Environmental Impact Assessment

Blind Creek Solar Farm

May 2022

Project Number: 20-403

Document verification

Project Title:	Blind Creek Solar Farm
Project Number:	20-403
Project File Name:	20-403 BCSF EIS Master Final v1.1

Revision	Date	Prepared by	Reviewed by	Approved by
Final v1	12/04/2022	Ainslee Roser Zeina Jokadar Sarah Hillis	Brooke Marshall	Brooke Marshall
Final V1.1	06/05/2022	Zeina Jokadar Minor edits and clarifications addressing DPE comments	Sarah Hillis	Zeina Jokadar

NGH Pty Ltd is committed to environmentally sustainable practices, including fostering a digital culture and minimising printing. Where printing is unavoidable, NGH prints on 100% recycled paper.

W. www.nghconsulting.com.au

E. ngh@nghconsulting.com.au

BEGA - ACT & SOUTH EAST NSW
Suite 11, 89-91 Auckland Street
(PO Box 470) Bega NSW 2550
T. (02) 6492 8333

BRISBANE
T3, Level 7, 348 Edward Street
Brisbane QLD 4000
T. (07) 3129 7633

CANBERRA - NSW SE & ACT
Unit 8, 27 Yallourn Street
(PO Box 62) Fyshwick ACT 2609
T. (02) 6280 5053

GOLD COAST
2B 34 Tallebudgera Creek Road
Burleigh Heads QLD 4220
(PO Box 424 West Burleigh QLD 4219)
T. (07) 3129 7633

NEWCASTLE - HUNTER & NORTH COAST
Level 1, 31-33 Beaumont Street
Hamilton NSW 2303
T. (02) 4929 2301

SYDNEY REGION
Unit 17, 21 Mary Street
Surry Hills NSW 2010
T. (02) 8202 8333

WAGGA WAGGA - RIVERINA & WESTERN NSW
35 Kincaid Street (PO Box 5464)
Wagga Wagga NSW 2650
T. (02) 6971 9696

WODONGA
Unit 2, 83 Hume Street
(PO Box 506) Wodonga VIC 3690
T. (02) 6067 2533

NSW • ACT • QLD • VIC
W. www.nghconsulting.com.au
ABN 31 124 444 622 ACN 124 444 622

Table of contents

Figures

Tables

Appendices

Declaration

Project name: Blind Creek Solar Farm

The Blind Creek Solar Farm Project includes the construction and operation of a solar photovoltaic (PV) energy generation facility with an estimated capacity of up to 350MW AC (420MW DC); and associated infrastructure, including grid connection and battery storage of nominally 300MW / 600MWh

Land to be developed:

The Blind Creek Solar Farm project would be located on an approximately 700 hectare (ha) area, selected from the approximately 1,026ha Development site. The following lots would be affected by the project:

Solar farm array and ancillary infrastructure	Lot 2 DP1154765	Lot 4 DP237079
	Lot 1 DP237079	Lot 1 DP456698
	Lot 1 DP1154765	Lot 9 DP237079
	Lot 2 DP237079	Lot E DP38379
	Lot 3 DP237079	Lot 17 DP535180
Substation and battery (if AC coupled)	Lot 1 DP456698	
Access road upgrades	Lot 1 DP 1154765	

Applicant: Blind Creek Solar Farm Pty Ltd

Applicant address: 114 Currandooley Road, Bungendore 2621

EIS prepared by: NGH Pty Ltd

This EIS has been prepared in accordance with Schedule 2 of the EP&A Regulation. It contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates. The information contained in the EIS is neither false nor misleading. It contains information required to be provided under the *Registered Environmental Assessment Practitioner Guidelines* in relation to EISs for SSD and SSI projects.

Name:	Brooke Marshall	Zeina Jokadar
Qualifications	Ba. Natural Resources (hons 1). Certified Environmental Practitioner	Ba. Sc. Resource and Environment Management Certified Environmental Practitioner
Signature:		
Date:	14/03/2021	14/03/2021 06/05/2022

Preface from the founders of Blind Creek Solar Farm

"Blind Creek Solar Farm is part of a broader program to increase the resilience of our property while enhancing its livestock carrying capacity and addressing climate change.

We have shifted our approach to farming and land use to help with the move towards a more sustainable future. This includes rehabilitating habitat, rebuilding the soil and sequestering carbon while improving our land for animal production.

As part of this refocus, it makes sense to use degraded country to become renewable energy farmers. The solar farm will co-exist with lamb production, regenerative agriculture, a soil carbon project, a green-waste humus compost facility and restoration works to improve the biodiversity and water-holding capacity of the catchment. Blind Creek Solar Farm is part of that vision."

Dominic Osborne, farmer

Acronyms and abbreviations

AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AWS	Automatic weather station
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCSF	Blind Creek Solar Farm
Biosecurity Act	*Biosecurity Act 2015* (NSW)
BOM	Australian Bureau of Meteorology
BESS	Battery Energy Storage System
CBSS	Community Benefit Sharing Scheme
CEMP	Construction environmental management plan
CSES	Community and Stakeholder Engagement Strategy
Cwth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment (Cwth) (formerly DoEE)
DECCW	(Former) Department of Environment, Climate Change and Water (NSW) (now DPIE)
DoEE	(Former) Department of the Environment and Energy (Cwth) (now DAWE)
DPE	Department of Planning and Environment (NSW) (formerly DPIE)
DPIE	Department of Planning Industry and Environment (NSW)
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EES	Environment, Energy and Science (NSW), Division of DPIE (formerly OEH, and, prior, DECCW)
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPC contractor	Engineering, Procurement and Construction contractor
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)

ESD	Ecologically Sustainable Development
FM Act	*Fisheries Management Act 1994* (NSW)
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
ICHLZ	Indigenous Cultural and Heritage Learning Zone
KFH	Key Fish Habitat
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LMP	Landscape Management Plan
m	metres
NES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NV Act	*Native Vegetation Act 2003* (NSW)
OEH	(Former) Office of Environment and Heritage (NSW) (now EES)
RAP	Registered Aboriginal Party
REF	Review of Environmental Factors
REP	Regional Environmental Plan
SAII	Significant and Irreversible Impact
SSD	State Significant Development
TEC	Threatened Ecological Community
TfNSW	Transport for New South Wales
TL	Transmission line
Transport and Infrastructure SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021 (NSW)*
VPA	Voluntary Planning Agreement
VRZ	Vegetated Riparian Zone

Table of definitions

Project	Blind Creek Solar Farm (BCSF)
Proponent	Blind Creek Solar Farm Pty Ltd (BCSF Pty Ltd).
Subject Land	All lots affected by the development.
Study area	The Study area site is the area surveyed for the assessment prior to identifying the constraints and exclusions. The area is 1,225ha. Refer to Figure 1-2
Development site	The Development site is the area where development is proposed and where landowner consent (freehold and Crown land) has been obtained. The area is 1,026ha. Refer to Figure 1-2
Development footprint	The uppermost area of land that would be directly impacted by the Project including solar arrays, perimeter fence, access roads, transmission line footprint and areas used to store construction materials and manage environmental impacts (including all temporary and permanent impacts). Approval is sought for this area, to enable micro-siting of infrastructure during post approval detailed design. Generous delineation of this footprint in the EIS allows flexibility during the final design stages of the project. The final disturbance is likely to be smaller than the Development footprint presented within this EIS, subject to detailed design with appointed contractors (refer to Indicative infrastructure layout definition below). The area is 680-700ha. Refer to Figure 1-5.
Indicative infrastructure layout	The Indicative infrastructure layout shows where key infrastructure components would be likely be located within the Development footprint. It most closely represents the area of actual impact required to construct and operate the solar farm. The final infrastructure layout will be subject to detailed design with appointed contractors. The area is approximately 475ha. Refer to Figure 1-6.
Exclusion zones	Areas of high environmental value within the Study area that would not be impacted. The total exclusion area is approximately 529.86ha, which includes: • 46.06ha of land with high biodiversity values • 4.2ha of waterways and their riparian buffers; a high catchment value. • 479.6ha of land with high heritage values (Aboriginal Heritage and Non Aboriginal Heritage) Additionally, no solar panel arrays would be placed within the approximately 8ha of existing electricity easement traversing the site, nor in any area South of Butmaroo Creek.

Associated receivers	These receivers are associated with the Project. While they are included in the assessment (ie noise, vibration and visual impacts) they are clearly denoted given their association with the project. Associated receivers are those that will either host project infrastructure or have entered into negotiated agreements with the proponent, accepting of the all project impacts; six receivers will host infrastructure and three receivers have interests in the project and have entered into negotiated agreements.
Non-associated receivers	These receivers are not associated with the project and include neighbouring properties that may be impacted (i.e. by noise, vibration and visual impacts). A subset of this group is included in the Project's Community Benefit Sharing Scheme but have not been asked nor given any agreement with respect to impacts or Project support.

Executive summary

Introduction to the Project

NGH Pty Ltd has prepared this Environmental Impact Statement (EIS) to assess the potential environmental impacts of the Blind Creek Solar Farm (the 'Project'). The project would be located within the Queanbeyan-Palerang Local Government Area (LGA); 30km northwest of Queanbeyan and 7km north of Bungendore, NSW, on the shores of Lake George. Accessed from Tarago Road, the site is an agricultural property with a long agricultural history of cropping, sheep and cattle grazing. Nearby land uses include agriculture, residential development, two sand quarries, and Capital Wind Farm.

Figure A1 Project site

The Blind Creek Solar Farm would have an estimated capacity of up to 350 MW AC (420MW DC). The solar modules would be the most dominant infrastructure component. They would be a single axis tracking system, orientated in rows with an approximate north-south axis (refer Figure A2). Inverters, or power conversion units, are distributed throughout the array to convert direct current (DC) electricity, generated by the solar panels, to alternating current (AC) which is used by the national electricity grid. To connect to the national electricity grid, a substation would be constructed and connected via the existing 330kV transmission line that traverses the site. The Project includes a battery energy storage system (BESS) of nominally 300 MW/600 MWh, to help even out the grid's demand and supply profiles as the network transitions to use more renewable energy generation. The Project also requires associated cabling, access upgrades, internal tracks, fencing, and landscaping that will assist to soften the views of the infrastructure for neighbours.

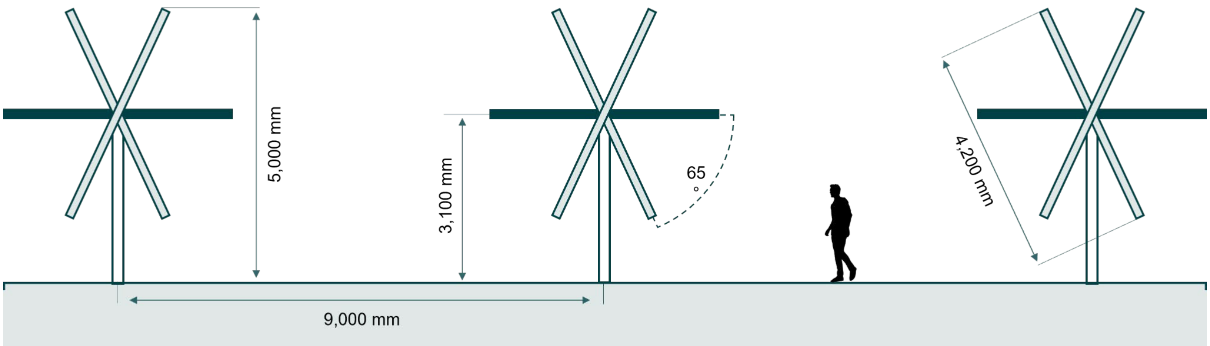


Figure A2: Schematic of single tracking modules. Dimensions shown are indicative only.

The Project can mainly avoid subdivision because solar farm leases in NSW are treated by the titles office as a lease of premises. Therefore, a plan of the solar facility can be registered which separates the Project from residual agricultural land within each lot. Two subdivisions will be required, however. One will separate the Project from the nearby Capital Wind Farm and a second will separate electricity connection assets that will become the permanent property of NSW consumers (shared assets) under either freehold or an easement. This process would be administered by Queanbeyan-Palerang Regional Council, subject to the Project's determination.

Required flexibility into the assessment approach

Development Approval is being sought for a 'Development footprint' rather than a specific infrastructure layout. This is the uppermost area of land that would be directly impacted by the Project, including all areas used to store construction materials and manage environmental impacts, temporary and permanent. Seeking approval for a generous Development footprint (and assessing this 'worst case scenario' impact area) allows flexibility during the detailed design stages of the Project.

Subject to approval, the detailed design stage would commence. Commercial tendering and procurement processes and will ensure the Project is optimised in terms of yield and efficiency, within the parameters of the approval. While it will be located entirely within the Development footprint, the final design will be smaller than the Development footprint presented within this EIS. Submission of final detailed design prior to construction is a standard requirement for State Significant Developments.

Blind Creek Solar Farm: Key features summary	
Nominal Capacity	Estimated capacity of up to 350MW AC (420MW DC)
Areas affected	Development site approximately 1,026ha. Development footprint (the uppermost area of land that would be directly impacted by the Project); approximately 680-700ha.
Subdivision	The Project will require subdivision to separate a lot from the nearby Capital Wind Farm and 'shared network' assets. The remainder of the land is expected to be treated as a 'lease of premises' and will therefore not require subdivision.
Land zoning	Queanbeyan-Palerang Local Government Area (LGA), on land zoned RU1 Primary Production and C3 Environmental management.
Solar array	Single-axis tracking system with approximately 850,000 panels, up to 85 inverters and transformers in containers, distributed throughout the array, for power conversion.
Transmission line connections, substation and switchyard	To existing 330 kV transmission line that traverses the site, via a purpose-built on-site switchyard and adjacent substation (approximately 1ha) . The substation will have a nominal transfer capacity of approximately 350MVA including up to 4 transformers.
Battery storage (BESS)	Li-ion battery cells with nominal capacity of 300MW and 2-hour duration, either

Blind Creek Solar Farm: Key features summary	
	grouped in containerised modules near the substation and / or distributed throughout the array.
Site access and intersection upgrades	Site access off Tarago Road (administered by Queanbeyan Palerang Regional Council) and Blind Creek Road Entrance (private road). A new left turn passing lane is required to allow passing traffic from Bungendore direction.
Internal tracks and waterway crossings	Approximately 6.6km of upgrades to existing tracks and approximately 20km of new internal tracks including use of Currandooley Road, and upgrades to the existing low-level crossing on Blind Creek and a new crossing on Wrights Creek.
Ancillary facilities	Permanent operations and maintenance facility with staff amenities and vehicle parking; agricultural style fencing around the array and 2.3m high chain wire security fence around the substation. Night lighting around the buildings and substation, switched on for maintenance and emergency purposes only. Task lighting will be installed at power conversion units. CCTV security cameras at the entrance gate and around the substation and battery storage, and O&M facilities and office areas.
Construction timing and hours	Approximately 12 to 18 months (peaking during the initial 6 – 9 months). Standard construction hours: Monday to Friday 7am to 6pm, and Saturday 8am to 1pm. No work on Sundays and Public Holidays.
Operation timing and hours	Nominally 35 years. Future infrastructure upgrades may extend the operational life of the Project. The Project would operate continuously.
Decommissioning and rehabilitation	All infrastructure removed from the site including DC cabling and AC above-ground cabling. AC cabling buried deeper than 500mm would not be removed. The site would be rehabilitated to a safe, stable and non-polluting state, consistent with future land use requirements.
Employment	Up to approximately 300 full-time jobs during peak construction. Approximately 5 full-time equivalent jobs during operation.
Capital investment value	Estimated $503,679,005million AUD

The proponent

The Proponent of the Project is Blind Creek Solar Farm Pty Ltd (BCSF Pty Ltd) which was set up to develop, own and operate a large-scale solar and battery project, co-locating renewable energy and sheep production.

BCSF Pty Ltd was founded and developed by local farmers and renewable energy experts. Their goal is to realise the potential of their land to host a farmer-led, utility scale, solar and battery project, co-locating renewable energy and sheep production. The farmers have strong historical and ongoing personal connections to the Project site and local area and are the same family who have lived on and farmed the Project site for over 150 years.

In order to take the Project to a final investment decision, and ultimately advance it towards construction and operation, the founders have now partnered with a joint venture between Octopus Investments Australia Pty Ltd (Octopus) and the Clean Energy Finance Corporation (CEFC). They have been working closely together for the past six months and the founders are confident that in Octopus and CEFC they have found a highly respected, socially conscious partner whose values are exceptionally well aligned with their own. Octopus and CEFC have come together to form BCSF Pty Ltd (as trustee for the Blind Creek Solar Farm Trust), the Proponent.

Octopus Group, which is headquartered in the UK, is one of the largest owners of renewable energy projects in Australia and Europe. It owns some 260 assets, on behalf of wholesale and institutional investors. Octopus Australia, its regional subsidiary, is responsible for managing over $1 billion of development, construction and operational assets across Australia, so it is exceptionally well-placed to accelerate the development of Blind Creek Solar Farm.

Octopus has just connected Australia's largest operating solar farm at Darlington Point (333MW), one of the 10 largest operating solar farms in the world. It is currently constructing the 180MW Dulacca wind farm in Qld and it has a number of other significant renewable energy development projects in its pipeline. It is rapidly growing its business in Australia and now has 26 full time dedicated renewable energy specialists across its Melbourne and Sydney offices.

Octopus, which invested in BCSF Pty Ltd in March 2022, will continue to work closely with the founders to ensure that the community, environmental issues and Agri-solar remain at the very heart of the Project.

Assessment requirements

The Project is considered a State Significant Development because it is an electricity generating project with a capital investment value that would exceed $30 million. The environmental assessment must be undertaken:

- In accordance with Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 2 of the NSW *Environmental Planning and Assessment Regulation* 2021 (EP&A Regulation) and Section 4.15 of the EP&A Act.
- In accordance with the project-specific Secretary's Environmental Assessment Requirements (SEARs) provided by Department of Planning, Infrastructure and Environment on 11 February 2021.

The EIS is intended to be a clear description of the proposed Blind Creek Solar Farm Project, its objectives and strategic context. It includes all agency and community engagement undertaken and details the assessment of all potential impacts and strategies developed to address them. It is supported by specialist technical assessments, undertaken by consultants with extensive experience in NSW renewable energy assessments. These reports are summarised and appended in full to the EIS and include:

- Biodiversity assessment, NGH
- Aboriginal cultural heritage, NGH
- Historic heritage, NGH
- Visual impact assessment, MLA
- Reflective glare assessment, SLR
- Noise impact assessment, Renzo Tonin & Associates
- Hydrological assessment, Footprint
- Traffic impact assessment, Amber
- Preliminary hazard assessment (specific to the battery energy storage system), NGH.

The body of the EIS also includes investigation of additional issues by NGH consultants, including but not limited to social impacts, bushfire impact, cumulative impacts, land use compatibility and impacts to soil and water resources.

This EIS will be publicly exhibited and determined by the New South Wales (NSW) Department of Planning and Environment (DPE). After exhibition, the Proponent will provide responses to the issues raised during exhibition. These will also be available to the public. No Commonwealth assessment or approval is relevant to the Project.

Community and stakeholder consultation

The Blind Creek Solar Farm Community and Stakeholder Engagement Strategy (CSES) has been developed to identify the key stakeholders for the Project, plan appropriate engagement actions (including dispersing information, obtaining feedback and engaging one on one on specific matters) and integrate the results into the Project. It has been guided by best practice consultation guidelines[1]. The stakeholders who have been consulted include the Aboriginal community, government agencies, representative bodies (Council, RFS, community groups and business community), the broader community as well as specific community members, defined by their potential to be impacted by the Project. The groups include:

- Immediate neighbours and residences with close elevated views of the site
- A residential development approximately 2.7km from the site
- Low lying residences 5 – 7km west of the site
- Residences between 6 and 7km with elevated views from the Lake George escarpment
- Additional residences in the vicinity who may be impacted during construction.

The engagement process has been extensive, commencing in November 2020, steadily implementing activities taking into account Covid restrictions throughout the detailed environmental assessment and further refinement of the project. The activities have included

- Face to face meetings and presentations
- On site visits, presentations and discussion sessions
- Emails, texts, telephone calls
- BCSF project website
- Dedicated freecall number
- Dedicated email address
- Media releases
- Online Community Information Sessions
- Open Days
- Specific stakeholder group on site meetings and discussion sessions.

In online community information sessions, issues of most interest were Agri-solar aspects of the project, jobs and local economy impacts. Community benefits, biodiversity and visual impacts followed. In Open day events, the most liked aspects of the Project related to renewable energy, Agri-solar, the Project being led by a local farmer and being committed to including an Indigenous Cultural and Heritage Learning Zone (ICHLZ). The broader community has shown higher than anticipated levels of interest and general support around the contribution to renewable energy

[1] DPE's *Guidelines for Major Project Community Consultation* (October 2007), NSW Large-scale Solar Energy Guideline for State Significant Development December 2018, Establishing the social licence to operate large scale solar facilities in Australia (ARENA n.d.) and DPIE (2020) draft *Social Impact Guidelines for State Significant Projects.*

transition. Many attended open days to discuss the Project showing keen interest in the positive potential of the Project for local farming enterprises.

In one-on-one consultation with the closer stakeholders, issues that raised the highest levels of concern included:

- Specific visual impacts and glare.
- The general location, scale, visibility, potential for project expansion and impact on valley infrastructure.
- Impacts to Lake George / Lake Ngungara / Weereewa.
- Land value impacts.
- Community benefits.

Responses have been provided to all issues raised and the potential impacts have been investigated within the EIS. In addition, the Project now includes a formalised Community Benefit Sharing Scheme (CBSS) which will contribute $3.5m, based on a 350MW Project, over the lifetime of the Project to key Stakeholder Groups and the local community. The theme of the CBSS is environmental sustainability, agricultural resilience and community building. Furthermore, specific ideas raised during the consultation process have now been incorporated into the Project:

- Removal of panels in the northern corner of the site.
- Tree planting at specific locations on the site's perimeter.
- Prioritisation of local job wherever possible.

Key environmental issues

This EIS assesses all matters identified in the project-specific SEARs issued by DPE. The detailed methodologies are summarised in the EIS and appended in full. The summaries below characterise the conclusions of those key investigations of most significance or relevance to stakeholders.

- Visual amenity and glare.
- Biodiversity.
- Aboriginal heritage.
- Hydrology and flooding.
- Noise and vibration.
- Cumulative impacts.

Visual amenity

The visual impact assessment investigates the nature and degree of visual change that would be introduced by the Project. Representative viewpoints were carefully selected to show a range of views surrounding the site. They were informed by topographical modelling as well as field work observations. All viewpoints have been taken either from accessible public land (typically gates, walking tracks, roads, recreation reserves and lookouts) or residential dwellings (with permission from landowners) which were identified as having a potentially high visual impact through the desktop review process.

Nineteen viewpoints were recorded as part of the field work process. Five montages were also produced to show the predicted impact on specific views (generally those viewpoints determined to have the greatest potential for visibility of the project and the highest visual impacts).

The results concluded that:

- Nine viewpoints would have negligible visual impact.
- Four viewpoints would have low visual impact.
- One viewpoint would have moderate visual impact (no dwelling in this location).
- No viewpoints would have a high visual impact.

The assessment was considered conservative. The viewpoints which were rated as having potential views to the site were taken within close proximity of the Project or located on higher elevation than the site where there was an absence of existing vegetation to screen views to the Project. The assessment noted that the visual impacts associated with the proposed development are likely to be higher during the construction phases and mitigated overtime with the implementation of screening measures to ultimately achieve a low or negligible visual impact level overall.

Generally, there are very limited opportunities to view the Project. The viewpoints that were rated as low or negligible contained limited views to the site, and adequate screening or roadside vegetation will obscure views of the Project. Due to the relatively low height of the solar panels and ancillary facility buildings and the views towards the Development site being broad in scale, the recommended vegetation screening proposed to reduce the potential visual impacts will be effective in integrating the development into the surrounding landscape; a Landscape Management Plan (LMP) is a commitment of the project to enhance vegetation screening for key viewpoint locations along the perimeter of the Development site, Currandooley Road and Butmaroo Creek. As such, the Project could be undertaken whilst maintaining the core landscape character of the area and have a minimal visual impact on the surrounding visual landscape and residential views toward the site.

Figure A3 Typical character of the surrounding landscape, visible from higher ground approximately 6.4km south of the site

Reflective glare

The potential to generate reflective glare and impact residential receivers, local airports, motorists on the local road network and nearby commercial operations (two quarries) was investigated by modelling the operational requirements of the tracking panels and considering the distance and height of nearby receivers. From 106 receivers, a representative set of 34 receivers was chosen for analysis.

The key result (and requirement for mitigation) concerned residential nuisance glare. It was noted that panel reflections from the solar farm may be visible for short periods of time in the early morning for certain months of the year for about 11 residential receivers located west of the Project (R60, R61, R62, R63, R67, R71, R77, R79, R81, R88, R97). However, the potential impact is considered low to minimal when considering the surrounding vegetation and trees, the distance of receivers and the low angle differences between incoming solar rays and their accompanying reflections. Nonetheless, mitigation measures that form commitments of the Project will manage panel angles to entirely eliminate these glare impacts.

In addition, the investigation found:

- The only potential for any night-time illumination glare would be associated with the nearest thoroughfares and residential receivers to the Project (which are associated receivers). Even if continuous 24/7 lighting were required (not proposed) negligible impact would result with adoption of the AS 4282-1997 *Control of the Obtrusive Effect of Outdoor Lighting requirements* (a commitment of the project).
- Due to the distances involved, the Project would not pose a potential glare issue for the identified nearest aerodromes.
- No glare is expected along Tarago Road, Quarry Access Road and Bombala Rail Line.
- No glare is expected at the nearby Bungendore Sand Mine and Paragalli Sands operation.
- There is glare potential along Currandooley Road however, this is a private road within the Development site.

Biodiversity

The biodiversity at the site and much of the surrounding land has been extensively modified by a long agricultural history. It is estimated that around 9% of the vegetation in the locality is native today (349ha in the surrounding 4,044ha). Nonetheless areas of higher habitat value were identified and will now be avoided. These include:

- Butmaroo Creek and its riparian corridor.
- The large ephemeral wetland area in the north-west.
- Areas of grassy woodland to the east.

The native vegetation within the remaining areas of impact include:

- Plant Community Type (PCT) 1100 – Ribbon Gum – Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion.
- PCT 1110 – River Tussock – Tall Sedge – Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion.

Due to their degraded state, they do not qualify as Threatened Ecological Communities (TEC), either under NSW or Commonwealth criteria, nor generate any ecosystem credit offset requirement.

The targeted survey program confirmed the absence of many threatened species at the site. However, one species generates a species credit offset requirement. The presence of Southern

Myotis *Myotis xxviiiroponen* was confirmed through survey and generates 97 species credits. White-fronted Chat (*Epthianura albifrons*) has been incidentally recorded at the site, as such BCD has requested that additional surveys are carried out to appropriately assess prescribed impacts. Further surveys will be undertaken for this species will also be surveyed in 2022 but it generates no species credits.

Noxxviiiropones and irreversible impact (SAII) candidates would be impacted by the project.

The retirement of the credits will be carried out in accordance with the NSW Biodiversity Offsets Scheme (BOS), and will be achieved by either:

- Retiring credits under the Biodiversity Offsets Scheme based on the like-for-like rules, or
- Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
- Funding a biodiversity action that benefits the threaten entities impacted by the development.

A suite of mitigation strategies has been developed for the Project that centre on containment of impacts to the areas approved for impacts (to protected adjacent vegetation and habitat), clearing protocols including pre-clearing surveys, daily surveys and staged clearing, to minimise harm during construction and relocating habitat features (fallen timber, hollow logs and embedded rock that requires removal) to retain these features as close by as practical.

Figure A4 Photo of Butmaroo Creek and large ephemeral wetland that will be protected from impacts.

Aboriginal Heritage

The Aboriginal Cultural Heritage Assessment Report (ACHAR) was carried out in consultation with Representative Aboriginal Parties (RAP) and included comprehensive landscape modelling, walked transect field surveys, subsurface testing program for areas of higher potential significance, as well as assessment in the context of important local studies.

The results of a number of previous archaeological surveys in the region show that the site is located within an archaeologically sensitive and well researched area. Sites and artefacts are common throughout the landscape surrounding Lake George especially in proximity to elevated areas and water sources and the sand deposits that are likely to be associated with former Lake George levels. Overwhelmingly, most site types in the region are comprised of isolated artefacts and artefact scatters, with significant potential for subsurface archaeological deposits on unmodified landforms. The presence of Butmaroo Creek, Wrights Creek, and associated elevated sand landforms within the current site, as well as the proximity to the shores of Lake George and Blind Creek to the south, significantly increase the likelihood of encountering Aboriginal heritage sites within the current Development site.

The surface survey found a total of 38 new surface sites, comprising of 11 isolated finds and 27 artefact scatters. The subsurface testing of 127 test pits across 10 landforms found a total of 409 stone artefacts. In total 21 areas contained subsurface artefacts and were recorded as sites and registered on AHIMS. Subsurface testing results supported the landform-based approach to assessment with average artefact densities ranging from 5.12/m^2 in low sensitivity landforms to 18.89/m^2 (and up to 43.47/m^2) in the high sensitivity landforms.

In considering the potential of the Blind Creek Solar Farm to impact Aboriginal cultural heritage, the most likely cause of harm to the artefacts will be through ground preparation activities such as vegetation clearance, installation of the solar array piles, tracks and underground cabling.

For each of the 76 sites recorded and lodged with the Aboriginal Heritage Information System (AHIMS), an assessment of the scientific significance of sites, as well as an assessment of impacts to the sites and an estimate of the level of harm posed by the impact, was tabulated. With reference to these sites, the recommendations of the assessment area that:

- 25 sites will be salvaged prior to any impacts.
- 7 sites will be further investigated via open area subsurface excavation.
- 35 sites will be excluded from impacts; the Development footprint will excise these areas. The landowner will facilitate the largest excised area (xxixropone. 2km^2) to become the ICHLZ.

This combination of avoidance, salvage through surface collection of artefacts, additional open area excavations and stop work measures for significant finds would minimise the potential impact of the Project upon existing sites, potential sites, and research opportunities to an acceptable level. These strategies now form commitments of the Project and would be implemented through a Cultural Heritage Management Plan (CHMP) that includes a role for ongoing consultation and engagement with the local Aboriginal community.

Hydrology and flooding

The purpose of the hydrological assessment was to ensure that proposed Blind Creek Solar Farm infrastructure:

- Would be located in areas that would not be at an unacceptable risk of flooding.
- Would not cause changes to local hydrology or exacerbate erosion.

Based on the hydraulic modelling of the proposed Development footprint, there is not predicted to be a significant impact on flood behaviour for the 1% Annual Exceedance Probability (AEP; used to describe how likely a flood is to occur in a given year[2]), with flood levels, depths, velocities and hazards shown to remain largely unchanged. This is due primarily to most of the infrastructure being located outside high hazard areas of the floodplain.

Some minor increases in flood levels of up to 50mm are shown to occur within the Butmaroo Creek northern overbank area and within the Wrights Creek floodplain however these changes are very localised and are largely contained within the Development site. Some minor (up to 20mm) increases are anticipated within the adjacent quarry pits however, these areas are already subject to flood depth more than 2m so this marginal increase should not create any adverse impact.

[2] For example, a 1% AEP flood represents a 1% risk this flood level will be exceeded, in any one year.

Generally, these risks are addressed by locating the Development footprint in accordance with the flood hazard mapping generated for the Project and implementing design measures with regard to infrastructure components and by adherence to project specific:

- Soil and water management protocols.
- Ground cover management protocols.
- Emergency response protocols.

These stipulations of the hydrology assessment are carried over as commitments of the Project.

Noise

The noise assessment modelled predicted construction and operational noise for the Project and compared the levels to relevant compliance criteria:

- Predicted construction noise levels at all non-associated receivers (residential and industrial) will comply with the construction noise management levels.
- The operational noise levels for the project comply at all non-associated receiver locations.
- Considering operational sleep disturbance criteria, all non-associated receiver locations comply.
- The potential for adverse comments to vibration impacts during the construction works was determined to be very low due to the large distances between the receiver locations and the construction activities.
- Road traffic noise level contributions from the vehicle movements associated with the construction works are within the applicable noise criteria based on dwellings being at the closest typical distance from the roads.

