially be exposed to a bushfire threat. The workers accommodation facility is located on lower slopes, on a lower lying valley and plains. The slopes are generally flat with potential for some 0-5-degree slopes.

Increased resident densities on existing bushfire prone lots may heighten the level of risk to occupants. Several mitigation measures will be implemented to effectively minimise temporary workforce accommodation facility occupants, including a minimum 11 m APZ setback from grasslands; construction of the facility in accordance with the relevant Australian Standards; provision of appropriate access for heavy vehicles and an emergency access track from the facility linking to the emergency access network for the solar farm; and the provision of suitable water supplies and connection points. These mitigation measures are summarised in Section 6.12.4.

6.12.4 Mitigation measures

Table 6.39 outlines mitigation measures to be implemented to manage the risk of bushfire for the Project.

Table 6.39 Bushfire mitigation measures

Reference	Mitigation measure	Timing
BF1	An APZ will be established including: • minimum 10 m wide APZ around the PV array perimeter • minimum 11 m wide APZ around the accommodation facility • maximise APZ around critical and sensitive infrastructure • APZ to be managed as an Inner Protection Area (IPA) for the life of development.	C, O, CR
BF2	Landscaping will be established and managed as: • manage (slashing) a 5m fire break at the perimeter fences • APZ management to manage fuel loads by slashing as required • grassland under the PV array to be managed to <10 cm (grazing/slashing) to prevent fire spread and impacts to critical components A Bushfire emergency management operations plan (BEMOP) will be developed (as per BF6) to guide landscape management, monitor and reduce potential fuel loads surrounding the solar farm and APZ areas via ongoing rural activities (e.g. slashing, grazing).	C,O
BF3	All buildings (BESS, substation buildings, offices etc) will be designed to provide for minimum ember protection consistent with consideration of construction standards for bushfire prone areas (AS3959-2018).	C, O
BF4	Water supplies will be available for bushfire fighting as: • minimum 20 kL steel tank dedicated water storage to be strategically located in consultation with NSW RFS, to allow for permanent emergency supply and ease of access • tank will have fast fill water connections (65mm Storz fittings) and suitable access provisions for Cat 1 fire fighting vehicle (weight load and manoeuvrability).	C, O

Reference	Mitigation measure	Timing
BF5	Access to the Project site will be: • main access, internal roads, and alternate egress to provide for safe, reliable, and unobstructed passage by a Cat 1 firefighting vehicle as per Section 3.5 of this document and maintained for the life of the development • two alternate emergency egress points on to Tallawonga Road and two emergency egress points on Sandy Creek Road.	C, O, CR
BF6	A BEMOP will be prepared and implemented for the Project in consultation with the local NSW RFS District Office and communicated to relevant stakeholders. The BEMOP should include: • detailed measures to prevent or mitigate fires igniting • 24-hour emergency contact details, including alternative telephone contact • inductions for construction personnel on bushfire risk management and other fire related risks that could present at the Project site, the Project bushfire contingency plan and emergency response procedures • availability of fire-suppression equipment, access, and water including site infrastructure plans and site access and internal road plans • location of hazards (physical, chemical, electrical) that will impact on the firefighting operations and procedures to manage any identified hazards during firefighting • storage and maintenance of fuels and other flammable materials • notification to the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during bushfire danger period to ensure weather conditions are appropriate • appropriate bush fire emergency management planning • additional matters as agreed and required by the NSW RFS District Office.	PC, C, O, CR
BF7	The accommodation facility will have a static water and hydrant supply, complying with the following recommendations of PBP: • a minimum 50,000L static water supply (above ground storage steel or concrete tank) • connections suitable for firefighting purposes located within the workforce accommodation facility, being 65 mm Storz outlets • fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2021 • fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2021 • a fire hose reel system be constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005 • unobstructed access to water supply points at all times • all above-ground water service pipes are metal, including and up to any taps.	C
BF8	Temporary workforce accommodation facility electricity and gas provisions to the property will be installed to relevant standards and will limit the possibility of ignition of surrounding bushland or the fabric of buildings, and these elements can be engineered into any future design scenarios.	C
BF9	APZ and landscaping across the workforce accommodation facility infrastructure area will be managed to ensure ongoing protection from the impact of bushfires. The entirety of the proposed temporary worker accommodation facility will be managed as an IPA in accordance with the requirements of Appendix 4 of PBP.	C
BF10	Construction standards for the accommodation facility will be: • BAL 29 level of construction as per Section 3 & 7 of AS 3959-2018 and Chapter 7.5 PBP to perimeter structures • BAL 19 and BAL 12.5 level of construction as per Section 3 & 5-6 of AS 3959-2018 to internal structures • access roads and tracks within the accommodation facility infrastructure area will comply with Table 5.3b of PBP.	C

Reference	Mitigation measure	Timing
BF11	The provision of suitable and appropriate bushfire emergency management planning for the occupants of the accommodation facility as follows: • A FMERP will be prepared by the operator consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and the AS 3745:2010*.	PC, C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.12.5 Conclusion

The BSS determined that:

- the Project site is suitable for development in the context of bushfire risk, but potentially constrained by environmental values
- new development on bushfire prone land can comply with the performance as detailed in PBP 2019 but recognises some environmental impacts must be considered and approved
- the solar farm and ancillary infrastructure can satisfy the performance criteria detailed in Chapter 8.3.5 of PBP 2019
- the temporary workforce accommodation facility can provide acceptable solutions and meet the performance criteria as detailed in Chapter 5 PBP 2019
- planning and design can avoid performance-based solutions
- planning and design can provide for adequate infrastructure associated with emergency evacuation and firefighting operations
- planning and design will facilitate appropriate ongoing land management practices.

The BSS concluded that with the provisions of bushfire protection measures and recommendations summarised in Section 6.12.5, the Project will comply with relevant provisions (aims and objectives) of *Planning for Bush Fire Protection* 2019 and therefore is compliant with the Project's SEARs.

6.13 Social

6.13.1 Introduction

A social impact assessment (SIA) was prepared for the Project by EMM (EMM 2023h) and is attached as Appendix R. The SIA was prepared in accordance with the *Social Impact Assessment Guideline* (DPIE 2021) and satisfies relevant social impact related SEARs as summarised in Appendix A.

6.13.2 Existing environment

The SIA study area is defined with reference to stakeholders who could potentially be directly or indirectly affected by the Project. This includes landowners, nearby neighbours, community members, businesses, service providers and Indigenous groups who may have an interest in the Project or may be directly or indirectly impacted.

The SIA study area includes two parts. Firstly, the local study area, which comprises the local area and nearby townships and communities that are likely to experience direct social impacts from the Project (i.e. impacts related to local social infrastructure and services; road infrastructure; amenity; workforce; local business and industry; local housing and accommodation; and community health and wellbeing). Nearby townships may also experience a range of positive and negative cumulative impacts.

Secondly, the regional study area, which includes the geographic areas likely to experience fewer direct, but more indirect social impacts of the Project. Indirect impacts are associated with use of infrastructure; supply chains; roads; transportation of goods, materials and equipment; the movement of workers; and cumulative impacts arising from other projects in the area.

The SIA study area is shown in Figure 6.14.

The Project site is within the LGAs of Warrumbungle Shire Council and Dubbo Regional Council, and is located across the localities of Elong Elong, Goolma, and Dunedoo, away from towns, in an area with very low population density and with a small number of residential receptors. There are several scattered rural residential properties within and surrounding the development footprint, including agricultural buildings and infrastructure (i.e.. silos and livestock yards). The Project site and surrounding area have been modified by historical land use practices and past disturbances associated with land clearing, cropping, and intensive livestock grazing.

In 2021, the local study area had a total population of 1,334 people, of which the majority (82.2% or 1,097 people) resided within Dunedoo, which is the closest township to the Project, located a 30-minute drive north-east. Between 2016 and 2021, the population of the local study area experienced a negative growth rate of -7.2%, contrasting with the positive growth in nearby regional communities (11.3%) and NSW (8.1%). This was particularly attributed to population decline which occurred in Dunedoo, with a 10.2% decrease between 2016 and2021. Housing availability is also low within the local study area.

The local study area had a higher proportion of people aged over 65 years (29.5%) than the NSW average and lower unemployment rates. Within the local study area, the largest industry of employment is agriculture, forestry, and fishing (33.6%). This contrasts with health care and social assistance being the largest industry for the nearby regional communities (20.0%), and NSW (14.4%).

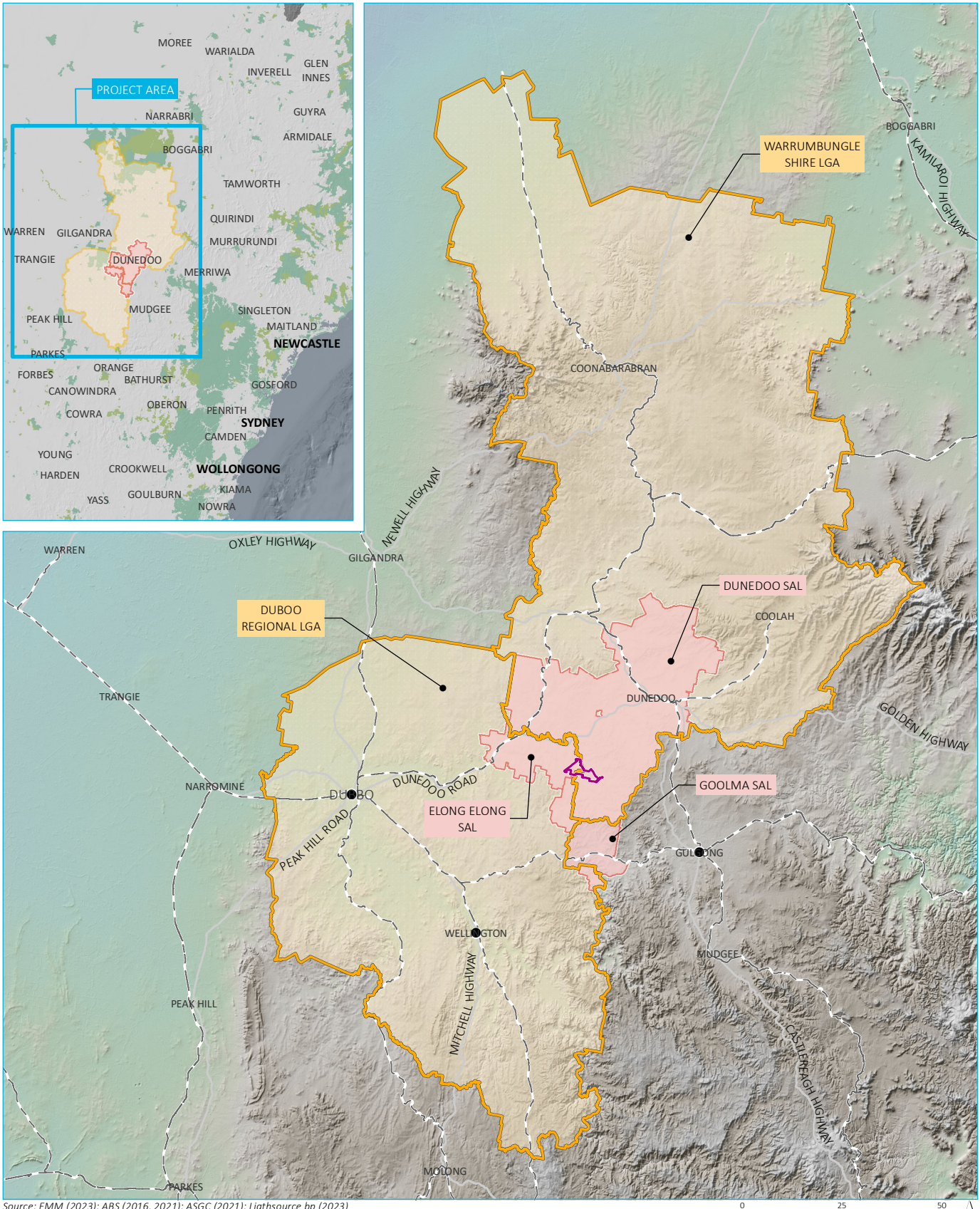
Dubbo Regional LGA, located in north-western NSW in the Far West and Orana Region, about five hours' drive from Sydney, is one of the fastest growing and largest LGAs in regional NSW (Dubbo Regional Council 2022). The LGA hosts a mix of agricultural, urban, and industrial land, along with significant areas of natural bushland and state forest. The population is relatively young, with a median age of 36 years, and the unemployment rate is very low (ABS 2021a). Dubbo is the main regional centre of the LGA, located about a 70-minute drive west of the Project site. It has the largest population out of the nearby regional communities with 38,783 people and experiences a higher rate of homelessness.

Dubbo Regional LGA has fewer properties in the housing and rental market, resulting in higher sales and rental prices, increased reliance on temporary housing, and reduced availability of emergency and/or crisis accommodation. A low unemployment rate results in ongoing worker shortages, worker poaching and salary hiking. The small unemployed cohort experience barriers to employment linked to intergenerational patterns and low skill levels.

Warrumbungle Shire LGA is situated on the north-western slopes and plains of NSW, about two hours' drive from Dubbo. Coonabarabran is the largest centre in Warrumbungle Shire LGA, providing retail, agricultural, and business services to surrounding areas. The LGA is characterised by an older population, where the median age (50 years) is substantially higher than the NSW average (38 years) (ABS 2021a). Employment opportunities are a key challenge within the LGA.

Tourism within the SIA study area includes Taronga Western Plains Zoo; Old Dubbo Gaol; Wiradjuri Tourism Centre; and Warrumbungle National Park, which contains the Warrumbungle Ranges and Australia's first dark sky park. There is also a range of cultural, sporting, and recreational attractions including the Bush Poetry Festival; the Model T Ford National Rally; Under Western Skies Festival; and Stock Route Country Music Festival.

The Project site is located within the CWO REZ with many renewable energy projects at various stages of planning or operation in the vicinity of the Project. As such, community consultation found there are community concerns regarding land use conflicts,; visual amenity; access to housing and social infrastructure; pest management; road safety; and social cohesion as a result of the Project and other surrounding renewable energy projects.



Source: EMM (2023); ABS (2016, 2021); ASGC (2021); Ligthsource bp (2023)

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KEY

- Study area
- Local study area
- Nearby regional community

Existing environment

- Local government area
- Rail line
- Major road
- Regional area
- NPWS reserve
- State forest

SIA study area

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.14

EMM
creating opportunities

6.13.3 Potential impacts and benefits

A risk-based framework as outlined in the SIA Guideline Technical Supplement (DPE 2021a) was adopted for the assessment of potential social impacts. Findings from technical reports and stakeholder perceptions have been used to capture expert and local knowledge in the impact assessment. Perceived and actual positive and negative impacts were considered.

A summary of potential social impacts and benefits is shown in Table 6.38.

Table 6.40 Summary of potential social impacts and benefits

	Matter	Benefit type	Details	Who/what would be impacted
	Transition to renewable energy	Positive & negative	• Intergenerational equity • Reduction in carbon emissions • Positive impact on growth of renewable energy generation • Positive impact on energy storage capacity • Stakeholders can feel their input is inconsequential in decision-making • To many stakeholders, not being involved in decision-making processes implies that impacts on land use and amenity may be more significant than is being conveyed, especially when considering clusters of proposed infrastructure within the wider CWO REZ area.	• Local residents • Regional residents
	Employment	Positive	• Employ local people • Could provide employment for vulnerable groups incl. youth, women, First Nations • Contract local businesses • Approx. 20% of construction workforce (49 workers) sourced from local area • 80 FTE indirect jobs during construction • 6 FTE jobs during operation	• Local residents • Community groups • Local businesses • Regional businesses
	Goods and services	Positive	• Procure various goods and services to construct and operate the Project • Procurement of goods and services within the region injects wealth into local economies	• Local businesses • Regional businesses

	Matter	Benefit type	Details	Who/what would be impacted
	Capital investment and access fees	Positive	• $400 million in capital investment • $5.24 million per year in access fees (paid to regional investments for community benefits, employment, training, and regional development)	• Community groups • Local residents • Local businesses • Regional businesses
	Income security through increased trade for retailers and accommodation providers	Positive	• Some Project personnel will likely choose to stay in short-term accommodation • Non-resident workers likely to increase patronage at local businesses	• Local businesses • Regional businesses
	Demand for short-term accommodation	Negative	• decreased availability for those seeking emergency accommodation • decreased availability for tourism • decreased availability for those visiting family or friends	• vulnerable populations • tourists • families and friends of local and regional residents
	Increased competition for labour and services	Negative	• existing worker shortage • high demand for business services associated with renewable project supply chains • Project may generate additional competition for local goods and service providers • Higher competition could price-out smaller businesses which could impact commercial viability or reduce profitability • Higher competition could result in closures of small businesses	• Workers • businesses

	Matter	Benefit type	Details	Who/what would be impacted
	Reduced access to housing	Negative	• extended duration Project workers may seek rental housing • additional demand could reduce supply available to residents in Wellington, Dunedoo, Gulgong and Dubbo • additional demand could decrease rental affordability • Decreased availability and affordability contributes to homelessness and risk of homelessness • Dubbo Regional Council noted local area has limited capacity to absorb housing demand generated by major projects	• Vulnerable populations • Local residents • Regional residents
	Reduced access to social services	Negative	• Project construction workers may increase demand on social and community services • Residents may experience reduce access to and availability of services (i.e. health and emergency)	• Local residents
	Increase in demand for social services	Positive & negative	• local and regional development can increase the need for funding • temporary population growth may increase demand for a variety of health services • yearly access fees for projects that intend to connect to energy network infrastructure includes a component dedicated to community or employment investments • access fees could be used to provide additional capacity for social infrastructure including health and emergency services	• Local residents • Local service providers • Regional service providers

	Matter	Benefit type	Details	Who/what would be impacted
	Changes to land use within the Project site	Negative	• to enable Project development, the associated private landowner will alter current agricultural land uses • lost productivity (relatively minor proportion regionally) • some agricultural land use could be retained with sheep grazing amongst solar panels	• Local agricultural productivity • Regional agricultural productivity • Land use
	Changes to adjacent agribusiness properties	Negative	• Some landowners felt the Project will "land lock" properties, restricting commercial expansion • no agricultural landholdings will be fragmented • no material impact is expected in worst-case scenario for land use changes associated with the roll out of renewable energy infrastructure across NSW • some 'small local effects' could be seen resulting from large number of projects in the region	• Adjoining land owners • Agribusinesses
	Local amenity	Negative	• Changes to visual character of local landscape may occur • Line of sight landowners and neighbours may be impacted • Visual impacts may cause stress and anxiety for nearby residents and broader community • Landscape changes may result in reduced enjoyment of surrounds and reduced sense of community • Multiple projects can result in cumulative impacts on how the landscape is experienced	• Nearby neighbours • Broader community

	Matter	Benefit type	Details	Who/what would be impacted
	Noise	Negative	• Project activities could generate additional noise for landowners near the Project site • Additional trucks along haulage routes could increase traffic noise • Noise can disrupt quality of life • It is not anticipated that noise would reach levels classified as 'highly noise affected'	• Nearby neighbours • Residents along haulage routes
	Cultural heritage	Positive	• Opportunities for connection to and caring for Country at the Project site have been identified • Opportunities for members of local First Nations community to access Country at the Project site (previously restricted due to private ownership) • Procurement targets for First Nations individuals and businesses including general labourers during construction and salvaging incidental finds • Encouraging First Nations community members and RAPs to be engaged in multiple projects in the area will facilitate a more meaningful understanding of cultural values of the area and opportunities for heritage interpretation.	• First Nations community
	Cultural Heritage (places, sites and artefacts)	Negative	• disturbances to culturally important places, sites, or artefacts could occur • As there are multiple projects either planned, or in development in the region, there will be some cumulative impact to the cultural assemblage of the region.	• First Nations community

	Matter	Benefit type	Details	Who/what would be impacted
	Community	Negative	• The local area will experience a very large population increase (accommodation facility will host up to 350 workers) • Population increase has potential to change character of local area • Change in character of local area could lead to changed community identity, reduced social cohesion • Impacts could be exacerbated with addition of other projects	• Local residents
	Safety	Negative	• fear of increased crime due to population increase • Actual or perceived increased risk to safety due to Project generated traffic during construction • Perceived risk of increased fire danger	• Local residents • Road users

Table 6.41 details the mitigation measures to be implemented to manage the Project's social impacts.

Table 6.41 Mitigation, management and/or enhancement measures

Reference	Mitigation measure	Timing
SO1	Engagement will continue with nearby and adjacent landholders, local councils, local Aboriginal community and Project RAPs and other key stakeholders. A complaints and grievance procedure will also be implemented.	PC, C, O, CR
SO2	Online and offline methods will be used to share and register interest in Project opportunities.	C, O, CR
SO3	An Aboriginal participation plan (APP) will be developed in consultation with First Nations stakeholders to optimise local capacity and aspirations through targeted participation initiatives within the regional area. The APP would sit under an Industry and Aboriginal Participation Plan (IAPP). The IAPP would be contractually binding upon award of Access Rights. Agreed commitments will be measurable, and a report of progress to the local First Nations community would contribute to the measurement of outcomes. Cultural awareness training will also be provided to key site personnel.	C, O, CR
SO4	A local procurement strategy will be developed to plan regular engagement with local businesses and the Dubbo Chamber of Commerce to establish relationships with the Project.	C, O, CR
SO5	Regular engagement will be undertaken with local businesses to advise of construction periods and the potential increase in trade or patronage. This provides these businesses with an opportunity to plan as required to maximise benefits of increased demand, and its associated revenue.	C

Reference	Mitigation measure	Timing
SO6	Engagement will be undertaken with local council, local businesses and the Dubbo Chamber of Commerce will inform an understanding of opportunities and limitations for a procuring local goods and services, as well as aspirations amongst local businesses.	C
SO7	Use of the Project's accommodation facility will be prioritised, and recruitment of local workers for the construction workforce will be maximised where possible. Non-resident workers who choose not to stay in the accommodation facility will be encouraged to seek accommodation across surrounding towns to reduce the impact on any one locality.	C
SO8	In relation to health services, engagement with Dubbo Regional and Warrumbungle Shire Councils will be undertaken to identify potential service limitations and implement measures such as provision of on-site first aid facilities to reduce competition for GP services closest to the Project site. Where safe to do so, non-resident workers will be encouraged to travel to regional health centres with higher capacity (i.e. Dubbo CBD) on their days off, to relieve impacts on services closest to the site.	C
SO9	A Community Engagement Plan and Worker Code of Conduct will be implemented to mitigate perceived privacy and public safety risk.	C
SO10	Undertake community engagement to explain the mitigation measures in relation to traffic movements associated with the Project to reduce the perceived public safety risk due to increased traffic from the Project.	PC, C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.13.5 Conclusion

The SIA study area was defined to reflect the geographic distribution of different types of social impacts and benefits. The local study area includes communities which directly surround the Project and are most likely to experience direct social impacts. The regional study area was identified as the area which may experience broader socio-economic effects.

Perceived and actual Project impacts are largely associated with the influx of the construction workforce, including impacts to labour and service competition; access to housing and services; and changes to the local community dynamic due to the presence of workers. Notably, a temporary workforce accommodation facility has been included in the Project to reduce potential impacts on housing and accommodation in the region.

The regional study area may experience more indirect impacts associated with use of infrastructure; supply chains; transportation of goods, materials and equipment; employment; accommodation demand; and movement of workers, along with cumulative impacts arising from other projects in the area.