Cumulative

The scoping exercise indicates that the Capital 2 Wind Farm Modification 1, a portion of which is located in the Development site, has the potential to produce cumulative impacts in relation to the Blind Creek Solar Farm Project. It is noted that the Proponent would revoke the approval for 9 of the 41 approved Capital 2 Wind Farm turbines within the Development site, if the solar farm is approved. The approved 50MW Capital Solar Farm, adjacent to the Project Site would also not proceed if the Project is approved. Thus if this project is approved some cumulative impact would be offset by these reductions.

The Blind Creek and Capital 2 Wind Farm Modification 1 projects have potential to impact biodiversity, land use and visual amenity values. There are likely to be negligible cumulative impacts affecting social and economic, access and traffic, water, air quality, Aboriginal heritage, noise and vibration, bushfire and hazards and other issues assessed the EIS.

No additional mitigation measures are considered to be required in relation to the Project’s cumulative impacts.

Other environmental issues

The following issues were also investigated and are covered in this EIS, but are considered of lower risk:

- Access and traffic
- Land use
- Soils and landforms
- Water use and water quality

- Non-Aboriginal heritage
- Social and economic
- Bushfire
- Hazardous materials
- Electric and magnetic fields
- Air quality and climate
- Resource and waste generation
- Cumulative impacts.

The Project has been designed to prevent environmental impacts by:

- Incorporating screening and landscaping elements to reduce visual impact.
- Selecting technologies that minimise glare.
- Avoiding the higher biodiversity and heritage value areas.
- Locating infrastructure to avoid hydrological hazards.
- Designing infrastructure to retain compatible land capability and land use; The layout will maximise the use of existing grazing and cropping land and allow for continued regenerative agriculture practices.

Specific impact minimisation measures have been incorporated into the design of the Project and form commitments of the Project. They are largely standard and highly certain strategies to manage the impacts of solar farm development, which has grown significantly as an industry sector in regional Australia over the last 10 years. These measures are considered practical and achievable by the proponent.

Justification

The Blind Creek Solar Farm would result in numerous benefits, local and regional. The Project's objectives centre on the development of a viable and acceptable renewable energy generation facility that will provide a meaningful contribution to the state's transition to renewable energy technologies. It aims to ensure continued agricultural land use and maximises positive community and environmental outcomes. Specifically, the Blind Creek Solar Farm would:

- Generate electricity from a low-cost renewable source
- Provide storage in order to deliver electricity at high demand times, when roof top solar is unavailable.
- Address Federal, state and local policies as well as international agreements in relation to reducing greenhouse gas emissions, global warming and the transition to greater renewable energy generation.
- Supply the equivalent of approximately 124,155 residential dwellings.
- Co-exist and compliment intensive sheep grazing and regenerative agriculture practices that will continue on the site.
- Respond to input from the community and environmental specialists in order to maximise the benefits to the local community and minimise adverse environmental impacts during construction, operation and decommissioning.

The Blind Creek Solar Farm would be an important part of building the regional skill base for this and other large solar projects to follow. It will assist to diversify the regional employment sector. It will build renewable specific skills such as electrical and civil engineering. As well, it will boost the existing service sector through the provision of recreation and accommodation services.

Significant financial and social benefits to the host communities of solar farms occur in the form of community sponsorships. The Project involves a scheme to share financial rewards with identified neighbours as far as 6.5km with visual or other verified impacts. Financial contributions are also made to local council, which will directly support local community projects and services.

On balance, the Project is considered appropriate:

- To the site's environmental constraints, avoiding high value areas and including long reaching mitigation strategies that will benefit the broader area in the longer term.
- To the site's resources, maximising renewable energy generation alongside existing agricultural and quarry operations.
- To the site's location where it will supply nearby population centres.
- To meeting global state and local policy targets to reduce in global greenhouse gas emissions.
- To the community's expectations.

It meets all relevant planning provisions and guidelines and is considered justifiable and acceptable.

1. Introduction

1.1 Purpose of this report

This Environmental Impact Statement (EIS) identifies and assesses the potential planning and environmental impacts associated with the construction, operation and decommissioning of the proposed 350-Megawatt (MW) Alternating Current (AC) Blind Creek Solar Farm (the 'Project'). NGH Pty Ltd (NGH) has prepared this EIS on behalf of Blind Creek Solar Farm Pty Ltd (the 'Proponent').

The purpose of this EIS is to assess the economic, environmental and social impacts of the Blind Creek Solar Farm. It is structured to helps the community, local council, government agencies and the consent authority to get a better understanding of the project and its impacts so they can make informed submissions or decisions on the merits of the project.

This EIS has been prepared in accordance with Part 4 of the New South Wales (NSW*)* *Environmental Planning and Assessment Act 1979* (EP&A Act) to support a Development Application (DA) to be lodged with the NSW Department of Planning and Environment (DPE). It fulfils the requirements of Schedule 2 of the NSW *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) and Section 4.15 of the EP&A Act. The structure and content of the EIS addresses the Secretary's Environmental Assessment Requirements (SEARs) provided by DPE on 11 February 2021 (Appendix A). The EIS also addresses the assessment requirements of the *NSW Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This EIS is supported by specialist technical assessments; these are summarised within the EIS and appended in full.

Community feedback received to date has been considered by the project development team to shape and enhance the project. Additionally, community feedback has been considered as part of this EIS to ensure key community concerns are addressed in the assessment chapters.

After the public exhibition of this EIS, the project will be evaluated by the NSW Government, considering input from the community. The development assessment process places the onus on the Proponent to provide the information required for the State Government to make an informed decision. The process provides for public transparency, accountability and participation in the decision-making process of development approvals.

1.2 Project overview

The Blind Creek Solar Farm Project includes the construction and operation of a solar photovoltaic (PV) energy generation facility with an estimated capacity of up to 350MWAC (420MWDC). It includes associated infrastructure, including grid connection and battery storage of nominally 300MW / 600MWh.

Site access is via Tarago Road, at the interstation of a private road, known by the Landowners as Blind Creek Road. The project would be connected to the national electricity grid via an existing 330kV transmission line which crosses the site.

The Project would require subdivision of:

- Lot 17 DP535180, to separate the solar facility from residual agricultural land.
- Lot 1 DP456698, to separate connection assets that will become the property of TransGrid.

The construction phase of the Project is expected to take approximately 12 to 18 months and the Project would have an operational life of nominally 35 years or more.

Section 3 and Section 4 provide more detail on the design selection process, chosen design, and works required for the Project.

1.2.1 The Proponent's philosophy

BCSF Pty Ltd was founded by local farmers with strong personal connections to the site and local community who then formed a partnership with renewable energy experts. At the heart of the Project is their desire to create a project that is visionary in every aspect including its approach to co-locating regenerative agriculture with solar, genuine community consultation and including their local community in the financial benefits.

The founders have led the community consultation for this Project and, together, the team has engaged specialists to inform the development of the Project and the mitigation of its impacts. The result is:

- A Project that responds to the issues raised by the community. This includes adjacent land holdings but also community members at some distance from the Project.
- A Project that responds to the environmental and archaeological values identified on the site. The areas that will be impacted exclude areas of high biodiversity, heritage and water catchment value.
- A Project that is compatible with current and proposed agricultural land use practices at the site. The 'Agri-solar' considerations include the height and spacing of solar panels, such that livestock grazing can be continued with the solar array and benefit from micro-climate effects, such as shading and soil moisture retention in summer.
- A Project that provides a meaningful contribution to the State's transition to renewable energy generation.

Following six months of discussions, a joint venture between Octopus Investments Australia Pty Ltd (Octopus) and the Clean Energy Finance Corporation (CEFC) invested in the Project in March 2022. The founders are very confident they have found a well-respected and socially conscious partner in Octopus and the CEFC whose values are exceptionally well aligned with their own and who shares their desire to continue developing the Project in this way. Octopus and CEFC have come together to form BCSF Pty Ltd (as trustee for the Blind Creek Solar Farm Trust), the Proponent.

1.2.2 Project locality

The Project would be located within the Queanbeyan-Palerang Local Government Area (LGA), which has an area of 531,888 hectares (ha). The Queanbeyan-Palerang LGA is situated in the South Eastern and Tablelands region of NSW and has close economic and social ties to the ACT, which is located approximately 35km southwest of the Project. Refer to Figure 1-1 for the regional context.

This region has been targeted by the NSW government as a strategic hub for renewable energy innovation and generation in the *South East and Tablelands Regional Plan 2036* (DPE, 2017).

Queanbeyan is the closest major regional centre to the Project (30km northwest). According to the 2016 Census (ABS, 2016), Queanbeyan accommodated 57,331 people. It includes a number of facilities, including hospitals, banks, churches, and primary and secondary education institutions.

The nearby town of Bungendore (7km south of the development footprint) has a population of 4,178 (ABS, 2016). The project is located on the south-eastern shores of Lake George. The Lake George locality had a population of 98 people in 2016 (ABS, 2016).

Lake George (known as Weereewa and Lake Ngungara to the Traditional Owners) is the most significant natural feature in the locality and is mapped as a wetland of National Significance. It is an ephemeral lake with its 20th century maximum extent being 21km long, north to south, and 10km wide, east to west. The lakebed is 674m above sea level. The lake is believed to be more than a million years old and has no outflow to rivers or oceans (endorheic) (A Bell, 1985).

1.3 Responsive to site

The project has been developed iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This is to ensure the project is responsive and appropriate to its context.

Specifically:

- Exclusion zones have been accurately mapped by specialists to ensure no impacts on areas with high biodiversity, heritage and catchment values
- The Development footprint (areas proposed for impact) is now around half the size of the Study area originally assessed (Figure 1-5).

Th Blind Creek Solar Farm, now detailed in this EIS, responds appropriately to the site's constraints to produce the most appropriate solar farm for the site. It meets the:

- DPE's Large Scale Solar Energy Guideline for SSD 2018
- Biodiversity Assessment Method (BAM) principles of avoidance and minimisation of biodiversity impacts
- NPWS Act objectives for avoiding and minimising impacts to Aboriginal Heritage.

To determine the most appropriate project, a Scoping Report (NGH, 2021) for the Study area was undertaken in the early planning stages to determine environmental constraints associated with the site[3]. The Scoping Report (NGH, 2021) was used to assist with developing the early solar farm layout and planning the detailed environmental assessment methodologies for the EIS. The Scoping Report was submitted to request the project-specific SEARS to guide the EIS for the Blind Creek Solar Farm.

In tandem with the detailed field investigations undertaken to inform this EIS, the constraints mapping was updated and further refined. This has allowed the delineation of the Development footprint (areas appropriate for development) and exclusion zones (areas of high environmental and cultural value that should not impacted). This process ensures the Project has appropriately responded to the site's constraints.

With reference to the site's key constraints, the Project assessed in this EIS has:

- Avoided higher biodiversity value land including:

---

[3] Environmental constraints can be defined as factors which affect the 'developability' of a site and include physical, ecological, social and planning factors. A map of these constraints was prepared for the Scoping Report (NGH, 2020). This map is updated by Figure 1-7, reflecting further detailed investigations provided in the EIS.

    - Critically Endangered Threatened Ecological Community *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion.*
    - At least 41 hollow bearing trees (likely more; 41 were identified during preliminary surveys before the Study area and Development Footprint were modified).
    - Aquatic and riparian habitat associated with Butmaroo Creek and Wrights Creek.
- Avoided higher value waterways and their prescribed buffers in accordance with the best practice "Guidelines for Riparian Corridors on Waterfront Land". This will minimise impacts on hydrology and water quality. Required waterway crossings will be designed, constructed and disturbed areas rehabilitated in accordance with these best practice guidelines.
- Avoided existing electricity easements, approximately 8ha (underground cable crossings will be required).
- Avoided areas identified as high archaeological sensitivity, including:
    - Lake George strandlines (historic shorelines)
    - Local sandy rises within the southern section of the Study area
    - The creek terrace in proximity to the proposed substation
    - A site of intangible cultural heritage within proximity of the site access.

These areas are mapped as Exclusion zones for avoidance, during construction and operation.

1.4 Required flexibility built into Project description

In addition to the Exclusion zones, the Development footprint is also mapped. It includes most of the remaining area within the Study area. The Development footprint will include land used for solar arrays, perimeter fence, access roads, transmission line footprint, vegetative screening and areas used to store construction materials and manage environmental impacts (including all temporary and permanent impacts). Approval is sought for this area, to enable micro-siting of infrastructure during post approval detailed design. Generous delineation of this footprint in the EIS allows flexibility during the final design stages of the project. The final disturbance is likely to be smaller than the Development footprint presented within this EIS, subject to detailed design with appointed contractors (refer to Indicative infrastructure layout definition and mapping).

Similarly, in detailing the infrastructure components, size and quantities, and construction methodology, a conservative or upper limit has been presented in this section (and assessed in Section 6 of this EIS). Again, this ensures there is flexibility for the detailed design, construction and operation of the proposal. This approach will allow innovation and efficiencies to be achieved as the project progresses, subject to approval. It will optimise the final project's yield and minimise the need for modifications to the development consent.

Specifically, flexibility is sought for the following:

- General layout; an indicative layout is provided and would be sited entirely within the Development footprint, but minor changes to the layout are likely in the detailed design stage.
- Infrastructure components; use of different technologies or plant to achieve the same outcome or to accommodate improvements in technology over time may be required to optimise the project's yield and efficiencies.
- Staging or sequencing of works may change during the delivery of the proposal, based on more detailed planning and the contributions by EPC contractors appointed, subject to approval of the project.

As such, Development Approval is being sought for the entire Development footprint, that is, the uppermost area of land that would be directly impacted by the Project, including solar array design, perimeter fence, access roads, transmission line footprint, vegetative screening and areas used to store construction materials and manage environmental impacts, including all temporary and permanent impacts. Generous delineation of this Development footprint in the EIS allows flexibility during the detailed design stages of the Project.

The detailed design stage commences, subject to approval. It will be subject to commercial tendering and procurement processes and will ensure the project is optimised in terms of yield and efficiency, within the parameters of the approval. While it will be located entirely within the consented Development footprint, the final design will be smaller than the Development footprint presented within this EIS (refer to Indicative infrastructure layout Figure 1-6). Submission of final detailed design prior to construction is a standard feature of State Significant Development approvals.

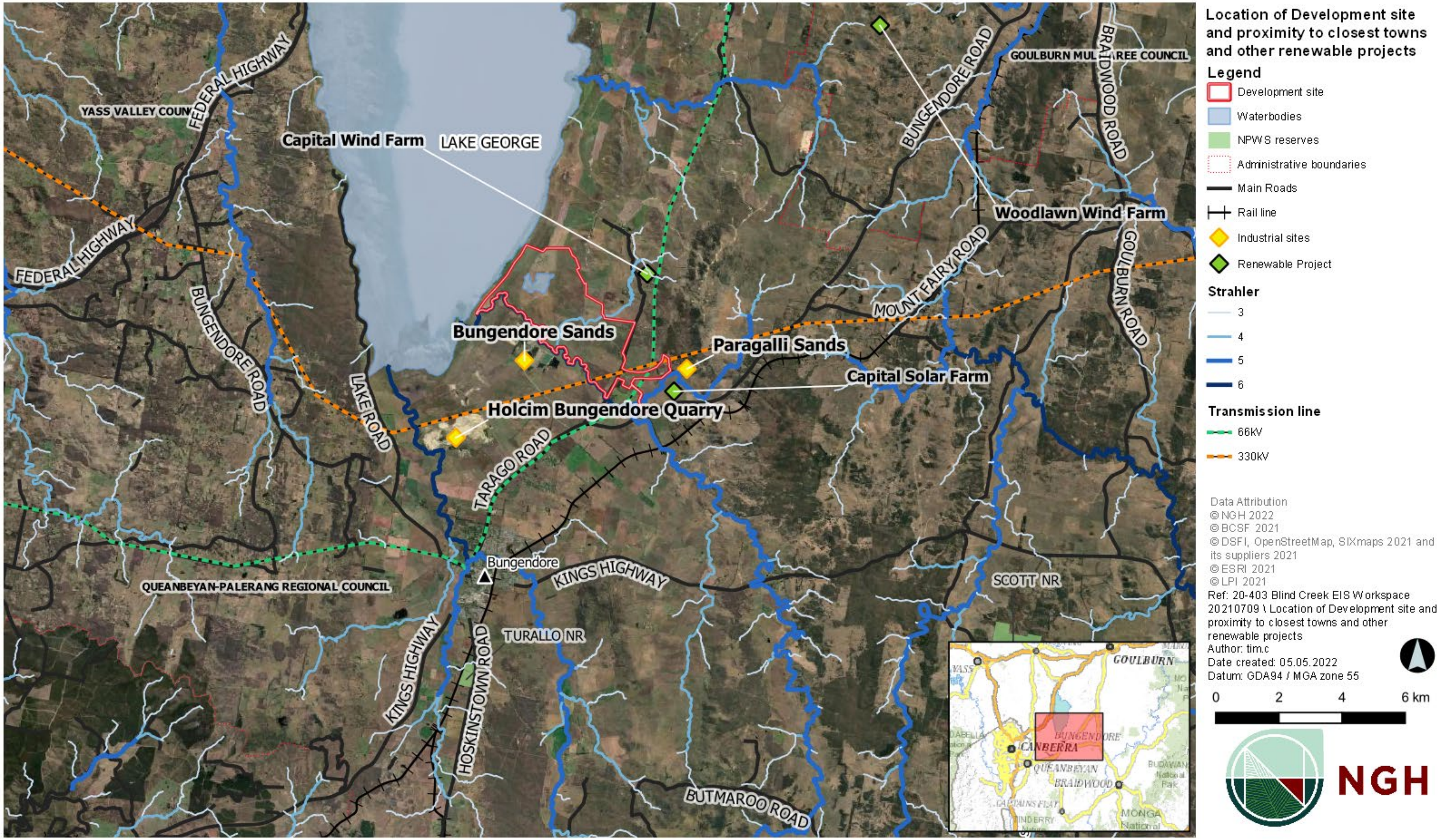


Figure 1-1 Location of Development site and proximity to closest towns and other projects

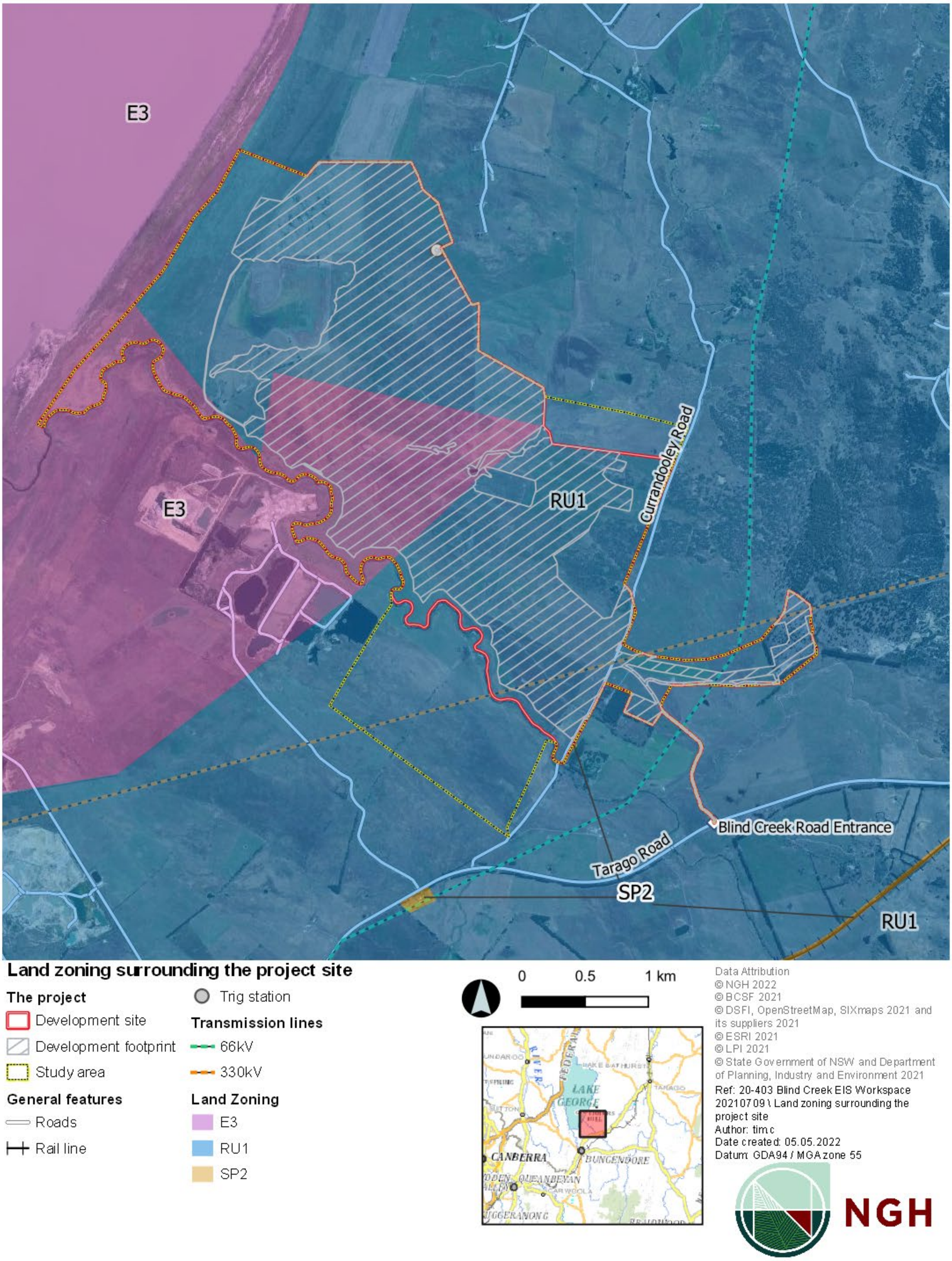


Figure 1-2 Land zoning of Development site and surrounding areas

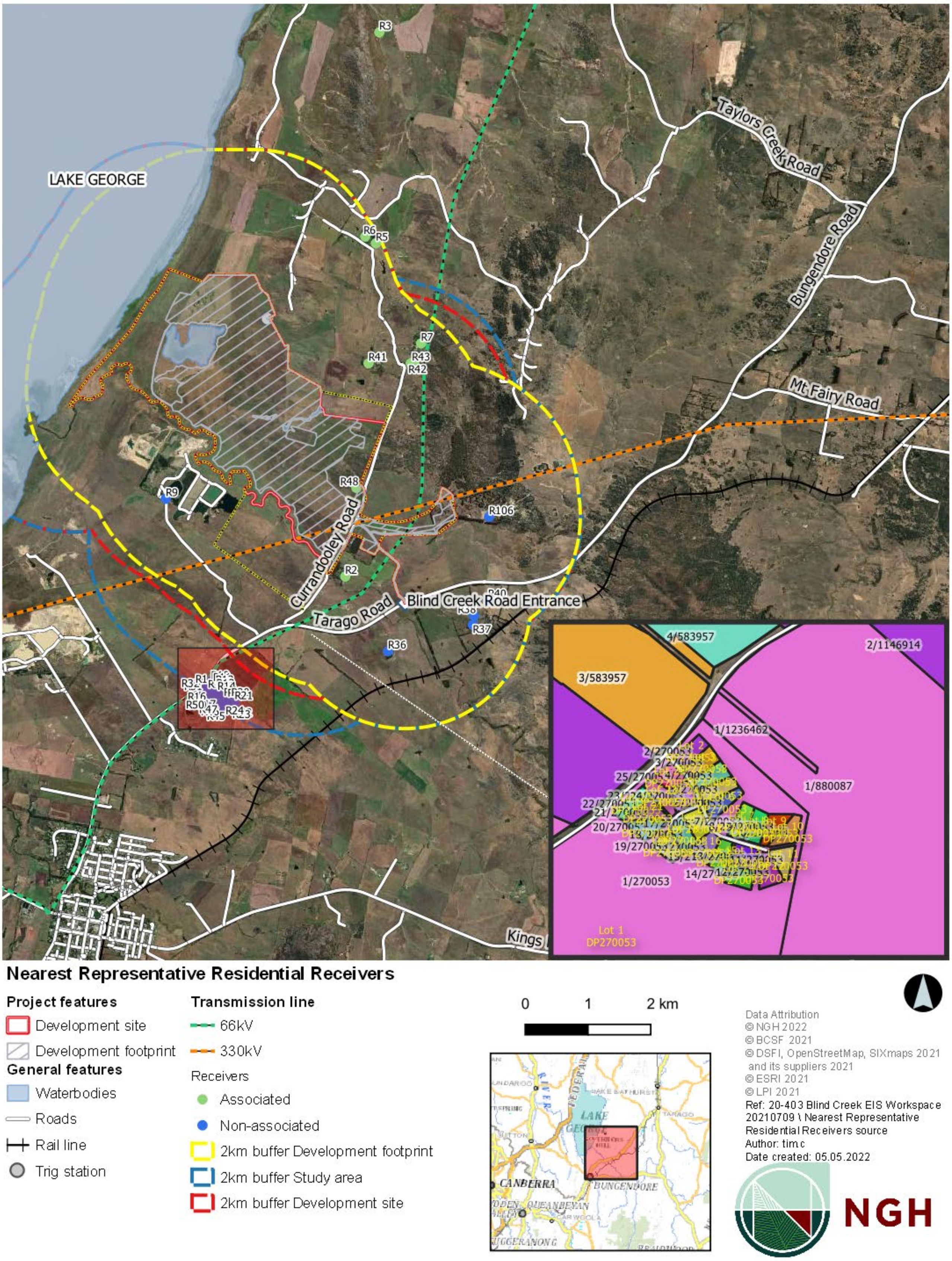


Figure 1-3 Development site and associated receivers

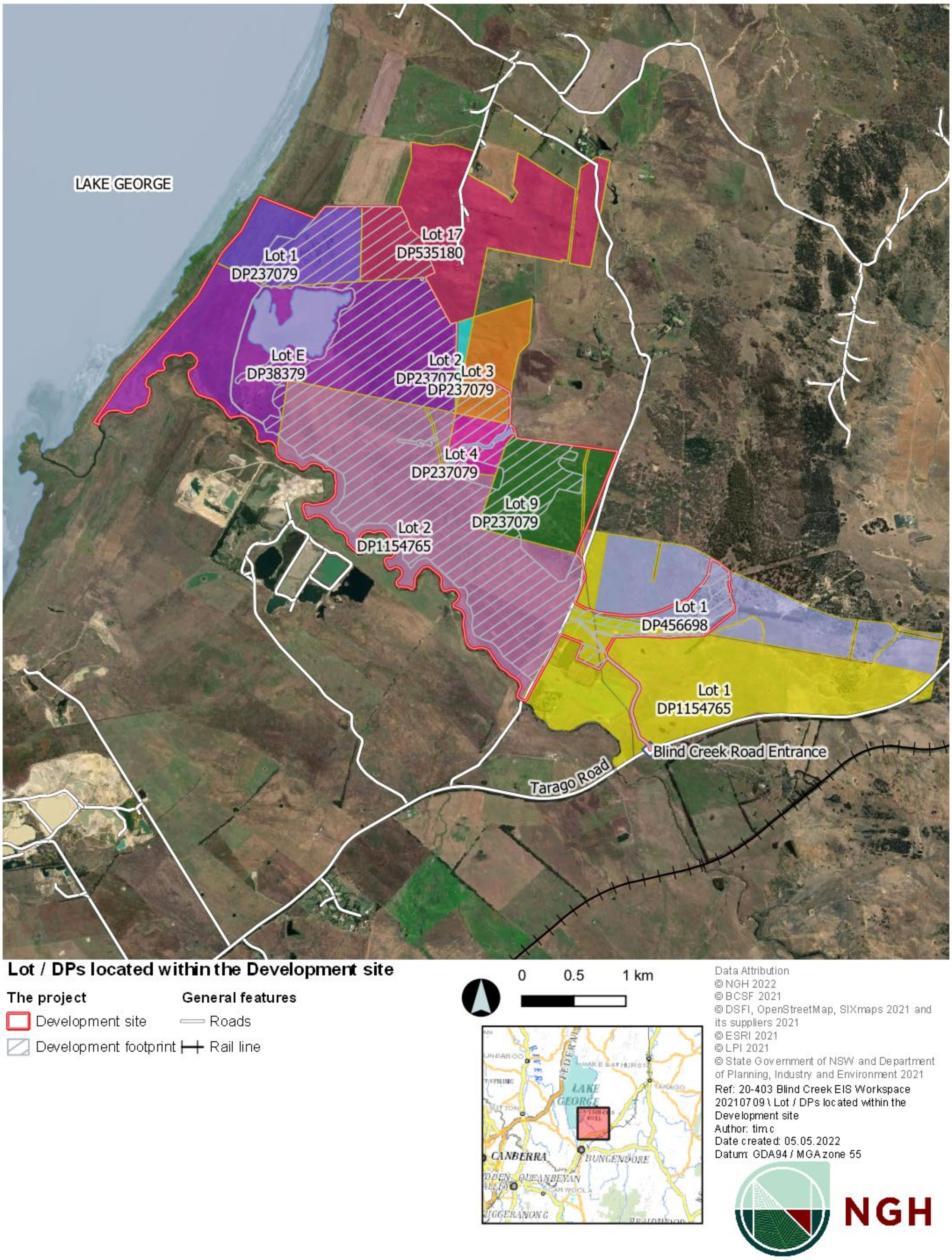


Figure 1-4 Lot / DPs intersecting the Development site

Figure 1-5 Project Development footprint

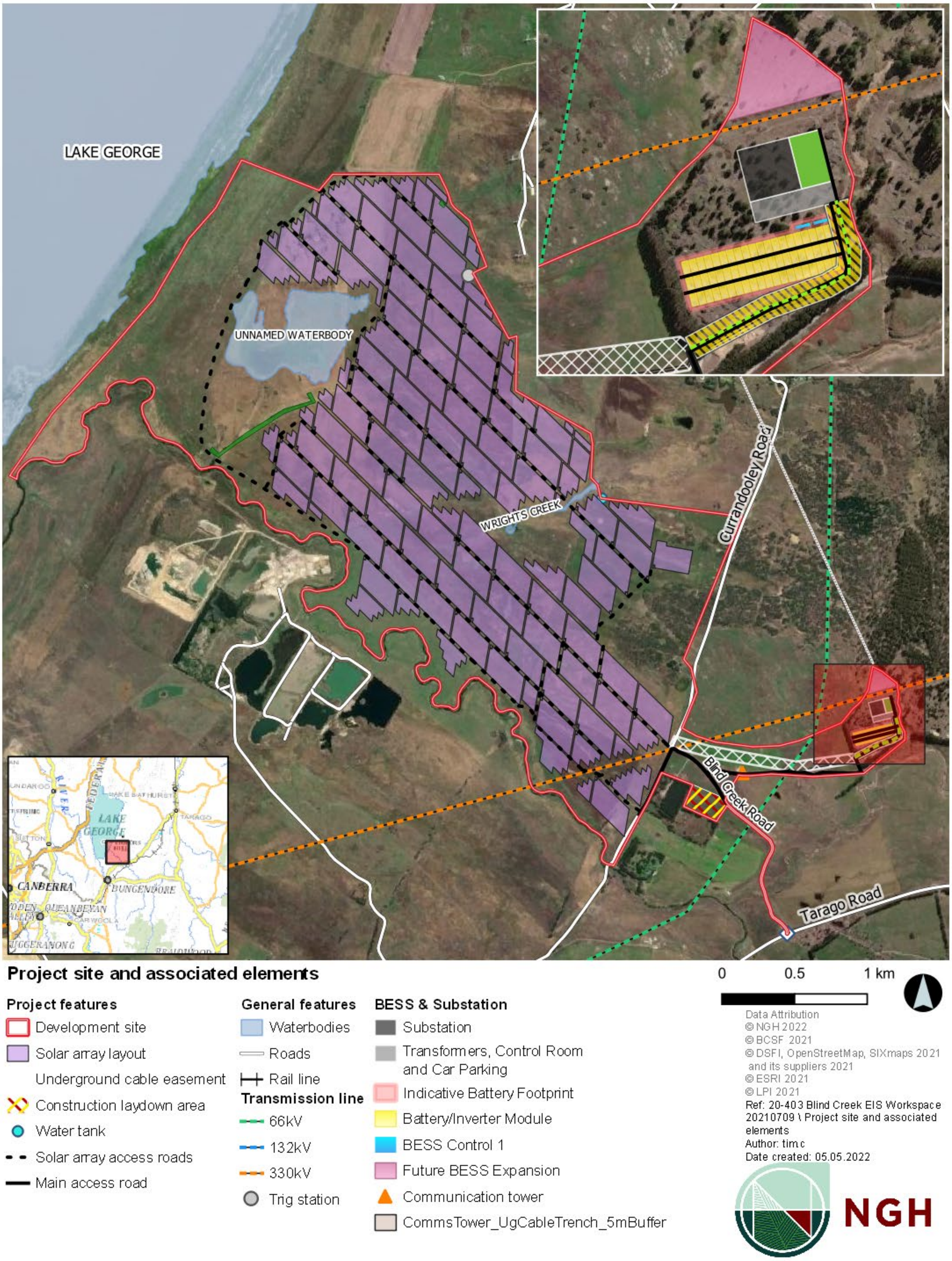


Figure 1-6 Indicative infrastructure layout (subject to detailed design)

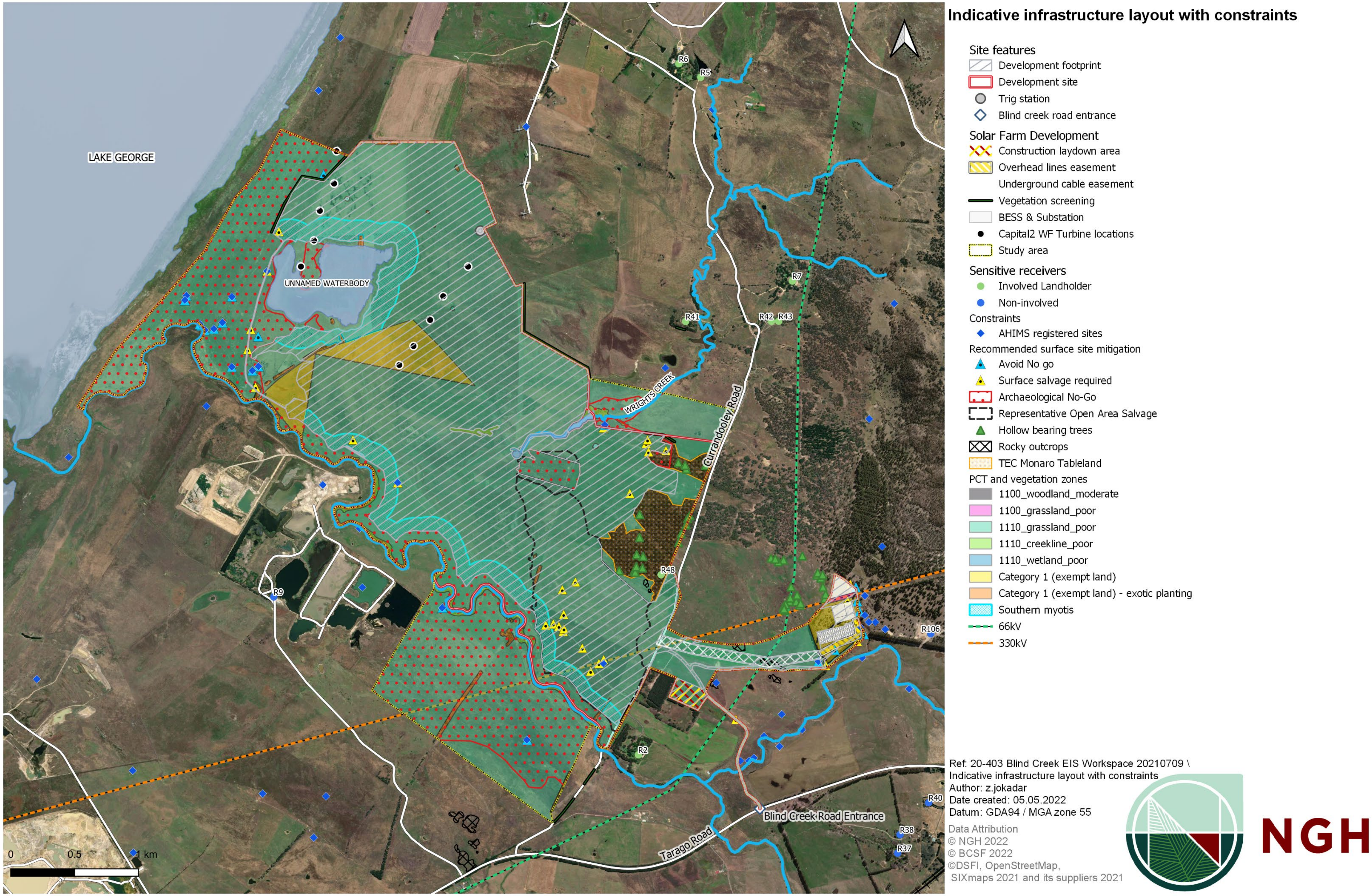


Figure 1-7 Environmental constraints within the Study area and Development site

1.5 Associated development and activities

1.5.1 Adjacent solar and wind proposals

Existing approval has been granted by the NSW State Government for the 50MW Capital Solar Farm (App. No. MP10_0121) ("Capital Solar"), on Lot 1 DP4556698. This is the lot proposed for the Blind Creek Solar Farm BESS and substation. There is also a legacy planning approval for nine turbines within the proposed Blind Creek Solar Farm Development footprint (Lot E DP38379), as part of the Capital 2 Wind Farm project (App. No. MP10_0135), as shown in Figure 1-8. The tenth turbine shown near the Development site boundary, has a 100m micro-sighting allowance, which may place it to the north of the boundary.

Since the approval of these two projects, technology and market conditions have changed. The Blind Creek Solar Farm is now considered by the Proponent to be a more appropriate and viable proposal. The owners of Capital 2 Wind farm have no proprietary rights over Lot E DP38379, and the landowners have entered into an option to lease agreement with BCSF Pty Ltd to grant proprietary rights over the property. If the Blind Creek Solar Farm proposal is approved, the existing approvals for as yet undeveloped Capital Solar Farm and those nine turbines within the Development footprint (a subset of the as yet undeveloped Capital 2 Wind Farm) would not be pursued. As such, consideration of cumulative impacts for the construction of and operation of these facilities is not relevant. A cumulative assessment of Blind Creek Solar Farm and the other proposed turbines of Capital 2 Wind Farm is discussed in Section 9.12.

Relationship to existing approvals:

Existing approval has been granted for the 50MW Capital Solar Farm (App. No. MP10_0121) ("Capital Solar"), on land neighbouring the Blind Creek Solar Farm Development site. There is also a legacy planning approval for nine wind turbines within the proposed Blind Creek Solar Farm project boundary, as part of Capital 2 Wind Farm (App. No. MP10_0135).

Since these projects were approved, technology and market conditions have changed. The Blind Creek Solar Farm is now considered by the Proponent to be a more appropriate and viable development and as such, if the Blind Creek Solar Farm is approved, the existing approvals for the as yet undeveloped Capital Solar 2 Farm and those nine wind turbines, being a part of Capital 2 Wind Farm, would not be pursued.

1.5.2 Agricultural operations

At the heart of the Project is the Proponent's desire for a more sustainable future. To this end, the intention is to generate solar energy production in a manner that ensures concurrent continued agricultural land use. The Blind Creek Solar Farm has been designed with panel spacing and heights suitable for continued stock grazing. Additionally, the landholder intends to incorporate regenerative agriculture practices, a soil carbon project, biodiversity restoration and compost production both within and outside the solar array.

These agricultural land use practices are compatible with Blind Creek Solar Farm and will maximise agricultural and land capability benefits alongside the operational solar farm. They are, however, separate operations. They do not form part of the Blind Creek Solar Farm proposal.

1.5.3 Quarrying

Sand quarrying has been active in the area for over 70 years. Two sand quarries currently operate within 2km of the Development site (R9 and R106), and several historical quarries (no longer active) are within the Subject land. The extracted material is known to be suitable for a range of construction activities and is within convenient transport range of Canberra.

Potential impacts of the Blind Creek Solar Farm (construction, operation and decommissioning) on these local resources and existing operations have been assessed in this EIS. The Project is not expected to have any impact on the operation of the quarries. Design and maintenance of the Blind Creek Solar Farm has taken into consideration potential dust issues generated by the quarrying activities.

Figure 1-8 Existing approvals within the Blind Creek Solar Farm Development site

2. Strategic context

2.1 Project objectives

The Project's objectives centre on the development of a viable and acceptable renewable energy generation facility that will provide a meaningful contribution to the state's transition to renewable energy technologies, in a manner that ensures concurrent continued agricultural land use and maximises local community and environmental outcomes.

The Blind Creek Solar Farm:

- Would generate electricity from a low cost renewable source, and 'firm' the electricity supply using storage such that it can deliver at high demand times when roof top solar is unavailable.
- Would address Australia's Federal, State (NSW) and local policies as well as international agreements in relation to reducing greenhouse gas emissions and global warming.
- Would generate electricity equivalent to supply approximately 124,155 residential dwellings.
- Would co-exist with an intensive sheep grazing operation employing regenerative agriculture practices to rehabilitate depleted soils and maximise soil carbon sequestration
- Has been designed with input from the community and environmental specialists to maximise the benefits to the local community and minimise adverse environmental impacts during construction, operation and decommissioning.

Project viability: The project would generate electricity from a low cost renewable source, and 'firm' the supply using storage such that it can deliver at high demand times.

Solar PV in Australia now competes with wind power to be the lowest cost new entrant (Lazard, 2021). It is expected that PV can help Australia transition to a new lower cost energy regime, saving consumers and helping re-energise Australian industry.

This site is designed to have the least cost of production. Most importantly, the Project's scale is sufficient to amortise the very large cost of creating a new switching station on Line 6, which links the load centres of Canberra and Sydney.

It is increasingly important that Australia balances its renewable production with storage, with an estimated 2.3GW of energy storage required in NSW (DPIE NSW, 2020a). The Project includes a substantial BESS, able to shift almost the full output of the project for up to two hours. This BESS may also be able to participate in reserve (FCAS) markets, which would offer a new competitive source for system security, saving consumers additional supply expense. The BESS would also be capable of charging from the grid, further helping balance and stabilise the grid as more renewables enter.

Assist in the reduction of Australia's GHG emissions intensity in relation to the Gross Domestic Product (GDP) and contribute to State and Federal efforts to meet climate change mitigation targets.

Emissions from PV technologies generate far less greenhouse gas (GHG) emissions per GWh than conventional fossil-fuel-based electricity generation technologies (Finkel, Moses, Munro, Effeney, & O'Kane, 2017) states that PV emissions intensity of zero vs the NEM average of 820kg CO_2 -e/ MWh). Whilst energy is required to produce PV modules, PV modules emit no pollution, produce no GHGs during plant operation, and use no finite fossil-fuel resources. Recycling options are available for solar panels, which have approximately 80 per cent of crystalline silicon that can be recovered through a refined recycling process.

Under the United Nations Paris Agreement on climate change, Australia has committed to a reduction of GHG emissions with specific targets to be reached by 2020, 2030 and the second half of the century.

In addition, the NSW Climate Change Policy Framework (State of NSW and OEH 2016) endorses and is intended to complement the Paris Agreement target, to make NSW more resilient to a changing climate.

Moreover, Australia developed the Commonwealth Renewable Energy Target (RET) scheme to achieve large-scale renewable generation (LRET) of 33,000GWh in 2020, by encouraging additional generation of electricity from renewable sources, thus reducing emissions of GHG in the electricity sector. The LRET of 33,000GWh target was met in September 2019, however the scheme will continue to require high-energy users to meet their obligations under the policy until 2030 and is frequently used as a mechanism to prove voluntary emission reduction.

Renewable energy technologies are well placed to address the scheme. They have the capacity to provide faster results due to their shorter potential construction and commissioning times (CER 2017). Solar projects in particular are benefiting from rapidly improving technologies.

Assuming an average household consumption of 5,920kWh pa, the BCSF Project would provide electricity to approximately 124,155 homes through the generation up to 735,000MWh per year. If this displaces NEM-average emissions intensity of 820kg, then the project will abate approximately 600,000 tonnes of C02-e emissions annually.

Minimise cultural and environmental impacts; designed and developed in a manner that is acceptable to the local community, traditional owners and responsive to the environment.

Unusually for a project of this scale, the Blind Creek Solar Farm was developed by local landholders, supported by energy experts. This connection to land and community assists the development team to develop the site in a sensitive manner.

The Proponent has ensured that Agri-solar is considered during design to enhance agricultural production on this site, as opposed to displacing grazing land. This reduces impacts on agricultural activities and the local agricultural economy.

The Project involves a shared benefit scheme to share financial rewards with identified neighbours as far as 6.5km with visual or other verified impacts. If approved, the Project would provide local and regional employment opportunities and other social benefits during all stages of the Project construction and operation.

The Project has involved local Aboriginal groups in a significant way, including the design and implementation of site survey and archaeological digs. This has resulted in considerable reduction in the Development footprint at an early stage of the design, to avoid sensitive areas. The representative Aboriginal parties have also assisted to develop proactive protocols that will protect the cultural heritage legacy and further minimise heritage impacts including preparation of a Cultural Heritage Management Plan for ongoing management of cultural heritage values during the construction, operation and decommissioning stages of the Project (refer to Section 12 of the ACHA in Appendix H for an extensive list).

The Development footprint has been chosen to minimise impacts on biodiversity. The site has had a long history of farming, grazing and sand mining. Areas that have been converted to exotic grasslands or are highly modified have been included preferentially. Areas of high biodiversity value within the boundary, including all woodland vegetation, have been avoided. Waterways have been buffered to protect riparian vegetation and catchment processes.

2.2 Strategic needs

The Blind Creek Solar Farm has been developed in consideration of Australia's Federal and international agreements in relation to greenhouse gas emissions and global warming. As well, it is consistent with State (NSW) and local policies to support the transition to renewable energy.

2.2.1 Greenhouse gas emissions and global warming

Global context

Human activity is resulting in the release of large amounts of GHGs which trap the sun's heat in our atmosphere and alter the balance of the Earth's climate (CSIRO, 2018). Concentrations of all the major long-lived greenhouse gases in the atmosphere are continuing to increase. Carbon dioxide (CO_2) concentrations have risen above 400 parts per million (ppm) since 2016 and the CO_2 equivalent (CO_2eq) of all gases reaching 500 ppm for the first time in at least 800,000 years. The ocean has absorbed around 80% of the anthropogenic CO_2, resulting in ocean acidification and global sea level has risen by over 20cm since 1880, with the rate continuing to accelerate in the recent decades. Since records began in 1850, the global averaged air temperature has warmed by more than 1^0C and each of the last four decades has been warmer than the last.

In 2016, global greenhouse gas emissions were 494.4 billion tonnes CO_2eq, with energy, agriculture, forestry and land use, waste and industry contributing the largest proportion globally (Figure 2-1).

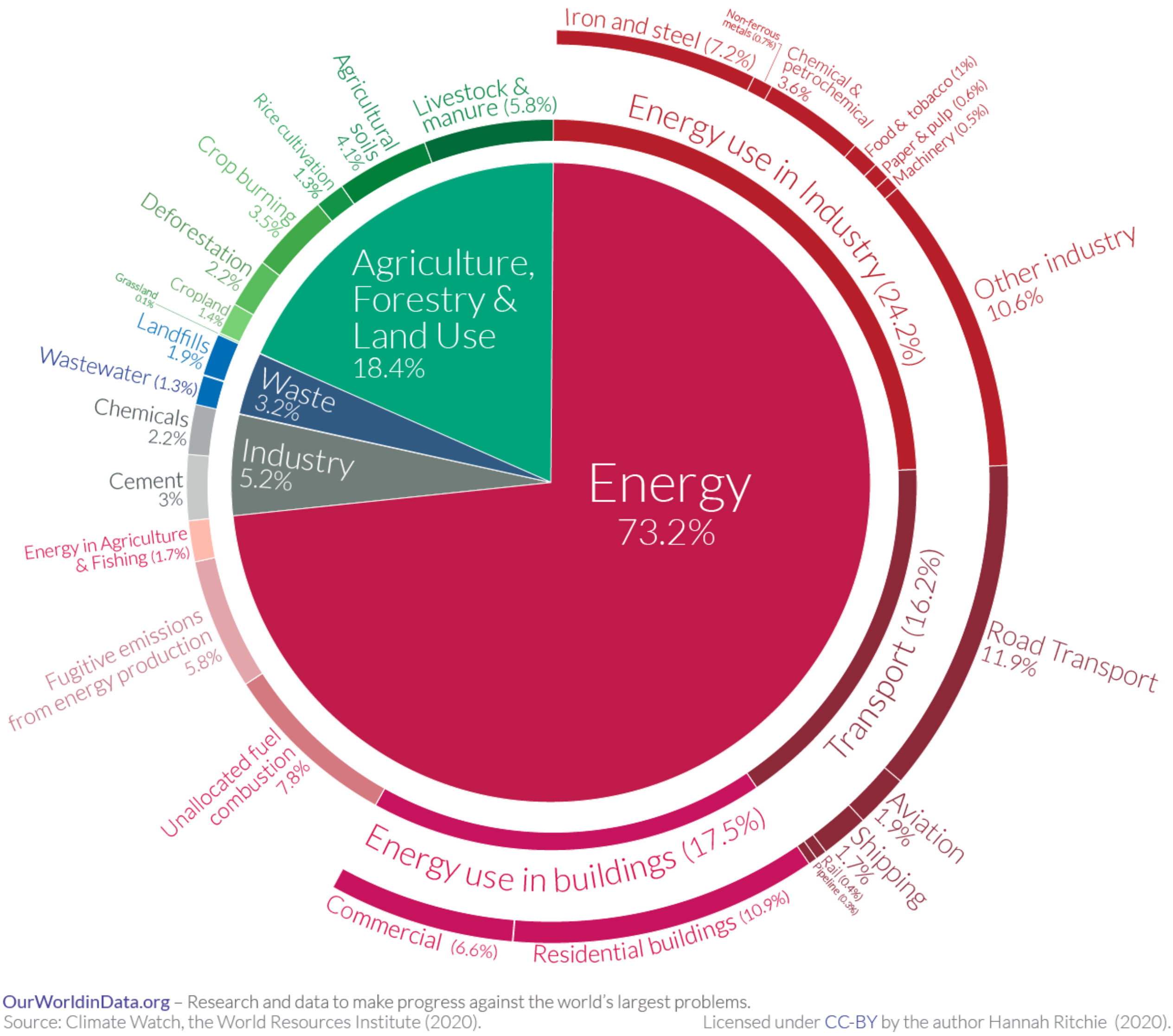


Figure 2-1 Global greenhouse gas emissions by sector (Ritchie, 2020)

Australian context

In general, electricity generation is experiencing a long-term decline in emissions, down 18.3% since the peak in 2009, primarily due to increasing generation from renewable sources (DoISER, 2020). The most recent Quarterly Update of Australia's Greenhouse Gas Inventory: December 2020 (Department of Industry, Science, Energy and Resources, 2021) shows that electricity generation is the largest individual contributor of greenhouse gas emissions in Australia, representing 33.6 % of emissions in the year up to December 2020. This represents a 4.9% decrease in emissions from the electricity sector when compared with the year up to December 2019. The decrease is mainly due to ongoing substitution of renewable energy sources for coal-fired power (Department of Industry, Science, Energy and Resources, 2021).

Emissions data from 2019 shows NSW was responsible for 107.40 Mt C02-e from the energy sector, the second highest state in Australia behind Queensland (Department of Industry, Science, Energy and Resources, 2019).

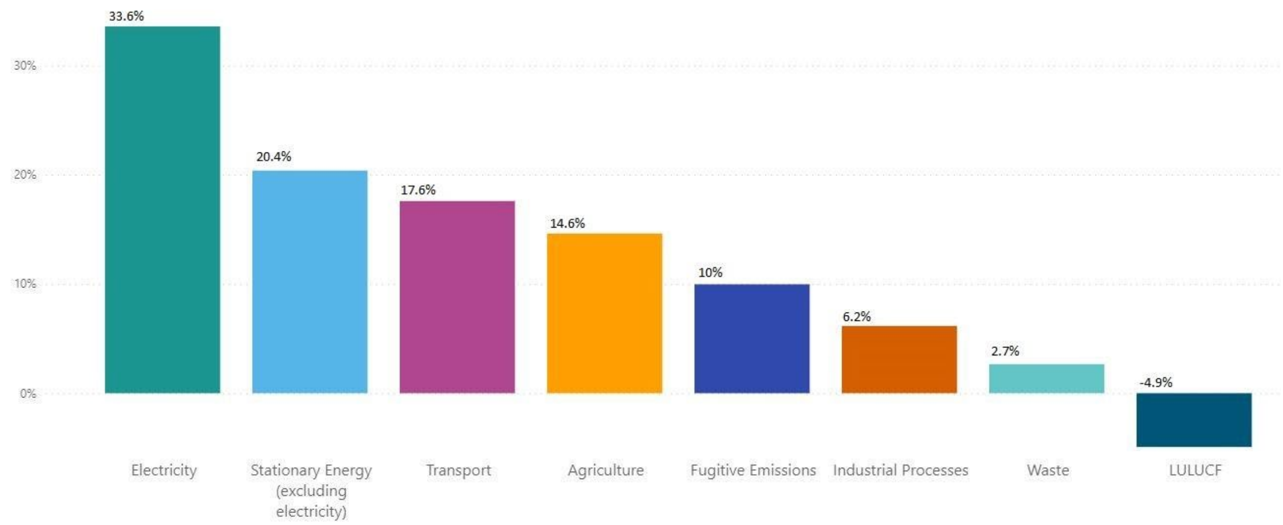


Figure 2-2 Share of total emissions, by sector, for the year to December 2020 (Department of Industry, Science, Energy and Resources, 2019).

Australia's climate has warmed by just over 1°C since 1910, and this has been accompanied by a large increase in extreme temperatures (CSIRO, 2018). The rate of change has also increased, with mean temperatures rising by 0.5°C per decade since 1990, compared to about 0.1°C per decade during the 1950s to 1980s. New South Wales is projected to continue to warm in this century. The warming is projected to average about 0.7°C in the near future (2020–2039), increasing to about 2.1°C in the far future (2060–2079). There are not many differences across the state in the projected increases in average temperatures, with all regions becoming warmer (OEH, 2016) . The warming projected for New South Wales is large compared to our normal natural temperature variability. Climate change will exacerbate NSW's natural climate variability, making it more difficult to manage our landscapes and ecosystems and the human activities that depend on them. Communities already affected by climate variability will be challenged by this shift in the climate (OEH, 2016).

In terms of renewable energy technologies, solar projects have the capacity to provide substantially more energy than is consumed, with Australia receiving an average of 58 million petajoules (PJ) of solar radiation per year, approximately 10 000 times larger than its total energy consumption (Geoscience Australia, 2010). The development of photovoltaic and concentrating solar thermal technologies through substantial research and development programs has contributed to increasing electricity generation (Geoscience Australia, 2010).

The Project would generate up to 735,000MWh per year, saving approximately 600,000 tCO_2e/yr, and contributing to a reduction in global greenhouse gas emissions. This assumes generation would otherwise be made by brown coal with a carbon factor of 0.34 tonnes per MWh (DoEE, 2019). Precise generation figures may change subject to final site design and product selection.

2.2.2 Global response

Paris agreement

The threat presented by climate change is acknowledged by scientists and politicians around the world, as illustrated by the United Nations Paris Agreement on Climate Change (UNCC, 2022). In December 2015, the Australian Commonwealth Government ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol, reinforcing its commitment to action on climate change. Australia has committed to the following greenhouse gas emission reduction targets:

- 5% below 2000 levels by 2020
- 26-28% below 2005 levels by 2030
- Net zero emissions in the second half of the century.

Electricity generation is the largest individual contributor of GHG emissions in Australia, representing 35% of emissions (DoEE, 2019). The transition to low carbon renewable energy sources would be critical to enable Australia to meet its Paris commitments.

It has been argued that the electricity generation sector should aim to achieve considerably higher reductions than the general 26-28% target to reduce pressures on other industries (such as agriculture, construction and manufacturing), where abatement is more difficult and expensive. A more efficient abatement model would see the electricity sector reduce GHG emissions by 40-55% below 2005 levels, requiring renewable penetration in the order of 66-75% by 2030 (Australia Institute, 2017).

In terms of renewable energy technologies, solar projects have the capacity to provide faster results because of potentially shorter construction and commissioning times (CER, 2017). Rapid advancement of technology in this sector has resulted in the improved performance of solar energy projects.

The Project would generate up to 735,000MWh per year, saving approximately 521,000 tonnes of carbon dioxide per year (tCO_2e/yr). This assumes generation would otherwise be made by brown coal with a carbon content factor of 0.34 tonnes per MWh (DoEE, 2019). Precise generation figures may change subject to final site design and product selection.

2.2.3 New South Wales response

NSW climate change policy framework

The NSW Climate Change Policy Framework (OEH, 2016a) aims to ‘maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change’. The framework endorses and is intended to complement national Paris Agreement targets, and has the following aspirational long-term objectives:

- Achieve net-zero emissions by 2050
- NSW is more resilient to a changing climate.

Implementation of the framework encompasses emission reduction and adaptation and includes the development of an advanced energy action plan, a new energy efficiency plan, a climate change adaptation action plan as well as additional policy investigations for sectors with significant opportunities and risks.

Climate Change Fund Draft Strategic Plan 2017 to 2022

The Climate Change Fund Draft Strategic Plan sets out priority investment areas and potential actions using $500 million of new funding from the $1.4 billion Climate Change Fund over the next five years. Investment in these areas would help NSW make the transition to net zero emissions by 2050 and adapt to a changing climate.

This Strategic Plan is an important first step to implementing the policy framework. The Strategic Plan organises potential actions into three priority investment areas that would form the basis of future action plans:

- Accelerating advanced energy (up to $200 million).
- National leadership in energy efficiency (up to $200 million).
- Preparing for a changing climate (up to $100 million).

The advanced energy priority strategy focuses on supporting the transition to a net-zero emissions economy by:

- Providing greater investment certainty for the private sector.
- Accelerating new technology to reduce future costs.
- Helping the community and industry make informed decisions about a net-zero emissions future.

The Blind Creek SF would be a working example of a project which showcases these elements of the transition to a net-zero emissions economy. Particularly, the Project would proactively involve the local community as well as host landowners, spreading the financial and social benefits.

Net Zero Plan: Stage 1 2020–2030

NSW emissions have fallen by about 18% under the NSW Climate Change Policy Framework, however, if no further action is taken, emissions are expected to stabilise out to 2030 (Figure 2-3). The Net Zero Plan Stage 1: 2020–2030 sets out how the NSW Government will achieve its objective of net zero emissions by 2050 over the next decade. The Plan is financially supported by a Bilateral Memorandum of Understanding on Energy and Emissions Reduction Policy between the Commonwealth and NSW Governments (DPIE, 2020).

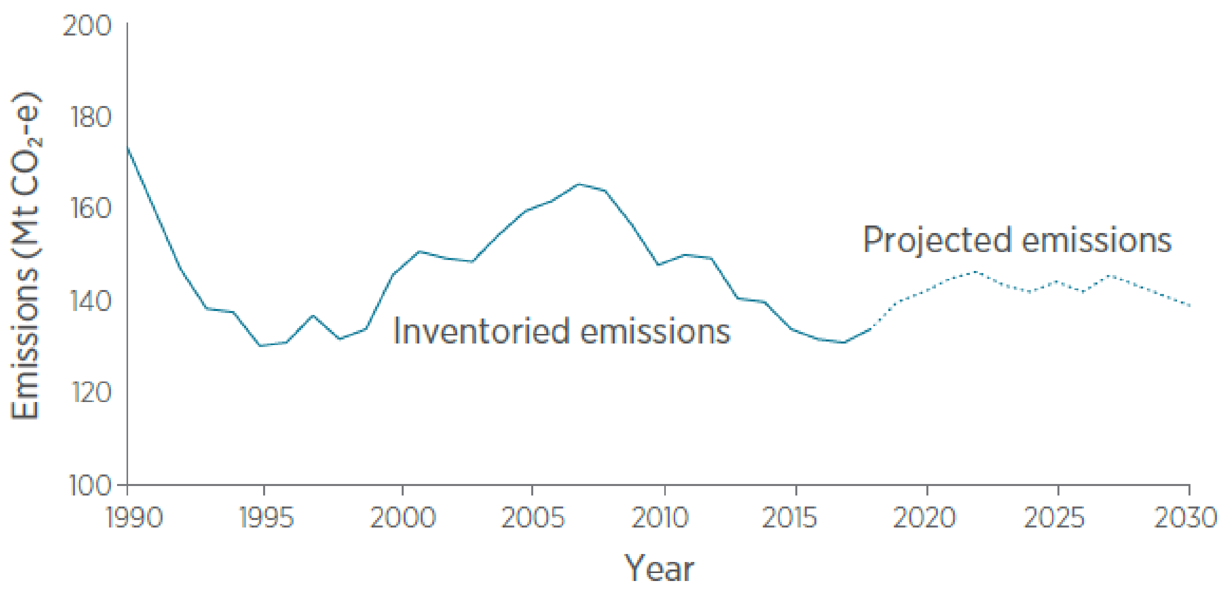


Figure 2-3 NSW total annual emissions to 2030 (MtCO2-e = Megatonnes of carbon dioxide equivalent)

It is expected that by delivering the Net Zero Plan, almost 2400 jobs will be created over the next 10 years. Of the estimated $11.6 billion of investment expected over the next 10 years, around two-thirds will go to regional and rural NSW. In addition, delivery of the plan is expected to save households $40 per year on electricity bills.

Development of utility scale solar projects, such as the proposed Blind Creek SF, will assist in delivery of the Net Zero Plan by providing emissions reduction technologies in the form of renewable energy generating infrastructure.

NSW Electricity Strategy

The three objectives of the NSW Government for the state's electricity system, as stated in the NSW Electricity Strategy, are:

- Reliability
- Affordability
- Sustainability.

The NSW Government's Electricity Strategy will:

- Improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, Government caused delays and by encouraging investment in new price-reducing generation and energy saving technology.
- Prompt Government to act if there is a forecast breach of the Energy Security Target which private sector projects are unlikely to address. This should be done in a way that minimises costs to consumers and taxpayers and does not give rise to moral hazard risk.
- Ensure that there are appropriate powers available for Government to analyse and respond to electricity supply emergencies, if they arise.

Renewables are now the most economic form of new generation, with a mix of wind and solar firmed with gas, batteries and pumped hydro expected to be the most economic form of reliable electricity. Wind and solar are cheaper than new coal and gas electricity generation projects, based on a levelized cost of electricity generated, and are also competitive when complemented with firm generation (Figure 2-4).

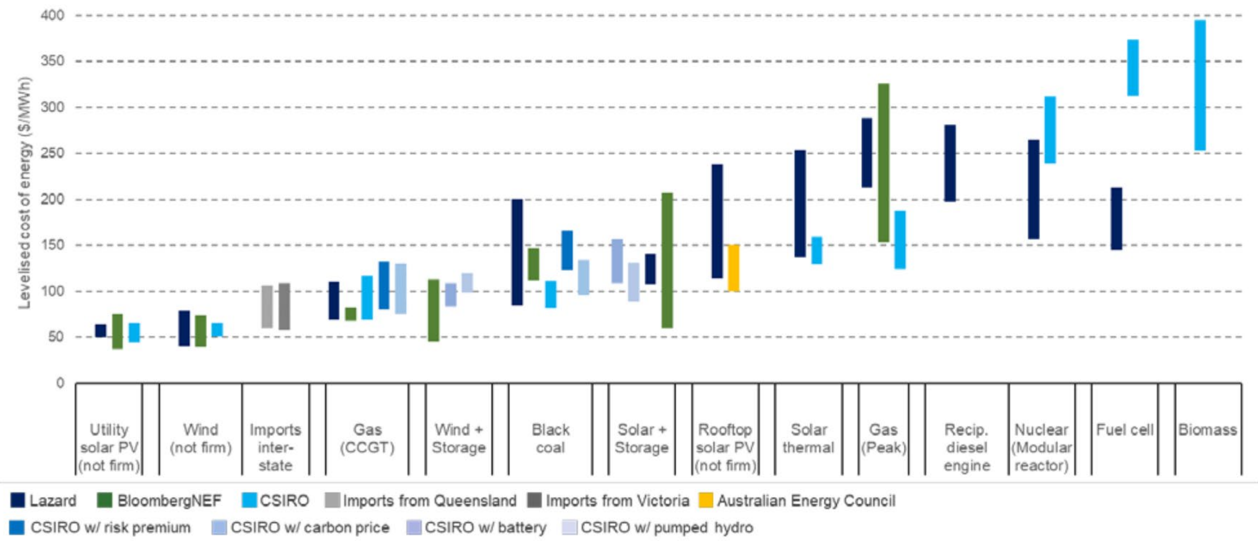


Figure 2-4 Levelised cost of electricity by type (DPIE, 2019).