An adaptive management approach is proposed, allowing LSbp to manage and respond to changing circumstances and new information over time through ongoing monitoring and periodic review of mitigation strategies, allowing for modification if required. An adaptive approach will ensure the effective management of social impacts identified in the SIA and the enhancement of social benefits experienced by the community.

6.14 Economic

6.14.1 Introduction

An Economic impact assessment (EIA) was undertaken by Ethos Urban and is provided in Appendix S. The EIA identified economic conditions and potential economic impacts and benefits. The EIA satisfies economic related SEARs as detailed in Appendix A. The EIA study area comprises Dubbo Regional Council LGA, Warrumbungle Shire Council LGA, and Mid-Western Regional Council LGA.

6.14.2 Baseline Regional economic profile

The population of the EIA study area totalled 90,480 people in June 2021 (ABS 2021a), with the population expected to grow by +0.7% per annum between 2022 and 2036. The EIA study area includes a labour force of approximately 45,920 people, with an unemployment rate of 3.2%, which is lower than that of NSW (4.2%).

The EIA study area includes around 1,580 construction businesses, which is 17% of all businesses within the EIA study area. Other businesses which could support the Project either directly or indirectly make up approximately 24% of all businesses in the EIA study area and include retail; accommodation and food services; rental, hiring and real estate services; and healthcare and social assistance.

6.14.3 Economic impact assessment

i Project investment

LSbp estimates the total cost of the Project to be approximately $1.3 billion. Major investment costs are associated with the purchase of PV panels and associated equipment; battery storage components; and civil, electrical and grid connection works.

Ethos Urban estimates around 15% of construction investment is generally retained within the host EIA study area, indicating approximately $179 million in wages (ABS 2021b). Contracts and other service provisions may be generated for the EIA study area's economy over the 22-28 month construction phase.

ii Project employment

Project employment is assessed in terms of direct jobs (i.e. site-related) and indirect (or flow-on) jobs in the local and wider economies (i.e. jobs that are generated through the industrial and consumption impacts of the initial investment). As of 2021, approximately 32% of employed residents within the EIA study area were broadly aligned with the skills required for construction of the Project (ABS 2021a).

a Construction phase

Direct construction employment

An average of 245 FTE jobs will be generated over the construction phase, expected to be around 22-28 months. That is, on average 245 FTE jobs will be sustained for each of the 22-28 months of construction activities. However, actual workforce numbers will vary from month to month depending on the intensity of construction at the time. At the Project's peak, which may last for several months, 350 FTE positions will be supported by on-site construction activities.

It is anticipated that approximately 20% of Project workers will be sourced from within the EIA study area, providing new opportunities for unemployed job seekers (subject to appropriate skills match), or 'back filling' employment opportunities associated with jobs vacated by workers taking up Project employment.

Based on LSbp's experience of solar farm construction projects in similar rural locations, the following employment split is considered realistic:

- 20%, or 50 FTE jobs sourced from within the EIA study area (local employment)
- 80%, or 195 FTE jobs sourced from outside the EIA study area (non-local employment).

The Project also has potential to provide new opportunities for workers who are beginning or seeking to transition from the mining sector to the renewable energy sector. This transition is predominately driven by Global, Federal, and State reduced emissions targets associated with electricity generation. At the time of the 2021 Census, approximately 6% of the EIA study area's resident labour force (1,700 workers) were employed in the mining sector.

Indirect construction employment

In addition to direct (onsite) jobs, employment will be generated indirectly through the employment multiplier effect. By applying an industry-standard multiplier for the construction industry of 1.6 (based on ABS Type B multipliers), the Project is estimated to generate an additional 390 indirect FTE jobs over the construction period. At the Project's peak, 560 indirect FTE positions will be supported by on-site construction activities based on relevant multipliers.

Indirect or flow-on jobs (which captures supply chain and consumption effects) include those supported locally and in the wider economy (including within other parts of NSW and nationally), as the economic effects of the capital investment flow through the economy. Indirect employment creation in local and regional economies includes jobs supported through catering; accommodation; trade supplies; fuel supplies; transportation; food and drink etc.

For the purposes of this assessment, it is assumed that 20% of indirect jobs or 80 FTE jobs (rounded) are supported on average during the construction phase in the EIA study area. This assumption is made with reference to findings from completed renewable energy projects in regional areas, where generally 20% share of indirect jobs is applied and noting the significant influx of non-local workers (and their spending) likely to be associated with the Project.

In total, an estimated 910 direct and indirect FTE jobs will be supported during peak construction of the Project.

b Operational phase

Direct operational employment

Approximately 10 FTE direct jobs will be supported locally (on-site) on an ongoing basis through operation and maintenance of the Project.

Indirect operational employment

Several additional jobs will also be supported indirectly through the employment multiplier effect. By applying an industry-standard multiplier for the electricity industry of 2.9 (based on ABS Type B multipliers) to the direct operational and maintenance jobs, a further 30 FTE permanent jobs (rounded) will be generated in the wider State and national economies, with some of these jobs supported locally through supply chains and consumption impacts.

It is assumed that 20% of indirect operational jobs, equating to approximately 6 ongoing FTE, are created in the EIA study area. Operational-related employment is for the lifetime of the Project (i.e., 40 years); therefore, while ongoing job creation is relatively small, it represents new long-term employment opportunities at a local, regional, and national level.

iii Business participation assessment

Large infrastructure projects located in regional areas are generally, where possible, serviced locally or from within the immediate region due to cost efficiencies (lower transport, labour costs etc).

Construction is a specialisation of the region's economy as indicated by the EIA study area's workforce structure (by occupation and industry). The EIA study area includes around 1,580 construction businesses, which is 17% of all businesses within the EIA study area. Other businesses which could support the Project either directly or indirectly make up approximately 24% of all businesses in the EIA study area and include retail; accommodation and food services; rental, hiring and real estate services; and healthcare and social assistance.

iv Housing and commercial accommodation sector impacts

It is estimated that approximately 280 non-local FTE workers may need to be accommodated in the region during the Project's peak construction. The EIA study area currently has a capacity of approximately 1,744 rooms and cabins in commercial accommodation in locations within a 60-minute drive of the Project site.

Assuming each non-local worker requires individual accommodation (280 rooms), 16% of this accommodation stock will be required at peak times to service the Project if all workers chose this type of accommodation. However, this requirement is likely to be lower as some workers may to choose to be accommodated in caravan/holiday parks (powered sites), B&Bs, shared private short or long-term rentals (i.e.. vacant houses, holiday homes, Airbnb properties) or stay with family or friends (where possible) rather than in commercial accommodation. Additionally, other workers may share motel rooms/cabins etc. to reduce personal costs. Currently there are 754 private short-term rentals on the market in the EIA study area, with an additional 4,040 unoccupied dwellings, some of which may be released to the market to support the Project.

Unmitigated, there is significant potential for the cumulative impacts of multiple concurrent infrastructure projects in the region to constrain the accommodation supply in the EIA study area's accommodation sector.

However, LSbp proposes to develop an on-site temporary workforce accommodation facility with capacity up to 350 personnel. The facility's operation will assist in reducing pressure on the EIA study area's commercial accommodation and rental markets.

v Local wage spending stimulus

Out of area workers, comprising approximately 80% of the Project's workforce, will earn an estimated $28.9 million in wages (2022 dollars) combined, over 24 months. A share of these wages will be spent in the EIA study area, where the workers will be based. An estimated $21.7 million in wages (2022 dollars) will likely be directed to local and regional businesses and service providers during the construction period. Expenditure will likely include housing, retail, recreation, personal medical, and other services.

vi Agricultural impacts

The study area covers 1,713 ha (approximately), which is primarily used for agricultural sheep and cattle grazing, with some broad-hectare cropping. The total annual value of agricultural production of the Project site is estimated to be in the order of $1,427,216 (rounded) considering the Land and Rehabilitation Assessment (EMM 2023c). This figure represents the agricultural value to the Project site itself, and excludes the value generated in broader supply chains.

A production value of $1,427,216 is approximately 0.3% of total (local) agricultural value generated in the EIA study area annually (this comes to approximately $452,000,000 or $0.4 billion). When considered at the regional level, the loss of agricultural land associated with the Project is negligible from an economic perspective.

Existing agricultural production at the Project site currently supports 1.5 FTE jobs, which are estimated to continue to be supported with the implementation of sheep grazing at a stocking rate equivalent to 75% of current operations.

vii Ongoing economic stimulus

Land will be leased to LSbp to host the Project, which could provide a local stimulus through investment in farming or other activities through business and individual consumption impacts associated with the host landowners.

It is estimated that LSbp will be required to pay Warrumbungle Shire Council and Dubbo Regional Council a total of $4.5 million in council rate payments over the lifespan of the Project. Additionally, the Project will support 16 FTE jobs in the EIA study area (direct and indirect) which will provide an estimated stimulus within the EIA study area of approximately $1.03 million (2023 dollars) in Year 1 of operations. Over the 40-year lifespan of the Project, the 16 local jobs supported by the Project will generate economic stimulus of $78 million.

The total economic stimulus associated with the operation of the Project is estimated at approximately $210 million (rounded) over 40 years, (2023 dollars, CPI inflated) relating to operational wage stimulus, community fund payments, and net land tax revenue to Council.

viii National grid supply benefits

The Project has the potential to provide sufficient renewable energy to support the annual electricity needs of the equivalent to approximately 253,419 NSW households, which is seven times the annual electricity requirements of the EIA study area.

The Project will provide renewable energy contributing to the reduction of greenhouse gases across NSW, displacing 1.2 million tonnes of CO_2 in the Project's first year of operation.

ix Decommissioning

Decommissioning will support significant employment, business contracts and provide a spending stimulus to the EIA study area over the decommissioning period.

Given decommissioning will not occur for at least 40 years after the operation of the Project commences, it is not possible to estimate potential impacts and benefits at this stage, noting economic, technological, and environmental factors may change considerably over this period.

6.14.4 Mitigation measures

Table 6.42 Economic mitigation measures

Reference	Mitigation measure	Timing
EIA01	Prior to commencing construction, a construction workforce and accommodation strategy (CWAS) will be prepared for the Project in consultation with relevant stakeholders. The CWAS will include: • measures to ensure there is sufficient accommodation for the workforce associated with the construction of the Project • measures to address any specific cumulative impacts arising associated with other SSD projects in the area • 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 during the construction phase.	PC

Reference	Mitigation measure	Timing
EIA02	A community shared benefit strategy (CSBS) will be developed for the Project: which will include: • a community fund to be available to the wider community. This might include annual grants to local community organisations and specific programs. While guidelines and management structures for the operation of a community fund will need to be put in place, there is potential for this to be governed through a VPA with council. Note: LSBP anticipates that access fees would total $5.24m p.a. including payments made for the purposes of a community fund, education and training	C, O

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.14.5 Net economic impact assessment – conclusion

The economic costs and benefits of the Project are summarised below:

1. The Project will require approximately $1.19 billion in investment during the construction phase (of which approximately $179 million will be retained in the EIA study area). Approximately 245 direct and 390 indirect FTE positions will be supported in the national economy on average over the 28-month construction period, with a peak of 350 direct jobs. Once operational, 10 direct and 30 indirect FTE jobs will be supported nationally by the Project. Of this national total, the EIA study area is expected to benefit from 130 FTE construction jobs and 16 FTE ongoing jobs (direct and indirect) associated with the Project.

2. Construction is a specialisation of the region's economy as indicated by the EIA study area's workforce structure (by occupation and industry). The anticipated number of direct and indirect FTE jobs in the EIA study area (130) represents only 0.9% of the total labour force in construction-related activities (13,720 workers), noting that many of the indirect jobs will be supported in non-construction sectors (e.g. services sector). The EIA study area also has approximately 1,460 unemployed labour force participants, some of whom could work on the Project and/or other major infrastructure projects (subject to suitable skills mix). In isolation, the workforce requirement of 130 FTE workers should not present a constraint to labour supply for the Project, but potential does exist for labour market constraints due to the cumulative impacts of multiple concurrent renewable and other large infrastructure projects in the region.

3. The study area also has a very constrained long term rental market, with a 0.8% vacancy rate and just 18 properties currently available to the market. In view of this situation, LSbp are proposing to deliver a temporary workforce accommodation facility with capacity for 350 personnel. This facility's operation will assist in reducing pressure on the EIA study area's commercial accommodation and rental markets associated with the concurrent construction of renewable energy projects in the CWO REZ. It is estimated that construction workers relocating to the region will inject approximately $21.7 million in new spending into the economy over the construction phase, supporting approximately 110 FTE jobs in the service sector in the EIA study area over this time.

4. The Project site is mainly used for agricultural grazing (sheep and cattle) and some broad-hectare cropping. These activities generate approximately $1,543,633 in gross revenue annually (inclusive of supply chain effects). This level of productivity theoretically supports around 1.5 agricultural FTE jobs). It is anticipated that grazing activities would continue at the Project site once the solar farm or operational at a stocking rate of at least 75% relative to current operations and generating a level of production that would continue to support 1.5 FTE jobs in the agricultural sector. Accordingly, it is estimated that the Project would result in the no loss of agricultural jobs.

5. The Project has the capacity to supply sufficient renewable energy to power the equivalent of approximately 253,419 homes per annum, which represents approximately seven times the total annual residential requirements of the EIA study area (36,360 homes).

6. In addition to supporting NSW State policy directions and national grid supply benefits, the Project will deliver the following key Statewide economic benefits:

   - capital investment: $360 million or 30% of total Project capital investment (60% attributed to imports and 10% to other states and territories)
   - construction employment: 820 FTE jobs (315 direct (noting an anticipated average of 245 across the construction period) and 505 indirect) or 90% of total construction employment (remaining 10% attributed to other states and territories)
   - ongoing employment: 36 FTE jobs (direct and indirect), or 90% of total operating employment (remaining 10% attributed to other states and territories)
   - access fee payments amounting to approximately $5.24m per year (CPI inflated)
   - supports ongoing industry transition in Regional NSW from agriculture, mining, etc. to renewable energy
   - future decommissioning investment and employment opportunities, to be determined.

6.15 Waste management

6.15.1 Overview

As part of the preparation of this EIS, consideration has been made as to how the Project's waste will be managed in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with Dubbo Regional Council and Warrumbungle Shire Council.

This meets the requirements of the SEARs to identify, quantify and classify the likely waste streams to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

The Project will produce several waste streams during the 22-28-month construction period. Minor quantities of waste will also continue to be generated by the day-to-day operation of the Project. Waste will also be generated as part of decommissioning at the end of the Project's operational life.

6.15.2 Existing environment

The site is currently used for farming purposes and therefore generates farming-related waste streams.

6.15.3 Potential waste types and management

The majority of the waste produced will be during the construction and decommissioning phases of the Project, withminimal waste generated in the operational phase. It is anticipated that the volumes of construction and decommissioning waste may exceed the capacity of the local waste facilities. Concerns were raised during discussions with Warrumbungle Shire Council that the expected volumes are likely to exceed the capacity of local waste facilities and may require the waste to be managed through commercial agreements with contractors, a licensed waste management company and relevant local councils during construction of the Project. These agreements will also be required if the Project is decommissioned in 40 years' time.

i Waste during construction

Waste streams generated during the construction stage will be typically associated with construction packaging and offcuts, cleared vegetation, and the presence of staff (waste type and approximate volumes to be removed from site is outlined in Table 6.43). Of each of the Project phases, the construction period will generate the largest volume of waste. Nonetheless, the overall volumes of construction waste will be low, short-term (approximately 22-28 months) and manageable.

Table 6.43 Waste during construction

Waste type	Approximate volume to be removed from site
General solid waste (non-putrescible) including: • cardboard packaging • wood pallets • plastic wrapping and ties • timber offcuts (i.e. wood separators to prevent damage to PV modules) • excess building materials (i.e. scrap metal, plastic, masonry, gravel/sand, etc) • domestic-type general waste from construction staff (i.e. food wrapping, etc) • domestic-type recyclable waste from construction staff (i.e. drink containers, etc)	20,100 m^3
Putrescible (i.e. food waste from staff)	Negligible
Cleared vegetation	None (to be reused onsite)
Hazardous waste (i.e. waste oils, paint and lubricants)	4,000 L
Wastewater from onsite toilet	14,000 m^3

Detail on the proposed management of these waste streams is outlined in Section 6.15.3.

ii Waste during operation

Waste streams generated during the operation stage will be typically associated with maintenance activities and the presence of staff (Table 6.44).

Detail on the proposed management of these waste streams is outlined in Section 6.15.4.

Table 6.44 Waste during operation

Waste type	Approximate volume to be removed from site
General solid waste (non-putrescible) (i.e. food wrapping, waste air filters, damaged or faulty components that have been replaced, chemical drums, wooden pallets, etc)	10 m^3 per annum
Putrescible (i.e. food waste from staff)	Negligible
Hazardous waste (i.e. waste oils, paint and lubricants)	1,500 L per annum

Waste type	Approximate volume to be removed from site
Wastewater from onsite toilet	400 m^3 per annum
Waste batteries (from BESS) will all be recycled	Quantity unknown

iii Waste during decommissioning

Waste streams generated during the decommissioning and closure stage will largely be associated with removal of infrastructure from the Project site . Recycling or reuse of PV modules and associated equipment will be maximised as far as possible to avoid landfill. Waste during decommissioning is summarised in Table 6.45.

Table 6.45 Waste during decommissioning

Phase	Waste classification	Expected waste type	Expected Volume	End use
Decommissioning	Green Waste	Green waste from removal of infrastructure above and below ground as well as landscaping.	None expected, Landscaping remains in situ	Reuse on-site where appropriate or recycled
Decommissioning	Hazardous waste	Waste oils, lubricants and liquids and paints	464 Tonnes	Transported to licensed facility
Decommissioning	Liquid Waste	Sewage from ablutions or portaloos	255 m^3	Transported to licensed facility
Decommissioning	General Solid Waste (Non-Putrescible)	Solar Farm infrastructure (solar panels, steel posts, electrical cabling, lithium phosphate iron battery, inverters)	1 million panels 40,000 tonnes of steel 15,000 tonnes of copper wiring	Recycled
Decommissioning	General Solid Waste (Non-Putrescible)	Security fencing	800 Tonnes	Remain in situ, reuse on site or recycled.
Decommissioning	General Solid Waste (Non-Putrescible)	Site office	None	Remain in situ, reuse on site or recycled
Decommissioning	General Solid Waste (Non-Putrescible)	Access Roads	None	Remain in situ
Decommissioning	General Solid Waste (Non-Putrescible)	Domestic waste	109 Tonnes	Recycled If not possible dispose at suitable facility.

Detail regarding proposed management of these waste streams is outlined in Section 6.15.4.

6.15.4 Mitigation measures

Proposed measures to manage and mitigate potential waste impacts are outlined in Table 6.46. A key objective of the plan is to ensure any use of local waste management facilities does not disadvantage local businesses or the local community by exhausting available capacity at these facilities.

Table 6.46 Waste mitigation measures

Reference	Mitigation measure	Timing
WM1	Waste will be managed in accordance with the NSW *Protection of the Environment Operations Act 1997* (POEO Act), NSW *Waste Avoidance and Resource Recovery Act 2001* and the following hierarchy, which is listed in order of preference: • reduce waste production • recover resources • dispose of waste appropriately.	At all times
WM2	Manage waste to ensure that: • generation of waste is kept to a minimum • no waste is received or disposed of onsite • waste is stored, handled, and disposed in accordance with the EPA's Waste Classification Guidelines 2014 (or its latest version) • waste is removed from site as soon as practicable • Skip bins will be available onsite to encourage waste separation for recycling/re-use. General waste bins/skips will be provided for disposal of materials that cannot be cost-effectively recycled/re-used. • waste is reused, recycled, or sent to an appropriately licensed waste facility for disposal.	At all times
WM3	During construction, wood pallets will be reused if in good condition, returned to the supplier if practicable, or sold for wood chip or recycled if damaged.	At all times
WM4	Hazardous waste (i.e.. waste oil, paint, septic wastewater, etc) will be collected by a licenced waste contractor for disposal at a licenced facility.	At all times
WM5	During operation, damaged PV modules will be collected by a specialised recycler for recycling.	At all times
WM6	Panels that are no loner operational will be recycled via Lotus Energy (or similar) during construction and operation.	At all times
WM7	Waste management providers that specialise in recycling end-of-life PV modules and associated infrastructure will be selected where possible.	At all times

6.15.5 Conclusion

The majority of the waste produced will be during the construction and decommissioning phases of the Project with minimal waste generated in the operational phase.

All waste produced by the Project will be managed in accordance with the waste hierarchy, and will be classified, stored, and handled in accordance with the *Waste classification guidelines – part 1: classifying waste* (EPA 2014).

Assuming the proposed waste management measures (Section 6.15.4) are implemented, there will be no material impact in relation to the management of waste. A key objective of the waste management plan is to ensure that any use of local waste management facilities does not disadvantage local businesses or the local community by exhausting available capacity at these facilities.

6.16 Air quality

6.16.1 Introduction

An air quality impact assessment (AQIA) was undertaken by EMM (EMM 2023i) and is provided in Appendix T. The AQIA considers potential impacts of Project construction on air quality, identifies management and mitigation measures, and satisfies air quality related Project SEARs as described in Appendix A.

The AQIA followed the Guidance of the Assessment of Dust from Demolition and Construction published by the Institute of Air Quality Management (IAQM) in the United Kingdom.

6.16.2 Existing environment

The region and local area are primarily agricultural; however, surrounding land use is changing with the introduction of the CWO REZ.