The Blind Creek SF would contribute to the NSW government's plan to achieve the objectives for the electricity system which include reliability, affordability and economic growth and sustainability. The contribution of the project to local employment and economy is set out in detail in Section 9.5 of this EIS.

2.2.4 National Electricity Market (NEM)

The Australian Energy Market Operator (AEMO) released the 2020 Integrated System Plan (ISP) in July 2020 (AEMO, 2020). The plan is released every two years and aims to guide industry and government in the investments needed for an affordable, secure and reliable energy future, while meeting prescribed emissions trajectories.

The Blind Creek SF sits outside the candidate Renewable Energy Zone (REZ) as shown in Figure 2-5.

Renewable Energy Zones (REZ's)

To strategically maximise benefits and smooth the transition to greater renewable energy development, the ISP identified potential REZ locations that can connect to the existing transmission network. Specifically, these REZs can:

- Reduce the need to build transmission lines into new areas.
- Reduce project connection costs and risks.
- Optimise the mix of generation, storage and transmission line investment across multiple connecting parties.
- Co-locate and optimise the otherwise 'lumpy' investments in network and system support infrastructure.
- Co-locate and optimise weather observation stations to improve real-time forecasting.
- Realise benefits of capital scale in all those investments.
- Promote regional expertise and employment at scale.

The ISP has identified 35 potential REZ after assessing resource, technical and economic parameters during scenario and assumptions consultation. The Project is outside the candidate REZ's (Figure 2-5) however is electrically within the strategically important Illawarra industrial region. The Project has an existing 330kV transmission line through the site, which neighbours the operational 140MW Capital Wind Farm. Proposed rule changes governing how electricity generators connect to the grid has the potential to increase renewable energy zones by allowing multiple parties to share the same privately owned infrastructure (like power lines) to connect to the wider transmission network and at the same time be given their own connection point (AEMC, 2020). This has potential to create 'mini-REZs' in areas such as where the Project is proposed.

The Queanbeyan region has the first utility scale solar farm connected to the NEM in the 20MW Royalla solar farm, and the 10MW Williamsdale solar farm, both currently operating. The provision of the Blind Creek Solar Farm along with the Snowy Hydro Scheme (with the Snowy 2.0 project anticipated to be completed in 2026) would contribute to the ACT being supplied by 100% renewable energy via the Line 6 connection which links the load centres of Canberra and Sydney.

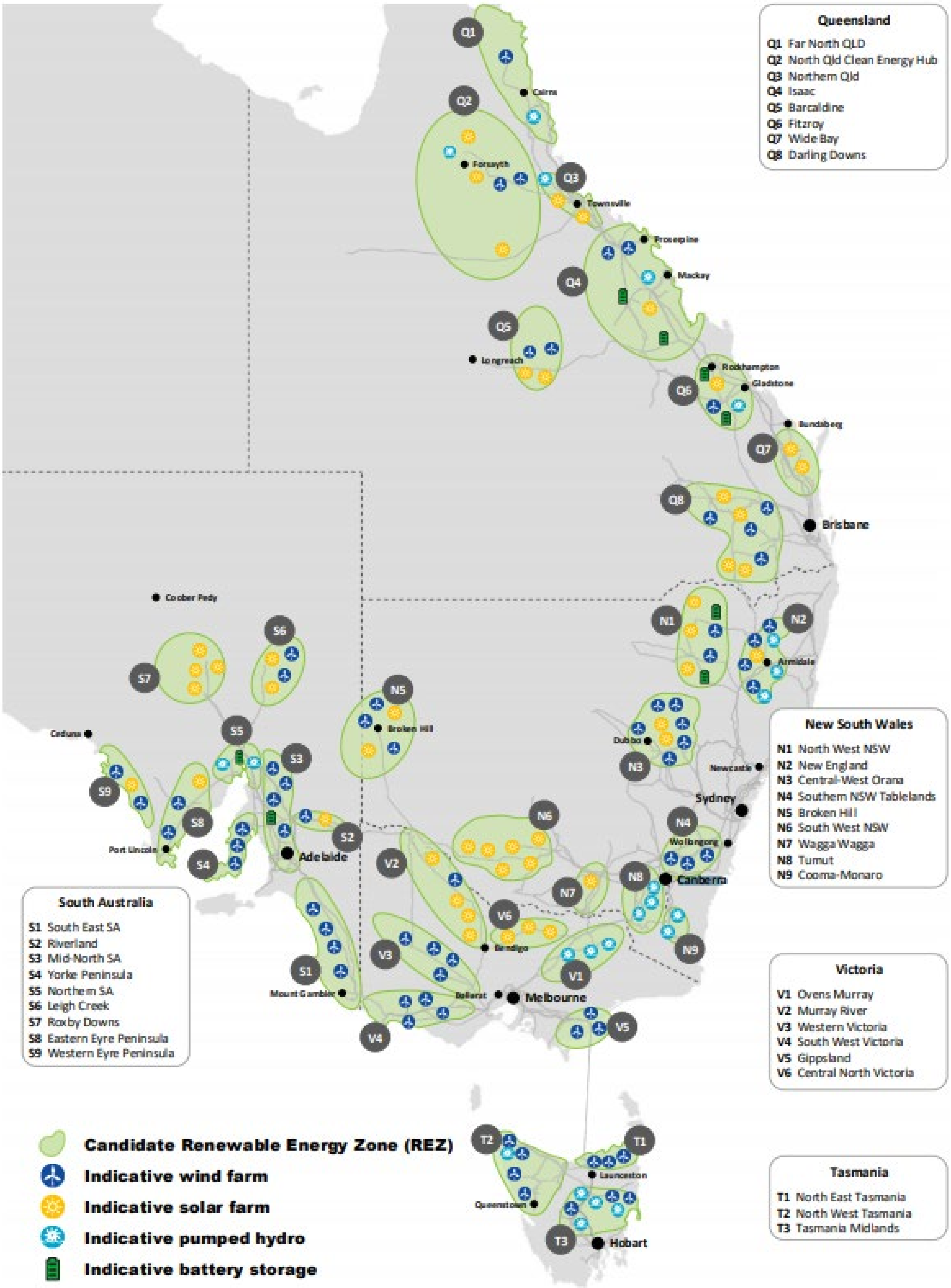


Figure 2-5 Identified candidate Renewable Energy Zones (REZs) for assessment in developing the optimal development path in the NEM (AEMO, 2020)

Electricity infrastructure roadmap

The NSW Electricity Infrastructure Roadmap (‘The Roadmap’) (DPIE NSW, 2020a) aims to redefine NSW as a modern, global energy superpower by delivering the electricity infrastructure needed to support a modern prosperous economy. The roadmap sets out a plan to transition the electricity sector from the existing power sources that are coming to the end of their lives, to cleaner, cheaper and more reliable energy sources including wind, solar, batteries and pumped hydro.

The electricity sector in NSW will be underpinned by five foundational pillars outlined in The Roadmap:

1. Driving investment in regional NSW: supporting our regions as the State's economic and energy powerhouse.
2. Delivering energy storage infrastructure: supporting stable, long-term energy storage in NSW.
3. Delivering Renewable Energy Zones: coordinating regional transmission and renewable generation in the right places for local communities.
4. Keeping the grid secure and reliable: backing the system with gas, batteries or other reliable sources as needed.
5. Harnessing opportunities for industry: empowering new and revitalised industries with cheap, reliable and low emissions electricity.

The Roadmap reiterates the need to act now given four of the five coal fired power stations in NSW are anticipated to close within 15 years, starting with the Liddell power station in 2022-23. These power stations provide, as of 2020 power mix generation, around three quarters of NSW electricity supply and two thirds of the firm capacity needed during summer heat waves, and as they age, tend to fail more frequently resulting in reliability problems. The infrastructure needed to replace coal fired power stations has long lead times, further justifying the need for action to coordinate and unlock investment before they close. The recent announcement of the early (2025) of Origin Energy's Eraring coal-fired power station has reinforced this objective.

The key benefits of The Roadmap are shown in Figure 2-6. The Blind Creek SF would contribute directly to four of the five pillars:

1. Driving investment in regional NSW by increasing economic activity during construction and through benefit sharing programs. Economic modelling suggests the Project could provide between $2 to $3.4 million in direct value add with additional contributions to the local community. The Project could provide around 300 full time equivalent jobs during construction.
2. Increasing large scale energy storage of nominally 300MW / 600MWhr, providing stability and reliability to the grid.
3. Contributing a combined installed capacity of approximately 735,00MWh per year of renewable energy to the grid network, with storage, to support stabilising the supply of electricity to the National Energy Market (NEM).
4. Developing opportunities for industry in planning, design, construction and operation of large-scale renewable energy infrastructure.

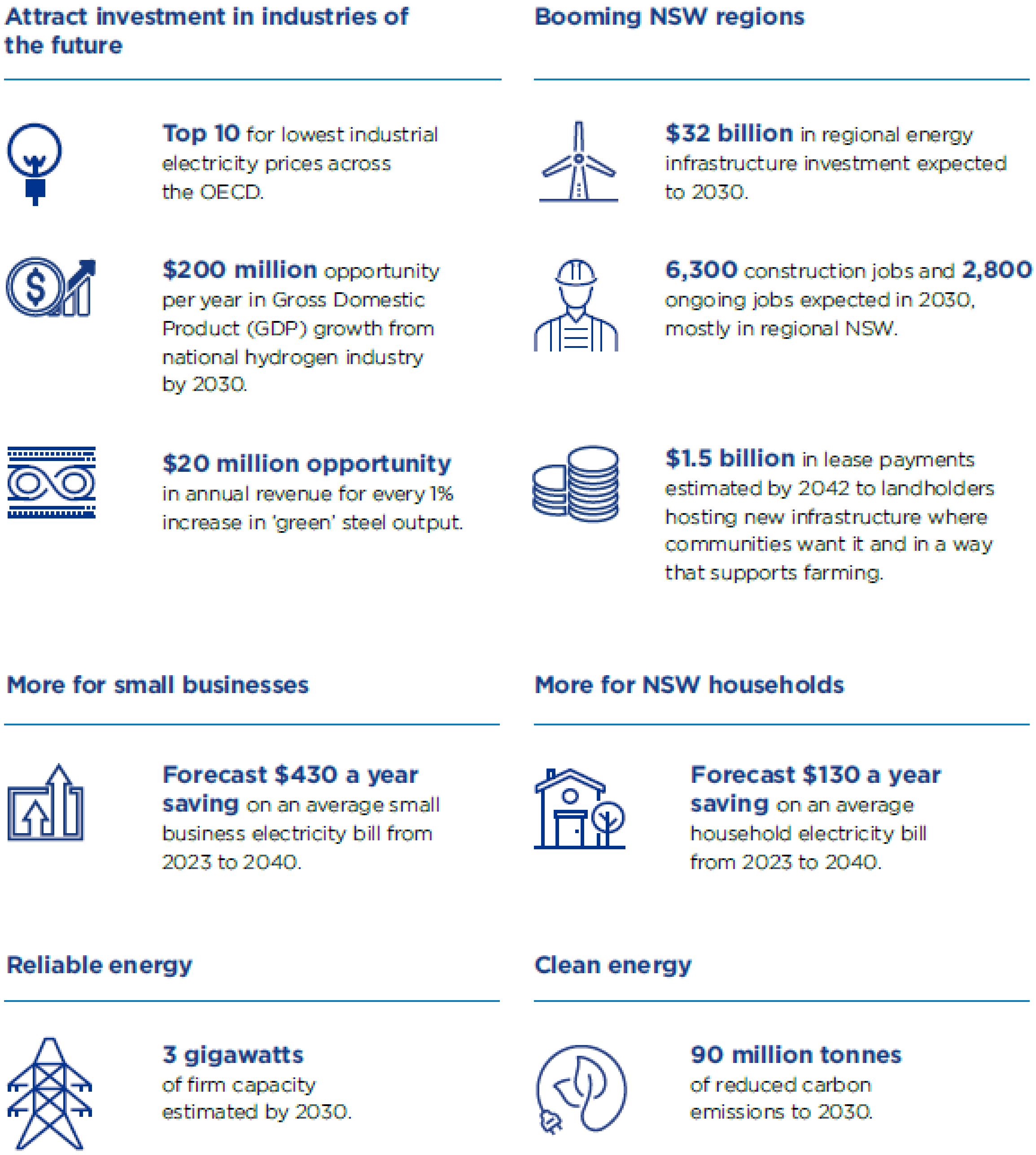


Figure 2-6 Key benefits of implementation of the NSW Electricity Infrastructure Roadmap (DPIE NSW, 2020a)

2.2.5 Electricity reliability and security benefits

The transition to renewable energy sources based on variable wind and solar PV generators has implications for reliability and security; these sources lack usable inertia to support power system security (Finkel, Moses, Munro, Effeney, & O'Kane, 2017). The National Energy Market grid is long and linear, with much less network meshing than many international systems. Geographic and technological diversity in the network can improve security and smooth out the impacts of variability (Finkel, Moses, Munro, Effeney, & O'Kane, 2017).

While grid-supplied electricity consumption is expected to remain stable (AEMO, 2020), the project is close to the dominant NSW demand centre, Greater Sydney, on a part of the network deemed high system strength in AEMO's *2020 Integrated System Plan* (AEMO, 2020). It is also likely to be supported electrically and commercially by Snowy 2.0. As such, the Project would benefit network reliability and security by providing embedded electricity generation closer to Greater Sydney, contributing to a more diverse mix of energy sources and potentially regulating inputs (including improving the security of supply) to the grid using a Battery Energy Storage System (BESS).

Energy storage using batteries and power conversion systems are one of the technical solutions for the integration of non-synchronous, variable renewable energy sources into the network (Finkel et al. 2017). Energy storage can improve reliability by storing electricity when it is cheap and supply is high, and discharging at times of peak demand, and when supply from variable generators is low. Storage can also support power system security, by providing services such as frequency control (including 'fast frequency response') and voltage control (Finkel, Moses, Munro, Effeney, & O'Kane, 2017).

The BESS constructed for the Project would be capable of storing energy for release when the use or cost is beneficial. The BESS would have a nominally 600MWh / 300MW rated capacity, provided by banks of lithium-ion batteries. The BESS, depending on available revenue streams at the time, would provide network services including 'energy smoothing' and frequency control integration, improved reliability as well as energy arbitrage. 'Energy arbitrage' is the price mechanism allowing energy to be stored during periods of low demand and then discharged during periods of high demand.

Energy smoothing would help to overcome the intermittency limitations of renewable energy sources such as solar and wind. Energy storage systems can also provide ramp control – acting as a buffer while the power output from a large generation source is ramping up or down – and on-demand distributed power generation, contributing to overall generating capacity while adding resiliency to the grid.

2.2.6 Local renewable energy targets

South East and Tablelands Regional Plan 2036

The Blind Creek Solar Farm is consistent with the vision and goals of the South East and Tablelands Regional Plan (DPI, 2020a). Achieving the vision of "A borderless region in Australia's most geographically diverse natural environment with the nation's capital at its heart" would be supported by contributing to the following goals:

- A connected and prosperous economy: Direction 6 – Position the region as a hub of renewable energy excellence.
- A diverse environment interconnected by biodiversity corridors: Direction 17 – Mitigate and adapt to climate change.

The Project is consistent with the above direction as it would contribute to making the region the renewable energy hub of New South Wales and assist in adapting to climate change through reduction of greenhouse gases.

The siting and environmental management commitments of the Project have been informed by detailed investigations to ensure the Project has a positive impact on the regional economy and that the health of the environment is protected throughout the life of the project. (Refer to Section 8 and 9).

Queanbeyan-Palerang Regional Council Draft Local Strategic Planning Statement 2040

The Queanbeyan-Palerang Regional Council Draft Local Strategic Planning Statement 2040 (the Statement) (Queanbeyan-Palerang Regional Council, 2020) identifies clear planning priorities for the Queanbeyan-Palerang LGA to address the planning and development issues of strategic importance as well as support and develop the local identity, values and opportunities. The Statement sets a planning vision for local strategic planning and community engagement in collaboration with the Community Strategic Plan 2018-2028 and the Queanbeyan-Palerang LEP.

The Statement identifies a number of planning priorities. Specifically, the Project is consistent with Planning Priority 8 – We ensure the future planning for the region is well coordinated and provides for its sustainable management.

Community Strategic Plan Queanbeyan-Palerang 2018-2028

The Community Strategic Plan Queanbeyan-Palerang 2018-2028 (the Plan) represents the vision, aspiration, goals, priorities and challenges for the community. The plan identifies a number of issues and challenges including climate change, renewable energy, attracting new enterprises and jobs and retaining and attracting young people in the area.

The Project is consistent with the outcomes of the Plan as it will encourage the employment of members of the local community and contribute to an increase in the use and production of renewable energy. It will promote the development of new skills and diversification in the local employment centre.

Climate Change Action Plan: Community Plan Period: 2020 to 2030

The Queanbeyan – Palerang Regional Council Climate Change Action Plan: Community Plan Period: 2020 to 2030 (CCA Plan) (100% Renewables Pty Ltd, 2020). The CCA Plan includes measures to both mitigate and to adapt to climate change impacts, including reducing GHG emissions, community consultation and setting action plans.

The Project is consistent with the actions of the Energy Action Plan and the Climate Change Adaptation Action Plan.

2.3 Project benefits

The Blind Creek Solar Farm has been developed iteratively, in tandem with input from the community and the specialist environmental assessment team. It reflects the opportunities identified early in the project to maximise the social and environmental acceptability and sustainability of the project. The project assessed in this EIS is one that responds appropriately to the site's context and community values.

Blind Creek Solar Farm will:

- **Be an important contribution to the transition to cleaner energy production**
- **Protect water catchments and biodiversity**
- **Enhance existing agriculture systems and ensure land use compatibility**
- **Protect cultural heritage values**
- **Support local employment, training and spread the project's economic benefits**
- **Assist in reducing wholesale electricity prices**

2.3.1 Transitioning to cleaner energy production

As set out above, the key environmental benefit of solar electricity generation is in relation to reducing greenhouse gas emissions and climate change. In 2019 the large-scale solar sector saw 1416 MW of new capacity added across 27 solar farms, whilst it was a record year for the medium-scale solar sector, with more than 162 MW of new capacity added throughout the year (Clean Energy Council , 2020). Large-scale solar contributed 9.3% of renewable generation and 2.2% of total electricity generation in Australia for 2019. Medium-scale solar contributed 1.3% of renewable generation and 0.3% of total electricity generation in Australia for 2019. Combined, this is the equivalent of powering 1,274,463 households for the year.

The Blind Creek solar farm would assist in transitioning the main form of electricity generation from fossil fuels to renewable energy. Exploration, mining and combustion of fossil fuel resources produce greenhouse gases which contribute to reduced air quality, land degradation and pollution and warming of the atmosphere. Estimates of Australia's greenhouse gas emissions are produced by the Australian Department of Industry, Science, Energy and Resources. NSW emissions in 2017/18 (financial year 2018), the most recent inventory of greenhouse gas data, were 131.7 million tonnes CO2-e (carbon dioxide equivalent' (Emissions, 2021). Coal combustion produces 53.5 million tonnes of emissions annually, which is 41% of all NSW greenhouse gas emissions. Since 2008 emissions from energy industries have decreased due to reduced energy demand during the global financial crisis, increased energy efficiency and more electricity generation from renewable energy sources (Emissions, 2021), however emissions are increasing again since 2015 in response to increasing demand.

Solar farms are a sustainable energy resource and do not produce any greenhouse gas emissions during electricity generation. As such, developing renewable resources for electricity generation will help meet growing demand while arresting current emission trends.

Utility battery storage is also recognised by NSW Government policies (NSW Electricity Infrastructure Roadmap and Renewable Energy Zones) as an important part of NSW's transition away from coal-fired energy, towards renewable energy. They have a proven ability to complement and support the network to increase renewable energy penetration and meet Australia's Renewable Energy Target.

If developed to the upper most capacity proposed (350MW AC), the Blind Creek solar farm would generate around 735,000MWh per year, saving approximately 521,000 tCO_2e/yr, and contributing to a reduction in global greenhouse gas emissions. The reduction in emissions as a result of renewable energy development will contribute to slowing the warming of the planet resulting in important flow on effects benefiting the environment. Slowing climate change will reduce ocean acidification, reduce sea level rise, improve air quality and prevent further loss of biodiversity.

2.3.2 Protecting water catchments and biodiversity

The Development site has been chosen to minimise impacts on biodiversity. The site has had a long history of farming and grazing. Areas that have been converted to exotic grasslands or are highly modified have been included preferentially. Areas of high biodiversity value within the boundary, including all woodland vegetation, have been avoided. Targeted survey programs undertaken for the Project have added to local biodiversity understanding of threatened species and communities. In perpetuity offsets will be a commitment of the project, where the Biodiversity Offset Scheme is triggered. Threatened species requiring credit offsets are the Rough Eyebright (*Euphrasia scabra*), Baeuerlen's Gentian (*Gentiana baeuerlenii*), Trailing Monotoca (*Monotoca rotundifolia*) and the Southern Myotis (*Myotis Macropus*). No ecosystem credits were generated under the BAM. Three entities (Trailing Monotoca, Rough Eyebright and Baeuerlen's Gentian) potentially at risk of a serious and irreversible impact could not be surveyed for during the EIA study period, as such the Project is temporarily assuming presence, although this is considered highly unlikely given the degraded nature of the vegetation and habitat within the Development site. Surveys are planned for Autumn 2022 to confirm presence or absence of the threatened plants. If these species cannot be ruled out by targeted surveys prior to the Project's determination, the retirement of the credits will be carried out in accordance with the NSW Biodiversity Offsets Scheme.

The Project has been sited to minimise adverse impacts on water quality and local catchments by setting back from creeks, Lake George and applying sensitive design within the Wrights Creek flood plain, including by minimally crowned tracks, aligning tracks with the flows and crossing in lower impact areas. All woodland vegetation has been avoided.

2.3.3 Agriculture and land use compatibility

The Project has been designed to align with regenerative agriculture, which is generally associated with better soil health, increased soil carbon sequestration, lower run-off and lower erosion. This aims to mimic natural grassland grazing with larger flocks intensively grazing for short periods, thus stimulating grass growth without over-grazing. In drought periods however, the Project will allow lesser stocking rates and intensity of agricultural management by providing an alternative income stream to host landholders.

2.3.4 Cultural heritage

A key contextual element affecting the project design is Aboriginal archaeology. Avoidance areas have been established through research, modelling, subsurface excavation and ongoing consultation and involvement with Aboriginal community representatives.

The Project includes the establishment of an ICHLZ. The landowners have committed to facilitate the establishment of the ICHLZ on approximately two square kilometres in between the proposed solar array and the lake shoreline in a geographical landscape identified as having high cultural value and archaeological sensitivity.

There are a total of 76 Aboriginal heritage sites within the Study area, which include 17 previously registered AHIMS sites, 38 isolated artefacts and artefact scatter sites recorded by NGH, and 21 areas containing subsurface artefacts recorded by NGH during the fieldwork for this assessment.

Mitigation in the form of alteration of the Development footprint has already been achieved through the removal of highly archaeologically sensitive landforms, namely the previously undisturbed strandline (i.e., apart from the historically quarried area within the strandline) and large portions of elevated sand bodies, and a buffer zone along riparian corridors. Further detail is provided is Section 8.4 and Appendix H.

2.3.5 Employment and local economic benefits

In 2019, over 25,000 Australians were employed in the renewable energy sector and this figure could rise to 44,000 by 2025 (Clean Energy Council , 2020). Large scale renewable projects create long term skilled employment opportunities, which are rare in many rural communities.

The employment benefits extend through the local supply chains to fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies, tradespersons, tool and equipment suppliers and many other businesses.

The Project would support approximately 300 direct jobs over the construction period, with up to 50% of employment opportunities coming from the local or regional area. It would employ approximately 5 full-time equivalent service and maintenance jobs during operation and development of new skilled labour in the region within the growing renewable energy industry.

Through its Community Benefit Sharing Scheme (CBSS), the Project is sharing the financial benefits of the Project with relevant community stakeholder groups, equivalent to approximately $330/MW per year. Included in this scheme is a proposal to Queanbeyan Palerang Regional Council to provide $1.25m over 20 years which the Council has recommended is put towards funding for the new community swimming pool.

The Project would deliver solar energy into the national electricity system at a strong network point (TransGrid's Line 6), making it one of the few renewable projects able to proceed without substantial grid extensions. It is also electrically near both Sydney, Canberra and the new Snowy 2.0 storage system, meaning electrical losses in delivering to these major consumption centres are low.

The Project would be an important part of building regional skill bases for this and other large solar projects to follow; diversifying the regional employment sector for renewable specific skills such as electrical and civil engineering, as well as boosting the existing service sector through the provision of recreation and accommodation services.

2.3.6 Electricity prices

Australian households would pay $510 million more for power in 2020 without renewable growth through the RET and up to $1.4 billion more per year beyond 2020 (Roam, 2014). Renewables increase diversity and competition in the wholesale energy market – and as in any market, less competition means higher prices.

The Australian Energy Market Commissions found that the average household power bill is anticipated to drop by 7.1% between 2019 – 2022 (Clean Energy Council , 2020). This fall in price is attributed primarily to an 11.6% reduction in wholesale prices as 8,594MW of new, mostly renewable generation comes online.

Variable renewable energy generation such as solar energy operates with no fuel costs and can, with the right policy framework and technological development to manage variability, be used to reduce overall wholesale prices of electricity (Finkel, Moses, Munro, Effeney, & O'Kane, 2017).

Several studies on the impacts of increased large-scale renewable energy generation under the RET have indicated that this is likely to put downward pressure on electricity prices (Australia Institute, 2015). To the extent that competition amongst retailers is limited, and to the extent that the RET creates greater contestability through the creation of economically sustainable new entrant retailers, there would be further downward pressure on the retail margins (Sinclair Knight Merz , 2013).

New wind energy generation is at least as cheap as coal in Australia, and the average cost of electricity (LCOE) from solar is set to drop another 66% by 2040. Solar is likely to beat the cost of existing, fully depreciated and unrefurbished coal plants by 2032 (BNEF, 2017). Solar is also cheaper than 'clean coal'; the LCOE per MWh of new solar is $38-60, whereas new 'ultra supercritical’ coal is $96 – $220 and coal with carbon capture and storage is $352 (Climate Council of Australia, 2017).

2.3.7 Financial benefits

Through its Community Benefit Sharing Scheme, the Project is sharing the financial benefits of the Project with relevant community stakeholder groups, equivalent to approximately $330/MW per year. Recipients of funding are encouraged to spend the money locally to ensure the financial benefits stay within the community.

Included in this scheme is a proposal to Queanbeyan Palerang Regional Council to provide $1.25m over 20 years which the Council has recommended is put towards funding for the new community swimming pool.

For more detail on this, please refer to Sections 2.3.5, 6 and 0.

3. Consideration of feasible alternatives

In the development of the Project outlined in this EIS, the Proponent has considered:

- The 'do nothing' option – avoiding all development impacts but not realising a proposal's potential benefits.

As well, various alternatives have been considered with regard to the:

- Site location.
- Site access points.
- Panel and battery technology.
- Scale of the project.
- Possible alternative land uses at the site.

This section details the evaluation of these options and arrival at the preferred Project, assessed in this EIS.

3.1 The 'do nothing' option

The 'do nothing' option must always be considered in any evaluation of options. It represents the status quo situation; avoiding all development impacts but not realising a proposal's potential benefits.

The 'do nothing' option would avoid the environmental impacts associated with the development and operation of the Project (detailed in Sections 8 and 9). However, these impacts have been determined to be acceptable and manageable with a set of Project-specific commitments that would accompany the development of the Project. They are largely standard and highly certain strategies to manage the impacts of solar farm development, which has matured as an industry sector in regional Australia over the last 10 years. These measures are considered practical and achievable by the Proponent. They are set out for each area of investigation in Sections 8 and 9 and summarised in Section 10.2 of this EIS.

The direct consequence of not proceeding with the Project would be to forgo the benefits outlined in Section 2.3, as summarised below:

- Assisting the transition to cleaner energy production
- Proactive water catchment and biodiversity management actions
- Enhancement of existing agriculture systems and diversification of land use and income streams in the local economy
- Increased understanding and protection of cultural heritage values at the site
- Realising greater local employment and training opportunities
- Assisting to push electricity prices down
- Assisting with environmental rehabilitation works proposed elsewhere on the landowners' properties.

Given the clear benefits of the Project and the acceptability or manageability of environmental impacts, 'do nothing' is not the preferred option from a strategic, economic, social, and environmental standpoint.

3.2 Alternative site locations

The Blind Creek Solar Farm site was selected by the Proponent following review of the solar generation potential of many areas in NSW by identifying grid connectivity capacity, planning constraints, biodiversity impacts and other site constraints. The proposed sites were considered in accordance with the Large Scale Solar Energy Guideline for State Significant Development (DPIE, 2018), which provides recommendations regarding selection of suitable Development sites and areas of constraint that should be identified. Once the broader site was selected, the Development footprint was refined iteratively, in tandem with the environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process responds appropriately to the site's constraints to produce the most justifiable proposal, which is presented in this EIS and in accordance with the Large Scale Solar Energy Guideline for State Significant Development (DPIE, 2018).

The selected Development site provides the optimal combination of:

- Access to onsite transmission with spare capacity,
- Low environmental constraints (predominantly cleared cropping land)
- At a location with minimal environmental and visual impact
- Level terrain for cost-effective construction
- High quality solar resource
- Low-density population and limited neighbouring properties, with all adjacent land owned bv participating landholders
- Suitable planning context
- Acceptable flood risk
- Road access
- Access to the distribution network for powering of ancillary services
- Supportive local community towards a utility-scale solar project
- Flexibility to design the site to avoid impacts where possible, in particular archaeology and biodiversity
- Ability to effectively mitigate and manage residual impacts through the EIS process
- Benefits that can be provided to the local region through economic development.

The design of the Project is the result of an iterative process and has been adapted progressively as information regarding site constraints, and the potential impacts and risks associated with the development of the Project have become available. Constraints related to cultural heritage, electricity network easements, visual impact and biodiversity values in particular have been taken into account in developing the proposed layout.

Based on biodiversity, heritage and other studies carried out for the EIS, the proposed layout achieves the objective of efficient electricity production while avoiding and minimising environmental impacts. The Development site's evaluation in terms of the *Large-Scale Solar Energy Guideline for State Significant Development* (DPIE, 2018) described in Table 3-1 below.