6.16.3 Potential impacts

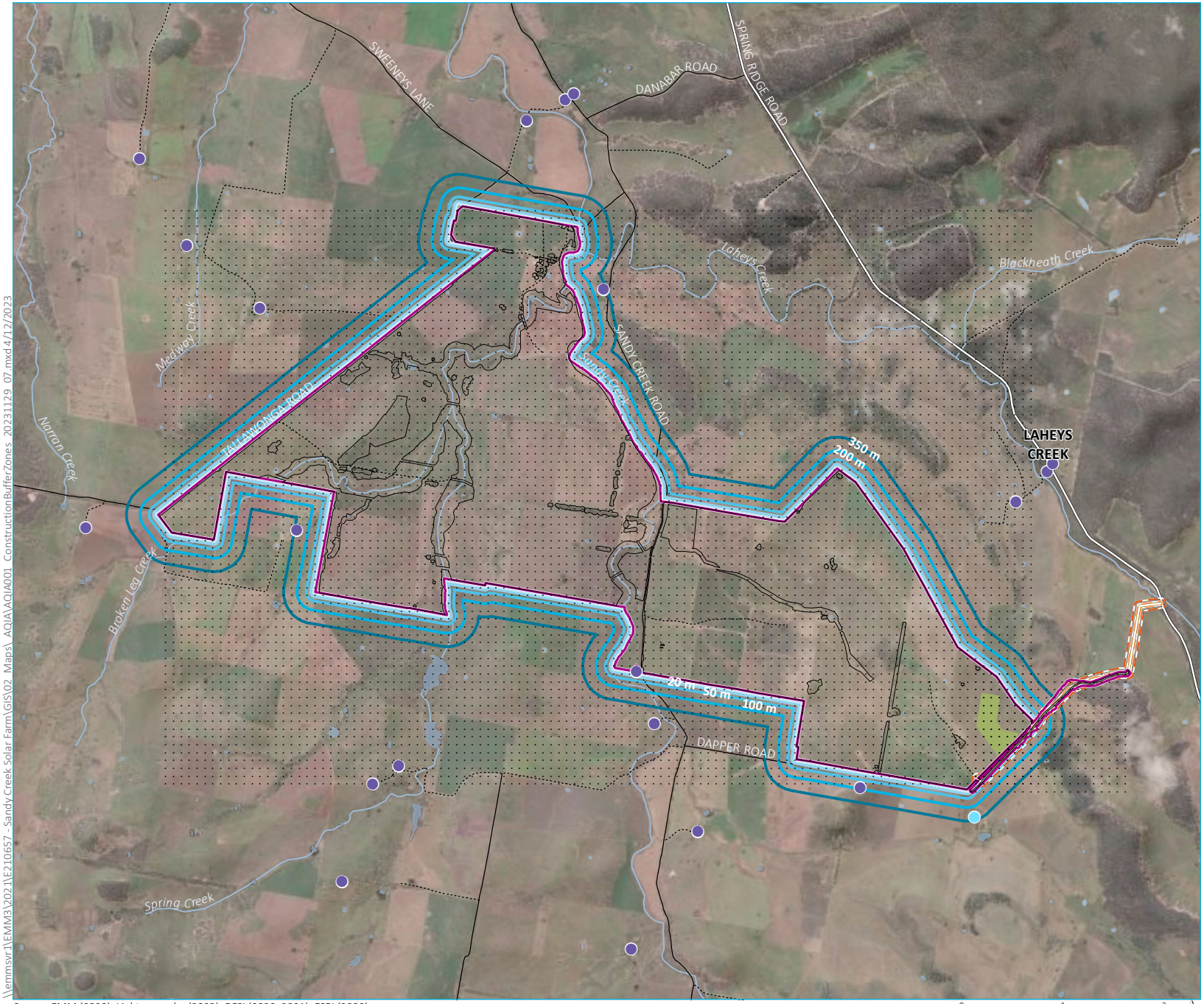
A screening requirement as part of the IAQM assessment procedure was undertaken for the Project to determine the level of assessment based on proximity of surrounding receptors. The IAQM guidance specifies that a detailed construction dust assessment should be undertaken if:

- a human receptor[3] is located within 350 m of the works boundary
- an ecological receptor[4] is located within 50 m of the works boundary
- a human/ecological receptor is within 50 m of a route used by construction vehicles up to 500 m from a site entrance.

The Project's impact footprint, and receptor locations, are shown in Figure 6.15. As there are human and ecological receptors within the distances from the development footprint specified above, the proposed construction activities triggered the requirement for a detailed dust assessment of construction impacts.

[3] A 'human receptor' refers to any location where a person or property may experience the adverse effects of airborne dust or dust soiling, or exposure to PM10 over a time period relevant to air quality standards and goals. In terms of annoyance effects, this will most commonly relate to dwellings, but may also refer to other premises such as museums, galleries, vehicle showrooms, food manufacturers, electronics manufacturers, amenity areas and horticultural operations.

[4] An 'ecological receptor' refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats).



Study area
Impact footprint
Accommodation facility

Receptor type
- Non-associated receptor
- Unoccupied structure (shed or yard, not associated)

Buffer zone for impact assessment
- 20 m
- 50 m
- 100 m
- 200 m
- 350 m
- 20 m (Haul route buffer)
- 50 m (Haul route buffer)

Existing environment
- Major road
- Minor road
- Vehicular track
- Haul road
- Watercourse/drainage line
- Waterbody

\\emmsvr1\EMM3\2021\E210657 - Sandy Creek Solar Farm\GIS\02_Maps_AQIA\AQIA001_ConstructionBufferZones_20231129_07.mxd 4/12/2023

Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2023)

0 1 2 km

GDA 1994 MGA Zone 55

N

Construction footprint for the project and buffer zones for impact assessment

Sandy Creek Solar Farm
Environmental Impact Statement
Figure 6.15

EMM
creating opportunities

i Earthworks and construction

The Project's main air quality impacts will be temporary as they will occur during construction, which will take approximately 22-28 months. Potential construction air quality impacts will be caused by dust generation from surface disturbance works, exhaust emissions from diesel powered construction equipment, and soil, mud and other organic debris being carried out of the construction site by vehicles (track-out). A map showing the extent of works can be found in Figure 6.15.

Surface disturbance works during construction will include:

- preliminary earthworks (resurfacing for construction facilities and infrastructure)
- construction of access tracks
- trenching for installation of underground cables
- driving or screwing piles to provide support for the mounting frameworks required for the PV modules
- preparation of foundations for the substation and BESS
- construction of the BESS and relevant infrastructure
- installation of permanent fencing and security
- road upgrade works
- track out
- installation of a temporary workforce accommodation facility.

Diesel powered construction equipment will include:

- vehicles travelling to and from the development footprint
- earthmoving machinery and equipment for site preparation
- cable trenching and laying equipment
- pile-driving equipment
- assisted material handling equipment (forklifts and cranes)
- machinery and equipment for connection infrastructure establishment and installation of BESS
- water trucks for dust suppression.

Potential air quality impacts from disturbance works listed above are limited to dust soiling; human health effects due to increased exposure to particulate matter with a diameter or 10 micrometres or less (PM_{10}); and harm to ecological receptors. Ecological receptors refers to any habitat affected by dust soiling, which includes direct impacts on vegetation or aquatic ecosystems and indirect impacts on fauna (i.e. foraging habitats). Dust emissions can vary substantially from day to day depending on the level of activity, the specific operations being undertaken, and weather conditions.

Unmitigated air quality risks during construction are summarised in Table 6.47.

Table 6.47 Summary of risk assessment

Activity	Potential for dust emissions	Sensitivity of area			Risk of dust impacts		
		Dust soiling	Human health	Ecological	Dust soiling	Human health	Ecological
Demolition	Not applicable						
Earthworks	Medium	Low	Low	Medium	Low risk	Low risk	Medium risk
Construction	Medium	Low	Low	Medium	Low risk	Low risk	Medium risk
Track-out	Small	Low	Low	Medium	Negligible risk	Negligible risk	Negligible risk

Assessment within the AQIA determined that without mitigation, during construction the risk of dust soiling will be low, the risk of human health impacts will be low, the risk of ecological impacts will be medium, and the risk of track-out impacts will be negligible. 'Good practice' general mitigation measures will be included in the CEMP and implemented to effectively manage and mitigate off-site air quality impacts (refer to Table 6.47).

ii Operation

The potential for air quality impacts during operation is negligible as all disturbed areas will be stabilised prior to operation and exposed areas revegetated, removing any significant sources of dust.

6.16.4 Mitigation measures

Mitigation measures will be included in the CEMP and implemented to effectively manage and mitigate off-site air quality impacts (Table 6.48).

Table 6.48 Air quality mitigation measures

ID	Mitigation measures	
AQ1	Prior to commencement of construction activities, develop appropriate communications to notify the potentially impacted residences of the Project (duration, types of works, etc.) and relevant contact details for environmental complaints reporting	PC
AQ2	Maintain complaints logbook throughout the construction phase which will include any complaints related to dust. If a dust complaint is received, the response actioned will be detailed in the logbook.	C
AQ3	Record any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the logbook.	C
AQ4	Erect shade cloth barriers to site fences around potentially dusty activities such as excavation and material stockpiles where practicable.	C
AQ5	Keep site fencing and barriers clean using wet methods (such as through application of sprays), as required.	C
AQ6	Impose a maximum-speed-limit of 20 km/h on all internal roads and work areas during construction.	C
AQ7	Ensure proper maintenance of all equipment engines	PC, C
AQ8	Deploy a water cart to ensure that exposed areas and topsoils/subsoil are kept moist, where necessary.	C
AQ9	Modify working practices by limiting activity during periods of adverse weather (hot, dry, and windy conditions) and when dust is seen leaving the site.	C

ID	Mitigation measures	
AQ10	Limit the extent of clearing of vegetation and topsoil to the designated footprint required for construction and appropriate staging of any clearing.	C
AQ11	Minimise drop heights from loading or handling equipment.	C
AQ12	Re-vegetate earthworks and exposed areas to stabilise surfaces as soon as practicable.	C
AQ13	Ensure vehicle loads entering and leaving sites are covered to prevent escape of materials during transport.	C
AQ14	Visually monitor dust by undertaking daily on-site and off-site inspections to monitor dust on surfaces. The inspection results will be recorded in a specific log.	C
AQ15	Review the local meteorological forecast, including the timing of notable increases in wind speed and/or temperature at the commencement of each day's activities. Appropriate increased intensity or additional mitigation measures will be planned for the day based on this forecast review. The likely meteorological conditions and implications for dust emissions will be discussed at the morning toolbox meeting.	C
AQ16	Increase site inspection frequency when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Should notable visual dust emissions be observed leaving the site boundary, increased intensity or additional mitigation measures will be deployed.	C
AQ17	Erect shade cloth barriers around areas of temporary accommodation facility that may be susceptible to potentially dusty activities.	C
AQ18	Keep barriers around the accommodation facility clean using wet methods as required	C
AQ19	Impose maximum speed limit of 20 km/h on internal roads close to the accommodation facility	C

Notes: PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

6.16.5 Conclusion

The construction dust assessment followed G*uidance on the Assessment of Dust from Demolition and Construction* published by IAQM. A risk-based methodology was used to consider amenity impacts due to dust soiling; health effects due to an increase in exposure to PM_{10}; and harm to ecological receptors.

For both dust soiling impacts and human health impacts, the risk was determined to be low for earthworks, low for construction and negligible for track-out. For ecological impacts, the risk was determined to be medium for earthworks and construction, and negligible for track-out.

A CEMP will be implemented for the Project and will include measures to manage dust. Ecological impacts were determined to have the highest potential for risk, with earthworks and construction determined to be medium-risk activities.The CEMP should pay particular attention to the dust generated from these activities. Recommended mitigation measures include logging dust complaints, carrying out regular inspections and recording results, ensuring that exposed areas are kept moist, and ensuring that vehicles entering and leaving sites with loads are covered to prevent escape of materials during transport.

The proposed mitigation measures are considered sufficient to ensure off-site impacts from the Project are effectively managed.

A conservative analysis of the risk of exposure to construction dust at the accommodation facility using the IAQM method found dust soiling impacts to be medium to low, and the risk of human health impacts is likely to be low.

6.17 Cumulative impacts

6.17.1 Introduction

The Project (referred to in this section as *this* Project to avoid confusion) will contribute to overall development of the CWO REZ. Other proposed, approved, under construction, and operational renewable energy developments known at the time of finalisation of this EIS which are in the vicinity of this Project are shown in Figure 2.5.

The Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE 2021b) defines two broad assessment approaches, comprising:

- Incremental types – including impacts of this Project to the existing baseline condition of each relevant assessment matter (i.e. air quality, odour, noise, water, biodiversity, heritage, traffic, employment and workforce) and the combined effect of the different impacts of this Project. Consideration of incremental impacts is standard practice and is addressed in the individual technical reports (appended to this EIS) and chapters and Project justification (Chapter 7 of this EIS).

- Cumulative types – impacts of this Project together with the impacts of other relevant future projects on specific issues within an identified area, and the combined effect of the different cumulative impacts of this Project with other cumulative impacts of relevant future projects within an identified area. The assessment of issue-specific cumulative impacts is presented in this section.

This section focuses on the latter approach. Future projects are proposed and under development throughout the CWO REZ, including in the immediate vicinity of this Project. The locations of surrounding developments are shown in Figure 2.5. There remains a high degree of uncertainty regarding many of these developments, including the likelihood that these projects will proceed, the type and nature of infrastructure proposed, and the exact timing of the projects. For this reason, the cumulative impact assessment undertaken is primarily qualitative in nature.

6.17.2 Other projects

There are several state significant development projects proposed, approved, or in construction in the vicinity of this Project, as identified through DPE's Major Projects Portal at the time of writing this EIS. Projects within the CWO REZ and projects within a radius of approximately 60 km from this Project were identified as future projects for consideration of potential cumulative impacts. A summary of relevant projects is presented in Table 6.49 and Table 6.50.

Table 6.49 Anticipated construction schedules of relevant renewable energy projects

Project	2024				2025				2026				2027				2028				2029			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Proposed CWO REZ related projects																								
Sandy Creek Solar Farm (the Project)																								
1 - EnergyCo Central-West Orana Renewable Energy Zone Transmission Project (Elong Elong Energy Hub)																								
2 - EnergyCo public road works																								
3 – EnergyCo Central-West Orana Renewable Energy Zone Transmission Project (proposed lines)																								
4 – Cobbora Solar Farm																								
5 – Dapper Solar Farm																								
6 – Spicers Creek Windfarm	Construction to commence within 1-5 years of approval and take 40 months																							
7 – Orana Windfarm																								
8 – Barneys Reef Windfarm																								
9 – Bellambi Heights BESS																								
10 – Tallwang Solar Farm																								
11 – Birriwa Solar Farm and BESS																								
12- EnergyCo Central-West Orana Renewable Energy Zone Transmission Project (Merothie Energy Hub)																								
13 – Wellington Town BESS																								
14 – Narragamba Solar Farm																								

Project	2024				2025				2026				2027				2028				2029			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
15 – Valley of the Winds Windfarm																								
16 – Ulan Solar Farm																								
17 – Wellington South BESS																								
18 – Orana BESS																								
19 – Burrendong Windfarm	Construction to commence within 1-5 years of approval and take 18-24 months																							
22 – Dubbo firming power station																								
23 – Liverpool range Windfarm																								
Other nearby developments (outside CWO REZ)																								
24 – Wollar Solar Farm																								
Approved CWO REZ related projects																								
20 – Apsley BESS																								
21 – Forest Glen Solar Farm																								
25 – Dunedoo Solar Farm*																								
28 – Stubbo Solar Farm																								
29 – Uungula Windfarm																								
30 – Wellington Solar Farm	Operational																							
32 – Maryvale Solar Farm																								
33 – Wellington North Solar Farm																								

Notes:
* Timeframes not known based on publicly available information
Numbers against each Project relate to Figure 2.5

6.17.3 Assessment of cumulative impacts

i Biodiversity

Spicer's Creek Wind Farm, located directly south-west, adjacent to this Project, is currently under assessment. The development of Spicer's Creek Wind Farm is expected to impact on 44.3 ha of Box Gum Woodland CEEC and 50.8 ha Grey Box Woodland EEC. Although this Project is likely to impact the same TECs as Spicer's Creek Wind Farm, it is unlikely to have cumulative ecological impacts due to this Project's much smaller impacts to the TECs (i.e. removal of 1.95 ha of Box Gum Woodland and 1.24 ha of Grey Box Woodland).

ii Aboriginal heritage

While many renewable energy generation projects are still under investigation and assessment, the cumulative impact to Aboriginal heritage in the region is likely to be significant due to the number and size of the projects within the same region, considered in conjunction with existing coal projects.

However, many of the larger renewable energy projects, especially those near this Project, are proposed wind farms. Such developments have highly localised ground disturbance impacts and are often able to avoid sites of high cultural significance. Solar farms result in a larger impact due to the type and extent of infrastructure, though they can remove or modify blocks of panels to avoid cultural materials in some circumstances. In both cases, renewable energy generation projects generally avoid construction activities and operation close to major creek lines by establishing riparian corridors, upon which most Aboriginal cultural materials have been encountered during field investigations for this Project.

This Project and previous archaeological assessments have shown that project design can largely be altered, as described above, to avoid impact to as many recorded sites as possible, especially to sites assessed as having high significance (i.e. higher density stone artefact scatters, rock shelters, grinding grooves and modified trees). This means that often renewable energy generation projects are only impacting on a smaller portion of the overall sites identified, and the sites that are subject to impact generally comprise isolated finds and low-density stone artefact scatters of low significance.

Potential cumulative benefits to Aboriginal heritage include:

- investigations of construction areas can improve archaeological and scientific understanding of previously poorly understood locales
- improved understanding of contemporary sites and values for the area
- increased opportunities for Aboriginal community to undertake heritage interpretation, development of narratives and visual representation of Aboriginal values, stories, and places (which is currently lacking in the region)
- improved understanding and public outreach of cultural heritage to the broader community into the future.

iii Land use, property, and agriculture

Due to the identification of centralised REZs, the cumulative impacts on availability of agricultural land within these areas is unavoidable. Cumulative impacts to soil, land and agriculture primarily relate to potentially reduced regional LSC, and impacts associated with agricultural land productivity and availability within the REZ and relevant LGAs throughout construction and operation.

However, it is acknowledged within the Solar guidelines that:

> cumulative risk to agricultural land and productivity because of large -scale solar development is very low. The Australian Energy Market Operator estimates that NSW will need approximately 20,000 MW of large-scale solar generation by 2050. This would require approximately 40,000 ha of land or only 0.06% of rural land in NSW. Even in the highly unlikely scenario that all of NSW's solar generation were located on important agricultural land (this land covers around 13.8% of the state and is 6 to 7 times more agriculturally productive than the remaining 86.2% of the state) only 0.4% of this land would be required.

Impacts from projects may also include site erosion and/or sedimentation resulting in reduced soil availability and sediment migration to watercourses that pass through or occur downstream of a construction site. All construction activities are required to operate under environmental management plans that will mitigate such impacts, as will be the case with this Project.

iv Visual

It is important to consider the effect of multiple projects on the visual character of the landscape. Multiple projects near each other can result in cumulative visual impacts that affect the way a landscape is experienced. Cumulative visual impacts can arise from the presence of similar projects that may have a low impact individually, but when viewed together can have a significant visual impact on the landscape. Generally, this occurs when:

- multiple renewable energy projects are located within an area, and they change perceptions of the area due to repeated exposure to similar projects – this can be referred to as 'sequential viewing' (projects do not have to be seen simultaneously)
- simultaneous views of multiple renewable energy projects from public or private viewing locations.

As this Project is within a REZ containing many of the same type of developments (or will in the future), as well as many renewable energy projects in the general vicinity, both sequential viewing and simultaneous viewing are possible visual cumulative impacts.

If Cobbora Solar Farm, Dapper Solar Farm and Spicers Creek Wind Farm are approved and constructed, this Project will be surrounded by renewable energy projects. Both Cobbora Solar Farm and Dapper Solar Farm have the potential for cumulative visual impacts with this Project, though both will be on undulating topography with a degree of vegetation screening. Spicers Creek Wind Farm will also contribute to cumulative visual impacts with tall turbines which are viewable from a greater distance.

The Spicers Creek Wind Farm Landscape and Visual Impact Assessment (Moir 2023), indicates that wind turbines may be visible to dwellings along Tallawonga Road, Sandy Creek Road, and Dapper Road, all of which contain viewpoints affected by this Project.

Table 6.50 lists renewable energy projects with the potential for cumulative visual impacts with this Project.

Table 6.50 Projects with potential for cumulative visual impacts

Project	Relative location	Status	Cumulative impact potential and timing
CWO REZ Network Infrastructure - Elong Elong Energy Hub	Less than 1 km east of the development footprint.	Planning stages	Indicative construction timing: Mid-2024 Indicative operational: Mid-2027 Due to the size of the infrastructure elements and proximity to Spring Ridge Road, Dapper Road, and two dwellings, the anticipated cumulative visual impact is: **Low-Moderate**

Project	Relative location	Status	Cumulative impact potential and timing
CWO REZ Network Infrastructure - Transmission line component.	Adjacent to the development footprint along Dapper Road. It extends through the south-eastern portion of the development footprint, and south of Dapper Road.	Planning stages	Indicative construction timing: Mid-2024 Indicative operational: Mid-2027 Due to the size of the infrastructure elements and proximity to Spring Ridge Road, Dapper Road, and seven dwellings, the anticipated cumulative visual impact is: **Moderate**
Cobbora Solar Farm	Adjacent and north-east of the development footprint.	Planning stages	Indicative construction timing: Late 2023, 36 months Indicative operational: Early 2026 The Cobbora Solar Farm is anticipated to be visible from the Golden Highway and Spring Ridge Road. However, the Sandy Creek Solar Farm is not predicted to be visible from either road. It is assumed that dwellings within the Cobbora Solar Farm area are associated residents (R01, R02, R03, and R04) and therefore excluded from impact measures. There is potential for cumulative visual impacts from R16, R14, R15, R09 as well as from Dapper Road and Sandy Creek Road. The anticipated cumulative visual impact is: **Low**
Dapper Solar Farm	Adjacent and south of the development footprint.	Planning stages	Indicative construction timing: Early 2025, 18 to 24 months Indicative operational: 2026-27 The Dapper Solar Farm is anticipated to be visible from Dapper Road and Sandy Creek Road. It is assumed that dwellings within the Dapper Solar Farm area are associated residents and therefore excluded from impact measures. There is potential for cumulative visual impacts from R09, R11, R12, R13, R25, as well as from Dapper Road and Sandy Creek Road. The anticipated cumulative visual impact is: **Moderate**
Spicers Creek Wind Farm	Adjacent west of the Project area.	Planning stages	Indicative construction timing: Commence within one year of approval, 24 to 30 months Indicative operational: *timing unknown.* Many of the dwellings along the western side of the Project are within the Spicers Creek Wind Farm area and therefore considered as associated residents. There is potential for cumulative visual impacts from R01, R02, R03, R09, R12, R13, R25 as well as from Dapper Road, Sweeneys Lane and Tallownga Road. The anticipated cumulative visual impact is: **Low-Moderate** – this rating dependent on the location of the wind turbines.

Project	Relative location	Status	Cumulative impact potential and timing
Orana Wind Farm	3 km east of the Project area.	Planning stages	Indicative construction timing: 2025-26 Indicative operational: 2027-28 There is potential for cumulative visual impacts from R01, R02, R03, R04, R09 as well as from Spring Ridge Road, Sweeneys Lane, Tallawonga Road and Dapper Road. The anticipated cumulative visual impact is: **Low** – this rating dependent on the location of the wind turbines.

v Noise and vibration

Several projects currently in planning in the immediate vicinity of this Project could contribute to cumulative noise impacts including Elong Energy Hub, CWO REZ transmission line network, Cobbora Solar Farm, Dapper Solar Farm, Spicers Creek Wind Farm, and Orana Wind Farm.

There is potential for cumulative construction noise impacts from other concurrent construction works particularly related to CWO REZ infrastructure including Elong Energy Hub and transmission line network. Construction noise impact results are worst case predicted impacts and are only likely to occur for a period of a few months as work is undertaken near the site boundary near noise assessment locations. Cumulative construction impacts from other projects are unlikely to significantly increase noise levels and no exceedances of highly noise affected management levels are predicted. Cumulative construction impacts should be considered in the construction management process with consideration to mitigation measures including work scheduling. Operational noise levels from this Project are predicted to comply with the project amenity noise level (PANL) of 38 dB, adopted to assess cumulative operational impacts for the Project.

Where a standalone project can meet the PANL, cumulative impact due to the Project is not expected as that criterion allows for industrial noise contributions from multiple sites/projects as per the NPfI.

vi Traffic

As this Project is within the CWO REZ, cumulative impacts from concurrent construction of renewable energy projects and transmission infrastructure are expected due to the increase in construction vehicles across the road network. However, there is uncertainty regarding other the timing of other projects and therefore the extent of cumulative traffic impacts.

Many projects will use the state road network between the Port of Newcastle and the CWO REZ. Renewable energy projects within the REZ will benefit from planned upgrades of the network which will support OSOM movements. Additionally, there is some spare capacity on most of the road network, including at intersections. Golden Highway and Dapper Road will be able to handle the proposed increases in their construction related vehicle movements, especially when proposed upgrades to the road network for this Project, as discussed in Section 6.9, are implemented.