Table 3-1 Site evaluation

Preferable Site Condition	Observation
Optimal solar resources	The site has a high solar exposure measuring between 18MJ/m2 to 20MJ/m2 (November 2021 to January 2022 (Bureau of Meteorology, 2022).
Suitable land	The Development site is flat and predominantly clear of native vegetation, and highly suited to efficient, high-output utility scale solar generation. The Development site is in a rural area with large setbacks from neighbours, where the dominant land use is broad scale agriculture carried on by associated landholders, existing renewable generation, and sand quarrying. The land uses surrounding the Development site and along the construction access route are described in Sections 9.2 and 9.3. The Project is not likely to restrict or negatively impact any surrounding land uses. The Development site comprises several large paddocks, which have been used for cropping, grazing and sandmining (no long active) over approximately 200 years. The crops grown are characteristic of agriculture in the Queanbeyan-Palerang LGA being a wheat/oat and brassica/lucerne rotation interspersed with periods of perennial exotic pastures. The Project would affect a very small proportion of the arable land in the LGA, and is at the lower end of productivity, being a very poor sandy soil. The Project would not impose requirements for additional Council or State Government services or facilities.
Capacity to rehabilitate	Project would involve minimal site disturbance and has potential to improve land by giving the site a rest from grazing. Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing and occasional cropping can be resumed.
Community support	Community consultation has been undertaken as part of the proposal and feedback has been considered within this EIS. The consultation undertaken and results are summarised in Section 6.
Proximity to electrical network	An existing TransGrid 330kV transmission line traverses the Development site. The proposed connection to the grid would be via construction of a new onsite substation and battery storage pad located adjacent to the existing TransGrid 330kV transmission line.
Connection capacity	The TransGrid network passes through the property, allowing connection to the transmission network and the substation to be sited on the property. This connection method means there are no off-site grid works. Preliminary electrical system studies show there is sufficient capacity on the 330kV TransGrid Canberra-Sydney (Line 6 & Line3W) to accept electrical generation into the network from the Project. The studies also show the level of generation is commensurate with demand in the Canberra, Snowy 2.0 and Greater Sydney area, leading to low electrical losses.

3.3 Alternative access points

The Proponent engaged Amber Organisation Pty Ltd to prepare a Traffic Impact Assessment (TIA) considering site access location. Three existing access points off Tarago Road were considered:

1. Blind Creek Road Entrance (intersection of Tarago Road and Blind Creek Road)
2. Currandooley Road entrance

3. Bungendore Sands entrance.

It was found that the Blind Creek Road Entrance had the least impacts on local traffic and required the least upgrades (See Figure 1-6 for location), as such it would be used for construction and operation access. The TIA determined that the Blind Creek Road Entrance is likely to require some widening to accommodate turn treatments for construction traffic, but the intersection already has suitable sight lines. The TIA found that the additional traffic generated by the site during operation can be comfortably accommodated by the local road network without upgrade. A schedule of road upgrades has been provided as part of the TIA. The final intersection designs would be completed in consultation Queanbeyan-Palerang Regional Council following approval of the Project.

3.4 Alternative technologies

Alternative technologies for renewable energy generation encompass generation technology (principally solar or wind), PV solar equipment and BESS.

3.4.1 Generation technology

PV solar technology was chosen for electricity generation because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site.

Solar generation is well suited to the particular characteristics of the Development site which include:

- Mostly flat to slightly undulating land and well screened.
- The land is not mapped as Biophysical Strategic Agricultural Land (BSAL; land identified with high quality soil and water resources capable of sustaining high levels of productivity, which is critical to sustaining the state's agricultural industry).
- The site has already been cleared and heavily disturbed by grazing within the proposed development areas.
- The site has interested landowners who are proactive in combining the Development site's existing agricultural use with a highly compatible solar design.

3.4.2 Solar farm components

Given the selection of PV solar technology, the additional technology options considered for the Project include:

- The type of solar panels
- Solar panel mounting system – fixed tilt or tracking
- The module arrangement within the tracking system (1-in-Portrait 1V/1P or 2-in-Portrait 1V/2P)[4]
- The type and number of Power Conversion Units (PCU) and BESS.

[4] 1V/1P is the industry term for single axis tracking system in a single panel configuration. 1V means vertical and 1P means one module in portrait position.

3.4.3 Solar panels and piling systems

The solar panels and piling system options remain flexible and all options are fully assessed in this EIS.

The Project will require nominally 850,000 PV modules, mounted on single axis trackers and in rows, with minimum 5.75m or greater row spacing, and a height of approximately 5m above the natural ground level at approximately 60 degrees full tilt. As solar panel technology evolves rapidly, specification of the exact make of the solar panels will be defined during detailed design. Notwithstanding, solar panels being considered for the Project would be expected to absorb 82% to 93% of the sun's light and would involve low reflective surface material that would limit glint and glare.

The PV mounting structure would comprise of piles driven approximately 2.5m (depending on geotechnical requirements) into the ground using a pile driver, or screw piles depending on geological conditions. Both options involve very little soil disturbance. The ground cover beneath the arrays can be maintained during construction and into operation.

3.4.4 Mounting System Array

Solar panels can be fixed on a specific angle or incorporate a mechanism that enables the modules to track the path of the sun. Three options are relevant:

- **Fixed**: the modules are fixed and installed at an optimal orientation and tilt/angle for the site
- **Single axis tracking system**: a mechanism enables the modules to track the sun from east to west, following the path of the sun. The tilt/angle of the module is fixed.
- **Dual axis tracking system**: a mechanism enables the modules to track the sun from east to west and north to south. This tracking ensures the module surface is always presented perpendicular to solar radiation, and therefore achieves maximum exposure.

The mounting options are compared in Table 3-2. The single axis tracking system has been selected as the preferred option as it maximises the productivity of the solar panels without higher cost and complexity of dual axis system.

Table 3-2 Comparison of mounting options

Element	Fixed	Single axis tracking system	Dual axis tracking system
Land area required	Low	Medium	High
Production	Medium	High	High
High generation output window	Noon ± 2 hours	From sunrise + 30 min to sunset -30 min	From sunrise + 30 min to sunset -30 min
Investment	Low	Medium	Very high
Operational expenses	Low	Low	High
Wind resistance	Very high	Very high	Low
System reliability	Very high	Very high	Medium

3.4.5 Energy storage technology

There are several alternative technologies that could be used for the proposed BESS. Battery technology was selected over mechanical or physical storage methods (flywheel, pumped hydro, liquid air, compressed air) or thermal storage (such as hot water or molten salt) because it enables modular installation without major infrastructure or specialised landform features. Batteries generally have lower weight and physical volume and better scalability compared to other technologies. Disadvantages of batteries include their relatively limited life, some batteries are made from hazardous materials, and they can be sensitive to climatic conditions (Finkel, Moses, Munro, Effeney, & O'Kane, 2017)

The lithium-ion ('Li-ion') battery is currently the preferred technology for storing energy generated from wind and solar sources and is likely to dominate battery chemistry for the next 20 years (Randell Environmental Consulting, 2016). The shift to Li-ion batteries is because of their greater energy density (which means they are smaller and lighter), expected longer life spans and ability to undergo deeper discharges, reducing the capacity required (Lewis, 2016). Li-ion batteries have a very long lifetime compared to other battery technologies, with 5,000 or more charge cycles (Finkel et al. 2017).

Alternative battery technologies include lead acid and relatively new technologies such as hydrogen, molten-state, sodium-ion, flow (vanadium redox, hydrogen bromide or zinc bromide) and saltwater batteries. Many of the competing technologies are either still in technical or commercial development, environmentally unfriendly or offer low energy and power density compared to Li-ion.

Li-ion battery cells were selected for the Project because they provided the optimal combination of:

- Proven ability to complement to solar generation developments
- Ability to support the network to increase renewable energy penetration
- Ability to provide fast frequency support
- Ability to provide energy during periods of peak demands
- Minimal environmental impact
- Safety and ease of integration
- Demonstration and maturity of technology
- Value for money.

Li-ion technology is established and proven, compact, lightweight, highly efficient, very high energy density, economically attractive, commercially available and easily installed with low maintenance requirements.

3.4.6 Energy storage configuration

Two configurations are being considered for the energy storage and it is possible that a hybrid or alternative architecture may be selected, noting that at this stage, all technical details are indicative only and quantities given are nominal.

1. DC coupled – distributed

- In this configuration the batteries and the solar array (both DC components) share PCUs.
- Each solar sub-array would contain batteries and associated DC-DC converters in addition to the PCU.
- The number of batteries would be selected to match the capacity of the PCUs.

- The batteries are likely to have similar dimensions to a half-sized shipping container and several may be added at each PCU site.
- In all, the impact of incorporating energy storage in this format would be approximately equivalent to including approximately 3 half-sized containers per sub-array (approximately 300 half-sized containers across the entire solar array).

2. AC coupled – concentrated

- AC coupling is the common format used to date. The batteries have independent PCUs for DC-to-AC conversion and for cost-effectiveness are grouped together near the grid connection.
- The batteries and conversion equipment would be grouped into BESS Units (approximately 60), with each unit including a transformer, multiple inverters, multiple batteries, and medium voltage switchgear.
- With appropriate spacing between all devices and equipment, a 5MW/10MWh Unit would occupy approximately 3ha
- The facility would also include internal access roads, and buildings for additional low and medium voltage switchgear. These buildings would occupy a footprint of approximately 0.03ha.
- In total, the facility would occupy approximately 3ha.

The energy storage configuration and the physical layout of the batteries on the site would be specified during the detailed design phase. At this stage both options are considered viable and are assessed in this EIS.

3.5 Scale of the Project

The scale of the Project has been influenced by:

- Land available from associated landowners, and availability of agricultural land from landowners willing to enter into lease or purchase agreements
- Constraints within the Study area that have arisen during the EIS investigations to avoid significant impacts to the land or solar farm infrastructure
- Demand for new renewable electricity generation to meet generation targets
- Commercial investment and viability considerations
- Transmission grid capacity.

The proposed scale of the solar farm successfully responds to the constraints and opportunities inherent in these factors.

As part of the site selection process, the Proponent has undertaken electrical load-flow modelling of the NSW electricity transmission system. This modelling has shown the available capacity on this section of the 330kV grid system to be sufficient to support a solar farm of this scale. These assessments have been discussed with TransGrid as part of the ongoing grid connection consultation and agreement process.

3.6 Consideration of other land uses in site selection

Potential uses for the Development site might include:

- Wind Energy. The site encompasses nine approved wind turbines as part of the Capital 2 Wind Farm. If the site is approved for solar, then these turbines would not be installed.
- Sand quarrying. The site includes a number of disused quarries and is adjacent to several others. The sand on site is suitable for a range of construction activities and within convenient transport range of Canberra.
- Ongoing farming and grazing. The site has low capability soils and is not very productive for traditional agriculture and would not provide a sensible return. However low intensity agricultural activities could continue provided they are part of a larger enterprise and or the owners had alternative income sources.
- Rural Residential development. Many large properties in the area have been converted to rural-residential estates.
- A combined regenerative agriculture and solar facility. This is described in more detail below.

The site has been developed with Agri-solar in mind. In particular, the Proponent intends to enable the landowners to practice regenerative agriculture beneath the panels. Although this is not part of this approval, the concept is described below.

Regenerative agriculture is a system of farming practices and principles to maintain diverse and abundant biological activity in the soil, leading to increased soil carbon, humates and ability of the soil to absorb and hold water. This process enables sequestration of carbon from the atmosphere, creates a healthy environment for diverse microorganisms and increases drought resistance. Regenerative agriculture practices include:

- Livestock: animals are an integral part of regenerative agriculture, spreading nutrients through their urine and manure and churning up the soil allowing nutrient recycling.
- Perennial grasses: perennial native grasses provide a permanent ground cover and play a role in reducing soil erosion and increasing water infiltration. These grasses are drought resistant, deep-rooted and can draw on moisture reserves from deep in the soil profile. Regenerative agriculture aims to stimulate growth of perennial grasses.
- Time controlled rotational grazing: plants are grazed in their vegetative state for relatively short periods, compared with continuous grazing, which reduces the tendency for preferred species to be grazed out. Grazing is then followed by a rest period allowing grasses to replenish their root reserves and better withstand dry periods, benefiting both soil structure and land condition.
- Organic fertilisers: fertilisers such as ‘humus compost’ – a nutrient-dense by-product of the natural decomposition of organic materials – return nutrients to the soil, promoting both grass growth and soil health.
- Cover cropping: a cover crop is an annual forage crop that is used primarily to provide extra green forage in non-growing seasons (i.e., winter & summer), improve soil health, enhance water availability, smother weeds, help control pests and diseases and increase biodiversity.
- The Agri-solar Strategy will employ these regenerative agriculture methods.

Using the principles of regenerative agriculture, the Agri-solar strategy will involve rotational grazing. Rotational grazing is the frequent movement of groups of livestock through a series of paddocks, organised around seasonal and plant growth cycles. This process aims to optimise pasture utilisation. An example of a combined solar and rotational grazing Strategy is illustrated in Figure 3-1 below:

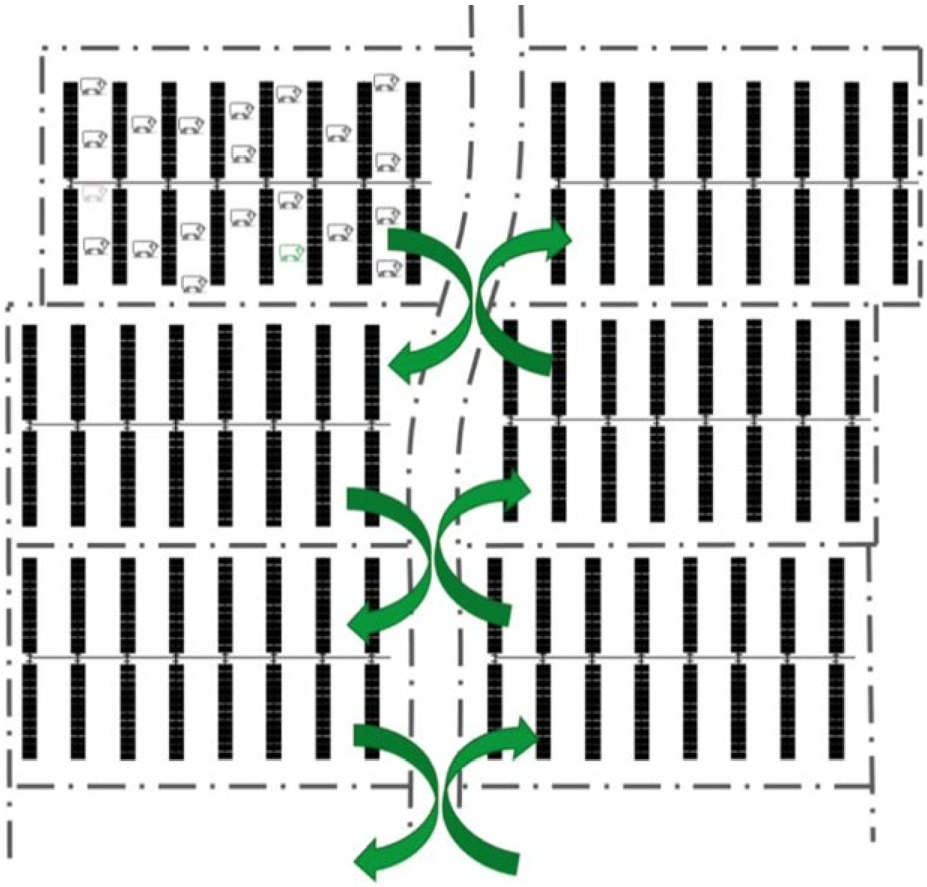


Figure 3-1 Rotational grazing of livestock with solar array

Rotational grazing is now widely recognised as best practice in agriculture to promote soil and plant health. It keeps the grass in its maximum growth state: neither too short nor in a tall reproductive state with seed heads. Ideally pasture is grazed evenly throughout the site.[5] This also means vegetation will be kept in a state of lower fire risk by minimising times when it is 'haying off.'

The Agri-solar Strategy is designed to maintain plant condition in Phase 2 growth (see Figure 3-2 below). This phase is where the most photosynthesis and carbon sequestration occurs.

[5] https://www.mla.com.au/research-and-development/Grazing-pasture- management/improved-pasture/grazing-management/grazing-strategies/

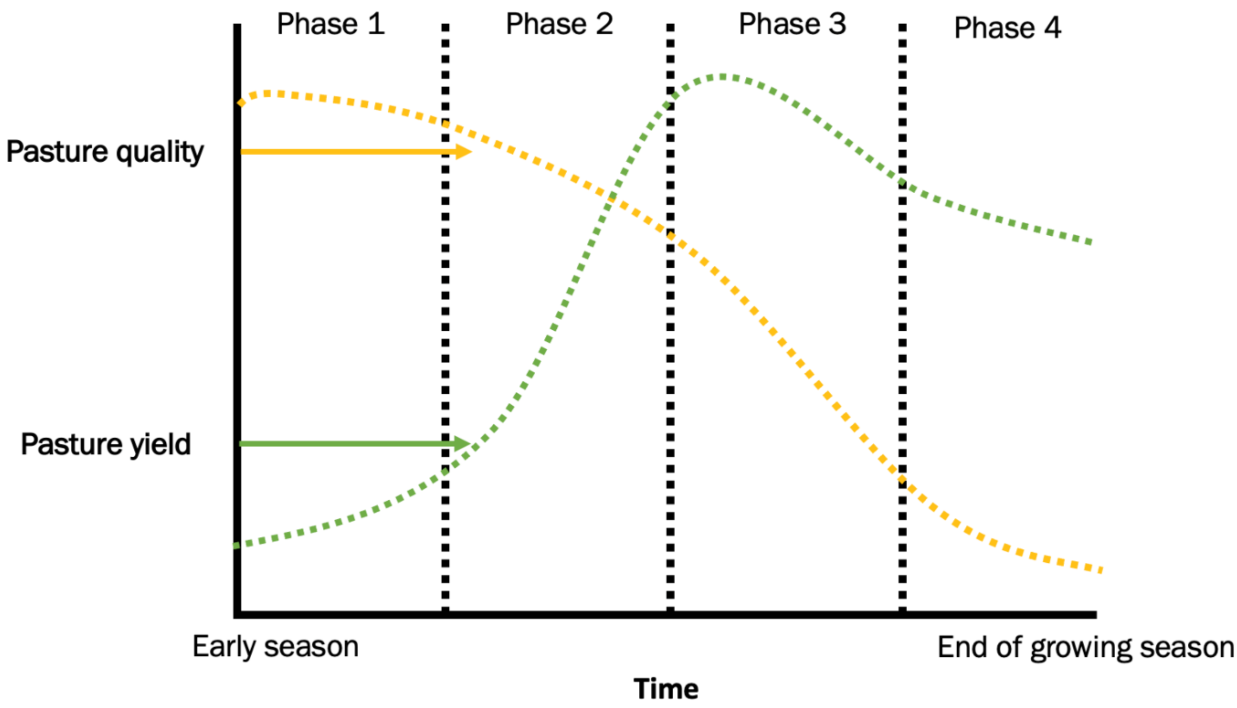


Figure 3-2 Plant growth, yield and quality phases

3.7 Preferred option

The preferred option represents a commercially viable, technologically feasible contribution to the need to reduce carbon emissions intensity in the energy sector, while achieving a low level of environmental impact.

- Solar generation using PV panels is particularly well-suited to the topographical and climatic conditions of the Project's development site.
- The site is well located to connect to the national electricity grid and supply high demand centres.
- The most appropriate site access has been selected, in consultation with the road's authority and traffic consultants.
- The scale of the Project balances technological, energy and environmental aspects, while retaining the flexibility and adaptability required in the final design stage of the Project. Exclusion areas are clearly identified and ensure the site's important values are not impacted.
- While not part of the Blind Creek Solar Farm proposal, the project ensures concurrent continued agricultural land use including regenerative agriculture. This achieves high land use compatibility.
- Mitigation strategies developed with the community including those with most potential for impact area now part of the project.

4. The Project

4.1 Project summary

The key features of the Project are summarised in Table 4-1 and mapped in Figure 1-6 (and the indicative layout of infrastructure in context of the Study area's identified constraints is shown in Figure 1-7.

The component specifications and location of infrastructure are subject to change during detailed design. Where required, upper limit quantities and power level estimates are provided to ensure the assessment and any subsequent approval maintains the flexibility required in the detailed design stage, post approval. The assessment of a broader Development site also provides resilience to minor layout changes.

Table 4-1 Summary of key features of the Project

Feature	Description
Project	Blind Creek Solar Farm (BCSF)
Proponent	Blind Creek Solar Farm Pty Ltd (BCSF Pty Ltd)
Nominal Capacity	Estimated capacity of up to 350MW AC (420MW DC)
Study area	The area surveyed for the assessment prior to identifying the constraints and exclusions. Approximately 1,225 ha. Refer to Figure 1-2.
Development site	The Development site is the area where development is proposed and where landowner consent (freehold and Crown land) has been obtained. The area is 1,026ha. Refer to Figure 1-2
Development footprint	The uppermost area of land that would be directly impacted by the Project. Approximately 680-700ha
Exclusion zones	As identified by the EIS investigations, approximately 529.86ha within the Study area would be protected from impacts. These exclusion zones reflect: • 46.06ha of land with high biodiversity values • 4.2ha of waterways and their riparian buffers; a high catchment value. • 479.6ha of land with high heritage values (Aboriginal Heritage and Non Aboriginal Heritage) Additionally, no solar panel arrays would be placed within the approximately 8ha of existing electricity easement traversing the site, nor in any area South of Butmaroo Creek.
Indicative infrastructure layout	Approximate location of key infrastructure components within the Development Footprint; subject to detailed design.
Subdivision requirements	The Project would require subdivision of:

Feature	Description
	• Lot 17 DP535180, to separate the solar facility from Capital Wind Farm. • Lot 1 DP456698, to separate 'shared network' electricity assets. Refer to the subdivision plan, Figure 4-2.
Local Government Area and land zoning	Queanbeyan-Palerang Local Government Area (LGA). RU1 Primary Production and C3 Environmental management.
Solar array	Single-axis tracking system Indicative number of panels: Approximately 850,000 Indicative area including panels: Approximately 475ha Tracker (row) spacing: 5.75m or greater row spacing Clear space between panels (pitch): Approximately 3.1m or greater. Height: Approximately 5m (at a 60 degree tilt). Refer to Figure 4-3 Up to 85 inverters and transformers in containers, distributed throughout the array, for power conversion.
Transmission line connections	Existing 330kV transmission line that traverses the site, via a purpose-built on-site switchyard and adjacent substation. This line connects Canberra to Kangaroo Valley.
Substation	The substation would have a nominal transfer capacity of approximately 350MVA and host up to 4 transformers. It would require approximately 1ha for the 330kV switchyard. The Project's dedicated assets would be adjacent, including transformers and switching equipment, O&M building, car parking and storage facility.
Battery storage (BESS)	An electrochemical BESS with a nominal capacity of 300MW and 2-hour duration, partly grouped in containerised modules near the substation on a pad of approximately 3ha (AC coupled), and/or wholly partly distributed throughout the array in containers adjacent to the solar inverters (DC coupled).
Site access and intersection upgrades	The entrance to the site for all stages of the project is off Tarago Road (administered by Queanbeyan City Council). The intersection of Tarago Road and a private road on Lot 1 DP1154765 (henceforth, Blind Creek Road Entrance) would be upgraded. The project requires a new left turn passing lane to allow passing traffic from Bungendore direction. This supplements the existing right turn passing lane which allows traffic from Tarago to pass vehicles turning into the site. An emergency access point/route has been identified and is shown in Figure 1-5 with more detail provided in section 4.3.7.
Internal tracks and waterway crossings	The project requires approximately 6.6km of upgrades to existing tracks and approximately 20km of new internal tracks. The Project would use Currandooley Road, an existing unsealed private road suitable for all vehicle types, as well as construct an additional internal access network.

Feature	Description
	The project requires upgrades to the existing low-level crossing on Blind Creek and a new crossing on Wrights Creek.
Operations and Maintenance (O&M) buildings	A permanent O&M facility with staff amenities and vehicle parking is required. It will include a control room with switch gear and have a height of approximately 5m, subject to final design.
Security fencing, lighting and CCTV	The solar array will include agricultural- style fencing. The switchyard, 330kV substation and O&M facilities would be enclosed by a 2.3m high chain wire security fence. Night lighting around the buildings and in the high voltage substation will be installed to comply with Australian/New Zealand *Standard AS/NZS 4282:2019 – Control of Obtrusive Effects of Outdoor Lighting*, or its latest version, but will only be used for maintenance and emergency purposes. Task lighting will be installed at PCUs. Lighting will be able to be remotely controlled as required. CCTV security cameras at the entrance gate and around the substation and battery storage, and O&M facilities and office areas.
Construction timing and hours	Approximately 12 to 18 months (peaking during the initial 6–9 months). Standard construction hours: Monday to Friday 7am to 6pm, and Saturday 8am to 1pm. No work on Sundays and Public Holidays.
Operation	The expected operational life of the Project is nominally 35 years. Future infrastructure upgrades may extend the operational life of the Project.
Hours of operation	The Project would operate continuously.
Decommissioning and rehabilitation	All infrastructure would be removed from the site including DC cabling and AC above-ground cabling. AC cabling buried deeper than 500mm would not be removed. The site would be rehabilitated to a safe, stable and non-polluting state, consistent with future land use requirements.
Employment	Up to approximately 300 full-time jobs during peak construction. Approximately 5 full-time equivalent jobs during operation.
Capital investment value	Estimated $**503,679,005** million AUD

4.1.1 The Subject land

The Blind Creek Solar Farm Project would be located on an approximately 700ha site. The Subject land is defined as all lots affected by the development. Table 4-2 sets out a summary of the Subject Land by lot of ownership, existing and proposed uses on the affected lots. Affected lot boundaries are shown in Figure 1-4.

Table 4-2 Affected Lots, exiting land use and proposed use

Proposed infrastructure	Lot and DP	Owner	Existing land use	Proposed ownership arrangements
Solar farm array and ancillary infrastructure	Lot E DP38379	Private landowner 1	Agriculture	
	Lot 17 DP535180	Private landowner 2	Agriculture	Subdivide to separate facility from Capital Wind Farm
	Lot 1 DP456698	Private landowner 3	Agriculture	
	Lot 9 DP237079	Private landowner 4	Agriculture	
	Lot 2 DP1154765	Private landowner 5 An isolated segment of Crown road is contained within this lot	Agriculture	Letter of consent has been granted from Crown Land to the Proponent for lodgement and exhibition of the EIS and other applications required under other legislation. The47roponentt has submitted an application to purchase the relevant Crown road
	Lot 1 DP237079	Private landowner 6	Agriculture	
	Lot 2 DP237079			
	Lot 3 DP237079			
	Lot 4 DP237079			
Substation and battery (the latter if AC coupled)	Lot 1 DP456698	Private landowner 3 Crown road forms the southern boundary of Lot 1 DP 456698	Agriculture	Subdivide to separate 'shared network' electricity assets. Letter of consent has been granted from Crown Land to the Proponent for lodgement and exhibition of the EIS and other applications required
Tarago Road/Blind Creek Road Entrance/intersection	Lot 1 DP1154765			Council and Crown land

Associated receivers

The are nine associated receivers with the Project. Eight of these are located within the 2km buffer of the Development site, and one receiver (R3) is located outside this buffer, refer to Figure 1-3. Associated receivers are those that will either host project infrastructure or have entered into negotiated agreements with the proponent, accepting all Project impacts. Of the nine receivers, six will host infrastructure and three have interests in the project and have entered into negotiated agreements. The following table details the receivers hosting infrastructure and the receivers that have negotiated agreements.

Table 4-3 Relationship of associated receivers with the Project

Receiver ID	Host Project infrastructure or Agreement
R2	Host PV panels, BESS and substation
R3	Agreement
R5	Host PV panels
R6	Agreement
R7	Host PV panels
R41	Agreement
R42	Host PV panels
R43	Host PV panels
R48	Host PV panels, BESS and substation

Environmental context

The Development site typically slopes from east to west with elevations ranging from about 670m AHD at Lake George to 720m AHD. On its northern flank the Development site abuts a relatively steep terrain which rises to an elevation of about 870m AHD.

The majority of the Development site consists of extensively cleared agricultural land, with a small area of remnant woodland vegetation in the eastern corner, that is associated with Plant Community Type (PCT) *1100 – Ribbon Gum – Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion*. The proposed Development footprint avoids this PCT.

Several watercourses traverse the Development site including Butmarro Creek (also known as Deep Creek), Blind Creek (also known as Dry or Bridge Creek) and Wrights Creek. All three watercourses within the Development site are ephemeral and would only contain flowing water during and shortly after rainfall events. The southwestern border of the Development footprint is bounded by Butmaroo Creek (Strahler order 6), flowing from the south-eastern area of the site and discharges into Lake George. Wrights Creek (Strahler order 4) roughly bisects the Development site. The Blind Creek Road crosses over Blind Creek. The edge of Lake George is adjacent to the north-western border of the site however the Development footprint is set back approximately 600m from the shoreline. There is an unnamed wetland in the north of the Development site which is avoided by the Development footprint. There are 5 dams and/or ephemeral wetlands within the Development site.

Related infrastructure

An existing TransGrid 330kV transmission line traverses the site. It will be used as the grid connection by the Project to the national electricity grid.

Nearby receivers: commercial

The Development site (the broader area assessed for the EIS) is in close proximity to Iberdrola Australia's operational Capital Wind and two industrial sites used for extractive activities:

- Bungendore Sands quarry located approximately 240m southwest of the Development site (closest point); and
- Paragalli Sands quarry, located approximately 524m east of the Development site (closest point).

Additionally, a small (private) airstrip is located within the Development site and is currently used by the associated landowner for recreation and aerial spraying of crops. It is proposed that this private airstrip will be decommissioned prior to the construction of the Project.

Nearby receivers: residential

There are eight associated residential receivers (dwellings) and six non associated receivers within the 2km buffer of the Development site, refer to Figure 1-3 (note R3 is an associated receiver but is outside the Development site). There are an addiotnal 23 non-associated receivers within 2km of the Study area. The closest non-associated residential receiver is 812m south of the Blind Creek Road Entrance to the Development site. The closest non-associated receiver to the infrastructure of the Blind Creek Solar Farm is approximately 1.4km to the BESS. Of the six non-associated receivers, two are sand quarries (R9 Bungendore sands and R106 Paragalli sands). Paragalli Sands is the closest non-associated receiver to the BESS.

A residential estate occurs nearby; The Estate includes residences which are within 2.6 – 2.9km from the Development footprint. Of the 24 residences in the northern end of the Estate two have a potential view of the Project from the rear gardens. The other 22 residences' view is either blocked by topography or existing vegetation. Refer to Figure 1-3.

4.2 Zoning, tenure, subdivision and easements

Zoning and tenure

The Subject land includes primarily RU1 Primary Production and C3 Environmental Management land zoning under the *Palerang Local Environmental Plan 2014* (Palerang LEP), refer to Figure 1-2. It is comprised of six private landholders as well as Crown land.

Table 4-2 sets out a summary by lot of ownership, existing and proposed uses on the affected lots. Affected lot boundaries is shown in Figure 1-4.

Subdivision and easements

The Project would require the subdivision of Lots as indicated in Table 4-4, for the purposes of creating new lots for the following uses:

- Solar Array area leasing on a title also used by the neighbouring Capital Wind Farm.
- Creation of a dedicated title for the 'shared asset' component of the grid connection as required by Transgrid.
- Easements and rights of way will also be created to facilitate the project.

The minimum lot size for land zoned RU1 is 40 hectares.

The subdivision plan shows Lot 17 DP 535180 to be subdivided into two lots, with the minimum lot size being greater than 40 hectares. As such, the subdivision is permitted with consent under the Palerang LEP.

The subdivision plan is outlined in Figure 4-2. Pending approval of the Project, the subdivision would be administered through consultation with Queanbeyan-Palerang Regional Council.

Table 4-4 Proposed subdivision and easements

Lot	DP	Subdivision	Easements and Rights of Way
Pt Lot 1	DP456698	Subdivision (approximately 1 ha) for new 'shared network assets' in order to allow the required rights for access and maintenance to be granted to the Transmission Network Services Provider (TransGrid) or other similarly empowered entity. The subdivided lot may be sold or otherwise provided to TransGrid or other similarly empowered entity. Refer to Figure 4-1	Easements and/or rights of way may be established for: Existing private road (i.e., the Project access route from Tarago Road) to be used to access the Development site and communications infrastructure; easements to BESS, substation, O&M and communications tower.
Lot 1	DP1154765		Right of way for the Project and network service provider via Project access route. Cable and communications easements to BESS, substation, O&M and communications tower. Refer to Figure 4-1
Lot 17	DP535180	Solar Array area (40ha) to be subdivided from balance of title as per the attached draft Plan of Subdivision Figure 4-2	Relevant lots to be burdened with access for new lot.