However, this Project's TIA (Appendix N) found that potential additional construction traffic using Spring Ridge Road associated with combined project construction, will require further consideration of a combined road condition management strategy for Spring Ridge Road The strategy should considerthe existing road surfaceto ensure that any identified road damage is quickly repaired and the ability of the road to be safely used by the combined construction traffic from all relevant energy projects in combination with existing local traffic is maintained. This recommendation is an extension of EnergyCo's own proposed mitigation measure to manage the road for their proposed construction access requirements for traffic using Spring Ridge Road.

Conversely, in the CWO REZ Transmission EIS, EnergyCo predicted only a minor cumulative impact on the capacity and efficiency of the road network even if 11 CWO REZ projects, including this Project, are developed concurrently (EnergyCo 2023a).

vii Social

Due to the large-scale and expansive nature of the CWO REZ, cumulative impacts are unavoidable to some extent and should be combatted at a policy level. The NSW Government and EnergyCo have an important role to play in terms of ensuring a coordinated, strategic approach is taken to address many of the cumulative impacts.

Identified social impacts this Project may materially contribute to include:

- access to accommodation and housing
- traffic and resident mobility
- an influx of workers placing additional pressure on social services, transport, and infrastructure
- demand for labour.

A potential cumulative benefit of the large number of local projects is related to significant combined community contribution (i.e. benefit sharing agreements and opportunities), procurement, and local investment.

viii Economic

During periods of concurrent project construction, competition for labour, accommodation and other services is likely.

Competition for labour could result in worker poaching and temporary wage increases which can render local businesses unable to retain workers. Additionally, competition for workers, goods, and services are expected to magnify competition in the regional market which could price out smaller businesses seeking the same resources, affecting their commercial viability and profitability, which could ultimately result in business closure (Black, Land & Nunn 2021).

The cumulative influx of workers within the CWO REZ is predicted to be up to 5,000. The area currently has a capacity of approximately 1,744 rooms and cabins in commercial accommodation within a 60-minute drive of this Project's site. Therefore, there is significant potential for cumulative impacts from multiple concurrent projects in the region to constrain the accommodation supply if accommodation needs are unmitigated. This could have a flow on effect on other sectors including tourism, agriculture, and emergency housing. Increased accommodation demand and accommodation shortages can also result in an increase in housing, rent and short-term accommodation prices.

This Project will employ around 280 non-local FTE workers during peak construction, which will largely be accommodated on-site in the temporary accommodation facility, which will decrease this Project's cumulative impact on accommodation. Some workers may choose to re-locate to the area temporarily by moving into rental accommodation, while others may choose to stay in temporary accommodation at commercial properties, holiday homes, caravan/holiday parks or B&Bs, rather than staying at the accommodation facility.

It should be recognised that the multiple renewable projects likely to be constructed concurrently in the CWO REZ (including this Project) will generate cumulative benefits for the regional economy, including:

- spending from non-local workers on goods and services (which will represent a stimulus to the regional economy)
- the likely development of a deep renewable energy skills base that results in supply chain efficiencies and further economic opportunities for the region.

6.17.4 Mitigation measures

Projects are required to mitigate their own impacts to acceptable levels, which will minimise cumulative impacts overall. Mitigation measures for this Project can be found throughout Chapter 6 and in Appendix F.

Additionally, LSbp has taken a collaborative approach to cumulative impacts through ongoing consultation with key stakeholders such as EngeryCo, Dubbo Regional Council, Warrumbungle Shire Council, and other projects within the CWO. The intention is to continue to encourage a collaborative effort as these projects progress, and take a flexible and iterative approach to ensure the best outcomes.

7 Justification

This chapter provides a justification and evaluation of the Project, having regard to the economic, environmental, and social impacts and benefits of the Project and the principles of ecologically sustainable development (ESD).

7.1 Strategic context

The Project is supported by Commonwealth, State, regional and local plans and policies (as described in Section 2) and will support meeting the Commonwealth and State governments' renewable energy generation targets and GHG emission reduction targets. Importantly, the Project will contribute to the continued growth of renewable energy generation and storage capacity in the CWO REZ.

7.2 Need for the Project

In November 2021 the CWO REZ became the first REZ to be formally declared. Primarily situated in the Dubbo Regional, Mid-Western Regional, Gilgandra, and Warrumbungle LGAs (see Figure 2.3), the REZ is expected to provide up to approximately 6 GW of network capacity by 2038, with 4.5 GW anticipated by the late 2020s (AEMO 2022b, EnergyCo 2023).

Energy generated within the REZ will be directed to the NEM via the planned CWO REZ Transmission Project (SSI-48323210), which will connect the Sydney, Newcastle, and the Hunter Valley regions, potentially via the Queensland-NSW Interconnector which could direct 1 GW of power north from the REZ to Queensland (EnergyCo 2023a).

The Project will deliver 700 MW of much needed renewable energy supply into NSW.Due to the Project's location within the CWO REZ, suitable infrastructure is being planned in the distribution of renewable energy generation to the NEM.

The study area location was selected and is considered highly suitable for the Project due to:

- high solar irradiance
- proximity to the proposed Elong Elong Energy Hub (with capacity to export energy into the grid)
- site location within the CWO REZ
- limited mapped biophysical strategic agricultural land within the study area
- high degree of historical land clearing and absence of high value native vegetation
- zoned RU1 which is a prescribed zone where electricity generating works are a permissible land-use and the environmental and planning constraints can be effectively managed
- suitable vehicular access from the Golden Highway and Sandy Creek Road
- adequate development footprint size
- minimal topography constraints
- low flood risk
- landholder willingness to enter into legal agreements
- isolated nature of the surrounding valley and low number of receivers relative to the size of the Project

- suitable distance from major townships (approximately 25 km).

7.3 Design development

Design of the Project has been flexible and iterative since inception, which has allowed the design to be efficiently revised in response to environmental and social constraints as they were identified, through field survey efforts, technical assessments, and consultation with stakeholders.

Throughout the refinement process, LSbp made considerable efforts to avoid or minimise potential environmental and social impacts where possible. The proposed development footprint has been refined to the most appropriate area to avoid key biodiversity constraints and incorporate riparian protection zones along key watercourses.

Where potential impacts cannot be avoided, LSbp has minimised environmental impacts and/or will implement mitigation measures as summarised in Appendix F. Residual biodiversity impacts will be offset through purchasing credits off the market or by payment through the BCF.

Placement of infrastructure and the extent of construction activities will be refined during detailed design prior to the commencement of construction to further maximise avoidance and minimise potential impacts, consistent with the Project's avoidance and minimisation objectives.

As described above, the Project site is suitable for construction and operation of a large-scale solar farm and associated BESS due to the location with the CWO REZ, favourable physical characteristics, minimal environmental constraints, high degree of existing land clearing, absence of high value native vegetation, and proximity to the proposed Elong Elong Energy Hub.

7.4 Objects of the EP&A Act

An assessment of the consistency of the Project with the objects in section 1.3 of the EP&A Act is provided in Table 7.1.

Table 7.1 Consistency with the objects of the EP&A Act

Object	Consistency with the Project
To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The Project is expected to have a positive impact on intergenerational equity (fairness between generations) due to a reduction in carbon emissions which will slow the impacts of human activity induced climate change. The local and regional economy will benefit from an estimated $21.7 million in wages being spent locally on goods and services by the Project workforce. Additionally, approximately $189 million in Project investment will be retained within the region. The Project will also promote the social and economic welfare of the community through the provision of jobs, training, and business opportunities. Additionally, the Project is expected to have a positive impact on the growth of renewable energy generation and storage capacity within NSW by providing 700 MW of clean energy to the grid, which will have far lower GHG emissions compared to fossil-fuel electricity generation. Iterative Project design refinements have significantly reduced impacts on biodiversity values. Where impacts can't be avoided, the Project will offset residual biodiversity impacts as described in Appendix G.

Object	Consistency with the Project
To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	This EIS describes the economic, environmental, and social context of the Project and the potential to allow informed consideration of these aspects in determining the development application. The Project will contribute to the continued growth of renewable energy generation and storage capacity, as well as providing energy security and reliability.
To promote the orderly and economic use and development of land.	The orderly and economic use of land is best served by development that is permissible under the relevant planning regime and predominantly in accordance with the prevailing planning controls. The Project is permissible with consent, is consistent with statutory and strategic planning controls, and is adjacent to significant proposed energy transmission infrastructure. As detailed in this EIS, the Project will result in positive economic impacts, with appropriate mitigation measures and management strategies being proposed to reduce any adverse environmental and social impacts.
To promote the delivery and maintenance of affordable housing.	Whilst this is not directly applicable to the Project, there is potential for the large construction workforce to indirectly affect affordable housing in the region by increasing demand. To mitigate this, on-site accommodation is proposed to accommodate the non-local construction workforce.
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Measures to avoid and minimise impacts to native vegetation and threatened species habitat were considered throughout design development of the Project, resulting in avoidance of significant biodiversity values and minimisation of impacts on other areas of native vegetation to the extent practicable. All unavoidable impacts will be offset in accordance with NSW Government policy. The Project will contribute to reducing GHG emissions as part of Australia's measures to reduce the impacts of climate change, including on threatened and other species of native animals and plants, ecological communities and their habitats.
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Aboriginal and historic heritage values have been avoided in Project design where possible. While the Project would result in some loss of Aboriginal cultural materials, the current and proposed impacts of the Project and associated material loss can also be considered to have some benefits, including increased understanding of a poorly understood locale. Avoidance of some locally significant historic heritage values was not possible, though these sites will be subject to archival recording.
To promote good design and amenity of the built environment.	The Project has been designed to limit potential visual, noise and air quality impacts at sensitive receptor locations and other locations and assessments have been undertaken by experts in accordance with government policy (as described throughout Chapter 6).
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Separation distances between project infrastructure and receptors has been carefully planned to minimise potential hazards and risks. These will be refined during detailed design. Project infrastructure will be maintained or upgraded over the Project's life to ensure safe and efficient operations. Project construction will be compliant with the Building Code of Australia and all relevant statutory requirements. Over the life of the Project, infrastructure will be maintained or upgraded to ensure safe and efficient operations.

Object	Consistency with the Project
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	This is a matter for the different levels of government in the State. As summarised in Chapter 5, a wide range of government agencies have been consulted regarding the Project including Dubbo Regional Council, Warrumbungle Shire Council and DPE.
To provide increased opportunity for community participation in environmental planning and assessment.	As described in Chapter 5, extensive engagement with the community has informed community members about the Project and has sought community (and other stakeholder) feedback. This EIS provides further detailed information regarding the Project and its potential impacts. This EIS will be placed on public exhibition by DPHI, and community members will be able to make formal submissions. LSbp will prepare a report responding to these submissions.

7.5 Consideration of community views

As described in Chapter 5, feedback from the community was received throughout the design process on a range of issues. Community views were varied and included both positive and negative views on a range of topics.

Community feedback included general support for renewable energy projects, dependant on suitable site selection. Concerns included accommodation and housing availability, additional stress on social services and infrastructure, land use conflicts, and visual amenity.

Project refinements occurred as a result of community feedback, most notably, a temporary workers accommodation facility was introduced into the proposal due to community concern over the Project's potential to negatively impact the availability of short and long-term accommodation in the region.

7.6 Summary of project impacts

This EIS considers the potential impacts associated with the Project, as well as the need for the Project and alternative development options. This section summarises the potential impacts and provides a justification for the Project on environmental, economic and social grounds.

7.6.1 Environmental impacts

This EIS assessed potential impacts to the biophysical environment which are summarised in Table 7.2.

Table 7.2 Assessment summary

Aspect	Summary
Biodiversity - terrestrial	The Project has been designed to avoid and minimise impacts to terrestrial biodiversity, resulting in the avoidance of high biodiversity value areas as much as possible. Six PCTs have been identified within the study area, four of which align with TECs listed under the NSW BC Act within at least one vegetation zone. Two PCTs identified within the study area align with TECs listed under the Commonwealth EPBC Act within at least one vegetation zone. The Project will impact 19.42 ha of native vegetation. With a total impact footprint of 1,489 ha, the area of native vegetation being cleared by the Project represents 1.3% of the impact footprint. This small portion of native vegetation in the impact footprint is consistent with the historic use of the site for agriculture. A summary of the impacts requiring offsetting is as follows: • 1.5 ha of PCT 81 Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion • 14.81 ha of PCT 201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion • 1.15 ha of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion • 0.74 ha of PCT 468 Narrow-leaved Ironbark – Black Cypress Pine +/- Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo) • 1.22 ha of PCT 599 Blakely's Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion. The Project also has the potential to result in a significant impact to two MNES: • Box Gum Woodland • Grey Box Woodland. The Project will require a total of 470 ecosystem credits to compensate for residual impacts on native PCTs, scattered trees and ecosystem credit species.
Biodiversity - aquatic	The Project has been designed to avoid and minimise impacts to aquatic biodiversity, including the introduction of a riparian protection zone around creek corridors, resulting in the avoidance of high biodiversity areas as much as possible. With mitigation measures, there is likely to be no residual negative impacts on aquatic ecosystems in the Spring Creek, Broken Leg Creek and Sandy Creek catchments. Improvements to current aquatic ecosystem conditions across the Project site are anticipated in the following areas: • The formalisation of access roads and waterway crossings across the study area has the potential to reduce the number of locations where each creek is being traversed by vehicles and therefore reduce overall disturbance within those creeks. • Where riparian protection zones are introduced and managed, riparian vegetation condition along Sandy Creek is likely to improve and in turn, improve aquatic ecosystem health.
Aboriginal heritage	The Project design avoids highly significant sites and will only directly impact sites of low to moderate value. 30 discrete stone artefact scatters and/or deposit sites in total will be adversely affected by the Project. These sites will be salvaged prior to Project related disturbance occurring.
Historical heritage	Activities associated with construction and operation of the Project are anticipated to have a low impact on the heritage values identified in the study area. Four locally significant sites could be adversely impacted by the Project (noting these are not listed sites), depending on final Project design. Archival photography and test and/or salvage excavation will be carried out where required.
Land and rehabilitation	The Project will result in a temporary change of land use within the development footprint for the life of the Project. However, the land could still be used for some agricultural activity with the implementation agri-solar initiatives such as sheep grazing. Land management practices will be employed to preserve soil resources and allow for suitable rehabilitation, minimise erosion, and preserve agricultural productivity. After decommissioning, the Project site will be rehabilitated and restored to a condition as near as practicable to the condition that existed prior to construction of the Project.

Aspect	Summary
Visual	While the Project design, development footprint, and placement of Project infrastructure have evolved to minimise or avoid visual impacts where possible, the development of the Project will result in some changes to the landscape. Visual impacts will likely occur during the construction and operational stages of the Project and the visual landscape will be altered from its current state for the duration and operation of the Project. There are 25 sensitive receptors within 4 km of the development footprint. Receptors near the development footprint are likely to have varying degrees of visibility toward the Project. Some will have fragmented views that are broken by existing vegetation, orientation of the dwelling, and/or topography. Screening landscaping will be planted and maintained to minimise visual impacts where required for two viewpoints, reducing the risk rating from a high to moderate for one receptor (R09) and reducing the risk rating from a moderate to low at the other (R14).
Noise and Vibration	Construction noise levels are predicted to exceed noise management levels at up to six receptor locations, largely in relation to site establishment works and piling, and typically only when works are being undertaken in close proximity to the receiver location. Appropriate management and mitigation measures will be implemented. No exceedance of the 'Highly Noise Affected' level is expected. Operational noise will comply withPNTL at all non-associated receivers. While road traffic noise will increase with construction of the Project, noise will remain in compliance with assessment criteria for arterial and sub-arterial roads under theRNP (DECCW 2011). However, due to low existing traffic counts on Spring Ridge Road, the predicted relative increase for the night period is greater than the 12 dB limit in the RNP. Despite this traffic being assessed against the night period criterion, most traffic movements on Spring Ridge Road will likely occur during a shoulder period between 6 am and 7 am on weekdays and 7-8 am on weekends. This relative increase will be temporary during the construction period only, with minimal impact predicted during the operational phase of the Project.
Traffic	Site access will be via Dapper Road, utilising an existing access location. The TIA found that: • key intersections have the capacity to accommodate Project traffic • the Golden Highway, Spring Ridge Road and Dapper Road have the capacity to cater for Project traffic • Spring Ridge Road requires a width upgrade between the Elong Elong Energy Hub and Project site access • EnergyCo's planned road upgrades in the vicinity are required prior to Project construction • traffic generated by the Project will be the highest during the construction period and is expected to be negligible during the operations phase.
Water	• Some parts of the study area are within the 1% AEP for flooding, but these areas are mostly within the riparian protection zones. Flood sensitive infrastructure will be located away from watercourses and their associated floodplains. • Project construction water requirements will be met via non-potable bore water, landholder dams, and rainwater tanks. • Potable water will be trucked in to provide a water supply to the construction workforce and workforce accommodation facility. • Groundwater is not expected to be intercepted during construction. • Mitigation measures will be implemented to manage water quality risks during construction. Overall, potential surface water and groundwater impacts during construction and operation are considered minor and can be adequately managed through the implementation of the mitigation measures.
Hazards and risk	The PHA concluded that: • The Project is not considered potentially hazardous within the meaning of the Resilience and Hazards SEPP. • For all identified events associated with operation of the Project, the resulting consequences are not expected to have significant off-site impacts. • The Project meets the HIPAP No. 4 qualitative risk criteria.

Aspect	Summary
Bushfire	The BSS determined that: • The site is suitable for development in the context of bushfire risk, but potentially constrained by environmental values. • New development on bushfire prone land can comply with the performance as detailed in PBP 2019 but recognises some environmental impacts must be considered and approved. • The planning and design will provide for adequate infrastructure associated with emergency evacuation and firefighting operations. • The planning and design will facilitate appropriate ongoing land management practices.
Waste	The Project will produce several waste streams during construction, operation and decommissioning. Assuming the proposed waste management measures (Section 6.15.4) are implemented, there will be no material impact in relation to the management of waste. All waste produced by the Project will be managed in accordance with the waste management hierarchy and will be disposed of as required at an appropriately licensed facility.
Air quality	The Project's main air quality impacts will be temporary as they will occur during construction. Potential construction air quality impacts will be caused by dust generation from surface disturbance works; exhaust emissions from diesel powered construction equipment and soil; and track-out. A CEMP will be implemented for the Project and will include measures to manage dust, paying particular attention to dust generated from earthworks and construction. The proposed mitigation measures are considered sufficient to ensure off-site impacts from the Project are effectively managed.

7.6.2 Economic impacts

Construction and operation of the Project will result in economic benefits for the local area and region including:

- $189 million of Project investment is anticipated to be retained in the EIA study area (which includes Dubbo and Warrumbungle LGAs more broadly)
- the EIA study area is expected to benefit from 130 FTE construction jobs and 16 FTE ongoing jobs (direct and indirect) associated with the Project
- the Project will provide new participation opportunities for businesses and workers located in the EIA study area
- construction workers relocating to the region are anticipated to inject approximately $21.7 million in spending into the economy over the construction phase and support approximately 110 FTE jobs in the EIA study area's service sector
- the ongoing economic stimulus associated with operation of the Project is estimated at approximately $545 million over 40 years (CPI adjusted).

LSbp will provide community payments and employment purpose contributions for the operating life of the Project (40 years). These payments will be linked to CPI and may take the form of a community fund, which will provide grants to local organisations/programs under a formal management arrangement (i.e. VPA between the Project operator and Council).

7.6.3 Social impacts

The Project will also benefit society by enabling renewable energy generation which will reduce carbon emissions, reduce the need for fossil fuel generated electricity, and help meet the need for alternative power as coal-fired plants progressively close.

The Project is also justified on social grounds for the following reasons:

- The main issue raised by the local community (accommodation) has been addressed and mitigated with the inclusion of a temporary workforce accommodation facility.
- The Project will contribute to the local and regional economy.
- The Project will provide increased opportunities for employment and training.
- The Project will provide increased opportunities for connection to Country.

Mitigation and management measures have been proposed for identified potential negative social impacts to minimise negative consequences and maximise social benefits for the community.

Public safety risks including bushfire, and hazards and risks associated with Project infrastructure will be mitigated through design and siting of buildings. Construction areas and other assets will include appropriate bushfire protection measures in line with policies, guidelines, and technical report recommendations. Emergency access and evacuation protocols will be developed as part of the emergency response plan.

7.6.4 Cumulative impacts

The Project has potential to contribute to cumulative impacts with nearby development and future projects. Cumulative impacts have been addressed in Section 6.17. Projects are required to mitigate their own impacts to acceptable levels, which will minimise cumulative impacts overall. Mitigation measures for this Project can be found in Chapter 6 and Appendix F.

7.7 Ecologically sustainable development

The principles of ecologically sustainable development are outlined in Part 8, Division 5, section 193 of the EP&A Regulation and are addressed in Table 7.3.

Table 7.3 Consideration of principles of ESD

Principle	ESD principle	Evaluation of the Project impact against principle
Precautionary principle	The **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by— i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and ii) an assessment of the risk-weighted consequences of various options.	During the Project planning phase and preparation of this EIS, experts in their respective fields have carefully assessed the potential environmental impacts of the Project through quantitative technical assessments, providing a high degree of certainty around Project impacts. The Project has been designed considering the precautionary principle and in response to legislation, policies, and guidelines to ensure that it does not pose an unacceptable risk to human health or the environment. Management measures have been proposed for all potential environmental impacts. The implementation of these measures will avoid or minimise the threat of serious or irreversible damage to the environment to the extent practicable. Therefore, the Project is consistent with the precautionary principle.

Principle	ESD principle	Evaluation of the Project impact against principle
Social equity including Inter-generational equity	**Inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.	The Project will contribute to the sustainable transition of electricity generation in NSW to a more reliable, more affordable, and cleaner energy future and contribute to a net reduction in GHG emissions. The Project is expected to have a positive impact on intergenerational equity (fairness between generations) due to a reduction in carbon emissions which will slow the impacts of human activity induced climate change. The unavoidable biodiversity impacts will be compensated via conservation mechanisms established under the NSW BOS. Once decommissioned, land within the development footprint can be rehabilitated to its current use if required, allowing continued renewable energy generation or a return to agricultural production, both of which would provide benefits for future generations. Therefore, the Project is consistent with the principle of inter-generational equity.
Conservation of biological diversity and maintenance of ecological integrity	**Conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	The conservation of biological diversity and ecological integrity was a fundamental consideration in the development of the Project. The location of the Project on land with a long history of agricultural use meansbiodiversity values are minimal in the study area. Specifically, a riparian protection zone was introduced to the Project design around creek areas to avoid areas of high biodiversity value. The BDAR assessed potential biodiversity impacts (Section 6.2 and Appendix G). Residual impacts will be compensated through the implementation of biodiversity offsets. Management and mitigation measures have been prescribed to minimise, manage, and offset residual biodiversity impacts (Appendix F).
Improved valuation and pricing of environmental resources	**Improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as— i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, and iii) established environmental goals 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.	Project benefits are considered to outweigh the costs. The Project will generate around 350 FTE direct jobs during the peak of construction and up to 10 FTE during operation, which will provide economic benefits to the local community. The purpose of the Project is to generate renewable energy, which supports the transition away from fossil fuel (coal and gas) energy generation, thereby contributing to a net reduction in the generation of pollution and the use of natural resources. LSbp accepts the financial costs associated with measures required for the Project to avoid, minimise, mitigate, and manage potential environmental and social impacts, for community payments throughout the life of the Project, and for the appropriate decommissioning required for Project infrastructure. Therefore, the Project is consistent with improved valuation, pricing, and incentive mechanisms

7.8 Conclusion

LSbp proposes to develop the Project, which is a large-scale solar PV electricity generation facility and associated BESS approximately 25 km south-west of the township of Dunedoo. The Project will be within the NSW Government declared CWO REZ and will play an important role in achieving the objectives of the REZ. The Project will also provide significant economic stimulus to the region through construction jobs and associated flow-on benefits.

The Project will deliver 700 MW of much needed renewable energy supply into NSW, and due to its location within the CWO REZ, suitable infrastructure is being planned in the distribution of much needed renewable energy generation to the NEM, which supports Commonwealth emissions commitments.

This EIS comprehensively considers the Project's potential environmental impacts in accordance with relevant legislation, policies, and guidelines.

The Project will provide the following benefits:

- contribution to energy security and reliability in NSW and assisting in the change from fossil fuel energy generation to renewable energy generation
- reducing the impacts of climate change through reduced GHG emissions
- alignment with Commonwealth and NSW Government electricity policies and strategies and regional plans
- economic stimulus locally, regionally, and nationally through direct and flow-on means
- provision of employment and business opportunities during construction.

The assessments undertaken and conclusions reached demonstrate the Project can be constructed and operated within acceptable limits though the implementation of mitigation and management measures described in Chapter 6 and Appendix F. The Project will not result in significant impacts to the environment or community.

It is considered that the environmental, social, and economic benefits for the local, regional, and NSW communities far outweigh the temporary impacts resulting from development and operation of the Project. Therefore, the Project is in the public interest.

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Appendix A

SEARs compliance table

Table A.1 SEARs compliance table

SEARs	Relevant EIS section
General requirements	
The environmental impact statement (EIS) must meet the minimum form and content requirements as prescribed by Part 8, Division 5 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) and must have regard to the State Significant Development Guidelines.	
In particular, the EIS must include:	
• a stand-alone executive summary	Executive Summary
• a full description of the development, including:	Chapter 3
– details of construction, operation and decommissioning	Sections 0, 3.7, 3.8
– a high-quality site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process)	Figure 3.1
– a high-quality detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development	Figure 2.6
• 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)	Chapter 2
• an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including:	Chapter 6
– a description of the existing environment likely to be affected by the development using sufficient baseline data	Section 2.5, Section 3.2 A description of existing environment is also provided for each impact assessed in Chapter 6.
– an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), including any cumulative impacts of the site and existing or proposed; developments in the region, 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, subject to revision) and Cumulative Impact Assessment Guideline (DPIE, 2021)	Chapter 6, including Section 6.17 – cumulative impacts
– a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below)	Appendix F A table of mitigation measures is also provided for each impact assessed in Chapter 6.
– a description of the measures that would be implemented to monitor and report on the environmental performance of the development	Appendix F A table of mitigation measures is also provided for each impact assessed in Chapter 6
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS	Appendix F
• a detailed evaluation of the merits of project as a whole having regard to:	

SEARs	Relevant EIS section
– the requirements in Section 4.15 of the Environmental Planning and Assessment Act 1979, including the objects of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development	Chapter 4, Chapter 7
– the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses	Section 2.4, Section 6.13.3, Annexure B of Appendix K
– feasible alternatives to the development and its key components (including opportunities for shared infrastructure with proposed developments in the region), and the consequences of not carrying out the development	Section 2.7
• a detailed consideration of the capability of the project to contribute to the security and reliability of the electricity system in the National Electricity Market, having regard to local system conditions and the Department's guidance on the matter	Section 2.2
• a signed statement from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.	Certification page (between title page and executive summary)
The EIS must also be accompanied by a report from a suitably qualified person providing:	
• a report from a suitably qualified person providing a detailed calculation of the capital investment value (CIV) (as defined in the Dictionary of the EP&A Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived	Appendix S
• an estimate of jobs that will be created during the construction and operational phases of the proposed project	Table 3.3, Chapter 6.14.3 Appendix S
• certification that the information provided is accurate at the date of preparation.	Appendix S
The development application must be accompanied by the consent of the owner/s of the land (as required in Section 23(1) of the EP&A Regulation).	Provided separately to EIS
Key Issues	
The EIS must address the following key issues:	
• Biodiversity – including a quantitative assessment of potential: – an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR), including a detailed description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts (including on grasslands) of the development over time, and a strategy to offset any residual impacts of the development in accordance with the BC Act	Section 6.2 Appendix G
– an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the Fisheries Management Act 1994, and a description of the measures to minimise and rehabilitate impacts, including impacts to Sandy Creek, Broken Leg Creek and Spring Creek	Section 6.3 Appendix H
– if an offset is required, details of the measures proposed to address the offset obligations.	Section 6.2.5, Section 7.3 of Appendix G
• Heritage – including: – an assessment of the impact to Aboriginal cultural heritage items (cultural and archaeological) in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) and the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010), including results of archaeological test excavations (if required)	Section 6.4, Section 9.2.2 and Chapter 11 of Appendix I
– evidence of consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures), having regard to the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	Section 6.4.2, Chapter 3, and annexure B of Appendix I

SEARs	Relevant EIS section
– assess the impact to historic heritage having regard to the NSW Heritage Manual.	Section 6.5, Appendix J
• Land – including: – a detailed justification of the suitability of the site and that the site can accommodate the proposed development having regard to its potential environmental impacts, permissibility, strategic context and existing site constraints (including any land contamination)	Section 2.4, Section 6.6, Section 1.1 and Chapter 9 of Appendix K
– an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including:	Section 6.6.3, Section 3.6 of Appendix K
▪ flood prone land, Crown lands, mining, quarries, mineral or petroleum rights	Section 3.2.2, Section 6.10.5c, Table 4.1
▪ a soil survey to determine the soil characteristics and consider the potential for erosion to occur	Section 6.2.2, Chapter 4 and 6 and Attachment A and C of Appendix K
▪ a cumulative impact assessment of nearby developments	Section 6.17, Section 7.4 of Appendix K
– an assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including:	
▪ consideration of the zoning provisions applying to the land, including subdivision (if required)	Section 2.4
▪ completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's Land Use Conflict Risk Assessment Guide	Annexure B of Appendix K
– a detailed assessment of the impact on agricultural resources and agricultural productivity, including:	
▪ an agricultural impact statement (including soil testing)	Section 6.6.2, Section 3.5.6, 3.8 and Attachment A and C of Appendix K
▪ consideration of potential mitigation measures which may reduce project impacts on agricultural land	Section 6.9.7, Appendix K
▪ detailed economic assessment of impacts on agricultural land, agricultural production, and agricultural supply chains	Section 6.14.3, Appendix K, Appendix S
▪ justification for the project considering other alternatives and site design which may have lesser impacts on agricultural land	Section 2.7.2
• Visual – including: – a detailed assessment of the likely visual impacts (including any glare, reflectivity and night lighting) of all components of the project (including arrays, transmission lines, substations, battery storage and any other ancillary infrastructure) on surrounding residences (including approved developments, lodged development applications and dwelling entitlements), and key locations, scenic or significant vistas and road corridors in the public domain and on the Siding Spring Observatory in accordance with the Dark Sky Planning Guideline (2016)	Section 6.7, Appendix M
– provide details of measures to mitigate and/or manage potential impacts (including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners)	Section 6.9.7, Chapter 10 of *of Appendix M, Annexure B of Appendix M
• Noise – including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry (2017), cumulative noise impacts (considering other developments in the area), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria	Section 6.8, Appendix M

SEARs	Relevant EIS section
• Transport – including: – an assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation	Section 6.9, Section 4 of Appendix N
– an assessment of the likely transport impacts to the site access route(s), site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance	Section 6.9.6, Section 4.6 and 5.9 of Appendix N
– a cumulative impact assessment of traffic from nearby developments	Section 6.17.3vi, Section 5.6 of Appendix N
– provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road authorities	Section 6.9.7, Section 6 of Appendix N
• Water – including: – an assessment of the likely impacts of the development (including flooding) on surrounding watercourses (including their Strahler Stream Order) and groundwater resources and measures proposed to monitor, reduce and mitigate these impacts	Section 6.10, Section 6.2 and 6.3 of Appendix O
– details of water requirements and supply arrangements for construction and operation	Section 6.10.3, Section 5.4 of Appendix O
– where the project involves works within 40 metres of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and (if necessary) Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI 2003), and Policy & Guidelines for Fish Habitat Conservation & Management (DPE, 2013)	Section 6.10.5, Section 6.2.4 of Appendix O
– a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (Landcom 2004)	Section 6.6.4, Section 6.10.6, Chapter 5 of Appendix O, Chapter 8 of Appendix K
• Hazards and Risks – Including: – a preliminary risk screening completed in accordance with the State Environmental Planning Policy (Resilience and Hazards)	Section 6.11, Section 3 of Appendix P
– a Preliminary Hazard Analysis (PHA) prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011). The PHA must consider all recent standards and codes and verify separation distances to on-site and off-site receptors to prevent fire propagation and compliance with Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning (DoP, 2011)	Section 6.11.2, Sections 4-10 of Appendix P
– an assessment of potential hazards and risks including but not limited to fires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields	Section 6.11.2, Sections 4-10 of Appendix P
– identify potential hazards and risks associated with bushfires / use of bushfire prone land including the risks that a solar farm would cause bush fire and demonstrate compliance with Planning for Bush Fire Protection 2019	Section 6.11.3, Appendix Q
• Social Impact – including an assessment of the social impacts in accordance with Social Impact Assessment Guideline (DPIE, 2021) and consideration of construction workforce accommodation	Section 6.13.3, Section 3.6, 6.2.2, 6.2.3 and annexure A of Appendix R
• Economic – including an assessment of the economic impacts or benefits of the project for the region and the State as a whole	Section 6.14, Chapter 4 of Appendix S

SEARs	Relevant EIS section
• Waste – identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.	Section 6.15
Plans and documents	
The EIS must include all relevant plans, diagrams and relevant documentation required under Part 3 of the EP&A Regulation. Provide these as part of the EIS rather than as separate documents. In addition, the EIS must include high quality files of maps and figures of the subject site and proposal.	Figures throughout EIS
Consultation	
During the preparation of the EIS, you should consult with the relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners and any exploration licence and/or mineral title holders. In particular, you must undertake detailed consultation with affected landowners surrounding the development, Warrumbungle Shire Council, Dubbo Regional Council, The Departments Biodiversity and Conservation Division, Crown Lands, NSW Aboriginal Land Council, Department of Planning and Environment's Water Group and Transport for NSW.	Chapter 5, Appendix E, Chapter 5 of Appendix R, Annexure E of Appendix R
The EIS must: • detail how engagement undertaken was consistent with the Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021)	Chapter 5, Appendix E, Chapter 2 of Appendix R
• describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, an explanation should be provided.	Section 1.4, Chapter 5, Section 6.13.3 and 6.13.4, Chapter 5 and section 6.1 of Appendix R

Appendix B

Copies of landowner consent

Letter to Applicant (consent granted)

File Ref: 23/02424
Account No: 640246

Jason Jones
Phone: (02) 6883 3300
dubbo.crownlands@crownland.nsw.gov.au

Lightsource Development Services Australia Pty Ltd
C/ Sandy Creek Solar farm
420 George St
SYDNEY NSW 2000

25 May 2023

Dear Sir/Madam

Landowner's Consent for Lodgement of Applications relating to development comprising: Solar Farm on Crown land: Locational: [redacted]

Consent is granted by the Minister for Lands to the lodging a development application under the *Environmental Planning and Assessment Act 1979*, and other associated applications required under other legislation, for the development proposal described above.

This consent is subject to the following:

(1) This consent is given without prejudice so that consideration of the proposed development may proceed under the *Environmental Planning and Assessment Act 1979* and any other relevant legislation.

(2) This consent does not imply the concurrence of the Minister for Lands and Water for the proposed development, or the issue of any necessary lease, licence or other required approval under the *Crown Land Management Act 2016*; and does not prevent the Department of Planning and Environment - Crown Lands (Department of Planning and Environment - Crown Lands) from making any submission commenting on.

(3) This consent will expire after a period of 12 months from the date of this letter if not acted on within that time. Extensions of this consent can be sought.

(4) The Minister reserves the right to issue landowner's consent for the lodgement of applications for any other development proposals on the subject land concurrent with this landowner's consent.

(5) Irrespective of any development consent or any approval given by other public authorities, any work or occupation of Crown land cannot commence without a current tenure from the Department of Planning and Environment - Crown Lands authorising such work or occupation.

This letter should be submitted to the relevant consent or approval authority in conjunction with the development application and/or any other application.

It is advised that the Department of Planning and Environment - Crown Lands will inform Dubbo Regional Council of the issue of this landowner's consent and will request that Dubbo Regional Council notify the Department of Planning and Environment - Crown Lands of the subsequent development application, for potential comment, as part of any public notification procedure.

You are required to forward to Department of Planning and Environment - Crown Lands a copy of any development consent or other approval as soon as practical after that consent or approval is received.

If any modifications are made to the application (whether in the course of assessment, by conditions of consent, or otherwise), it is your responsibility to ensure the modified development remains consistent with this landowner's consent.

For further information, please contact Jason Jones via the details given in the letter head.

Yours faithfully

Jason Jones
Department of Planning and Environment - Crown Lands

Lightsource Development Services Australia
L29/420 George St
Sydney
2000
Australia

www.lightsourcebp.com

1/07/20223

[redacted]

Dear Iwan,

Being the owner of land located at [redacted] and identified as the following title references:

Lot 25 in Deposited Plan 754305, Folio 25/754305 (Lot 25)

Lot 36 in Deposited Plan 754305, Folio 36/754305 (Lot 36)

Lot 38 in Deposited Plan 754305, Folio 38/754305 (Lot 38)

Lot 54 in Deposited Plan 754305, Folio 54/754305 (Lot 54)

Lot 58 in Deposited Plan 754305, Folio 58/754305 (Lot 58)

Lot 7 in Deposited Plan 754317, Folio 7/754317 (Lot 7)

Lot 8 in Deposited Plan 754317, Folio 8/754317 (Lot 8)

Lot 20 in Deposited Plan 754317, Folio 20/754317 (Lot 20)

Lot 23 in Deposited Plan 754317, Folio 23/754317 (Lot 23)

Lot 24 in Deposited Plan 754317, Folio 24/754317 (Lot 24)

Lot 25 in Deposited Plan 754317, Folio 25/754317 (Lot 25B)

Lot 26 in Deposited Plan 754317, Folio 26/754317 (Lot 26)

Lot 29 in Deposited Plan 754317, Folio 29/754317 (Lot 29)

Lot 33 in Deposited Plan 754317, Folio 33/754317 (Lot 33)

Lot 36 in Deposited Plan 754317, Folio 37/754317 (Lot 37)

Lot 37 in Deposited Plan 754317, Folio 37/754317 (Lot 37)

Lot 66 in Deposited Plan 754317, Folio 66/754317 (Lot 66)

provide consent to the applicant,

Lightsource Development Services Australia Pty Limited ABN 26 623 301 799 of Level 29, 420 George Street, Sydney, NSW, 2000,

to apply to a consent authority under section 4.12 of the Environmental Planning and Assessment Act 1979 (NSW) for consent to carry out development, known as Sandy Creek Solar Farm, under development application number SSD 41287735,

which is to be carried out on the land described above and includes:

- the construction and operation of a photovoltaic generation facility with an estimated capacity of 850 MWp;
- A Battery Energy Storage System (BESS) with a estimated capacity of 800 MWh;
- A temporary accommodation village; and
- associated infrastructure, including grid connection hardware

Signed,

[redacted]

Lightsource Development Services Australia Pty Ltd
L29/420 George St
Sydney NSW, 2000
ABN 26 623 301 799

Lightsource Development Services Australia
L29/420 George St
Sydney
2000
Australia

www.lightsourcebp.com

1/07/20223

[redacted]

Dear Iwan,

Being the owner of land located at [redacted] and identified as the following title references:

- Lot 49 in Deposited Plan 754305, Folio 49/754305
- Lot 55 in Deposited Plan 754305, Folio 55/754305
- Lot 65 in Deposited Plan 754305, Folio 65/754305
- Lot 66 in Deposited Plan 754305, Folio 66/754305
- Lot 96 in Deposited Plan 754305, Folio 67/754305
- Lot 97 in Deposited Plan 754305, Folio 97/754305
- Lot 98 in Deposited Plan 754305, Folio 98/754305
- Lot 99 in Deposited Plan 754305, Folio 99/754305
- Lot 100 in Deposited Plan 754305, Folio 100/754305
- Lot 102 in Deposited Plan 754305, Folio 102/754305
- Lot 2 in Deposited Plan 1190816, Folio 2/1190816

We provide consent to the applicant,

Lightsource Development Services Australia Pty Limited ABN 26 623 301 799 of Level 29, 420 George Street, Sydney, NSW, 2000,

to apply to a consent authority under section 4.12 of the Environmental Planning and Assessment Act 1979 (NSW) for consent to carry out development, known as Sandy Creek Solar Farm, under development application number SSD 41287735,

which is to be carried out on the land described above and includes:

- the construction and operation of a photovoltaic generation facility with an estimated capacity of 850 MWp;
- A Battery Energy Storage System (BESS) with a estimated capacity of 800 MWh;
- A temporary accommodation village; and
- associated infrastructure, including grid connection hardware

Signed,

David John Brennan
380 Birriwa Rd, Dunedoo NSW 284

Date: 24/7/2023

Peta May Brennan
380 Birriwa Rd, Dunedoo NSW 284

Date: 24/7/23

Coonabarabran:

14-22 John Street
Coonabarabran NSW 2357

PO Box 191
Coonabarabran NSW 2357

ABN: 63 348 671 239

warrumbungle
SHIRE COUNCIL

Calls from within Shire
1300 795 099

Calls from outside Shire area
Coonabarabran:
02 6849 2000

Coolah: 02 6378 5000

Fax: 02 6842 1337

Email:
info@warrumbungle.nsw.gov.au

Coonabarabran - Coolah - Dunedoo - Baradine - Binnaway - Mendooran

Please address all mail to:
The General Manager

Please refer enquiries to: Leeanne Ryan
Doc ID 206104

17 October 2023

[redacted]

Dear [redacted]

Consent to Applicant

Being the owner of the Council Public Road comprising:

- Dapper Rd, Dunedoo; and
- Sandy Creek Rd, Cobbora

Warrumbungle Shire Council provides consent to the applicant:

Lightsource Development Services Australia Pty Limited
ABN 26 623 301 799
Level 29, 420 George Street
SYDNEY NSW 2000.

to apply to a consent authority under section 4.12 of the *Environmental Planning and Assessment Act 1979* (NSW) for consent to carry out development, known as Sandy Creek Solar Farm (the Project), under development application number SSD 41287735, which is to be carried out on the land described in Figure 1.1, showing the solar farm and associated infrastructure location, and Figure 1.2, showing the location of the various road upgrades and repairs.

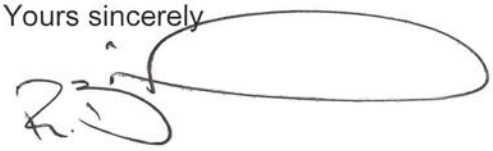
The Project includes:

- the construction and operation of a photovoltaic generation facility with an estimated capacity of 850 MWp;
- a Battery Energy Storage System (BESS) with an estimated capacity of 800 MWh;
- a temporary accommodation facility;
- connection to the Elong Elong Energy Hub;
- various road repairs and upgrades, including:
    - widening Dapper Road between the Elong Elong Energy Hub site access point and the Project site access point; and

- installing a crossing on Sandy Creek Road to allow construction vehicles to pass from one side to the other.

For avoidance of doubt, the granting of this consent to Lightsource Development Services Australia Pty Ltd to submit a DA under the EP&A Act does not infer or imply in any way that a s138 consent under the Roads Act would be granted by Council.