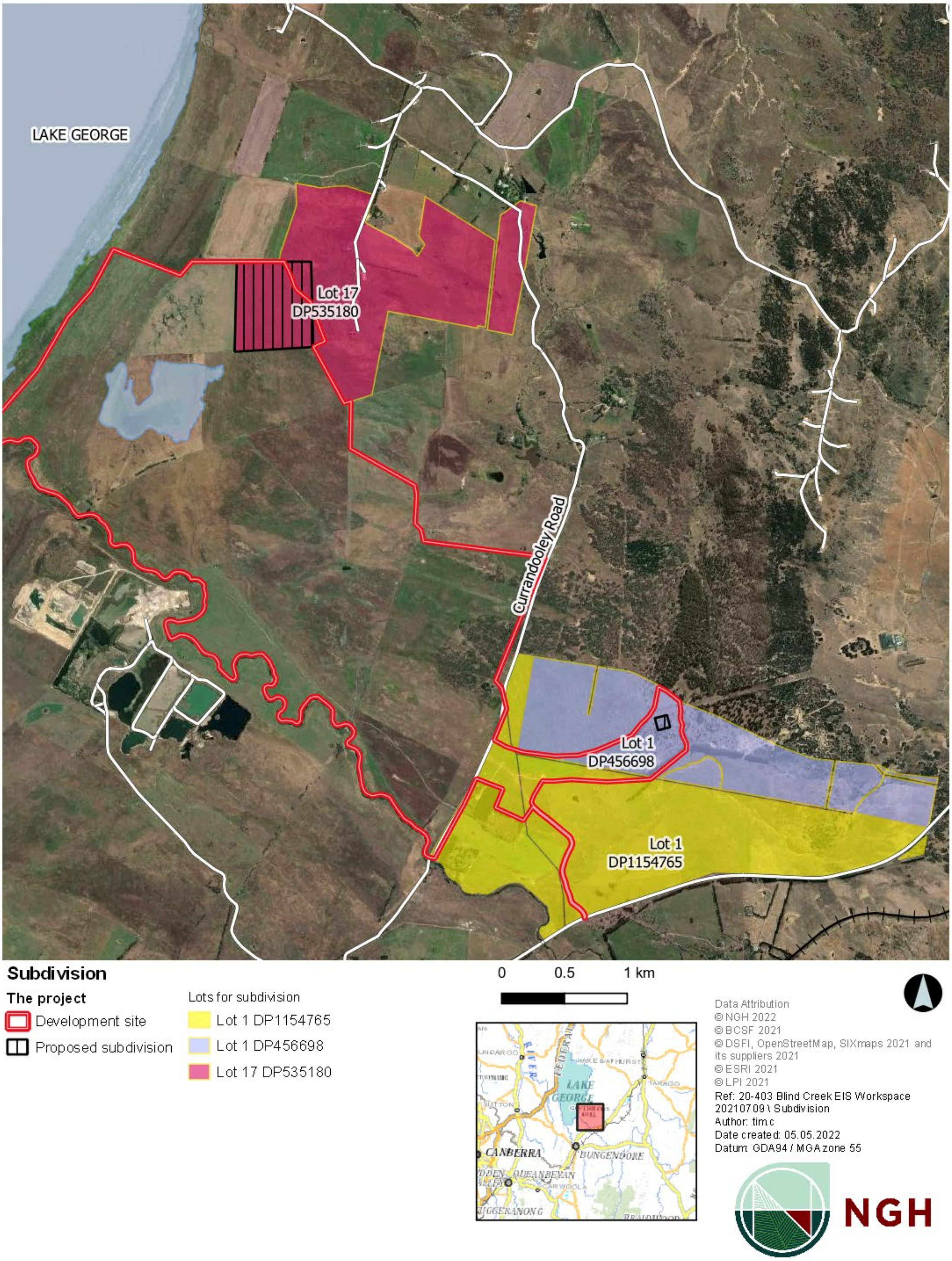


Figure 4-1 Proposed Lot/DPs for subdivision

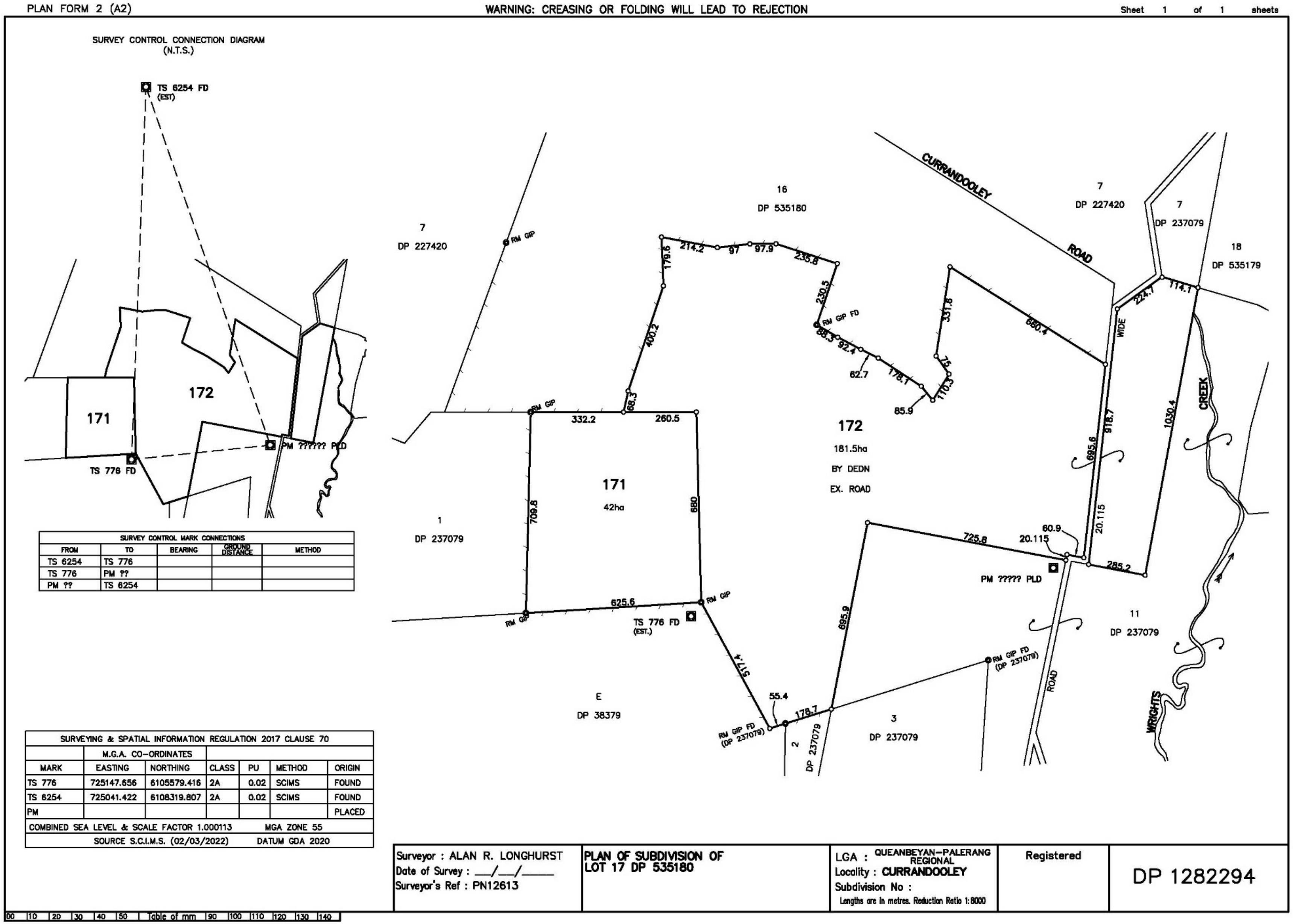


Figure 4-2 Proposed subdivision of Lot 17/ DP535180

4.3 Permanent infrastructure

4.3.1 Overview

The Project includes the following main infrastructure components:

- Approximately 850,000 PV single axis tracking solar modules (mounted on pile-driven foundations).
- Approximately 85 inverters and transformers.
- A BESS including nominally 300MW/600MWh of lithium-ion batteries with inverters.
- An onsite 330kV substation connected to the existing 330kV transmission line that passes through the site.
- Underground cabling to connect solar modules, combiner boxes, PCUs and batteries, data services and communications.
- Buildings to house a site office, switchgear, protection and control facilities, maintenance facilities, storage and staff amenities
- A communications tower for high reliability grid operations.
- Internal tracks, new and upgraded sections totalling approximately 27km.
- Perimeter security fencing (if required), closed-circuit television (CCTV) and security lighting at the switching station, BESS and O&M building area, only.
- Stock fencing and water.
- Visual amenity plantings in specific locations.
- Site access intersection upgrades off Tarago Road.

During construction phase, temporary facilities would include a laydown area with secure compound, construction site offices and amenities and car and bus parking areas for construction staff. The construction phase of the Project is expected to take approximately 12 to 18 months and the Project would have an operational life of nominally 35 years or more.

Each infrastructure component is detailed below.

4.3.2 Solar array

The Project's solar array would include approximately 850,000 PV solar modules, with a generating capacity of approximately 420MW DC (350MW AC). To support co-located grazing activities, spacing between trackers (known as 'pitch') will be optimised for solar farm capacity, taking into account agricultural production under the panels (refer to Figure 4-3 for indicative panel spacing).

The solar array would be split into many sub-arrays of roughly equal size. These sub-arrays would consist of grouped tables of PV modules with an azimuth orientation between -10° and + 10°. The modules would be mounted to a single-axis tracking system and would reach a height of approximately 5m above ground level when the tracking system is titled to its full extent. Each sub-array would be paired with an enclosed PCU (see Section 4.3.3). BESS devices may also be included within each sub-array (see Section 4.3.4). Underground cabling would be used for electrical connections between PV modules and PCUs, storage, and transmission infrastructure. All electrical devices would be accessible via internal access tracks.

Steel piles would be used as foundations to support the solar modules and the mounting system. Each pile is a steel profile, such as an i-beam or channel, approximately 275mm wide and 100m deep. Each pile would be driven greater than 1m into the ground. The pile heights will vary according to topography and expected flood level. Where possible, driven-pile foundations would be used, as they minimise the soil disturbance and can be installed quickly. In locations where the soil is not compatible with driven-piles, helical or screw piles may be used. This may require additional processes such as pre-drilling and grouting if bedrock is encountered.

Two types of cable are necessary on the site: DC and AC. Competing requirements dictate whether they are installed above or below ground. While above-ground cabling would reduce ground disturbance, underground cabling improves the resilience, safety, agricultural access and visual impact of the site and is therefore the preferred option.

An illustration of the solar array is shown in Figure 4-3 and an indicative layout of a sub-array is shown in Figure 4-4.

During the detailed design the layout may vary in several ways, listed below:

1. The dimensions and aspect of the sub-array footprint, panel rows, and the pad for PCUs and energy storage infrastructure.
2. The azimuth-orientation of PV module rows, sub-array footprints, and access roads.
3. The relative placement of infrastructure within the sub-array footprint.
4. 1P/2P module format and number of trackers and modules.

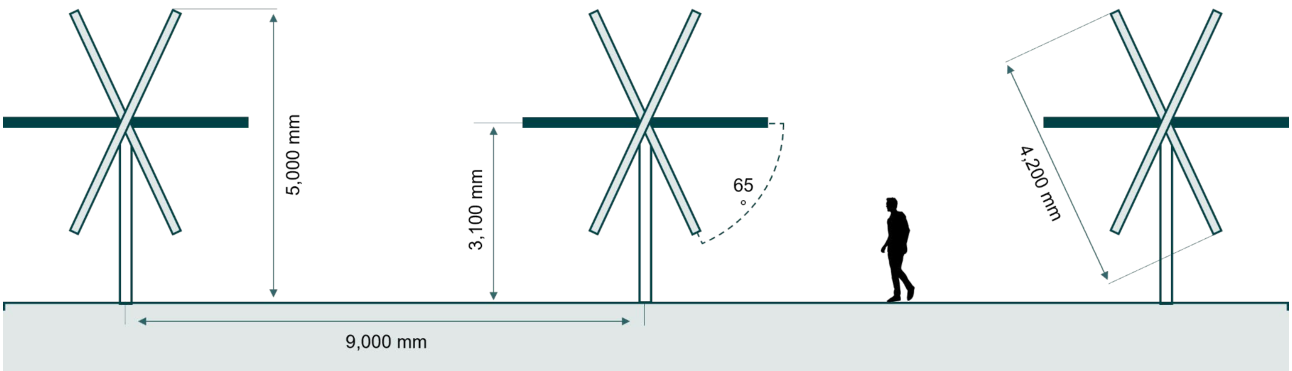


Figure 4-3 Schematic of a mounted PV module. Dimensions shown are indicative only and are for the larger 2P configuration

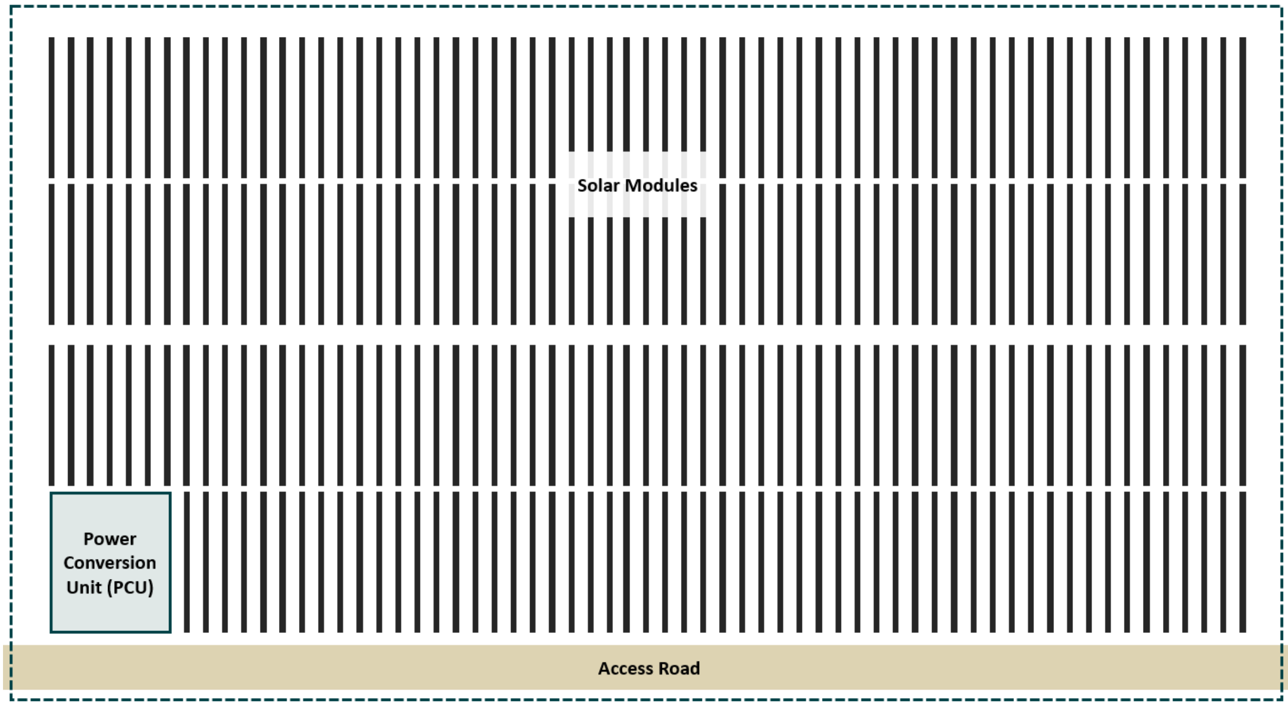


Figure 4-4 Typical sub-array schematic using single access tracking. The precise arrangement, orientation, and dimensions of components are subject to detailed design. Up to two containerised battery modules may be installed adjacent to the PCU (See Section 4.3.3)

4.3.3 Inverters/ Power Conversion Units

Each sub-array would be connected to a housed PCU. The purpose of the PCU is to convert direct current (DC) electricity, generated by the solar panels, to AC which is used by the national electricity grid. The conversion is performed by inverters, and the voltage is stepped up to the site's reticulation value (approximately 33kV) using transformers. The PCUs typically hold all power conversion devices, switchgear, communication devices, and ancillary equipment.

The precise layout of PCUs within the Project's solar array is subject to detailed design and technology selection. An indicative design includes a single PCU which includes one inverter and one transformer and is connected to 12,000 solar modules forming a subarray. Approximately 85 PCUs of this size would be needed for this configuration, with an indicative location in relation to the subarrays shown in Figure 4-4. The PCUs are likely be constructed on steel piles to elevate them above 1% AEP flood levels but a concrete foundation may be needed. This design is indicative only, as it is possible that an alternative architecture may be selected. An example of a PCU product that could be used in this configuration is shown in Figure 4-5. Ground disturbance associated with PCUs is to a large extent associated with the 'cable pit' below the PCU, which allows underground cabling to enter under the unit (Figure 4-6).

Figure 4-5 Typical housed power conversion units used within a commercial solar power plant (source SMA). The dimensions of this specific product are 6058mm (W) x 2896mm (H) x 2438mm (D)

Figure 4-6 PCU installed on pile foundation (Courtesy of Octopus Investments Australia)

4.3.4 Battery Energy Storage System (BESS)

The Project has been designed to include energy storage in the form of batteries to firm the generating capacity. Subject to detailed design, the Project is seeking approval for approximately 300 MW of storage using Lithium-ion batteries (LiBs). The LiBs would be constructed on concrete footings or driven piles, as required, to provide stable and resilient service.

Energy storage configuration

The physical layout of the batteries on the site would be specified during the detailed design phase with two possible configuration options identified below. These configurations are indicative only, and it is possible that a hybrid architecture may be selected with the BESS divided between the two.

Option 1 DC-coupled distributed BESS

- This configuration is shown schematically in Figure 4-7, with each battery sub-array containing at least one battery module and ancillary electrical equipment. The number of batteries would be selected to match the specifications of the devices in the PCUs.
- The batteries are likely to have similar dimensions to a half-sized shipping container. The ancillary electrical equipment would only occupy a small area; likely less than a half-sized shipping container (i.e., approximately 20ft long) per sub-array.
- In all, the impact of incorporating energy storage in this format would be equivalent to including an additional 3 half-sized containers per sub-array, or up to 300 half-sized containers across the entire solar array.

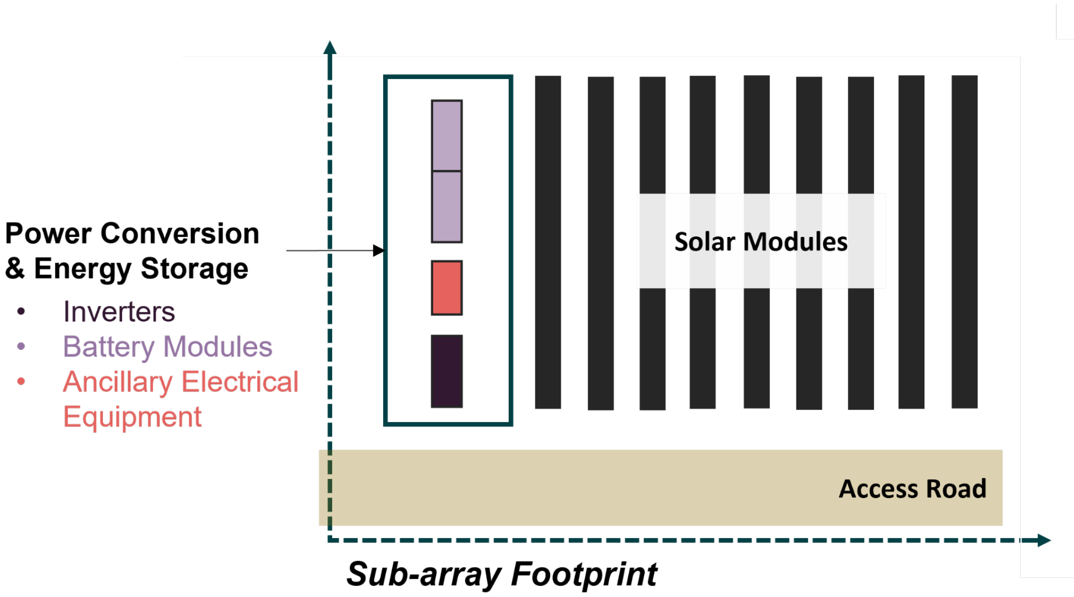


Figure 4-7 Indicative placement of all power conversion components and battery storage within the solar sub-arrays, for a DC-coupled configuration

Option 2. AC-coupled BESS

- The AC BESS option for battery storage is schematically represented in Figure 4-8 with the AC-coupled BESS located close to the substation (see Figure 4-9). The batteries and conversion equipment are grouped into BESS Units, with each unit including a transformer, multiple inverters, multiple batteries, and medium voltage switchgear. With appropriate spacing between all devices and equipment, a 5MW / 10MWh Unit would occupy approximately 300m^2. To meet the desired capacity of approximately 300MW, the AC-coupled BESS would have approximately 60 Units. The AC-coupled BESS would also include internal access roads, and buildings for additional low and medium voltage switchgear. These buildings would occupy a footprint of approximately 300m2. In total, the AC-coupled BESS would occupy approximately 3ha.

- Figure 4-8 shows an indicative layout of such a AC-coupled BESS, illustrating the Units and the other components that would be included. Figure 4-8 shows the indicative placement of this facility on the site. Figure 4-10 shows an example of an existing AC-couple storage facility.
- The energy storage configuration and the physical layout of the batteries would be specified during the detailed design phase. At this stage both options are considered viable and are assessed in this EIS.

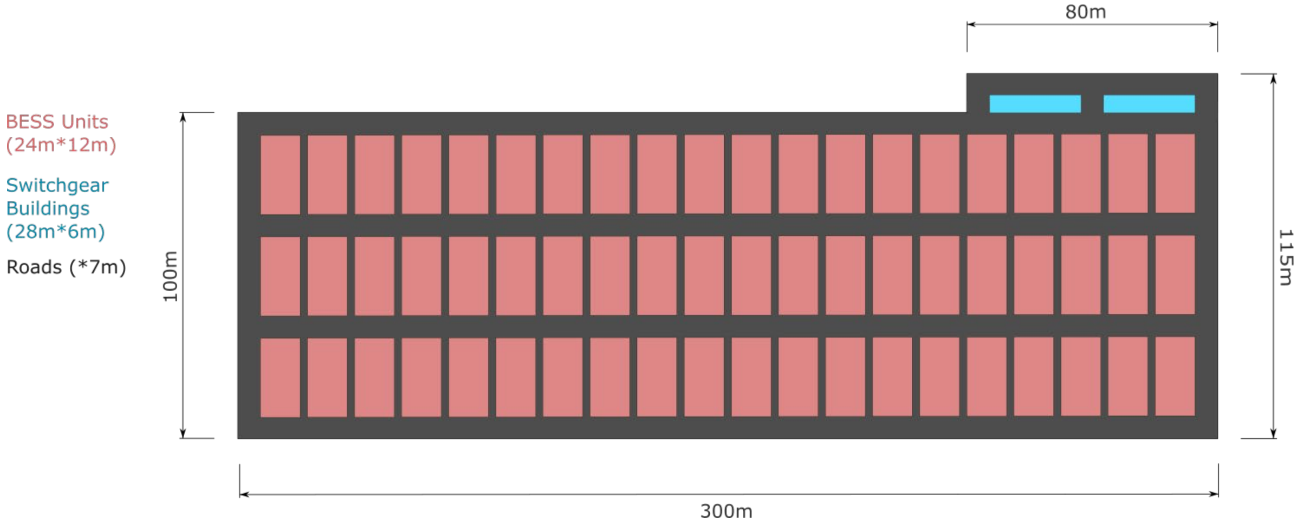


Figure 4-8 Indicative layout and size of the AC-coupled BESS Facility. Exact sizing, layout and capacity is subject to detailed design

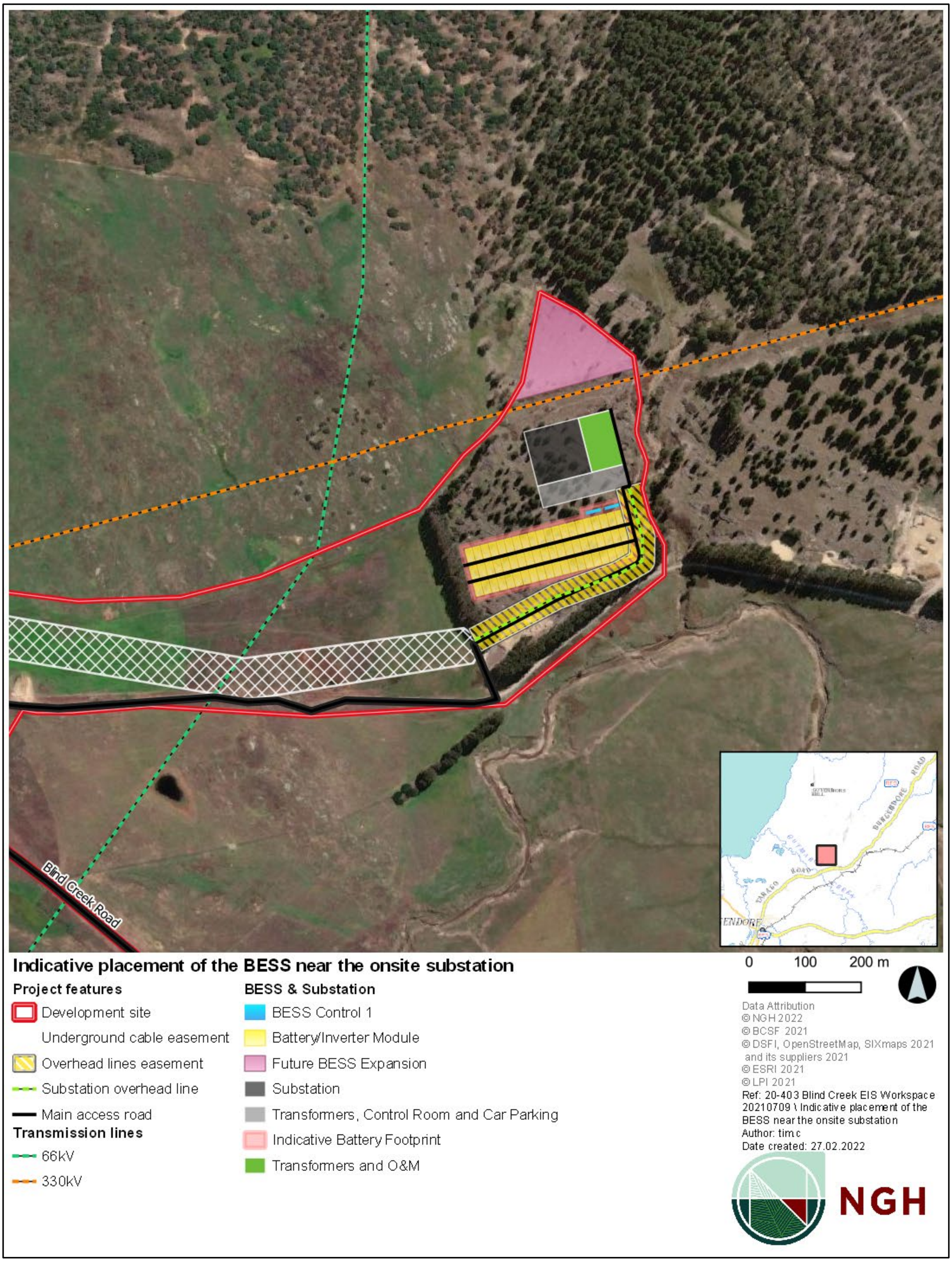


Figure 4-9 Indicative placement of the BESS near the onsite substation, for an AC-coupled configuration

Figure 4-10 Example of an AC-coupled BESS. The Hornsdale Power Reserve is 100MW / 129MWh and has a footprint of less than one hectare (Source Hornsdale Power Reserve)

Considerations for BESS risk mitigation

All energy storage systems carry risks associated with the uncontrolled release of energy. Lithium-ion batteries (LiBs) are commonly used in renewable energy generation facilities. While LiBs offer significant advantages over competing commercialised storage technologies in terms of energy density, efficiency and charging times, these advantages also elevate the risk of fire. Both options of the Lithium-ion based BESS (AC or DC configuration) would be designed with proper disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate the fire risk to the required level of safety.

Regardless of the configuration of battery system used (i.e., AC or DC-coupled, or a hybrid), it will include active monitoring of temperature and remote monitoring of temperature systems. The batteries may be actively cooled by internal systems. They would be temperature monitored, and the automated control system would stop their operation if required. Depending on the technology, suppression systems may be built in to mitigate the risk of extreme overheating. Further still, this equipment would be surrounded by an Asset Protection Zone (APZ) including gravel surfacing to minimise the risk of fire escaping from the project and the risk of external fire affecting the site. The BESS equipment will also be surrounded by an Asset Protection Zone (APZ) including gravel surfacing to minimise the risk of fire escaping from the development and the risk of external fire affecting the site.

The Project will manage the fire risks associated with the BESS by:

- Maintaining an APZ around each BESS,
- Maintaining a crushed gravel surface for a 20m radius around the BESS and inverters,
- Locating the BESS as far as practicable from any sensitive receptors (residences) or large stands of vegetation,

- Installing reliable automated monitoring (voltage and temperature), alarm and shutdown response systems,
- Designing appropriate physical separation and isolation between individual BESS containers and between batteries and other infrastructure, including gravel surfacing around the facility,
- Compliance with all relevant guidelines and standards,
- Preparation of a specific Battery Fire Response Plan, under the general Fire Response Plan, in consultation with fire authorities, fire suppression experts, and in reference to relevant standards and guidelines,
- Facilitation (including funding) of first responder training in the management of LiB fires at the site for local brigades.

The Bushfire and Preliminary Hazard Assessment sections (Section 9.7 and 0) provide further information on risks and mitigation strategies associated with BESS.

4.3.5 Onsite 330kV substation and connection to existing 330kV transmission line

Switching Station

To connect to the national electricity grid, the Project would make use of the existing 330kV transmission line that traverses the Development site, connecting Canberra to Kangaroo Valley. To facilitate this connection, a new transmission substation would be constructed as part of this Project (see Figure 1-6).

The switching station would contain power transformers, high voltage switchgear and other equipment to achieve a transfer capacity of approximately 350MVA. It would be built on the eastern edge of the Development footprint and cover approximately 1ha. It would connect to the existing 330kV transmission lines onsite via an underground or overhead powerline. No buildings, arrays or roads would be constructed within the existing 330kV transmission line easement as shown in the Indicative infrastructure layout (Figure 1-6).

The switching station will be accessed via the Blind Creek Solar Farm entrance to Currandooley Road and will primarily use existing access tracks during construction and operation, some of which may need to be upgraded and/or widened. An indicative location of the switching station in relation to the BESS is shown in Figure 4-8.

Communications tower

A communications tower would be installed within line-of-sight to TransGrid's existing microwave network, most likely to TransGrid's nearby Hammond's Hill radio repeater. This is to provide secure operational control of the solar farm over the transmission network. To gain line of sight to this or another tower, it would be necessary to have the tower somewhat removed from the switching station and set back from vegetation and landscape features such as hills, connected by underground cabling. This tower would be monopole in design and approximately 25m tall. It would be connected underground with power and communication cables for most of its length but may change to overhead as it approaches the substation and operations buildings.

Transformers at Substation

The Project allows for up to four power transformers to be installed at the substation site. These transformers would be located at the substation shown in (Figure 1-6). The purpose of transformers is to 'step up' the voltage from the reticulation value to match that of the proposed switchyard and the existing transmission line that passes through the site. Specifically, the transformers would increase the voltage from the internal-to-site reticulation value (approximately 33kV) to 330kV.

The transformers will be oil-filled (either mineral or biodegradable oils) with bunds to capture any oil that escapes before it reaches the surrounding environment. The bunds will be adequately sized at 110% of the volume of the transformer, ensuring that they are effective even in the worst case where all oil is lost. Furthermore, to mitigate the impacts of any potential oil leak, the transformers will be located away from water courses.