Yours sincerely



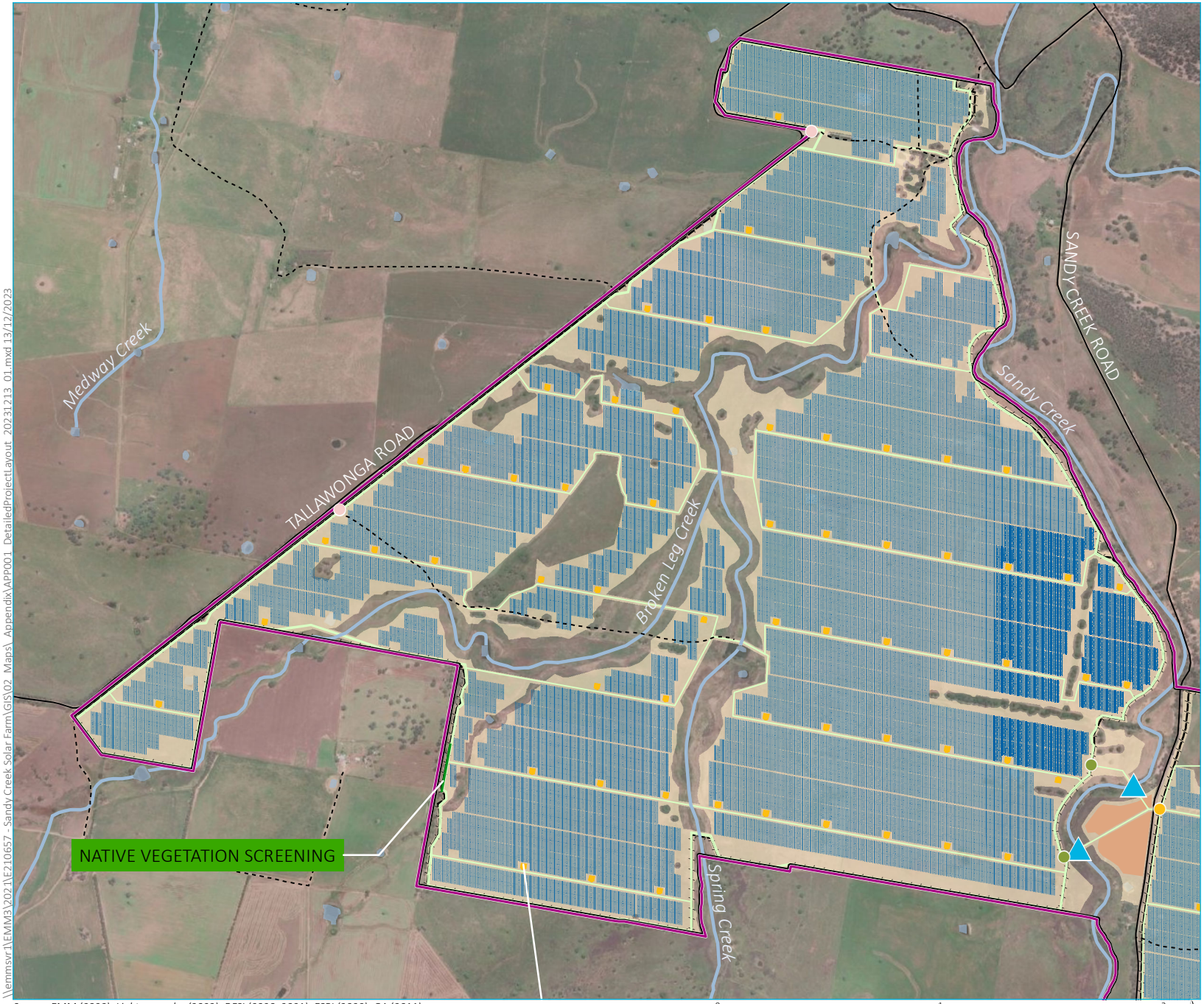
ROGER BAILEY
GENERAL MANAGER

lightsource bp

Appendix C

Detailed maps and plans

EMM
creating opportunities



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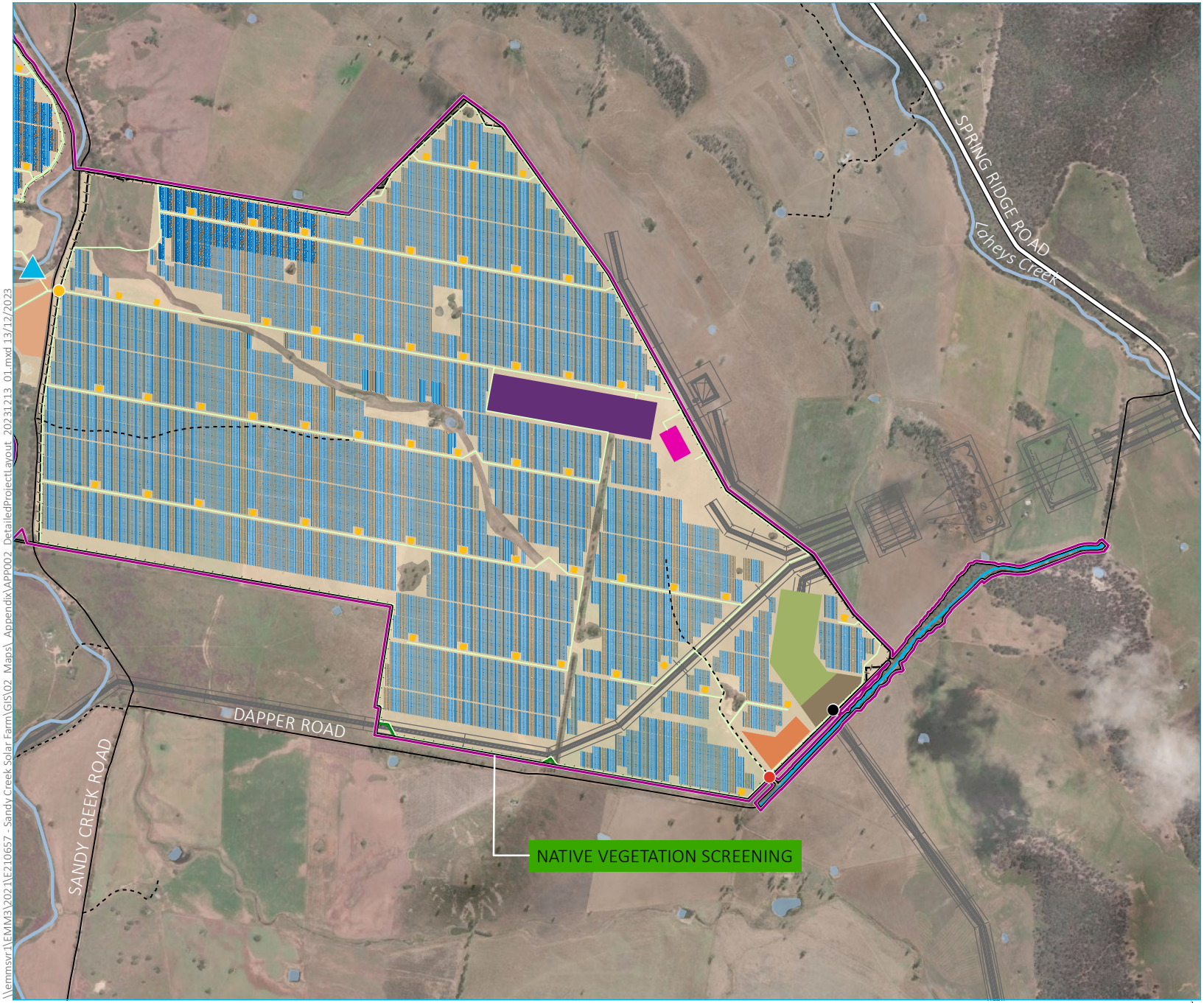
Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011)

Conceptual site layout

Sandy Creek Solar Farm
Appendix C - Detailed maps and plans
Appendix C.1

EMM
creating opportunities



Study area
Development footprint
Road upgrade corridor

Existing environment
Major road
Minor road
Vehicular track
Named watercourse
Waterbody

Site feature
Primary site access
Accommodation site access
Sandy Creek Road crossing
Sandy Creek bridge crossing
Internal access track
Central-West Orana REZ transmission infrastructure. (Simplified; subject to separate approval (SSI-48323210))
Security fence
APZ buffer
Substation
Accommodation facility
Temporary construction compound and operation and maintenance facility
Secondary temporary construction compound
Parking area
Inverter / BESS Option A: DC-Coupled BESS (decentralised)
BESS Option B: AC-Coupled BESS (centralised)
Native vegetation screening
Solar panel array

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Source: EMM (2023); Lightsource bp (2023); DFSI (2020, 2021); ESRI (2022); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 55

N

Conceptual site layout

Sandy Creek Solar Farm
Appendix C - Detailed maps and plans
Appendix C.2

EMM
creating opportunities

Appendix D

Statutory compliance table

Table D.1 Statutory compliance table

Statutory document	Reference	Requirement	Section in EIS
Commonwealth acts			
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)		The EPBC Act provides the legal basis to protect and manage internationally and nationally important flora, fauna, ecological communities, heritage places and water resources which are deemed to be matters of national environmental significance (MNES). MNES, as defined under the EPBC Act, are: 1. world heritage properties 2. places listed on the National Heritage Register 3. wetlands of international significance listed under the Ramsar Convention 4. threatened flora and fauna species and ecological communities 5. migratory species 6. Commonwealth marine areas 7. Great Barrier Reef Marine Park 8. nuclear actions (including uranium mining) 9. water resources, in relation to coal seam gas or large coal mining development. Under the EPBC Act, a proponent proposing to undertake an action that may or will have a significant impact on matters of national environmental significance (MNES), or the environment generally for 'Commonwealth agencies', is to be referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for determination as to whether or not it is a controlled action. A search of the Commonwealth Protected Matters Search Tool indicates that there are no World Heritage Properties, National Heritage Places or wetlands of international importance within the vicinity of the project area. A biodiversity development assessment report (BDAR) was prepared for the project and found that the project is likely to have a significant impact on Box Gum Woodland CEEC and Grey Box Woodland EEC, therefore, a referral under the EPBC Act has been submitted.	Section 4.7 Other approvals Section 6.2 Biodiversity Appendix G Biodiversity Development Assessment Report

Statutory document	Reference	Requirement	Section in EIS
The Commonwealth *Native Title Act 1993*		The Commonwealth *Native Title Act 1993* recognises and protects native title rights in Australia. It allows a native title determination application (native title claim) to be made for land or waters where native title has not been validly extinguished, for example, extinguished by the grant of freehold title to land. There are currently no native title determinations over the project area.	Section 6.4 Aboriginal Heritage Appendix I Aboriginal Cultural Heritage Assessment
NSW Acts			
Environmental Planning and Assessment Act 1979 (EP&A Act)	Section 1.3	Relevant objects of the Act	Section 7.4Objects of the EP&A Act
	Section 4.15(1)	Matters for consideration—general In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:	
		(a) the provisions of— (i) any relevant environmental planning instruments, and … (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates.	Chapter 4 Statutory context
		(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Chapter 6 Assessment of impacts Section 6.17 Cumulative impacts
		(c) the suitability of the site for the development.	Section 2.4 Site suitability
		(e) the public interest.	Chapter 5 Engagement, Chapter 7 Project justification

Statutory document	Reference	Requirement	Section in EIS
Biodiversity Conservation Act 2016 (BC Act)	section 7.14	(2) The Minister for Planning, when determining in accordance with the *Environmental Planning and Assessment Act 1979* any such application, is to take into consideration under that Act the likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report. The Minister for Planning may (but is not required to) further consider under that Act the likely impact of the proposed development on biodiversity values. (3) If the Minister for Planning decides to grant consent or approval and the biodiversity offsets scheme applies to the proposed development, the conditions of the consent or approval may require the applicant to retire biodiversity credits to offset the residual impact on biodiversity values (whether of the number and class specified in the report or other number and class). The residual impact is the impact after the measures that are required to be carried out by the terms or conditions of the consent or approval to avoid or minimise the impact on biodiversity values of the proposed development. (4) A condition to retire biodiversity credits is required to be complied with before any development is carried out that would impact on biodiversity values. If the retirement of particular biodiversity credits applies to a stage of the development, compliance with the condition for their retirement is postponed until it is proposed to carry out that stage of the development.	Section 6.2 Biodiversity Appendix G Biodiversity development assessment report
Water Act 1912 and *Water Management Act 2000*		*The NSW Water Act 1912* (Water Act) and WM Act regulate the management of water by granting licences, approvals for taking and using water, and trading groundwater and surface water. The WM Act applies to those areas where a water sharing plan has commenced. Alternatively, if a water sharing plan has not yet commenced, the Water Act applies. The WM Act is progressively replacing the Water Act as relevant water sharing plans are introduced across the State. Water sharing plans have commenced for most of NSW. Licensing of monitoring bores continues under the Water Act until a regulation for aquifer interference gives a mechanism to approve these activities.	Section 6.10 and Appendix O Water resources assessment

Statutory document	Reference	Requirement	Section in EIS
Crown Lands Act 1989		The NSW *Crown Lands Act 1989* provides for the administration and management of Crown land in the eastern and central divisions of NSW. Crown land may not be occupied, used, sold, leased, dedicated, reserved, or otherwise dealt with unless authorised by this Act or the NSW *Crown Land (Continued Tenured) Act 1989*. A number of Crown roads have been identified within the study area (Table 3.2, Figure 3.4). Crown roads within the development footprint will require closing or an application for tenure, which will be undertaken in consultation with NSW Crown Lands in parallel with the assessment process for the project.	Section 3.2.2 Crown land
NSW Waste Avoidance and Resource Recovery Act 2001 (WARR Act)		The WARR Act promotes waste avoidance and resource recovery with the objective of minimising waste generation and disposal, and sets out objectives to ensure that resource management considers the following hierarchy: 1. Avoid unnecessary resource consumption. 2. Resource recovery (reuse, reprocessing, recycling, energy recovery). 3. Disposal. The project aligns with the objectives of the WARR Act.	Section 6.15
Protection of the Environment Operations Act 1997 (POEO Act)	section 48	The generation of electricity from solar power is not defined as a scheduled activity in Schedule 1 of the POEO Act and therefore an EPL is not required.	Section 4.7 Other approvals
Roads Act 1993	section 138	Approval will be required under Section 138 of the NSW *Roads Act 1993*, for any works in, on or over a public road. This will include the access road upgrade and public road crossings. Approval will be required from: • Warrumbungle Shire Council (access road upgrade on Dapper Road and road crossing over Sandy Creek Road).	Section 4.7 Other approvals
Conveyancing Act 1919	Section 23G		Table 4.1 Approvals and licences required
NSW Regulations			
Environmental Planning and Assessment Regulation 2021	Section 24	(1) A development application must— (a) be in the approved form, and (b) contain all of the information and documents required by: (i) the approved form, and (ii) the Act of this Regulation, and (c) be submitted on the NSW planning portal.	The EIS will be submitted via the NSW planning portal and has been prepared in the approved form.

Statutory document	Reference	Requirement	Section in EIS
	Section 190	(1) An environmental impact statement must contain the following information –	
		(a) the name, address and professional qualifications of the person who prepared the statement,	Certification page
		(b) the name and address of the responsible person,	Section 1.2 The applicant
		(c) the address of the land— (i) to which the development application relates, or (ii) on which the activity or infrastructure to which the statement relates will be carried out,	Table 3.1 Cadastral lots intersecting with the Project site
		(d) a description of the development, activity or infrastructure,	Chapter 3 Project description
		(e) an assessment by the person who prepared the statement of the environmental impact of the development, activity or infrastructure, dealing with the matters referred to in this Division.	This table
		(2) The person preparing the statement must have regard to— (a) for State significant development—the State Significant Development Guidelines, or (b) for State significant infrastructure—the State Significant Infrastructure Guidelines.	This EIS has been prepared in accordance with SSD guidelines.
		(3) An environmental impact statement must also contain a declaration by a relevant person that— (a) the statement has been prepared in accordance with this Regulation, and (b) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure, and (c) the information contained in the statement is not false or misleading, and (d) for State significant development or State significant infrastructure—the statement contains the information required under the Registered Environmental Assessment Practitioner Guidelines.	See certification page.
	Section 192	(1) An environmental impact statement must also include each of the following—	
		(a) a summary of the environmental impact statement,	Executive summary

Statutory document	Reference	Requirement	Section in EIS
		(b) a statement of the objectives of the development, activity or infrastructure,	Section 1.3 and Section 2.2 Project need
		(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure,	Section 2.7 Feasible alternatives to the Project
		(d) an analysis of the development, activity or infrastructure, including—	
		(i) a full description of the development, activity or infrastructure, and	Chapter 3 Project description
		(ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and	Section 2.5 Key features of the site and surrounds
		(iii) the likely impact on the environment of the development, activity or infrastructure, and	Chapter 6 Assessment of impacts
		(iv) a full description of the measures proposed to mitigate adverse effects of the development, activity or infrastructure on the environment, and	Chapter 6 Assessment of impacts Appendix F Mitigation measures table
		(v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out,	Chapter 4 Statutory context (section 4.7)
		(e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d)(iv),	Appendix F Mitigation measures table
		(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in section 193.	Chapter 7 Project justification
Environmental Planning Instruments			
State Environmental Planning Policy (Planning Systems) 2021	Schedule 1, Section 20	The project is SSD as it is a type of electricity generating works that has a capital investment value of more than $30 million.	Section 4.4 Approval pathway

Statutory document	Reference	Requirement	Section in EIS
State Environmental Planning Policy (Resilience and Hazards) 2021	Section 3.7	Consideration of Departmental guidelines in determining whether a development is— (a) a hazardous storage establishment, hazardous industry or other potentially hazardous industry, or (b) an offensive storage establishment, offensive industry or other potentially offensive industry, consideration must be given to current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development. The Project is a type of hazardous industry. A PHA has been prepared (Appendix P).	Section 6.11 Hazards and risk, Appendix P Preliminary hazard assessment
	Section 3.12	Potentially hazardous development • Whether any public authority should be consulted • A preliminary hazard analysis • Any feasible alternatives • Any likely future land use of surrounding land	Section 6.11.2 Preliminary hazard analysis, Appendix P, Preliminary hazard analysis
	Section 4.6	A consent authority must not consent to the carrying out of any development on land unless— (a) it has considered whether the land is contaminated, and (b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and (c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.	Section 6.6 Land and rehabilitation
State Environmental Planning Policy (Transport and Infrastructure) 2021	Section 2.48	Before determining a development application for development immediately adjacent to an electricity substation, the consent authority must— (a) give written notice to the electricity supply authority for the area in which the development is to be carried out, inviting comments about potential safety risks, and (b) take into consideration any response to the notice that is received within 21 days after the notice is given. There is electricity infrastructure within the vicinity of the development boundary and the project will require connection to the electricity transmission network. TransGrid is the relevant electricity supply authority	Chapter 5 Engagement, Appendix E

Statutory document	Reference	Requirement	Section in EIS
	Section 2.118(2)	The consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that— (a) where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and (b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of— (i) the design of the vehicular access to the land, or (ii) the emission of smoke or dust from the development, or (iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and (c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.	Section 6.9 Traffic and Transport Appendix N Traffic Impact Assessment
State Environmental Planning Policy (Biodiversity and Conservation) 2021		Chapter 3 and Chapter 4 of this SEPP aims 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.	Section 6.2 Biodiversity – terrestrial, Appendix G Biodiversity development assessment report
Warrumbungle Shire Council LEP 2013	Clause 2.3 (2)	(2) The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.	Section 2.4 Site suitability, Section 4.5 Permissibility
	Clause 4.2 (Rural subdivision)	(3) Land in a zone to which this clause applies may, with development consent, be subdivided for the purpose of primary production to create a lot of a size that is less than the minimum size shown on the Lot Size Map in relation to that land.	Table 4.1 Approvals and licences required

Statutory document	Reference	Requirement	Section in EIS
	Clause 4.2B (Erection of rural workers' dwellings in Zone RU1)	(3) Development consent must not be granted to the erection of a rural worker's dwelling on land to which this clause applies, unless the consent authority is satisfied that— (a) the development will be on the same lot as an existing lawfully erected dwelling house, and (b) the development will not impair the use of the land for agriculture or rural industries, and (c) the agriculture or rural industry being carried out on the land has a demonstrated economic capacity to support the ongoing employment of rural workers, and (d) the development is necessary considering the nature of the agriculture or rural industry land use lawfully occurring on the land or as a result of the remote or isolated location of the land.	Section 2.5.2 Nearby receptors, Chapter 4 Statutory context, Section 6.14 Economic, Appendix S Economic impact assessment
	Clause 6.1 (Earthworks)	(3) Before granting development consent for earthworks (or for development involving ancillary earthworks), the consent authority must consider the following matters— (a) the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development, (b) the effect of the development on the likely future use or redevelopment of the land, (c) the quality of the fill or the soil to be excavated, or both, (d) the effect of the development on the existing and likely amenity of adjoining properties, (e) the source of any fill material and the destination of any excavated material, (f) the likelihood of disturbing relics, (g) the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area, (h) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	Section 0 Activities during construction, Chapter 4 Statutory context

Statutory document	Reference	Requirement	Section in EIS
	Clause 6.3 (Terrestrial biodiversity)	(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider— (a) whether the development is likely to have— (i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and (ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and (iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and (iv) any adverse impact on the habitat elements providing connectivity on the land, and (b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	Chapter 6 Assessment of impacts, Appendix F Mitigation measures table, Appendix G-Appendix T technical assessments
		(4) Development consent must not be granted to development on land to which this clause applies (i.e. land identified as Moderate or High Biodiversity Sensitivity) unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	Section 1.4 Strategy to avoid, mitigate and offset impacts, Chapter 6 Assessment of impacts, Appendix F Mitigation measures table, Appendix G-Appendix T technical assessments
	Clause 6.4 (Groundwater vulnerability)	(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	Chapter 6.10 Water, Appendix O Water resources assessment

Statutory document	Reference	Requirement	Section in EIS
	Clause 6.5 (Riparian land and watercourses)	(2) This clause applies to— (a) land identified as "Watercourse" on the Riparian Lands and Watercourses Map, and (b) all land that is within 40 metres of the top of the bank of each watercourse on land identified as "Watercourse" on that map. (3) Before determining a development application for development on land to which this clause applies, the consent authority must consider— (a) whether or not the development is likely to have any adverse impact on the following— (i) the water quality and flows within the watercourse, (ii) aquatic and riparian species, habitats and ecosystems of the watercourse, (iii) the stability of the bed and banks of the watercourse, (iv) the free passage of fish and other aquatic organisms within or along the watercourse, (v) any future rehabilitation of the watercourse and riparian areas, and (b) whether or not the development is likely to increase water extraction from the watercourse, and (c) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	Section 6.3 Biodiversity – aquatic, 6.10.2(v) Water quality, Section 6.10.3 Water demands, Appendix F Mitigation measures table, Appendix H Aquatic biodiversity, Appendix O Water resources assessment
		(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that— (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	Section 2.4Site suitability, Section 6.3 Biodiversity – aquatic, Appendix F Mitigation measures table
Dubbo Regional Council LEP 2022	Clause 2.3 (2)	The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.	Section 2.4 Site suitability, Section 4.5 Permissibility

Statutory document	Reference	Requirement	Section in EIS
	Clause 5.14 (Siding Spring Observatory – maintaining dark sky)	(2) Light emissions – general considerations for all development. Before granting development consent for development on land to which the Plan applies, the consent authority must consider whether the development is likely to adversely affect observing conditions at the Siding Spring Observatory, taking into account the following matters – (a) the amount and type of light to be emitted as a result of the development and the measures to be taken to minimise light pollution, (b) the impact of those light emissions cumulatively with other light emissions and whether the light emissions are likely to cause a critical level to be reached, (c) whether outside light fittings associated with the development are shielded light fittings, (d) the measures to be taken to minimise dust associated with the development, Note— Dust tends to scatter light and increase light pollution. (e) the Dark Sky Planning Guideline prepared by the Planning Secretary and published in the Gazette.	Section 6.7 Visual, Appendix L Landscape and visual impact assessment
	Clause 7.1 (Terrestrial biodiversity)	(3) In deciding whether to grant development consent for development on land to which this clause applies, the consent authority must consider— (a) whether the development is likely to have— (i) an adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and (ii) an adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and (iii) the potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and (iv) an adverse impact on the habitat elements providing connectivity on the land, and (b) appropriate measures to avoid, minimise or mitigate the impacts of the development.	Chapter 6 Assessment of impacts, Appendix F Mitigation measures table, Appendix G-Appendix T technical assessments
		(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied— (a) the development is designed, sited and will be managed to avoid a significant adverse environmental impact, or (b) if a significant adverse environmental impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise the impact.	Section 1.4 Strategy to avoid, mitigate and offset impacts, Chapter 6 Assessment of impacts, Appendix F Mitigation measures table, Appendix G-Appendix T technical assessments

Statutory document	Reference	Requirement	Section in EIS
	Clause 7.2 (Earthworks)	(2) Development consent is required for earthworks unless— (a) the work is exempt development under— (i) this Plan, or (ii) another applicable environmental planning instrument, or (b) the work is ancillary to other development for which development consent has been granted.	Section 0Activities during construction, Chapter 4 Statutory context
		(3) In deciding whether to grant development consent for earthworks, the consent authority must consider the following matters— (a) the likely disruption of, or any detrimental effect on, existing drainage patterns and soil stability in the locality, (b) the effect of the development on the likely future use or redevelopment of the land, (c) the quality of the fill or the soil to be excavated, or both, (d) the effect of the development on the existing and likely amenity of adjoining properties, (e) the source of any fill material and the destination of any excavated material, (f) the likelihood of disturbing relics, (g) the proximity to and potential for adverse impact on any watercourse, drinking water catchment or environmentally sensitive area.	Section 6.4 Aboriginal heritage, Section 6.5 Historic heritage, Section 6.6 Land and rehabilitation, Section 6.7 Visual, Section 6.10 Water, Appendix I-Appendix L, Appendix O

Statutory document	Reference	Requirement	Section in EIS
	Clause 7.3 (Natural resource – riparian land and waterways)	(2) This clause applies to land— (a) identified on the Natural Resource—Water Map, or (b) situated within 40m of the bank or shore, measured horizontally from the top of the bank or shore, of a waterway on land identified in paragraph (a). (3) Development consent must not be granted to development on land to which this clause applies unless the consent authority has considered the following matters— (a) the potential adverse impact of the development on the following— (i) water quality within the waterway, (ii) aquatic and riparian habitats and ecosystems, (iii) stability of the bed, shore and banks of the waterway, (iv) the free passage of fish and other aquatic organisms within or along the waterway, (v) the habitat of any threatened species, population or ecological community, (b) the likelihood that the development will increase water extraction from the waterway for domestic or stock use and the potential impact of any extraction on the waterway, (c) a description of the proposed measures that may be undertaken to ameliorate any potential adverse impact.	Section 6.3 Biodiversity – aquatic, 6.10.2 (v) Water quality, Section 6.10.3 Water demands, Appendix F Mitigation measures table, Appendix H Aquatic biodiversity, Appendix O Water resources assessment
		(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development is consistent with the objectives of this clause and— (a) the development is designed, sited and managed to avoid potential adverse environmental impacts, or (b) if a potential adverse impact cannot be avoided—the development will be managed to mitigate the adverse impact.	Section 2.4 Site suitability, Section 6.3 Biodiversity – aquatic, Appendix F Mitigation measures table

Appendix E

Stakeholder engagement table

E.1 Government departments and agencies

Table E.1 provides an overview of the engagement with Government departments, agencies, and relevant Ministers, which included proactive correspondence and in-person and online Project briefings and meetings.

Table E.1 Government department and agency engagement

Stakeholder	Method	Date	Purpose
State Government Departments/ Agencies			
Department of Planning and Environment	Email OUT	7 August 2023	• Outlined approaches to construction workforce accommodation and cumulative impact assessment • Offer to organise an update to discuss further.
	Meeting	11 August 2023	• Pipeline of Projects in general. • Road impacts.
	Email/ letter IN	11 September 2023	• Requested temporary construction workforce accommodation facility be included, as part of the Project.
	Email OUT	05 October 2023	• Offered briefing and notified of upcoming Community Information Session.
Department of Fisheries	Video conference	3 April 2023	• Discussed riparian protection zone requirements and interactions with bushfire zones.
	Email OUT	5 July 2023	• Issued an infographic for comment/feedback on the riparian protection zone requirements.
	Email IN	10 July 2023	• Feedback about the riparian protection zone requirements.
	Email OUT	10 July 2023	• Provided alternative approach to the riparian protection zone requirements.
	Email OUT	12 September 2023	• Follow up on previous consultation.
	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
DPE Division: Biodiversity, Conservation and Science Directorate (BCS)	Site visit	2 September 2022	• Site walk-over. • Discussed category one land assessment
	Video conference	23 September 2022	• Issued category one land application.
	Email OUT	2 March 2023	• Project update on the biodiversity assessment
	Email IN	10 March 2023	• Acknowledgement of project update
	Email OUT	29 July 2023	• Issued updated category one land assessment.
	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
NSW Rural Fire Service	Phone call OUT	15 March 2023	• Discussed riparian protection zone requirements and interactions with bushfire zones.

Stakeholder	Method	Date	Purpose
	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
EnergyCo-convened Central -West Orana Community Reference Group	Video conference	27 April 2023	• Project update provided.
Heritage NW NSW EPA Department of Primary Industries Department of Regional NSW, Mining, Exploration and Geoscience	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Federal Government Ministers			
Climate Change and Energy,	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Environment and Water	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
State Government Ministers			
Minister for Transport and Roads	Email OUT	9 September 2022	• Offered briefing, issued Community Information Sheet #2. • Offered briefing and update.
	Email OUT	9 March 2023	• Offered briefing and update.
	Email OUT	9 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Minister for Environment and Heritage	Email OUT	9 September 2022	• Offered briefing, issued Community Information Sheet #2.
	Email OUT	9 March 2023	• Offered briefing.
	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Minister for Environment and Planning	Email OUT	9 September 2022	• Offered briefing, issued Community Information Sheet #2.
	Email OUT	9 March 2023	• Offered briefing.
	Email OUT	9 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.

Stakeholder	Method	Date	Purpose
Ministers for: • Environment • Energy • Heritage • Climate Change • Transport • Regional Transport and Roads • Regional NSW • Planning and Public Spaces	Email OUT	9 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Local Government			
Dubbo Regional Council Officers	Email IN Video conference	7 October 2022 4 May 2023	• Construction workforce accommodation, cumulative impacts, waste, transport and traffic, and community benefits.
	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Warrumbungle Shire Council Executive team	Video conference Email OUT	4 April 2023 21 April 2023	• Cumulative impacts and construction workforce accommodation. Collaboration to identify potential accommodation sites.
	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
Mid-Western Regional Council Officers	Email OUT	5 October 2023	• Offered briefing and notified of upcoming Community Information Session #2.
	Email IN	5 October 2023	• Requested briefing.

E.2 Elected Representatives

LSbp engaged regularly with the local Federal, State, and local Government Elected Representatives, to advise them about Project progress and share correspondence being sent by the Project to their constituents, for their awareness. Table E.2 provides a summary of these key activities undertaken. This included emailing Project information and convening briefings.

Table E.2 Elected Representative engagement

Stakeholder	Method	Date	Purpose
Elected Representatives			
Federal Member for Parkes	Email OUT Email OUT Video conference Email OUT	9 September 2022 9 March 2023 4 April 2023 5 October 2023	• Offered briefing, issued Community Information Sheet #2. • Offer of briefing and update. • Offered briefing and notified of upcoming Community Information Session #2.
State Member for Dubbo	Email OUT Email OUT Email OUT Email OUT Email OUT Email OUT	9 September 2022 9 March 2023 20 January 2023 9 March 2023 17 April 2023 5 October 2023	• Offered briefing, issued Community Information Sheet #2. • Offer of briefing and update. • Advised Project team was attending the Dunedoo Show. • Offered briefing and update. • Advised about landowner/ resident communication received about potential insurance cost impacts. • Offered briefing and notified of upcoming Community Information Session #2.
Mayor and Councillors Dubbo Regional Council	Email OUT Email OUT Meeting Email OUT	9 September 2022 9 March 2023 1 June 2023 5 October 2023	• Offered briefing, issued Community Information Sheet #2. • Offered briefing and update. • Project briefing. • Offered briefing and notified of upcoming Community Information Session #2.
Mayor and Councillors Warrumbungle Shire Council	Email OUT Email OUT Email OUT	9 September 2022 9 March 2023 5 October 2023	• Offered briefing, issued Community Information Sheet #2. • Offered briefing and update. • Offered briefing and notified of upcoming Community Information Session #2.

E.3 Adjacent and nearby landowners and residents

Table E.3 provides a summary of the engagement undertaken with landowners and residents adjacent to and in the vicinity of the Project area, including along local transport routes. This included proactively providing Project information via registered addressed and regular mail, phone and email. Over the life of the Project the nearby landowner list was expanded, as more information became available about the local community. Landowners on the southern side of the Project were identified as high-interest stakeholders.

Table E.3 Adjacent and nearby landowner and resident engagement

Stakeholder	Method	Date	Purpose
	Email OUT/registered post /regular post	9 September 2022	• Offered briefing, issued Community Information Sheet #2.

Stakeholder	Method	Date	Purpose
Adjacent and landowners within 2km of the Project area (17)	Email OUT /regular post	9 October 2023	• Invitation to attend Community Information Session #2
Nearby landowners (83)	Email OUT/registered post /regular post	9 September 2022	• Offered briefing, issued Community Information Sheet #2.
	Email OUT /regular post	9 October 2023	• Invitation to attend Community Information Session #2
Absent Landowners (x2)	Email OUT	9 September 2023	• Offered briefing, issued Community Information Sheet #2.
	Phone call OUT Phone call OUT Email OUT Email OUT Email OUT	31 October 2022 11 November 2022 2 December 2022 20 January 2023 24 March 2023	• Field survey work notifications.
	Email OUT	23 March 2023	• Invitation to participate in SIA.
	Email OUT /regular post	9 October 2023	• Invitation to attend Community Information Session #2.
Resident	Phone call IN	13 October 2022	• Enquiry to confirm if LSbp were looking to extend their footprint onto the landowner's land.
Landowners (16)	Email OUT/registered post	20 January 2023	• Request for land access to conduct visual impact assessment.
Resident	Email IN	3 February 2023	• Enquiry about potential insurance cost impacts for neighbouring landowners.
Stakeholders who opted-in to email distribution list	Email OUT	9 February 2023	• Advising the Project Team was attending the Dunedoo Show and inviting participation in the SIA.
Landowners (6)	Email OUT/registered post	16 February 2023	• Land access request for the Visual Impact Assessment.
Landowners (16)	Email OUT/ registered post	17 April 2023	• Responded to insurance cost impact concerns.
Landowner	Letter IN	4 October 2023	• Community benefit sharing opportunities.
	Email OUT	4 October 2023	• Meeting offer. Date to be confirmed.
Landowners (123)	Email OUT/ regular post	7 October 2023	• Invitation to attend Community Information Session #2
Registered Aboriginal Parties (9)	Email OUT	9 October 2023	• Invitation to attend Community Information Session #2.

E.4 Business Groups

Table E.4 includes the local business groups that were engaged, as part of the Project.

Table E.4 Local business group engagement

Stakeholder	Method	Date	Purpose
Gulgong Chamber of Commerce	Email OUT	9 October 2023	• Invitation to attend Community Information Session #2.
Dubbo Business Chamber			
Business Mudgee			
NSW Farmers Federation, Dunedoo Branch			

E.5 Broader community

Five enquiries were received from local residents. Table E.5 provides details of interactions with the broader community, including residents, a local business and nearby solar farm proponent.

Table E.5 Broader community engagement

Stakeholder	Method	Date	Purpose
Resident	Phone call IN	16 September 2022	• Enquiry to confirm location of the Project in relation to the landowner's land.
Resident	Phone call IN	21 October 2022	• Enquiry about impact mitigations (i.e. land values, bushfire management, glare and heat, aesthetics, increased traffic on local roads).
Local business	Email IN	8 December 2022	• Enquiry about contractor opportunities during construction.
Resident	Phone call IN	2 February 2023	• Concerns raised about the transmission line and grid connection. Enquiry onforwarded to EnergyCo.
Resident	Email IN	10 February 2023	• Enquiry asking to be contacted by the team. Concerned they were not aware of the project. Meeting subsequently held.
Dapper Solar Farm	Video conference	2 March 2023	• Project updates, cumulative impact discussion.

Stakeholder	Method	Date	Purpose
Adjacent landowner	Email IN	4 October 2023	• Concerns about impacts on: – visual amenity on two properties – glare – biosecurity – fire risk and insurance costs. • Request for shared benefit funding/ payment arrangement to be considered. • Impact management measure suggestions and items for further discussion: – exclusion fences for pest control – security – potential design changes.
	Email OUT	4 October 2023	• Meeting request.

Appendix F

Mitigation measures table

F.1 Mitigation measures

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Biodiversity – terrestrial		
E01	Options to further minimise impacts during construction and operation of the Project will be explored and implemented where possible. This includes: • minimising removal of hollow-bearing trees within the approved impact footprint • minimising removal of tree resources and native vegetation along the Dapper Road upgrade corridor.	PC
E02	Exclusion zones around the woodland areas will be established and retained and construction contractors informed not to disturb or enter areas outside the impact footprint. All workers to be made aware of ecologically sensitive areas and the need to avoid impacts. This includes adjacent native vegetation.	PC, C, O, CR
E03	A site plan will be included in a Construction Environmental Management Plan (CEMP) and will include: • the extent of approved impact • any relevant sensitive areas for avoidance • stockpile, material laydown areas, and site compounds. The site plan is to be placed in an accessible location to be viewed by all site personnel (site office for example).	PC
E04	All occurrences of threatened flora will be identified on the site plan and delineated in the field as 'no-go' zones. All contractors will be provided with an environmental induction prior to starting work on site, which includes communications about sensitive areas and no-go zones.	PC, C
E05	The construction laydown areas will be rehabilitated following completion of construction works if they are not required for operational purposes and will include removal of any materials brought into site such as gravel.	C
E06	The CEMP and any operational management plan will include provisions for the appropriate management of the 10 m indirect impact area, including: • protocols for bushfire asset management • management of weeds and run-off into adjacent off-project areas.	PC, C
E07	Sediment controls will be implemented during construction in accordance with a sediment and erosion control plan, including installation of fencing and sediments traps in any areas where works will occur in proximity to low lying vegetation or streams.	PC, C
E08	The Construction Traffic Management Plan (CTMP) will include construction speed limits to minimise risk of vehicle strike during construction phase of the Project when there is expected to be an increase in traffic movements.	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
E09	Pre-clearance inspection will conducted by a suitably qualified ecologist to: • inspect hollows prior to tree clearing • seed collection of native species prior to tree clearing are to be removed by a qualified seed collector/native nursery professional/bush regenerator. This seed can be propagated for use in any revegetation projects within the study area. Additionally, seed storage for future usage will also be investigated • inspect existing farm structures prior to removal • remove any individuals if found • relocate animals to suitable habitat within the locality • any animals injured during clearing works should be taken to a veterinarian or wildlife clinic.	PC
E10	Nest boxes or equivalent will be installed in remnant woodland within the study area. As a priority, removed hollows will be retained to re-installed on remnant trees within the site. Where this is not possible, nest boxes can be used. These will be installed at a rate of 1:1 for each hollow removed. A hollow bearing tree replacement plan will be prepared to guide the replacement of hollows throughout the life of the project. Additionally, any remnant woody vegetation that is cleared is to be relocated to woodland exclusion zones within the study area to provide habitat for fauna, where possible. Any remnant woody vegetation that is not able to be relocated will be mulched and re-used on site.	C
E11	A Biodiversity Management Plan (BMP) will be implemented for retained vegetation adjacent to the impact footprint that includes (but is not limited to): • protocols to control and manage weeds that may be exacerbated, spread or otherwise affected by the construction and operation of the Project • protocols to monitor the vegetation condition and habitat values of any such retained vegetation • provisions for corrective actions should a decline in vegetation or habitat condition be detected.	PC, C, O CR
E12	The Biodiversity Management Plan (BMP) will include prescriptions for the protection and ongoing management of the habitat of retained occurrences of Pine Donkey Orchid surrounded by the approved impact footprint.	PC, C, O CR
E13	Weeds will be removed prior to vegetation clearing. Weeds will be stockpiled appropriately prior to removal from the study area to avoid the spread of seed and other propagules. Weed hygiene protocols will be implemented prior to entering the study area. This includes wash-down procedures to all plant and machinery.	PC, C, O CR
E14	Dust levels will be monitored, and suppression strategies implemented where required, such as wetting down dirt roads or reducing vehicle speeds.	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Biodiversity – aquatic		
BA1	Riparian vegetation mitigation measures are as follows: • The design of all waterway crossings will follow guidelines that reflect the level of protection required for each creek. In addition, riparian protection zone widths and activities allowed within those zones will be in line with the NRAR's *Guidelines for Controlled Activities on waterfront land—Riparian corridors* (NRAR 2018) • During construction, including all trenching, boring and waterway crossing construction, no remnant riparian trees will be removed. • The construction of the crossing on Sandy Creek will be in a location which is highly disturbed as indicatively shown in Figure 8 of the AEIA (Appendix H). • A 40 m protection zone will be applied for Spring Creek and Broken Leg Creek, and a 50 m protection zone will be created and managed for Sandy Creek within the project area. The riparian protection zones suggested are likely to protect remaining riparian vegetation in the Sandy Creek catchment from being impacted by the construction and operation of the Project through the actions set out in Figure 7 of the AEIA (Appendix H).	PC, C, O
BA2	Additional mitigation measures during waterway crossing construction will include: • Erosion and sediment control measures will be implemented according to the Blue Book (Landcom 2004) during and after construction that limit sedimentation in downstream waterways and receiving waters, whilst allowing for fish passage. These measures will be detailed in the CEMP. • Earthworks associated with waterway crossing construction will only take place during periods of low/no flow periods where possible to minimise disturbance and poor downstream water quality outcomes. Where flow is present, fish passage will be maintained throughout the construction process utilising guidance from DPI (2013). • Planning of earthworks associated with trenching works for Sandy Creek will only take place during periods of low/no flow (dry) periods where possible to eliminate impacts on aquatic fauna. Where flow is present, fish passage will be maintained throughout the construction process utilising guidance from DPI (2013).	C
BA3	Mitigation measures during all other construction activities on the development footprint include: • Development of a Soil and Water Management Plan that includes stormwater management controls, appropriate infrastructure placement on the site and erosion and sediment control. • Storage of stockpiles of fill or excavated material above the potential flood extent.	C, O

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Aboriginal heritage		
AH1	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed by a heritage specialist in consultation with the RAPs and Heritage NSW to provide the post-approval framework for managing Aboriginal heritage within the construction area. The contents and guiding principles for the management of identified site types for the ACHMP are presented in Section 9 of Appendix I and will include: • processes, timing, communication methods and project involvement for maintaining Aboriginal community consultation and participation through the remainder of the project • inputs and content of a cultural heritage induction package for all construction personnel and subcontractors • descriptions and methods for surface collection of identified isolated objects and stone artefact scatters that would be adversely affected by the project • descriptions and method for mitigation and/or recovery of grinding grooves and culturally modified trees that would be adversely affected by the project • delineating and protecting Aboriginal and cultural sites within or in close proximity to the construction area, including clear marking, fencing, surface protection, etc. • procedures for managing the unexpected discovery of Aboriginal objects, sites and/or human remains during the project • procedures for the curation and long-term management of recovered cultural materials • methods of salvage analysis and reporting, including suitable collection and processing of stone artefacts • a monitoring regime for implementing the above measures.	PC, C
AH2	Given the potential complete and/or partial destruction of 30 sites, these will be subject to additional surface salvage recovery (conservation *ex situ*). While the specific methodologies and quantum would be developed as part of the ACHMP in consultation with the project team and RAPs, a number of guiding principles should be adopted, including: • A systematic surface collection should be undertaken of the sites (or portion of the sites) to be impacted (by a suitably qualified archaeologist and the RAPs). • The objects (along with those recovered from the test excavation) should be moved to a location decided upon in conversation with the RAPs, outside the impact footprint. • Post-salvage recording of the updated sites location/s. In the case of the potential complete or partial destruction of any remaining subsurface archaeology (low to moderate significance), no further mitigation measures are recommended.	PC
AH3	Passive avoidance of Aboriginal sites within the study area not impacted by current development plans that may include but not limited to: • fencing requirements for sites within the study area that won't be impacted and are within 100 m of the impact footprint. • cultural heritage site induction for construction team These measures will be incorporated in the ACHMP.	PC, C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
AH4	If the project design were to change such that it will impact the culturally modified tree, an inspection will be undertaken by a qualified arboriculturist of the tentatively identified culturally modified tree, to confirm whether it has formed through anthropogenic or natural processes. The findings of this investigation and subsequent management of the trees confirmed as being culturally modified will be integrated into the ACHMP as required.	PC
AH5	Consultation will be maintained with the RAPs during the finalisation of the assessment process and subsequent stages of the project where cultural heritage requires management.	PC, C, O
AH6	A copy of the ACHA and all relevant AHIMS site recording forms and information for the project will be lodged with Heritage NSW and provided to each of the RAPs.	PC
Historical heritage		
HH1	Historical Heritage Management Plan An Historical Heritage Management Plan (HHMP) will be developed and incorporated into the Cultural Heritage Management Plan for the Project, that will be integrated into the CEMP. The HHMP will include the mitigation measures described below and will provide processes and procedures in the event that impacts to heritage items become warranted and also contain an unexpected finds procedure.	PC, C
HH2	Archaeological investigation Four sites (SCSF-HS01 - SCSF-HS04) have been identified for potential archaeological test excavation prior to construction, as these sites are currently located inside the development footprint. If the alignment of access tracks and electrical trenching cannot be realigned during the final design phase a program of archaeological salvage excavation would need to occur. Notification under s146 of the Heritage Act would also need to be made to the NSW Heritage Council. If it is possible to move the alignment, this would be the preferred method of management to retain heritage significance. If it is not possible to move the alignment, the program relies on the final design of the Project and is therefore scheduled at the post approval stage of the Project. The archaeological research design and methodology for test excavation is to be provided in the HHMP.	PC
HH3	Archaeological monitoring Leaholme has been identified in the development footprint and is recommended for archaeological monitoring. If relics are discovered and it is possible to move the development footprint, this would be the preferred method of management to retain heritage significance. If it is not possible to move the development footprint, a program of archaeological salvage excavation would need to occur. Notification under s146 of the Heritage Act would also need to be made to the NSW Heritage Council. The program relies on the final design of the Project and is therefore scheduled at the post approval stage of the Project.	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
HH4	Archival photography An archival record in the form of digital photography will be prepared to capture the pre-construction state of the landscape; the images will capture fields/paddocks and their relationship to Sandy Creek, the shearing shed, surviving stockyards and ramps, road and tracks, and exotic trees. The record of the photographs, and other data relating to the history of the study area will be provided to Dubbo Regional Council and Warrumbungle Shire Council local studies library (or equivalent) and Gulgong Historical Society. A copy of the archival photographs and related material will be lodged with the Heritage NSW library for access to researchers also. The archival records will be prepared generally in accordance with the following guiding documents: • Photographic recording of heritage items using film or digital capture (Heritage Office 2006) • How to prepare archival records of heritage items (NSW Heritage Office 1998).	PC
HH5	Unexpected finds protocol An unanticipated finds protocol will form part of the HHMP to provide guidance to construction personnel should works uncover objects and fabric that may indicate relics.	PC, C
Land and rehabilitation		
L1	Land and soil capability Suitable soil management measures as documented in the Soil and Water Management Plan (SWMP) will be implemented, in accordance with the *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004), *Volume 2A* and *Volume 2C* (DECC 2008a, 2008b) to ensure the preservation of soil resources to allow for suitable rehabilitation, minimise erosion and preserve agricultural productivity.	PC, C, O, CR
L2	Agricultural productivity In addition to the maintenance and rehabilitation of pre-project soil and land capability, impacts to agriculture will be mitigated by the utilisation of agrisolar practices, including: • construct and maintain internal livestock fencing and other required infrastructure • graze sheep between the panels at a rate of at least 75–130% of the usual stocking rate for wool and meat production • undertake monitoring of agri-solar activities and adjust stocking rates to prevent land degradation	O
L3	Once the Project reaches the end of its investment and operational life, the Project infrastructure will be decommissioned and the development footprint returned to its pre-existing land use, namely suitable for cropping or grazing of sheep and cattle, or another land use as agreed by the Project owner and the landholder at that time.	CR

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
L4	Biosecurity The following controls will be implemented to manage impacts associated with weeds, pathogens and pest species be implemented as part of the CEMP: • hygiene and washdown protocols, including: – prior washdown and inspection of vehicles, plant and machinery prior to entry onto or exit from site – washdown and inspection of vehicles, plant and machinery when moving from on-site areas with known populations of weed and pest species onto other areas with low or no known populations • removal of identified weeds through methods such as herbicide spraying, scalping and hand-pulling • where gravel, crushed rock or other non-soil substrate is required to be imported to site, care will be taken to ensure that the material is free from noxious weed seed • prohibition on the import of soil • 1080 poison baiting programs and ripping of rabbit warrens and fox dens within the study area boundary and any exclusion areas (if established).	PC, C, O, CR
L5	Erosion and sediment control Erosion and sediment control measures and site rehabilitation and revegetation practices will be implemented generally in accordance with industry standard practice comprising *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004), Volume 2A and Volume 2C (DECC 2008a, 2008b) and *Best Practice Erosion and Sediment Control* (IECA 2008). Drainage and landform design The location of Project infrastructure should plan to utilise the existing topography where practicable, to avoid major land reshaping during the construction phase and rehabilitation phase as far as possible, and to minimise land disturbance and the alteration of drainage patterns. Some cut to fill will be required for both the battery energy storage system, substation and inverter blocks, limited to small areas. The constructed slopes associated with these areas should consider the guidance of Landcom (2004) as per Appendix K. As dispersive subsoils are present within the development footprint, the drainage and landform design will need to: • avoid concentration of flow and maintain sheet flow conditions, where practicable • avoid where possible excavating drains in dispersive soils and locate roads, hardstands and pads to utilise the natural slope so that water drains away as required • maintain the velocity of flows to suitable rates to prevent erosion • avoid where possible the use of structures that pond water and can cause tunnel erosion such as check dams and channel banks in concentrated flows and benches on cut and fill batters • use back-push diversion banks in lieu of channel banks if it is necessary to divert flow, where possible • ameliorate dispersive soils particularly in cable trenches and fill embankments where there is a high risk of tunnel erosion • use sediment basins (Type D) to capture and allow treatment of turbid runoff to protect downstream receivers.	PC, C, O, CR