The substation would also include switch gear and associate monitoring equipment. This would allow for the automatic and manual disconnection of all or part of the Project without interrupting service on the 330kV system.

Onsite buildings associated with Substation

For the ongoing operation of the solar farm, permanent buildings would be installed to house monitoring and control equipment, computers, communications equipment, supplies, spares, and crew facilities. It will be used during commissioning of the solar farm and as a maintenance facility during the operational phase. Indicative descriptions of these buildings are provided below, and the indicative location is given as the Operations and Maintenance (O&M) facility in Figure 4-8. Each building would contain essential fire safety equipment as required by the relevant standards.

Control room and site office

This facility would be a single storey building, up to approximately 14m x 5m and 5m high. It would contain an office and amenities for staff (toilet, kitchen, first aid, potable water supply, etc.) as required for the safe operation of the site.

The foundations, finishings, and other features would be designed as required by relevant standards. The colours would be chosen to be low contrast with the surroundings to reduce visual impact. Guttering and a water tank may be installed to collect rainwater.

The control room and site office facility would include water supply as required for the services installed (including a septic system). Fire detection and suppression will be installed as required by relevant standards. Permanent parking facilities will be provided adjacent to the control building to facilitate up to 10 cars and light vehicles on site. The parking ground cover would be formed of crushed rock or similar.

Adequate rubbish waste/facilities will be established, which will be emptied weekly or as required and defined in operational management plans. No permanent or long-term storage of rubbish or waste will be permitted on site.

Switch room

A building footprint of approximately 20m x 5m and approximately 5m high would be constructed for the HV switch room, with services, protection and control facilities. The building may be installed on stilts and will be designed and constructed to meet relevant standards.

Storage shed

A storage shed with footprint of approximately 20m x 15m and approximately 6m high would be constructed. The building will have appropriately designed foundations, finishings and other features as required by relevant standards. Guttering and a water tank would be installed to collect rainwater. Appropriate fire detection and suppression will be installed if required by relevant standards.

4.3.6 Underground cabling

Underground cabling on the Development site would be designed in accordance with Australian and International standards with the goal of minimising ground disturbance. Both AC and DC cables are required.

DC cabling may be installed either in cable trays above ground, or in trenches to Australian Standards.

AC underground cabling at the reticulation voltage would be installed at a depth of at least 500mm with the electrical reticulation typically buried to either 600mm (low voltage) or 800m (high voltage) depth, following the relevant Australian Standard. Underground cables and pipes would be buried to ensure agricultural land capabilities are not reduced if underground infrastructure is left in situ after decommissioning.

Prior to excavating the cable trench, the topsoil would be stripped and stockpiled for use in rehabilitating the trench line. Depending on the quality of the excavated material, sand may be used in the trench to create a cable bed (the site overlies a considerable sand deposit). If the natural sand is unsuitable, imported sand may be required. Once the cables are installed another layer of sand may be placed above the cable prior to covers and markers being installed. The trench would later be backfilled with excavated material. Finally, topsoil would be replaced and sown with perennial grasses to assist revegetation of the disturbed areas.

Cables would be protected in accordance with *Australian Standard (AS) 3000:2007 Electrical Installations*.

4.3.7 Internal access tracks

The site would use both existing access tracks (approximately 6.6km), upgraded where necessary, and new access tracks where none currently exist (approximately 20km). The access tracks within the solar array area could also form laneways for movement of sheep as part of the regenerative Agri-solar plan (see Section 3.6).

The final location and design for new access tracks and new parts of existing access tracks will not be completed until post approval, however an indicative access track network is shown is in Figure 4-9. Some or all of the internal access tracks would be constructed of local or engineered fill, crowned for run-off and topped with a gravel cap. In areas of the Wrights Creek riparian corridor (Figure 8-29) and in sensitive archaeological areas (Figure 9-6 of the ACHA in Appendix H), wherever possible native soil disturbance will be minimised and the access tracks will instead be installed on top of the existing soils using by laying imported fill and gravel over the native soil (i.e. the topsoil will not be removed).

The existing access tracks, which service the laydown compound and the substation would be approximately 4–6m wide (including shoulders and any required drainage), whilst other internal access tracks would be approximately 3.5–5m wide.

Access tracks would be clearly marked on the site environmental management plan and passing lanes and turning circles would be provided to internal tracks in line with the bushfire management plan.

Figure 4-11 Indicative layout of internal access tracks

Creek crossings and all-weather access roads

Repairs to an existing crossing over Blind Creek and a new crossing over Wrights Creek are proposed. The crossing designs will be undertaken to recognised design standards during detailed design, therefore all technical specifications in this section are indicative only at this time. The repair works and new crossing works will avoid any sensitive cultural features and minimise environmental impact as discussed in Section 8.3 and 8.4.

The low-level crossing over Blind Creek has been in service for over 40 years and would require repair (Figure 4-12), including replacement of blocked culvert drains and resurfacing with concrete. The repaired crossing would be approximately 5-6m wide at the road level, with a flare outward by approximately 1 metre to the exposed bedrock of the creek, refer to Figure 4-12 and Figure 4-13. The pipes would be sized to facilitate crossings in normal flood conditions (1 in 5 year flood) and will act to preserve upstream and downstream flow connectivity. The battered sides and drains of the existing ramps in and out of the crossing may be reinforced with loose stone to stabilise them during flood conditions.

The new crossing over Wrights Creek would be a low level crossing, designed to overflow in floods. The crossing would be a smaller version of the Blind Creek crossing and would have a concrete deck, pipes, bevelled edges and rock stabilisation. Figure 4-15 provide an indicative design. The crossing would be sized to preserve upstream and downstream flow connectivity during rain events.

During emergency events such as flood or fire, the Blind Creek bridge on the main access road may occasionally be cut off. In such events, an alternative, “all weather” emergency access road can be used (refer to Figure 4-16), which is an unsurfaced road through Capital Wind Farm, primarily used for servicing the turbines. This route is approximately 15.17km from the site to Taylors Creek Road (compared to approximately 1.35km from Tarago Road to the entrance of the site on Blind Creek Road). During fire events the route is suitable as it runs to the North of the site in contrast to the regular site access in the southeast, allowing site staff emergency vehicles to use a different cardinal direction when the main access is blocked by fire. Furthermore, the emergency route reaches Taylors Creek Road, providing an alternative should Tarago Road become impassable. It exits onto Taylors Creek Road close to the Taylors Creek fire shed. During flood events the main access point may occasionally be cut by flooding on Bridge (Blind) Creek. Typically, these flood events have a short peak period, however, may delay egress and entry to the site.

The proposed emergency access route is used by local landholders and the Capital Wind Farm in flooding events. It does not cross any major creeks and has a bridge on the upper reaches of Wrights Creek. It therefore represents a safe all-weather means for vehicles to access the site. It should be noted that proposed upgrade of the Blind Creek culvert crossing will reduce the frequency of flooding cutting this access route, thus improving safety for existing users of Currandooley Road.

Comparison of distance and time of each route is detailed in Table 4-5below:

Table 4-5 Distance and time for each access route to emergency services

Location	Blind Creek Road access		Emergency Access (via Taylors Creek Road)	
Bungendore Medical Centre	12 minutes	9.9km	43 minutes	38km
Canberra Hospital Emergency Department	48 minutes	47.4km	77 minutes	76.5km
Bungendore Rural Fire Brigade	12 minutes	10.7km	44 minutes	38.8km

Details of the site access and emergency access and when they are to be used will be detailed within the Traffic Management Plan and the Emergency Response Plan.

Figure 4-12 Damaged low-level crossing over Blind Creek. This crossing would require repair

Figure 4-13 Proposed crossing repairs over Blind Creek

Figure 4-14 The repaired crossing would be similar to the one depicted here

Figure 4-15 Proposed new crossing over Wrights Creek

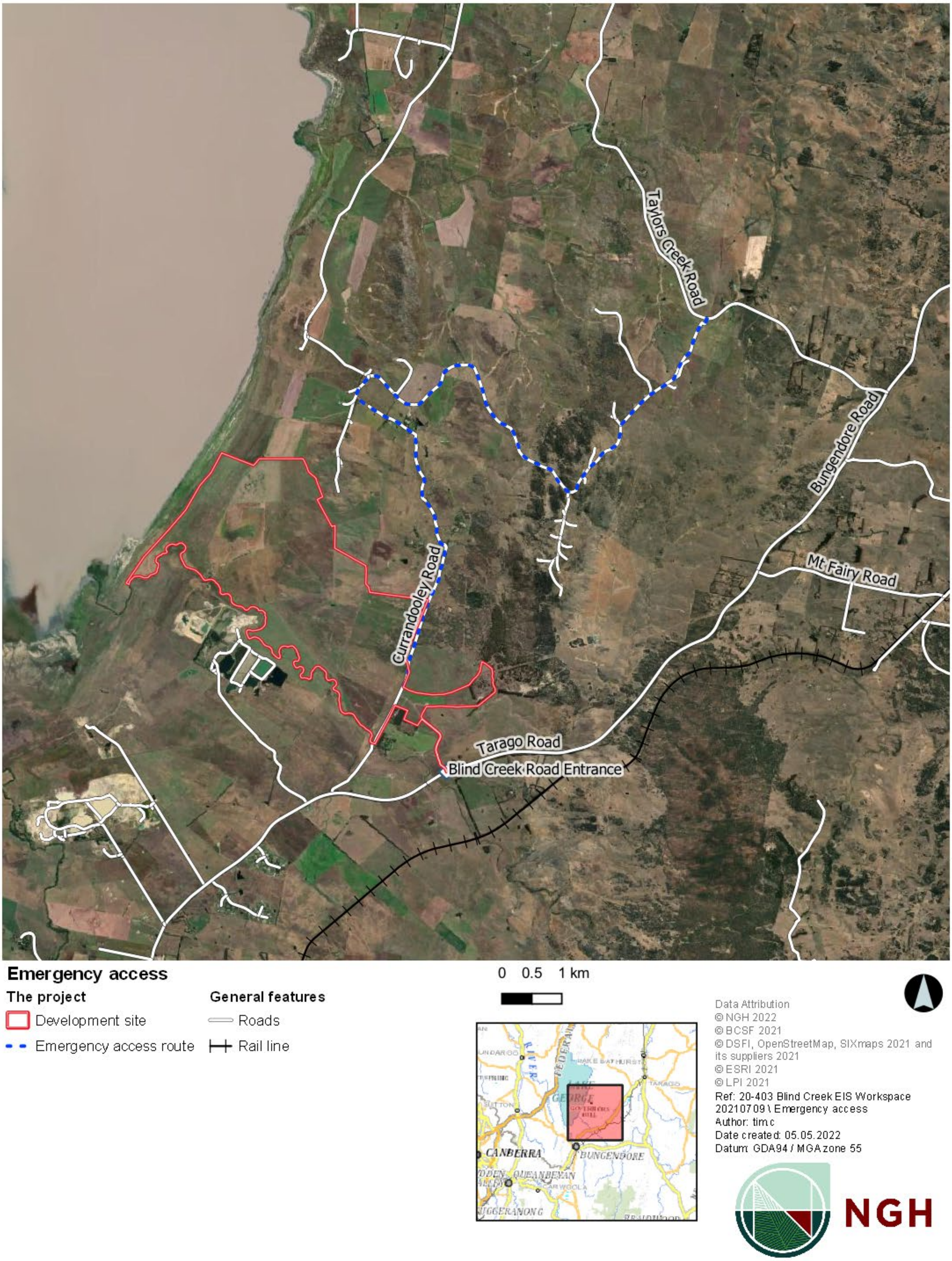


Figure 4-16 All-weather access point and track for emergency access to the Development site

4.3.8 Fencing, closed-circuit television (CCTV) and lighting

Fencing the solar panel array area

The solar array would be located on private land with no public right of access. For this reason, it is intended to fence the solar panel array area with typical livestock fencing and not include more robust ‘security’ fencing. It is hoped that this option would provide sufficient security, whilst having the least impact on visual amenity. However, if security breaches or vandalism occur, then the Project would retain the right to install more robust ‘security’ fencing if it deems it necessary.

At the entrance points to the site, signage would be installed indicating “no entry without authorisation”. Entry to the site would be by invitation from authorised personnel only (and would be given for several residents who use the entrance for access to their property). Contact details for the site office would be provided on the signage.

Fencing the substation / battery area

The substation area would be enclosed by a security fence in accordance with TransGrid’s (or other empowered entity’s) requirements. This is expected to be a steel security fence approximately 2.3m high with barbed wire topping, or similar.

CCTV

CCTV cameras would be installed at each entrance and throughout the solar array area for continuous monitoring by site staff. A security company would be contracted for monitoring outside of business hours. The CCTV cameras would be solar/battery powered with a wireless communication connection and would be mounted on up to 4.5m poles complete with sensors or infrared security lighting. The number of cameras installed would be sufficient for coverage of site entrances, access roads and building areas.

Lighting

There would be no permanently lit night lighting within the solar array. Lighting would be included in each PCU for night-time maintenance or emergency purposes only. Lighting would be installed around the substation, battery storage facility and O&M facilities to be used in case of night works or an emergency only.

Motion sensor or infrared security lighting (and CCTV cameras) would be installed at sensitive boundary locations and around the substation, battery storage facility, O&M facilities, and office areas.

All external operational lighting would be designed to reduce disturbance to neighbouring properties, as such it would be low intensity lighting (except where required for safety or emergency purposes) and would not shine above the horizontal. The external operational lighting would be used only when there are staff on site, as part of night works (where required), site security or during emergency situations including through remote operation to allow improved camera visibility.

External lighting would be installed to comply with Australian/New Zealand Standard *AS/NZS 4282:2019 – Control of Obtrusive Effects of Outdoor Lighting*, or its latest version.

4.3.9 Site access intersection upgrades

The Development site would be accessible via Tarago Road and along an unsealed private road, known by the landowners as Blind Creek Road. This point of entry to the site is referred to as the Blind Creek Road Entrance (refer to Figure 4-17). The privately owned portion of Currandooley Road would also form part of the internal access road network and is located along the southern section of the Project boundary.

Tarago Road links to both Bungendore Road and Braidwood Road, which provide access to Canberra and Sydney via the Federal Highway and Hume Highway. The Tarago Road is currently used for a variety of purposes and already carries heavy vehicles for local sand mines, waste to Veolia's Woodlawn landfill site, agricultural transport, and coastal traffic via Nerriga. There are various connections between the Tarago Road and major highways in the area (Hume, Federal and Barton Highways).

The Proponent engaged Amber Organisation Pty Ltd to prepare a Traffic Impact assessment (TIA) considering site access location. It found that the Blind Creek Road entrance requires some widening to accommodate turn treatments for construction traffic, but the intersection already has suitable sight lines. The TIA found that the additional traffic generated by the site during operation can be comfortably accommodated by the local road network without upgrade. A schedule of road upgrades has been provided as part of the TIA. The final intersection designs would be completed in consultation with Queanbeyan-Palerang Regional Council following approval of the Project.

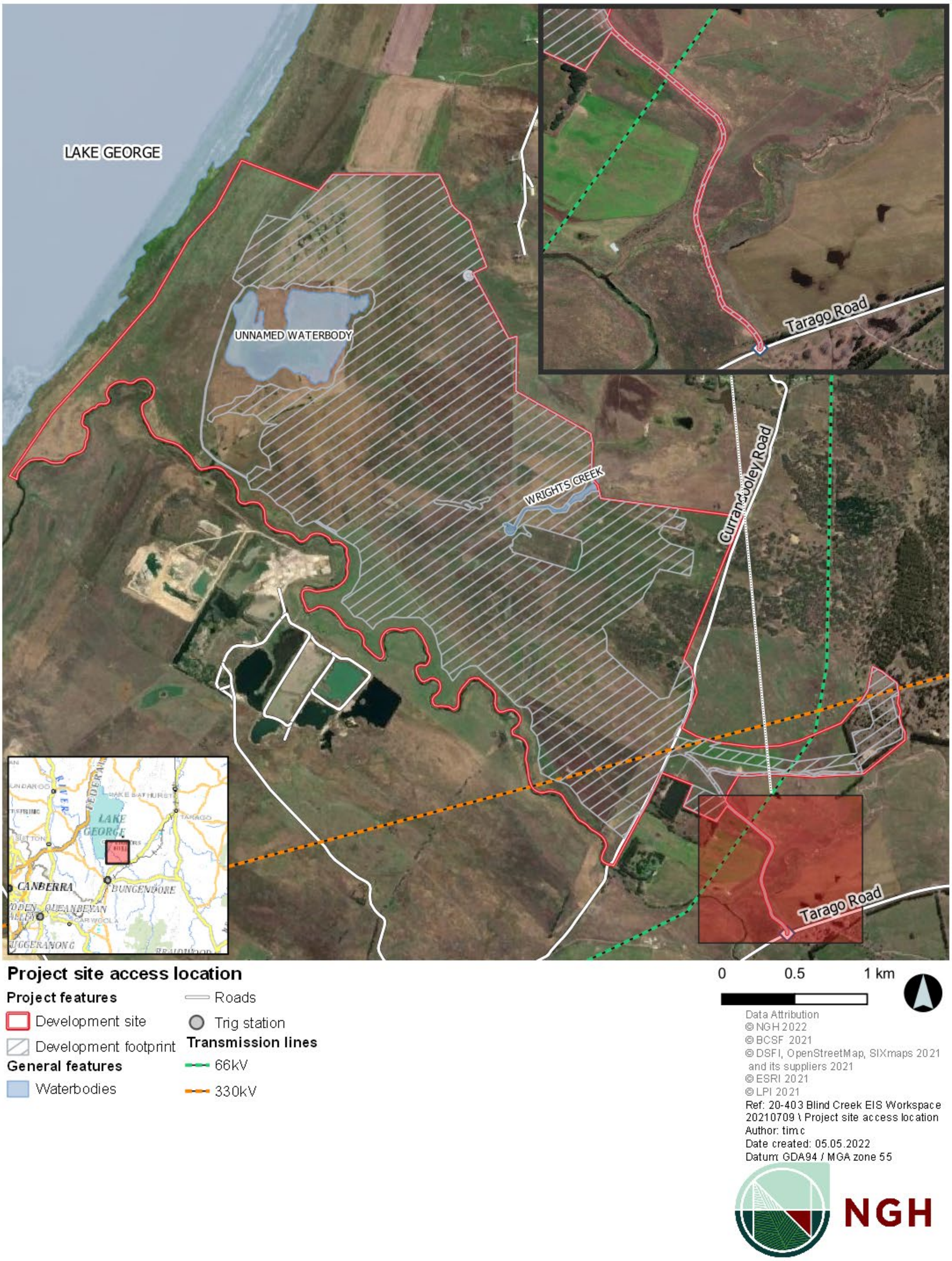


Figure 4-17 Development site access

Visual impact mitigation planting

Landscaping and screen planting would be undertaken in some sections of the perimeter of the Development site to minimise visual impacts from outside the Project. The proposed locations for screening planting is shown in Figure 8-8. Tree and shrub species suited to site conditions would be used, placed and selected to avoid shading impacts on the solar array and to achieve effective screening of the solar farm infrastructure (refer to measures described in Section 8.1.4). Screening planting has already been undertaken along Blind Creek (approximately 5,000 trees between 2013-2020), refer to Figure 8-8, and this vegetation would not be disturbed during construction and operation.

4.4 Temporary construction facilities

Approximately 10 transportable offices are expected to be required for the duration of the construction phase, with associated amenities (i.e., portaloos/toilets, lunchroom etc.) refer to Figure 4-18. These would be removed at the conclusion of construction. The offices may be powered with either an off-grid solar-based solution or through a connection to the nearby 11kV network.

A construction laydown area would be established adjacent to the site offices. This area would include a cleared gravel pad and would be used to unload vehicles, store materials and vehicles. It may be monitored with CCTV and have a temporary security fence.

Post construction, the laydown area may be used by the landholder as a site for livestock yards and handling (not part of this approval). If the landholder does not proceed with this plan or it proves unviable, then the pad would be removed and the site re-sown (presently sown to perennial exotic pasture).

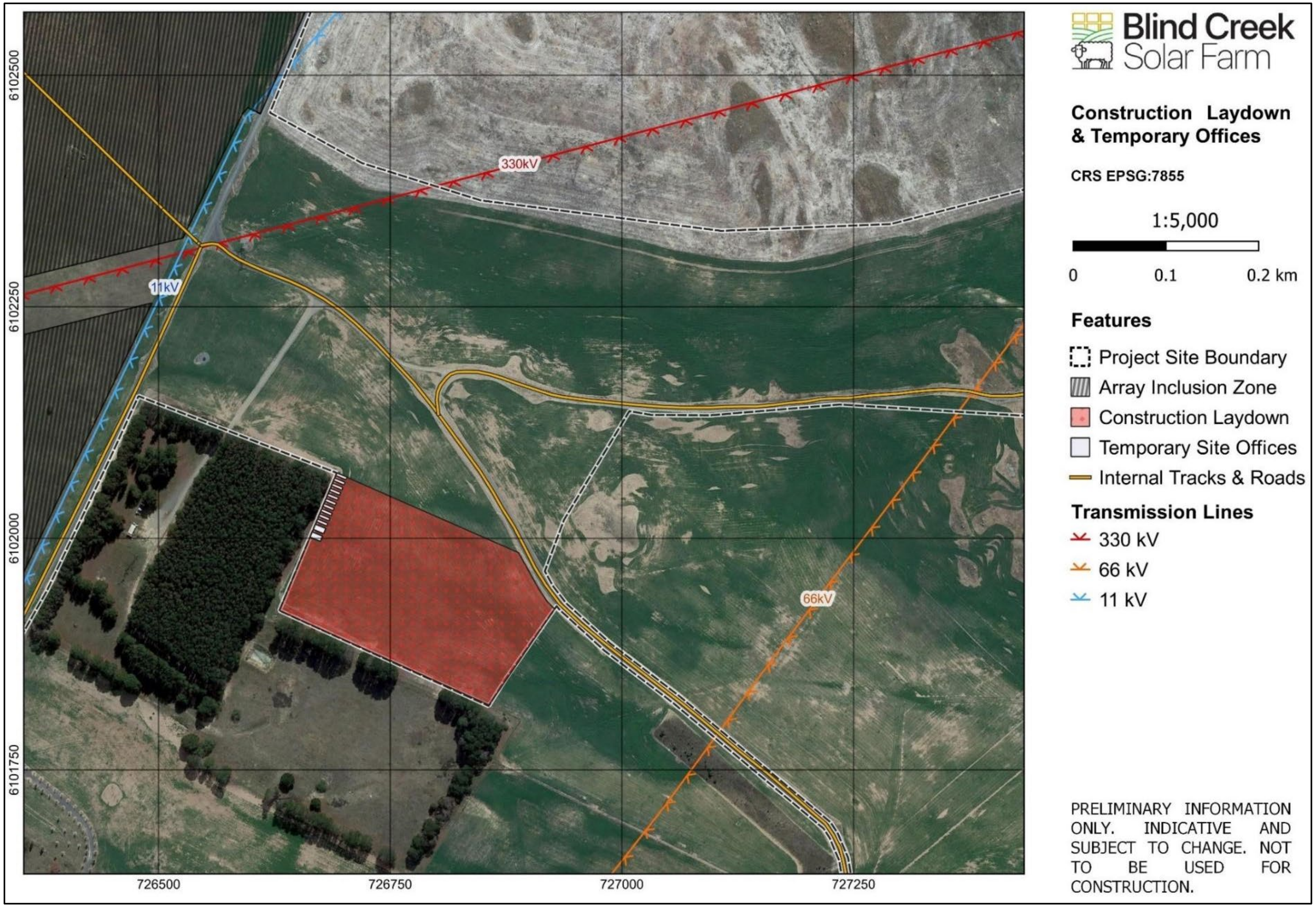


Figure 4-18 Indicative placement of the construction laydown area and temporary site offices

4.5 Phases of the project

The Project would be implemented in three general stages: Construction, operation and decommissioning. Refer to indicative timeline below.

Table 4-6 Indicative timeline for the Project over its lifetime

Phase	Approximate Commencement	Approximate Duration
Construction	Q1 2023	14-18 months
Operation	Q2 2024	35 years or more
Decommissioning	Q1 2059	9 months

Please note that these timelines are indicative only. It is possible the Project could be re-powered and, as such, that the operational life could be longer.

4.5.1 Construction

Construction activities

Construction of the Project is expected to last approximately 12–18 months. The main construction activities, inclusive of the substation, are detailed in Table 4-7.

Table 4-7 Expected construction activities

Activity	Details
Site establishment and preparation	• Detailed site survey. • Establishment of site access. • Establishment of the construction set out area involving excavation works to level the site and installation of any required drainage infrastructure. • Construction of internal access roads and their associated drainage works. • Delivery of equipment and materials (ongoing). • Installation of security fencing requiring minor excavation works and construction of concrete footings.
Installation of solar panels	• Site survey to determine levels and depth of steel posts (part of the mounting structure). • Driving of steel posts into the ground using specialist pile driving equipment. Depending on site survey results, some piles may need to be predrilled and grouted in. • Installation of mounting structure on posts. • Installation of tracking equipment and solar modules onto the mounting structure.
Installation of PCU	• Excavation works to level the ground at location of the unit only.

Activity	Details
	• Installation of form work and pouring of concrete slab. • Use of crane to lift the PCU into place.
Cabling	• Install low voltage DC wiring electric cable to each solar module and connection to collectors at end of each row of panels. Install underground cabling to the PCUs. • Install medium voltage AC electric cables from the PCUs to the site substation. Cable would be installed either underground in trenches, or overhead across water courses, to be designed in accordance with HV electrical industry best practice.
Substation and control room (works may be undertaken concurrently with the solar panel installation)	• Excavation works to level site area only. • Installation of form work and pouring of concrete slabs. • Installation of road-base to provide level hard standing as required. • Construction of the buildings. • Installation of transformers, switchgear, circuit breakers, electrical equipment and cable structures using cranes where necessary. • Installation of control room and connecting facilities, including septic tank. • Laying and connection of cables to transformers and switching equipment. • Commissioning.
Connection of the solar farm to the 330kV overhead powerline	• Stringing of high voltage cables from the site substation to connect to high voltage overhead line. These would be either above or below ground. • Cable terminations and testing.
Testing and commissioning of solar farm.	• This would include testing all cable connections and electrical equipment and progressively connecting stages of the Project to the grid as commissioning is completed. Comprehensive regulatory approvals are required at this stage prior to final connection to the grid.

Procedures and management plans for all construction activities would be included in a Construction Environmental Management Plan (CEMP) that would be prepared for the site prior to any works commencing.

Soil disturbance during site preparation and earthworks

Ground disturbance resulting from earthworks associated with the Project would mainly arise from:

- The installation of piles to support the solar panels; either driven, drilled-and-grouted or screwed into the ground.
- Trenching to connect the PV modules to inverters
- Trenching to connect the inverters to the substation
- Upgrade of the existing tracks, construction of new tracks, and repair/construction of crossings as described in Section 4.3.7 .

- Decommissioning of 5 dams currently within the Development footprint. This would involve filling the dams with the material originally excavated from them, which is presently part of the dam wall.
- Removal of existing fences and construction of perimeter fencing
- Removal of some aging/dying/dead pine trees (no native trees are expected to be removed)
- Levelling the ground for buildings and PCU (inverter) pads.
- Localised areas of earthworks (cut and fill, grading and compacting) in areas where there are significant changes in ground slope. This is expected to be minimal, as the site is largely flat, with the exception being the substation, BESS and O&M building area
- Installation of water pipes and troughs for stock water
- Temporary construction laydown areas, site offices, vehicle parking etc.

Minimal cut and fill is required for the project over most of the site due to the flat topography. The minimal cut and fill that would be required would be limited to inverter footings, access tracks and primarily the building of the substation. An elevation of approximately 10m occurs across the substation site, therefore cut and fill would be negligible to provide a flat base for the foundation of the building. Existing vegetation provides visual screening (as shown in Figure 1-6) of the substation site.

Topsoil under the footprint of the solar panels would remain in-situ during the construction of the Project, with disturbance for the solar arrays limited to churning of topsoils by tracked machines to insert piles. Avoidance and mitigation measures outlines in the Aboriginal Heritage assessment (Appendix H and summarised in Section 8.4). Topsoil salvaged from the construction of the access tracks and other works would be securely stored for use in targeted rehabilitation of disturbed areas. This would occur at the end of the construction period.

Where required, weed treatments would be undertaken prior to earth works commencing in order to reduce the potential for spread of these species within the Project footprint.

Groundcover establishment beneath the array

The solar panels would be mounted above the ground and suitable perennial ground cover would be established and maintained beneath the panels. Groundcover species would be selected to facilitate sheep grazing to control grass height and bushfire hazard, as well as contribute to the Agri-solar component of the Project. Groundcover grass species would be selected which are tolerant of the partially shaded conditions produced by the solar panels and suitable for the soil type and climate at the Development site. Areas disturbed during the construction phase would be stabilised and revegetated with suitable perennial grass species immediately after construction.

Construction materials, labour and equipment

Materials

The final requirements and sources for construction materials would be selected by the Engineering, Procurement and Construction (EPC) Contractor. However, for the purposes of traffic planning, the Project has assumed that sand is procured from one or more of the three local sand quarries, the water from the water treatment plant in Bungendore, the concrete from a supplier in Bungendore, and the gravel from one of several quarries to the north of the site. Additionally, a small amount of potable water would be required which would be delivered to site and stored in a temporary tank.

Table 4-8 Estimated resources required for civil component construction. The materials required for the array and substation are discussed in Section 4.3

Resource	Estimated Quantity
Non-potable water for road construction and dust suppression for the construction period	≤ 70ML
Potable water for the construction period	≤ 1ML
Bedding sand for cables	Existing sand deposit under site likely to be suitable, but if not if not ≤ 10,000 cubic meters
Gravel for Road Capping, laydown pad	≤ 10,000 cubic meters
Concrete for inverter pads, transformer pads, crossing repair and the like	≤ 500 cubic meters

Labour

It is anticipated that approximately 300 construction staff would be engaged to complete the work during the peak construction phase (6–9 months). This would include supervisors, tradesmen, and labourers. Every effort would be made to hire staff locally. Non-local staff would be mainly accommodated in Canberra, Queanbeyan and Goulburn.

Equipment

Plant and equipment used during construction would include:

- Small pile driving rigs.
- Cranes, for power line and removal of heavy loads from trucks.
- Road rollers.
- Wheeled loaders.
- Dump trucks
- Excavators, of various sizes.
- Graders.
- Bulldozers, for dam fill.
- Chain trenchers
- Water trucks.
- Telehandlers
- Forklifts.

Construction transport and access requirements

Haulage Route

Road transport is the preferred option for the delivery of construction infrastructure, as opposed to rail. It is expected that the haulage route for most vehicles, including heavy and over-dimensional vehicles during construction would be from the Hume Highway, Braidwood Road, Bungendore

Road and Tarago. It is expected that the equipment would be transported from port facilities in either Port Kembla, Sydney or Newcastle and delivered to the site in 12m shipping containers or other suitable transport mode. The larger transformers would likely be delivered by low loaders on up to two occasions. The proposed haulage route is an approved 19m B-double route on the Transport for NSW Restricted Access Vehicles Map.

All vehicles would gain access to the site at the Blind Creek Road Entrance (Figure 4-17). This entrance is currently used by heavy vehicles for sand quarry operations. The Blind Creek Road would be suitable for light vehicles, medium and heavy rigid vehicles and semi-trailers.

A Construction Traffic Management Plan would be prepared following project approval to manage haulage traffic during the construction phase. Transport and access impacts are discussed in detail in Section 9.1.

Intersection upgrade

Specialist oversize equipment including the grid connection transformer and 200 Tonne cranes would require oversized vehicles to transport them to the Development site. This equipment would have 'Oversize' transport management in place to transport these items to site.