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
L6	Minimising the extent and duration of land disturbance As part of the CEMP, land disturbance processes will be developed to ensure unnecessary land disturbance does not occur, including provision for site inspection by the site Environmental Manager or delegate prior to disturbance to identify any necessary environmental, cultural, drainage and erosion and sediment controls are planned and implemented as required.	C
L7	Promptly stabilising disturbed areas As recommended in minimising the extent and duration of land disturbance, progressive stabilisation and rehabilitation of disturbed areas should be undertaken to minimise erosion and the generation of sediment and turbid runoff. Due to the gentle slope gradients and presence of suitable quality topsoil, bonded fibre matrix hydro-mulches (BFM) are considered appropriate for Project rehabilitation purposes. Topsoil should not be applied to slopes steeper than 1:2 as there is a risk it will slump. For slopes steeper than 1:2, a hydraulically applied growth medium (HGM) is recommended. Ensure that non-water soluble, mineral based, biologically inoculated fertilisers are used in any revegetation works, if required, to not impact on proximal landowners participating in organic or carbon farming initiatives. Maximise sediment retention on site Type D sediment basins are recommended where calculated soil loss exceeds 150 m^3/y from disturbed areas, or where the control of turbidity is required to protect watercourses. Using enhanced erosion control measures, such as trafficable soil stabilising polymers or gravelled hardstand, could reduce soil loss below the threshold of 150 t/y and remove the requirement for a sediment basin. Maintain drainage, erosion and sediment control measures Drainage, erosion and sediment control measures will be implemented at all times until their function is no longer required. Inspections of control measures will be undertaken following rainfall that causes run-off or monthly during dry conditions.	C, O

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
L8	Monitor and adjust drainage, erosion and sediment control practices to achieve the desired performance standard It is recommended that a hierarchical ESC planning system be adopted for construction and operation of the Project consisting of an overarching Project-wide erosion and sediment control plan (ESCP) with Progressive ESCPs for all disturbance areas to ensure that the Project's ESCPs are dynamic documents that can and will be modified as site conditions change, or if the adopted control measures fail to achieve the desired treatment standard. The ESCPs are recommended to be prepared and certified by a suitably qualified and experienced professional, such as a Certified Professional in Erosion and Sediment Control (CPESC). If a site inspection or environmental monitoring identifies a significant failure of the adopted drainage, erosion and sediment control measures, a critical evaluation of the failure should be undertaken to determine the cause and appropriate modifications made to the control measures on site and ESCPs amended. <u>Drainage, Erosion and Sediment Control Competence</u> All Project personnel, including contractors, are recommended to have an appropriate level of drainage, erosion and sediment training. <u>Watercourse crossings</u> Any required watercourse crossings should be suitably constructed, including: • install watercourse crossings as early as possible in the construction program. • design and construct water course crossings as per the recommendations in *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull, S. and Witheridge, G. 2003) and associated policy and guidelines further described in the Water Resources Assessment (EMM 2023). • ensure watercourse crossing have necessary inlet, outlet, bank and headwall erosion protection.	C
L9	<u>Rehabilitation</u> At the end of the Project life, the development footprint will be rehabilitated to a condition as near as practicable to the condition that existed prior to construction of the Project and in consultation with the landowner.	CR
Visual		
V1	Dust will be minimised during construction.	C
V2	The number and brightness of lighting used in construction yards, offices, and the workforce accommodation facility will be minimised.	C
V3	Light shields will be used on lights to minimise light spill.	C, O
V4	Non-reflective surface treatments will be applied to buildings and structures where practical to minimise reflection.	C, O
V5	Landscape screening will be installed and maintained at R09 and R14	C, O
V6	Existing vegetation will be retained along all roadways. In particular, vegetation will be maintained vegetation along: • Tallawonga Road to screen views and glare • Sandy Creek Road to screen views and glare.	C, O

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Noise and vibration		
N1	Directional noise sources, including battery containers and inverters, will be orientated away from receptors where possible.	PC, C
N2	Remodel of operational noise levels will be undertaken when the final design has been confirmed prior to construction. Should the modelling indicated an exceedance will occur, noise sources will be relocated, or re-orientated, away from receivers.	PC, C
N3	Unnecessary metal-on-metal contact will be minimised.	C
N4	The need for vehicle reversing will be minimised as much as practical, for example, by arranging for one-way site traffic routes where possible.	PC, C, O, CR
N5	Site access roads will be suitably maintained.	PC, C, O, CR
N6	Potentially noisy plant and equipment will be maintained in accordance with manufacturer specifications.	PC, C, O, CR
N7	During the procurement phase, the quietest equipment will be requested/required.	PC, C, O, CR
N8	Unnecessary movement of equipment/material/plant will be minimised.	PC, C, O, CR
N9	Plant and equipment will be operated in the quietest and most efficient manner.	PC, C, O, CR
N10	Regular inspections/maintenance of plant and equipment will be undertaken to ensure that all noise reduction devices are operating effectively.	PC, C, O, CR
N11	Construction work will be limited to standard construction hours, including delivery of plant and equipment.	C
Traffic and transport		
TT1	As part of the EnergyCo Elong Elong Energy Hub Road improvements, an upgraded intersection design will be provided for the Spring Ridge Road and Dapper Road intersection to allow for large trucks up to and including OSOM vehicles to access Dapper Road.	PC
TT2	A detailed construction traffic management plan (CTMP) will be developed by the construction contractor in consultation with WSC prior to the commencement of construction.	PC
TT3	Road surfaces of unsealed roads for construction access will be adequately watered to mitigate dust generation impacts.	C
TT4	A permit (from NHVR) will be obtained to allow OSOM vehicles to use the road network as part of construction.	PC
TT5	Spring Ridge Road will require a detailed road condition management strategy including an initial road condition dilapidation survey, to ensure that any construction traffic related road damage and other defects are promptly identified and repaired to ensure the road remains safely trafficable by construction traffic from all of the identified energy projects which are using the route in combination with existing local traffic. A coordinated approach between relevant parties will be required to manage the cumulative traffic impacts from all the surrounding projects where construction traffic is using Spring Ridge Road.	PC

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
TT6	To accommodate the increase in traffic and OSOM turning movements during the construction phase, Dapper Road will be widened between the site access and the Elong Elong Energy Hub access, in accordance with Austroads rural roads design standards. Road widening sections on Dapper Road will be selected based on appropriate sight distances between the sections.	C
TT7	All Project accesses will be upgraded as per Typical Rural Property Access standard to the satisfaction of TfNSW and WSC.	PC
TT8	A decommissioning plan will be prepared prior to decommissioning which addresses potential traffic related issues and required management measures at the time (many factors could change during the life of the Project).	CR
TT9	In relation to the CWCT, the following will be implemented: • "Watch for Bicycles" (G9-57) signage will be installed where the CWCT overlaps with the Golden Highway at Cobbora • in consultation with the CWCT committee, a signage plan will be prepared, highlighting the CWCT in the vicinity of the Project • the CWCT routes will be highlighted within the site induction and driver's code of conduct to increase awareness of cyclists' presence in the area.	PC
TT10	Traffic controls will be developed as part of the CTMP for the crossing on Sandy Creek Road prior to construction.	PC
Water		
W1	A SWMP will be developed and implemented to address temporary and site-specific risks to surface water and groundwater during the construction phase, and describe soil and water management measures to be implemented.	PC
W2	Specific stormwater management measures for the substation area will include: • diversion of clean runoff away from potentially oil-contaminated areas • bunding of potentially oil-contaminated areas • provision of stormwater treatment device(s) to remove oil/grease, hydrocarbons, and sediment from runoff prior to discharge to the downstream drainage system.	PC
W3	The SWMP will be updated to describe required site management and protocols and address ongoing site-specific risks to surface water and groundwater during the operational phase. This will address: • rehabilitation of temporary works and construction disturbance areas not utilised for operations • continuation and maintenance of stabilised and vegetated surfaces, drainage and sediment and erosion control measures that will be retained for operations.	O
W4	Erosion and sediment control measures will be implemented, along with and site rehabilitation and revegetation, in accordance with industry standard practice comprising *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004), *Volume 2A* and *Volume 2C* (DECC 2008a, 2008b) and *Best Practice Erosion and Sediment Control* (IECA 2008). The LRA (EMM 2023b) describes a range of proposed measures for adoption. Proposed measures will be considered further and formalised as part of detailed design and will form part of the SWMP.	PC
W5	Progressive Erosion and Sediment Control Plans (PESCP) will be developed for all discrete disturbance areas.	PC

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
W6	Community engagement will be undertaken to notify the Project's intention to abstract groundwater for water supply. This will include the expected impacts and explain the concept of make good provisions if any impacts are to occur outside of the expected natural range.	PC
W7	A bore census will be undertaken to confirm if the Cobbora mine exploration bores have been decommissioned, repurposed or could be used for water supply	PC
W8	Groundwater monitoring will be undertaken in Project water supply bores to ensure impacts are consistent with base case scenarios.	PC
W9	Pumped volumes will be measured and recorded to comply with works and use approvals.	C, O
W10	Purchase shares during the next controlled allocation order for the Gunnedah-Oxley Basin MDB Groundwater source. If the Project cannot obtain the required entitlements through a controlled allocation, the Project could purchase water permanently or temporarily on the water market via a water broker, once a zero share WAL has been secured.	PC
W11	A flood management plan will be developed and implemented to describe required site management and protocols in the event of flood events that could impact construction sites or access, including: • suitable early warning/prediction measures and communication protocols • site preparedness activities and procedures • triggers for closure, evacuation and recovery • emergency response and support.	PC
W12	Construction site planning at detailed design stage will: • consider flood risk and adopt appropriate placement of temporary works, plant, materials and workforce facilities, that gives due consideration to overland flow paths and mainstream flood risk • ensure that temporary works minimise offsite flooding impacts as far as practical.	PC, C
W13	Design and construction of permanent works will: • locate sensitive infrastructure (e.g. substation, BESS) on high ground above 1% AEP flood levels (or other suitable level of flood immunity as may be determined during detailed design), and avoid or otherwise divert local overland flow paths around infrastructure • ensure finished ground levels are constructed at-grade and not materially higher than existing levels in areas subject to existing mainstream flooding, in order to minimise potential offsite flooding impacts as far as practical.	PC, C
W14	The flood management plan will be updated to describe the required site management and protocols in the event of flood events that could impact ongoing operation of the site.	O
W15	Watercourse crossings will be designed and constructed to: • consider the appropriate level of serviceability and flood immunity required for the Project • consider local hydraulic conditions and minimise scour potential • minimise local flooding impacts • be consistent with relevant guidance comprising Guidelines for watercourse crossings on waterfront land (DPE 2022c) and *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G. 2003).	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Hazards and risk		
HR1	Equipment and systems will comply with relevant international and Australian standards and guidelines (i.e. AS/NZS 5139, AS 2067)	PC, C, O
HR2	BESS units will be certified to UL 9540A and installed in accordance with manufacturer instructions and required separation distances	C
HR3	A minimum 10 m APZ will be provided for all structures, buildings, and infrastructure associated with the solar farm and a minimum of 11 m APZ between the accommodation facility and grassland	C, O
HR4	LSbp will review investigation reports on the on the 2021 Victorian Big Battery Fire to ensure scenarios (including fire propagation to the topside of the adjacent BESS units) and findings have been considered in designing the Project's BESS.	PC
HR5	LSbp will consult with FRNSW to ensure relevant aspects of fire protection measures have been included in Project design.	PC
HR6	A fire management and emergency response plan (FMERP) will be developed for the Project.	PC
HR7	Appropriate security fencing, warning signs, and cameras will be installed, and onsite security protocols implemented.	C, O, CR
HR8	BESS fire detection, protection/suppression systems will be installed.	C
HR9	Earthing, a lightning protection mast, and surge protection devices will be installed at the BESS substation.	C
HR10	The PHA will be reviewed and updated once the design has been finalised and a BESS selected, to ensure that aspects considered (i.e. control measures, clearances between BESS units, separation distance) and assessment made in the PHA is still valid.	PC

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Bushfire		
BF1	An APZ will be established including: • minimum 10 m wide APZ around the PV array perimeter • minimum 11 m wide APZ around the accommodation facility • maximise APZ around critical and sensitive infrastructure • APZ to be managed as an Inner Protection Area (IPA) for the life of development	C, O, CR
BF2	Landscaping will be established and managed as follows: • manage (slashing) a 5m fire break at the perimeter fences • APZ management to manage fuel loads by slashing as required • grassland under the PV array to be managed to <10 cm (grazing/slashing), prevent fire spread and impacts to critical components A Bushfire emergency management operations plan (BEMOP) will be developed to guide landscape management, monitor and reduce potential fuel loads surrounding the solar farm and APZ areas via ongoing rural activities (e.g., slashing, grazing).	C,O
BF3	All buildings (BESS, substation buildings, offices etc) will be designed to provide for minimum ember protection consistent with consideration of construction standards for bushfire prone areas (AS3959-2018).	C, O
BF4	Water supplies will be available for bushfire fighting as follows: • minimum 20 kL steel tank dedicated water storage to be strategically located in consultation with NSW RFS, to allow for permanent emergency supply and ease of access • tank will have fast fill water connections (65mm Storz fittings) and suitable access provisions for Cat 1 fire fighting vehicle (weight load and manoeuvrability).	C, O
BF5	Access to the Project site will be as follows: • main access, internal roads, and alternate egress to provide for safe, reliable, and unobstructed passage by a Cat 1 firefighting vehicle as per Section 3.5 of this document and maintained for the life of the development. • Two alternate emergency egress points on to Tallawonga Road and two emergency egress points on Sandy Creek Road.	C, O, CR
BF6	A Bushfire Emergency Management Operations Plan (BEMOP) will be prepared and implemented for the Project in consultation with the local NSW RFS District Office and communicated to relevant stakeholders.	PC, C, O, CR
BF7	The accommodation facility will have a static water and hydrant supply, complying with the following recommendations of PBP: • a minimum 50,000L static water supply (above ground storage steel or concrete tank) • connections suitable for firefighting purposes located within the workforce accommodation facility, being 65 mm Storz outlets • fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2021 • fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2021 • a fire hose reel system be constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005 • unobstructed access to water supply points at all times • all above-ground water service pipes are metal, including and up to any taps.	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
BF8	Temporary workforce accommodation facility electricity and gas provisions to the property will be installed to relevant standards and will limit the possibility of ignition of surrounding bushland or the fabric of buildings, and these elements can be engineered into any future design scenarios.	C
BF9	APZ and landscaping across the workforce accommodation facility infrastructure area will be managed to ensure ongoing protection from the impact of bushfires. The entirety of the proposed temporary worker accommodation facility will be managed as an IPA in accordance with the requirements of Appendix 4 of PBP.	C
BF10	Construction standards for the accommodation facility will be as follows: • BAL 29 level of construction as per Section 3 & 7 of AS 3959-2018 and Chapter 7.5 PBP to perimeter structures • BAL 19 and BAL 12.5 level of construction as per Section 3 & 5-6 of AS 3959-2018 to internal structures • Access roads and tracks within the accommodation facility infrastructure area will comply with Table 5.3b of PBP	C
BF11	The provision of suitable and appropriate bushfire emergency management planning for the occupants of the accommodation facility as follows: • A Bush Fire Emergency Management and Evacuation Plan is prepared by the operator consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and the AS 3745:2010*.	PC, C
Social		
SO1	Engagement will continue with nearby and adjacent landholders, local councils, local Aboriginal community and Project RAPs and other key stakeholders. A complaints and grievance procedure will also be implemented.	PC, C, O, CR
SO2	Online and offline methods will be used to share and register interest in Project opportunities.	C, O, CR
SO3	An Aboriginal participation plan (APP) will be developed in consultation with First Nations stakeholders to optimise local capacity and aspirations through targeted participation initiatives within the regional area. The APP would sit under an Industry and Aboriginal Participation Plan (IAPP). The IAPP would be contractually binding upon award of Access Rights. Agreed commitments will be measurable, and a report of progress to the local First Nations community would contribute to the measurement of outcomes. Cultural awareness training will also be provided to key site personnel.	C, O, CR
SO4	A local procurement strategy will be developed to plan regular engagement with local businesses and the Dubbo Chamber of Commerce to establish relationships with the Project.	C, O, CR
SO5	Regular engagement will be undertaken with local businesses to advise of construction periods and the potential increase in trade or patronage.	C
SO6	Engagement will be undertaken with local council, local businesses and the Dubbo Chamber of Commerce will inform an understanding of opportunities and limitations for a procuring local goods and services, as well as aspirations amongst local businesses.	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
SO7	The use of the Project's accommodation facility will be prioritised, and recruitment of local workers for the construction workforce will be maximised where possible. Non-resident workers who choose not to stay in the accommodation facility will be encouraged to seek accommodation across surrounding towns to reduce the impact on any one locality.	C
SO8	In relation to health serves, engagement with the Dubbo Regional and Warrumbungle Shire Councils will be undertaken to identify potential service limitations and implement measures such as provision of on-site first aid facilities to reduce competition for the GP services closest to the site. Where safe to do so, non-resident workers will be encouraged to travel to regional health centres with higher capacity (i.e., Dubbo CBD) on their days off, to relieve impacts on services closest to the site.	C
SO9	A Community Engagement Plan and Worker Code of Conduct will be implemented to mitigate perceived privacy and public safety risk.	C
SO10	Undertake community engagement to explain the mitigation measures in relation to traffic movements associated with the Project to reduce the perceived public safety risk due to increased traffic from the Project.	PC, C
Economic		
EIA01	Prior to commencing construction, a construction workforce and accommodation strategy (CWAS) will be prepared for the Project in consultation with relevant stakeholders. The CWAS will include: • measures to ensure there is sufficient accommodation for the workforce associated with the construction of the Project • measures to address any specific cumulative impacts arising associated with other SSD projects in the area • 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 during the construction phase.	PC
EIA02	A community shared benefit strategy (CSBS) will be developed for the Project: which will include: • A community fund to be available to the wider community. This might include annual grants to local community organisations and specific programs. While guidelines and management structures for the operation of a community fund will need to be put in place, there is potential for this to be governed through a VPA with council. Note: LSBP anticipates that access fees would total $5.24m p.a. including payments made for the purposes of a community fund, education and training	C, O

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
Waste management		
WM1	Waste will be managed in accordance with the NSW *Protection of the Environment Operations Act 1997* (POEO Act), the NSW *Waste Avoidance and Resource Recovery Act 2001* and the following hierarchy, which is listed in order of preference: • reduce waste production • recover resources • dispose of waste appropriately.	At all times
WM2	Manage waste so that: • the generation of waste is kept to a minimum • no waste is received or disposed of onsite • waste is stored, handled and disposed in accordance with the EPA's *Waste Classification Guidelines 2014* (or its latest version) • waste is removed from site as soon as practicable • Skip bins will be available onsite to encourage waste separation for recycling/re-use. General waste bins/skips will be provided for disposal of materials that cannot be cost-effectively recycled/re-used. • waste is reused, recycled or sent to an appropriately licensed waste facility for disposal.	At all times
WM3	During construction, wood pallets will be reused if in good condition, returned to the supplier if practicable, sold for wood chip if damaged or recycled.	At all times
WM4	Hazardous waste (e.g. waste oil, paint, septic wastewater, etc) will be collected by a licenced waste contractor for disposal at a licenced facility.	At all times
WM5	During operation, damaged PV modules will be collected by a specialised recycler for recycling.	At all times
WM6	Panels that are no longer operational will be recycled via Lotus Energy (or similar) during construction and operation.	At all times
WM7	Waste management providers that specialise in recycling end-of-life PV modules and associated infrastructure will be selected where possible.	At all times
Air quality		
AQ1	Prior to commencement of construction activities, appropriate communications will be developed to notify the potentially impacted residences of the Project (duration, types of works, etc.) and relevant contact details for environmental complaints reporting	PC
AQ2	A complaints logbook will be maintained throughout the construction phase which will include any complaints related to dust. If a dust complaint is received, the response actioned will be detailed in the logbook.	C
AQ3	Exceptional incidents that cause dust and/or air emissions will be recorded, either on or off site, as well as the action taken to resolve the situation in the logbook.	C
AQ4	Shade cloth barriers will be erected to site fences around potentially dusty activities such as excavation and material stockpiles where practicable.	C
AQ5	Site fencing and barriers will be clean using wet methods (such as through application of sprays), as required.	C

Table F.1 Summary of mitigation measures

Reference	Mitigation measure	Timing
AQ6	A maximum-speed-limit of 20 km/h will be imposed on all internal roads and work areas during construction.	C
AQ7	Equipment engines will be properly maintained.	PC, C
AQ8	A water cart will be deployed to keep exposed areas and topsoils/subsoil moist, where necessary.	C
AQ9	Working practices will be modified by limiting activity during periods of adverse weather (hot, dry, and windy conditions) and when dust is seen leaving the site.	C
AQ10	the extent of clearing of vegetation and topsoil will be limited to the designated footprint required for construction and appropriate staging of any clearing.	C
AQ11	Drop heights will be minimised from loading or handling equipment.	C
AQ12	Exposed areas will be re-vegetated to stabilise surfaces as soon as practicable.	C
AQ13	Vehicle loads entering and leaving sites will be covered to prevent escape of materials during transport.	C
AQ14	Dust will be visually monitored by undertaking daily on-site and off-site inspections to monitor dust on surfaces. The inspection results will be recorded in a specific log.	C
AQ15	The local meteorological forecast will be reviewed, including the timing of notable increases in wind speed and/or temperature, at the commencement of each day's activities. Appropriate increased intensity or additional mitigation measures will be planned for the day based on this forecast review. The likely meteorological conditions and implications for dust emissions will be discussed at the morning toolbox meeting.	C
AQ16	Site inspection frequency will be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. Should notable visual dust emissions be observed leaving the site boundary, increased intensity or additional mitigation measures will be deployed.	C
AQ17	Shade cloth barriers will be erected around areas of the temporary accommodation facility that may be susceptible to potentially dusty activities.	C
AQ18	Barriers around the accommodation facility will be kept clean using wet methods as required	C
AQ19	A maximum speed limit of 20 km/h will be imposed on internal roads close to the accommodation facility.	C

Note

PC = pre-construction; C = construction; O = operation; CR = closure and rehabilitation.

Australia

SYDNEY
Ground floor 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA
Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

ADELAIDE
Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Suite 8.03 Level 8
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 9.02 Level 9
109 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO
2345 Yonge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER
60 W 6th Ave
Vancouver BC V5Y 1K1
T 604 999 8297

linkedin.com/company/emm-consulting-pty-limited

emmconsulting.com.au