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Amber Organisation Pty Ltd (2020) undertook a swept path assessment of the intersection of Blind Creek Road Entrance with Tarago Road, to confirm B-Doubles are able to suitably access and egress the Blind Creek entrance. It was found that additional widening is likely to be required in the north-eastern corner of the intersection to allow B-Doubles to exit the site to the north. As such a design for the intersection has been prepared in accordance with *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* for a Basic Left Turn (BAL) facility, refer to Appendix K. This design would ensure the access would operate in a safe manner and would be able to accommodate the maximum design vehicle expected to access the Development site.

Traffic movements

Estimated average and peak daily traffic movements during construction and peak construction are shown in Table 4-9 and detailed traffic volumes and requirements are shown in Table 4-10.

Table 4-9 Summary of traffic volumes and requirements for the Project (estimated)

Type of Vehicle	Average daily trips (One Way)	Peak daily trips (One Way)
Light Vehicles	48	100
MRV/HRV	6	40
Over-sized Trucks	0	4
Low-loaders	1	5
Semi-Trailers (AV)	3	13
B-Double	4	10
Total	**62**	**170**

Table 4-10 Detailed traffic volumes during construction (estimated)

Vehicle Type	Daily values in month of construction														Total construction period
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
B-Double	6	6	6	6	6	6	6	6	0	0	0	0	0	0	1,162
Low-loaders	1	1	1	0	0	0	0	0	0	0	0	0	0	0	40
Semi-Trailers	0	0	1	7	7	7	7	7	7	0	0	0	0	0	1,119
Over-sized Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
MRV/HRV	0	8	8	8	8	8	8	8	8	8	8	0	0	0	2,000
Light Vehicles	10	17	17	33	100	100	100	67	67	67	33	33	17	17	16,917
Total	**16**	**31**	**32**	**54**	**121**	**121**	**121**	**88**	**82**	**75**	**41**	**33**	**17**	**17**	**21,240**

Construction hours

During the construction phase of the Project, work would be undertaken during the following hours:

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

There may, however, be a need to work outside these hours due to, for example:

- To avoid disrupting traffic when delivering bulky equipment (such as power transformers).
- To avoid taking outages of existing HV transmission lines during periods of high load.
- To undertake emergency work to avoid serious injury or loss of property.

4.5.2 Operation

Operation Activities

Blind Creek Solar Farm would operate continuously over its lifespan. It would operate automatically but there would be provision to both locally and remotely monitor the performance of the equipment and to control the BESS.

Activities undertaken during operation would include, but are not limited to:

- Routine visual inspections, general maintenance and cleaning operations of the solar arrays as required.
- Routine visual inspections, general maintenance and cleaning operations of the substation.
- Vegetation management, using livestock to control grass growth beneath the panels where possible but may include periodic mowing. Groundcover vegetation would be maintained over the site to minimise erosion, dust and weeds (subject to climatic conditions). Groundcover would be monitored and remediation (such as reseeding or soil protection) undertaken as required.
- Panel cleaning
- Site security response (24-hr) if required.
- Site operational response (24-hr) if required.
- Replacement of equipment and infrastructure as required.
- Maintenance of landscaping and screening plantings.
- Pest plant and animal control as required.
- Livestock movements and agricultural operations, such as fertiliser spreading.

Procedures and management plans for all operational activities would be included in an Operational Environmental Management Plan (OEMP) that would be prepared for the Project prior to commissioning.

Operation materials, labour and equipment

Materials

During operation, it is estimated that approximately 200KL per year of non-potable water may be required for cleaning solar panels, landscaping and for bathroom facilities at the O&M building. It is expected that some of this will be obtained from rain water tanks that would be installed on the site and some would likely be imported. An approximately 20KL rainwater tank would be installed adjacent to the O&M buildings at the substation site to provide water for panel cleaning, irrigation and other non-potable uses, such as sanitary/domestic water and cleaning of equipment and plant.

Water for bushfire mitigation will be non-potable and the locations and volumes of the storage tanks will be determined in the Bushfire Management Plan (BMP), following consultation with the Rural Fire Services (RFS). Indicatively, it is proposed to provide a 20KL non-potable water tank close to the entrance of the substation area, and a 100KL water tank (fed by a nearby existing bore) near the entrance to the solar array area (possibly utilising an existing concrete tank previously used for stock water). A portion of this storage tank will be dedicated for fire fighting purposes. Water for bushfire mitigation is further discussed in Section 9.7.

A small amount of potable (drinking) water (up to 50KL) would be imported or filtered from rainwater tanks.

Labour and equipment

BCSF would employ up to 5 equivalent full-time staff during the operations period and would utilise local commercial entities (nearby quarry, local water suppliers and subcontractors) as required. Firefighting equipment is described in Section 9.7.

Operational transport and access requirements

It is estimated that the daily peak travel demand during normal operations would be approximately 10 vehicle movements per day from full time staff and maintenance personnel, although this may increase during periods of planned or unplanned maintenance works or repairs.

Traffic associated with the operation and maintenance of the solar farm would use the routes specified for the construction phase (Section 9.1)

Operational hours

During the operations phase, the solar farm would only generate electricity during sunlit hours, but the energy storage system would be operational at any time. The solar panels would be expected to produce electricity during daylight hours (i.e., prior to 7am and after 6pm and outside the standard hours), so the tracker units would similarly operate outside standard hours. However, the noise impact of this equipment has been assessed to be negligible to the nearest sensitive receivers.

Staff would mostly drive light vehicles and would generally be on site during the standard working hours; weekdays 7am–6pm and Saturdays 8am–1pm.

In general, work would not occur outside the standard working hours, on Sundays or on public holidays; however, in exceptional circumstances or in the event of an emergency, asset inspection and/or maintenance programs may be undertaken outside standard construction hours. If this needed to occur, then local council and surrounding landholders would be notified if such works are expected to cause noise exceedance to neighbouring dwellings, refer to Section 8.6 for operational noise criteria.

Maintenance of the inverter station, transformer and HV switchgear, PV arrays, trackers and batteries would be undertaken by site staff on a rolling basis with activities scheduled throughout the year. On some occasions, such as during a major substation shut down, additional maintenance staff may be required on site. In this case, the staff would work from the operations building at the site and additional traffic would be minimised through carpooling where possible.

Refurbishment and upgrading

The Project is proposed to have an operational lifetime of nominally 35 years or more. After its useful operational life, the infrastructure would either be upgraded or decommissioned. The decision to refurbish or to decommission would be made by the Proponent based on the economic opportunity at the end of life, additional approval requirements for continued operation, and other considerations.

During the operational life of the solar array, it is possible that the BESS may be separately upgraded or decommissioned. The assessment of the battery infrastructure is likely to take place 15 years after operation commences. Similarly, the decision to refurbish or to decommission this equipment would be based on the context at the time.

4.5.3 Decommissioning and rehabilitation

At the end of the Project's useful life, decommissioning and rehabilitation of the site would be undertaken. The objective of decommissioning would be to return the land to as close to its pre-construction condition as possible. There are provisions in the land and lease agreements for rehabilitation of the site after decommissioning. During the decommissioning process, all below-ground infrastructure would be removed to a depth of approximately 500mm or less. All above-ground infrastructure would also be removed, with the possible exception of the 330kV substation, as this would be up to the discretion of the asset's owner, TransGrid. Rehabilitation of the site would commence at this stage.

Key elements of decommissioning would include:

- Removal of the solar arrays and the foundation piles. Materials would be sorted and packaged for removal from the site.
- Removal of all site amenities and equipment, including buildings, PCUs and all footings.
- Removal of all cabling, where practical. All low voltage cables would be removed. High voltage cabling, which is typically installed deeper than 500mm below the ground, may be left in place.
- Some fencing would be removed. The removal of fences would be coordinated with the landowner and their preference.

- Rehabilitation of disturbed surfaces, in consultation with the landowner.

Wherever possible and practicable, materials removed from the site would be either re-used or recycled. Traffic required for decommissioning would be similar in type but of shorter duration than that required for the construction phase. A Decommissioning Environmental Management Plan (DEMP) would be prepared and submitted to DPE for approval prior to the works, including details of likely traffic movements.

Note also that some rehabilitation activities would be completed during the construction and operational phases of the Project. For example, surfaces would be graded back to their original level (where possible) and exotic perennial grasses would be re-sown. Also, the Project would quickly address disturbances, including rehabilitation of cable trenches, new roads/tracks and drainage works. Erosion mitigation strategies would be implemented on any sloped areas.

4.6 Capital investment

The Project would have an estimated capital investment of $503,679,005 million (including storage). A quantity surveyor's report confirming the capital investment has been provided to DPE.

5. Planning context

This section summarises the permissibility and approval pathway for the Project, with more detail provided in Appendix C.

5.1 Assessment context

Table 5-1 Assessment context

Act	Approval Pathway	Appendix
Environmental Planning and Assessment Act 1979 (EP&A Act)	Section 4.36 of the EP&A Act provides that a development would be State Significant Development (SSD) if it is declared to be SSD by a SEPP. Section 4.12 (8) of the EP&A Act requires an SSD DA to be accompanied by an EIS prepared in accordance with the EP&A Regulation. This EIS is intended to meet the objectives and assessment requirements of the EP&A Act, and the EP&A Regulation and *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP).	Appendix C.1
Environmental Planning and Assessment Regulation 2021 (EP&A Reg)	Part 8 Division 5 of the EP&A Regulation specifies the form and content of EISs, which provide the basis for the Secretary's Environmental Assessment Requirements (SEARs) issued for Projects. Part 3, Division 1 identifies who can make a DA. Section 59 of the EP&A Regulation addresses public participation for SSD. Section 251 requires an 'estimated cost' of the CIV of a DA in order for the Planning Secretary to make their determination.	Appendix C.2
State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP)	Schedule 1 and Schedule 2 of the Planning Systems SEPP identifies development which is SSD due to the size, economic value or potential impacts of the development. Clause 20 of Schedule 1 of the Planning Systems SEPP defines SSD as including: *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:* *a) has a capital investment value of more than $30 million…*	Appendix C.3

5.2 NSW legislation

Table 5-2 NSW Legislation approval pathway

Act	Approval Pathway	Appendix
State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP)	Part 2.3 Division 4 of Transport and Infrastructure SEPP relates to electricity generating works in any land in a prescribed rural, industrial or special use zone. The Land use zone of the Development site is RU1 and C3. RU1 is a prescribed zone. However, C3 is not a prescribed zone. The declaration of the Project as SSD extends to all parts of the Project. Section 2.121 of the Transport and Infrastructure SEPP requires certain developments to be referred to TfNSW. Electricity generation or solar energy systems are not included within the SEPP. However, the Project would result in the generation of fewer than 50 vehicles per hour during peak construction and operation. As such, the requirements under Section 2.121 of the SEPP do not apply.	Appendix C.4.1
State Environmental Planning Policy (Primary Production) 2021 (Primary Production SEPP)	Part 2.2 Section 2.8 of the Primary Production SEPP identifies State significant agricultural land as land listed in Schedule 1. The Project is compatible with the aims of the Primary Production SEPP, as it would not entirely remove the Development site from agricultural land use, with synergistic sheep or other small animal grazing to occur under the solar panels during operation. The Project also does not permanently divert the land from future grazing, as the Development site would eventually be returned to the landowner following decommissioning.	Appendix C.4.2
State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)	For developments classified as 'potentially hazardous industry', Part 3 of the Resilience and Hazards SEPP requires a preliminary hazard analysis (PHA) to determine risks to people, property and the environment. Chapter 4 Section 4.6 of the Resilience and Hazards SEPP requires the remediation of land to be considered by a consent authority, when determining a DA.	Appendix C.4.3
State Environmental	Chapter 3 of the Biodiversity and Conservation SEPP encourages the conservation and management of	Appendix C.4.4

Act	Approval Pathway	Appendix
Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP)	natural vegetation that provides habitat for Koalas The SEPP applies to each LGA listed in Schedule 2 of this SEPP, where Queanbeyan-Palerang LGA is listed. The BDAR for this Project has considered the potential impacts of the Project to the Koala. No evidence of Koalas was identified as part of the BDAR.	
Roads Act 1993 (Roads Act)	Construction traffic would access the Project via Tarago Road. The need for upgrade works on the access roads has been considered as part of the traffic assessment conducted for the Project. If works are required, approval from the relevant roads authority would be sought under section 138 of the Roads Act.	Appendix C.4.5
Water Management Act 2000 (WMA)	Under section 89J of the EP&A Act, SSD developments do not require a water use approval, a water management work approval under section 90 nor an activity approval (other than an aquifer interference approval) under section 91 of the WMA. The Project does not require approval to construct and use a bore within the development site. However, a permit for aquifer interference as per section 4.41(g) of the EP&A Act would be required, post approval, to penetrate the aquifer, where the establishment of a new groundwater bore was proposed to supply water for the Project.	Appendix C.4.6
Fisheries Management Act 1994 (FM Act)	No threatened species, populations or communities would be impacted by the Project. As the Project does not include any dredging activities and no passage of fish would be blocked, a permit under sections 201 or 219 of the FM Act is not required under the provisions of Section 89J of the EP&A Act.	Appendix C.4.7
Crown Land Management Act 2016	Under Part 3 of the Act, land must be assessed prior to any allocation action (reservation, dedication, sale, lease, licence or permit), considering capabilities and suitable uses. Consultation with Crown Lands has revealed that two segments of Crown land are located within the Development footprint. The Proponent has received consent from Crown Lands to lodge the EIS and acknowledgment of receipt of an application purchase/close the isolated Crown Road and undertaking works over other Crown land.	Appendix C.4.8

Act	Approval Pathway	Appendix
Aboriginal Land Rights Act 1983	The Project includes an easement through Crown land. A search of the Register of Native Title Claims identified no active claims across the site.	Appendix C.4.9
Biodiversity Conservation Act 2016 (BC Act)	Given this Project is assessed as SSD and may have impacts on biodiversity values, a Biodiversity Development Assessment Report (BDAR) has been prepared (refer to Section 8.3 and Appendix G). There are no significant impacts on BC Act listed threatened species, ecological communities or their habitats. Where some unavoidable impacts are predicted to threatened species and ecological communities, an offset obligation has been calculated in accordance with BAM.	Appendix C.4.10
Local Land Services Amendment Act 2016 (LLSA Act)	Under the LLSA Act, clearing is permitted if it is authorised under other legislation, including development consent under Part 4 of the EP&A Act. Although the Project is not being assessed under the LLSA Act, it is still consistent with its objectives, and its vegetation clearing would be assessed under Part 4 of the EP&A Act.	Appendix C.4.11
National Parks and Wildlife Act 1974 (NPW Act)	An Aboriginal Cultural Heritage Assessment (ACHA) was carried out for the Project which included site survey and test excavation within the Development site. The ACHA concluded that impacts of the proposal vary across the Development site based on the type of activities to be undertaken. Under section 4.41 of the EP&A Act, an Aboriginal Heritage Impact Permit under section 90 of the NPW Act would not be required for an SSD. The potential impacts to Aboriginal heritage are discussed in Section 8.4 of this report.	Appendix C.4.12
Biosecurity Act 2015 (Biosecurity Act)	The EIS provides for the control of priority weeds occurring at the Development site as part of the Project (refer to Section 8.3).	Appendix C.4.13
Heritage Act 1977 (Heritage Act)	Under Section 4.41 of the EP&A Act, an approval under Part 4 of the Heritage Act or an excavation permit under Section 139 of the Heritage Act would not be required for an SSD. The Project is unlikely to directly or indirectly affect any items of heritage significance (refer section 9.5).	Appendix C.4.14

Act	Approval Pathway	Appendix
Conveyancing Act 1919 (and *Real Property Act 1900*)	When land is leased from a landowner and the lease affects part of a lot or lots in a current plan, a subdivision under section 7A of the Conveyancing Act is required when the total term of the lease, together with any options of renewal, is more than five years. However, a lease of a solar farm is treated as a lease of premises, irrespective of the lease term. A deposited plan will be prepared by a surveyor showing the part of the land as the solar farm premises, together with any associated easements. Subdivision under section 23G of the Conveyancing Act is not required. The Project will however require subdivision as described in Section 4.2.	Appendix C.4.15
Protection of the Environment Operations Act 1997 (POEO Act)	Under Section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). Clause 17 of Schedule 1 of the POEO Act concerns electricity generation works, however does not include solar power. The Project would not be a scheduled activity under the Act and an EPL is not required. Legal requirements for the management of waste are also established under the POEO Act and the Protection of the Environment Operations (Waste) Regulation 2005.	Appendix C.4.16
Waste Avoidance and Resource Recovery Act 2001 (WARR Act)	The WARR Act includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The Project's resource management options would be considered against a hierarchy.	Appendix C.4.17

5.2.1 NSW policies and guidelines

Non-statutory State policies and guidelines used in the environmental assessment, and relevant sections in the EIS, are identified in Table 5-3.

Table 5-3 Relevant non-statutory State policies and guidelines

Guideline	EIS section
Biodiversity	
Framework for Biodiversity Assessment (BCD)	Section 8.3
Threatened Species Assessment Guidelines Assessment of Significance (BCD)	
NSW Biodiversity Offsets Policy for Major Projects (BCD)	
Why Do Fish Need to Cross the Road? Fish Passage Requirement for Waterways Crossings (DPI)	
Policy and Guidelines for Fish Habitat Conservation and Management (DPI)	
Heritage	
Aboriginal Cultural Heritage Consultation Requirements for Proponents (BCD)	Section 8.4
Code of Practice for Archaeological Investigations of Objects in NSW (BCD)	Section 8.4
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (BCD).	Section 8.4
NSW Heritage Manual (BCD)	Section 9.6
Land	
Primefact 1063: Infrastructure Projects on rural land (DPI)	Section 9.3
Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry (ARENA)	Sections 6.3, 8.3 and 9.3
The land and soil capability assessment scheme: second approximation (BCD)	Section 9.3
Noise	
NSW Noise Policy for Industry (EPA)	Section 8.6

Guideline	EIS section
Interim Construction Noise Guideline (EPA)	
NSW Road Noise Policy (EPA)	
Transport	
Guide to Traffic Generating Development (RTA)	Section 9.1
Road Design Guide (RMS) & relevant Austroads Standards	
Hazards and Risks	
Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis (DPE)	Section 9.8
Multi-Level Risk Assessment (DPE)	
Water	
Managing Urban Stormwater: Soils & Construction (Landcom)	Sections 9.3 and 8.5
Floodplain Development Manual (NCD)	
Guidelines for Controlled Activities on Waterfront Land (DPI Water)	
Water Sharing Plans (DPI Water)	
Floodplain Management Plan (DPI Water)	
Guidelines for Watercourse crossings on waterfront Land (DPI Water)	
Waste	
Waste Classification Guidelines (EPA)	Section 9.11
Light	
Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring (DPE)	N/A

5.3 Commonwealth legislation

Table 5-4 Commonwealth legislation approval pathway

Act	Approval Pathway	Appendix
Environment Protection and Biodiversity Conservation Act 1999 (Cwth) (EPBC Act)	The EPBC Act provides an assessment and approval process for actions likely to have a significant impact on Matters of National Environmental Significance (MNES). Also, consideration is required of whether there is any impact on Commonwealth Land. Actions that adversely affect these matters may be deemed to be a 'controlled action' under the EPBC Act. The only matters relevant to the Blind Creek Solar Farm are in relation to listed threatened species and ecological communities. These are assessed in the BDAR (refer Appendix G) and summarised in Section 8.3. The assessment concluded no adverse impacts to these entities and therefore, the Project has not been referred to DAWE under this Act.	Appendix C.5.1
Native Title Act 1993	A search of the National Native Title Tribunal Registers on 05 March 2021 found no Native Title Claims for the Development site.	Appendix C.5.2
Renewable Energy (Electricity) Act 2000 (RE Act)	Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth Government's RET; this includes solar. Certificates for the generation of electricity are issued using eligible renewable energy sources. Renewable energy certificates were reclassified as either large-scale generation certificates or small-scale technology certificates following changes to the RET scheme. The Project would need to be accredited as a Renewable Energy Generator to create Renewable Energy Certificates.	Appendix C.5.3

5.3.1 Palerang Local Environmental Plan 2014

The Development site is located within the Queanbeyan-Palerang LGA. There are seven existing Local Environment Plans (LEPs) for this LGA, with each applying to different geographical areas of the LGA. The Development site is subject to the provisions of the Palerang Local Environmental Plan 2014 (Palerang LEP).

The Development site traverses land zoned as RU1 Primary Production and C3 Environmental Management under the Palerang LEP (refer to Figure 1-2). The objectives of these land use zones are provided in Table 5-5.

For the life of the proposal, the development site would harness a renewable natural resource (solar energy). The activity would impact on land availability for primary production, however, would be developed in a way that would minimise fragmentation and alienation of resource land and minimise land use conflict. Being reversible and involving limited ground disturbance, it would not remove the potential to use the land for primary production at the end of the life of the development. Upon decommissioning of the proposal, the development footprint would be rehabilitated to restore land capability to pre-existing agricultural use.

The Project is considered highly consistent with the objectives of the RU1 land zone as sheep grazing would be carried out beneath the solar arrays, thereby continuing the existing primary industry production use. Consistency of the Project with the objectives of the C3 land zone is achieved through strategic design of the Development Footprint to reduce impacts on Aboriginal heritage and preserve areas of highest value.

Table 5-5 Objectives of RU1 and C3 land zones

RU1 Primary Production objectives	C3 Environmental Management objectives
• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To encourage diversity in primary industry enterprises and systems appropriate for the area. • To minimise the fragmentation and alienation of resource lands. • To minimise conflict between land uses within this zone and land uses within adjoining zones. • To minimise the impact of any development on the natural environment. • To ensure that development does not unreasonably increase the demand for public services or facilities.	• To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values. • To provide for a limited range of development that does not have an adverse effect on those values. • To encourage the retention of the remaining evidence of significant historical and social values expressed in existing landscape and land use patterns. • To encourage development that is visually compatible with the landscape. • To promote ecologically sustainable development. • To minimise the impact of any development on the natural environment.

Electricity generation is prohibited within both RU1 and C3 land zoning, however the Transport and Infrastructure SEPP allows the development for the purpose of electricity generating works in a prescribed zone and the declaration of the Project as SSD extends to all parts of the Project, even those that are to be carried out on land that is not within a prescribed zone as a result of the Planning Systems SEPP. Both these SEPPs prevail over the local provisions.

Note, however, that in response to the merger of the Queanbeyan and Palerang Councils in 2014, the new Queanbeyan Palerang Regional Council (QPRC) is currently in the process of developing a comprehensive LEP for the Queanbeyan-Palerang LGA under the EP&A Act.

Currently in draft stage, the Draft Queanbeyan Palerang Comprehensive Local Environmental Plan 2020 intends to combine the seven respective LEPs that applied to the formerly separate Queanbeyan and Palerang Council areas to ensure more consistent land use planning across the Queanbeyan-Palerang LGA (QPRC, 2020).

As detailed within Section 4.2, the proposed subdivision adhered to the minimum lot size of RU1 Primary Production zoned land. The subdivision plan shows Lot 17 DP 535180 to be subdivided into two lots, with the minimum lot size being greater than 40 hectares.

5.4 Other relevant policies and matters

5.4.1 Objects of the EP&A Act

Section 1.3 of the EP&A Act provides the objects which require consideration. Table 5-6 below provides responses to how the Project considers the objects of the EP&A Act. Overall, it is concluded the Project is consistent with these objects.

Table 5-6 Consideration of the objects of the EP&A Act

Relevant objects of the EP&A Act
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. During operation, it is intended that sheep grazing would occur within the Development footprint, beneath the arrays.
To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. ESD principles are considered in Section 5.5.3 below.
To promote the orderly and economic use and development of land. The subject land is currently zoned as RU1 Primary Production and C3 Environmental Management under the Palerang LEP 2014. The Project would be consistent with RU1 land zoning and further support the ongoing use of the subject land as a recreational area. Consistency of the Project with the objectives of the C3 land zone is achieved through strategic design of the Development Footprint to reduce impacts on Aboriginal heritage and preserve areas of highest value.
To promote the delivery and maintenance of affordable housing. Not applicable.
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats. The Project has been assessed against the relevant provisions of the BC Act, FM Act and the

Relevant objects of the EP&A Act
EPBC Act, with potential impacts identified and mitigation measures provided where impacts cannot be avoided. As far as possible, the design of the Project has been prepared to minimise impacts on the environment and high value biodiversity. Where some unavoidable impacts are predicted to threatened species and ecological communities, ecosystem credits to be retired have been calculated.
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage). Both Aboriginal heritage and non-Aboriginal heritage have been assessed within this EIS. As far as possible, the design of the Project has been prepared to avoid impacts on Heritage values, where avoidance could not be achieved a salvage program would be implemented to preserve heritage materials.
To promote good design and amenity of the built environment. Design of the Project has been carried out in accordance with relevant standards.
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants. Not applicable.
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State. This EIS forms part of a DA which will be assessed by DPE. Relevant agencies have had input into the EIS process during SEARs preparation.
To provide increased opportunity for community participation in environmental planning and assessment. As documented in Section 6.3, the community has had the opportunity to participate in the development of the Project, with outcomes from the consultation used to assist in modification of design features and identification of suitable mitigation measures. The community would have the opportunity to provide further feedback during the EIS exhibition process. Community comments received from the exhibition of the EIS would be responded to within a submissions report and considered by DPE in the development assessment process.

5.4.2 Matters of consideration

Under Section 4.15 of the EP&A Act, the consent authority is required to consider several matters when determining a DA under Part 4. These matters are listed in Table 5-7 and assessed in terms of their relevance to the Project.

Table 5-7 Matters for consideration

Provision	Relevance to the Project
Any environmental planning instrument;	Relevant environmental planning instruments (EPIs) are discussed in the preceding sections. The Project and this report are consistent with the objectives and assessment requirements of these instruments.
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority;	At the time of writing, there are no draft instruments relevant to the Project.
Any development control plan;	Development control plans do not apply to SSD under the provisions of Part 2.2 Section 2.10 of the Planning Systems SEPP.
Any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F;	Voluntary contributions have been negotiated with the community and Bungendore Council. This is discussed in Section 6.3.
The regulations (to the extent that they prescribe matters for consideration);	The form and content of this EIS fulfill the provisions of Schedule 2, Part 3, Clause 6 and clause 7 Content of environmental impact statement of the Environmental Planning and Assessment Regulation 2021.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	The likely impacts of the Project include environmental impacts on both the natural and built environments, and the social and economic impacts in the locality, are detailed in Section 6, 8 and 9 of this EIS. This EIS demonstrates that the environmental impacts of the Project have, to the extent reasonably and feasibly practicable, been avoided or minimised through careful Project design and through the implementation of mitigation measures provided.
The suitability of the site for the development;	The Project has been selected according to criteria relating to solar resources, network connection, hazard potential, planning requirements and likely environmental impacts. A number of alternatives and options were considered in developing the Project. A description of the options considered is provided in Section 3. The site is considered highly suitable for a utility scale solar farm development.

Provision	Relevance to the Project
Any submissions made in accordance with the EP&A Act or the regulations; and	This EIS has been prepared in response to agency input to the SEARs, and the results of consultations involving a wide range of government and non-government stakeholders; refer to Section 6. Submissions received during the exhibition period of the EIS would also be taken into account in the planning and implementation of the Project.
The public interest.	The Project is in public interest for a number of reasons, as discussed in Section 2 of this EIS. The Project is considered to be demonstrably in the public interest because it would: • assist with the abatement of greenhouse gas emissions and the avoidance of dangerous climate change by displacing approximately 600.000 tonnes of carbon dioxide per year; • benefit network reliability and security by providing embedded electricity generation close to local consumption, by providing a more diverse mix of energy sources, and potentially by providing stabilisation services to the grid using BESS; • support 300 direct and 480 indirect jobs over the construction period, and 5 direct and 9 indirect jobs during operation; • provide an economic boost to the local economy through the purchase of local goods and services.

5.4.3 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In NSW, the concept has been incorporated into legislation including the EP&A Act, the EP&A Regulation and the *Protection of the Environment Administration Act 1991* (NSW).

Based on the likely costs and benefits of the proposed solar farm, the Project is considered to comply with the principles of ESD. ESD principles and their relationship to the design, construction and ongoing operations of the Project are identified in Table 5-8.

The aims, structure and content of this EIS have incorporated these ESD principles. The mitigation measures in Section 10.2 provide an auditable set of environmental management commitments to these parameters. Based on the social and environmental benefits accruing from the Project at a local and broader level, and the assessed impacts on the environment and their ability to be managed, it is considered that the Project would be ecologically sustainable within the context of ESD.

Table 5-8 Assessment of the Project against the principles of ESD

Assessment of the Project against the principles of ESD
(a) The precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and* *(ii) an assessment of the risk-weighted consequences of various options.*
The precautionary principle has been adopted in the assessment of impact of the Project; with first preference given to avoiding and minimising environmental impacts (as described in Section 3). The impacts of the construction of the solar farm at the site are likely to be reasonably predictable and carry low levels of uncertainty and risk. Based on field surveys and assessments, the works would be unlikely to result in irreversible environmental damage. The development would have an operational life of nominally 35 years or more and would be highly reversible. A 'worst case' impact assessment has been undertaken to account for any uncertainty in the final impact footprint.
(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
The Project would not diminish long term ecological or agricultural productivity, biological resources or future land use options at the site. At the end of the operating life of the solar farm, the above-ground infrastructure would be removed (to a depth of 500mm or less) to restore former land use potential, agricultural productivity and land use and planning options at the site. Soil values would be restored with reference to the results of a pre-works baseline soil survey. The Project would provide a significant environmental benefit by producing sustainable energy, reducing the reliance on fossil fuels which threatens the well-being of current and future generations through climate change. In contrast to non-renewable energy sources, the solar farm would not emit carbon dioxide, airborne particulates or other pollutants. At the end of its operational life, the Project would not require expensive and difficult land remediation or leave a legacy of toxic waste to be stabilised and stored.
I conservation of biological diversity and ecological integrity— namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.
Layout planning and mitigation measures have been adopted to avoid or mitigate any impacts which would affect the long-term viability of populations of all native species at and around the site, particularly threatened species and communities. These measures include avoiding and protecting natural areas and habitats on the site. It is noted that climate change is a key global threat to many species and communities, and that the Project would contribute to the abatement of carbon emissions from the electricity sector in Australia.

Assessment of the Project against the principles of ESD
(d) improved valuation, pricing and incentive mechanisms— namely, that environmental factors should be included in the valuation of assets and services, such as: *(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and* *(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) *environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*
The Project would provide for the increased penetration of renewable energy into the energy market. The BESS would use the market to regulate the storage and release of energy based on prevailing demand. To date the environmental and social costs of electricity generation have not been fully measured or incorporated into wholesale or retail electricity pricing. The long-term external costs of carbon-intensive energy sources in terms of climate change in particular have not been factored into prices. For each kilowatt hour of electricity generated over the lifetime of a solar farm, it has an emissions footprint of 6 grams of CO2 equivalent (gCO2e/kWh). In contrast, coal has an emissions footprint of 109 gCO2e/kWh (Evans, 2017). External costs are similarly not included in calculations of Levelised Cost of Electricity (LCOE) - the discounted lifetime cost of ownership and use of a generation asset expressed in cost per MWh. In terms of life cycle energy consumption, the 'energy payback time' for polycrystalline PV modules has been estimated at one (1) year for a solar installation in Southern Europe (refer to Section 9.11).

5.4.4 NSW Large-scale Solar Energy Guideline for State Significant Development 2018

The guideline provides the Proponent and regulators with general guidance on the planning framework for the assessment and determination of state significant large-scale solar energy projects under the EP&A Act.

The objectives of the guideline are to:

a) *Provide guidance to the community, applicants, industry and regulators on how DPE assesses environmental, social and economic impacts of state significant solar energy projects.*

b) *Encourage industry to select suitable sites for projects to reduce the likelihood and extent of land use conflicts and environmental and social impacts.*

c) *Facilitate better on-ground outcomes by promoting early identification of potential impacts.*

d) *Promote meaningful, respectful and effective community and stakeholder engagement.*

e) *Support the development of a sustainable solar industry in NSW by providing a clear, consistent and responsive policy framework.*

Table 5-9 Guideline objectives discussion

Objective/s	Response
a) Provide guidance to the community, applicants, industry and regulators on how DPE assesses environmental, social and economic impacts of state significant solar energy projects.	The Project has been identified as a State Significant Development. This requires the Project to gain approval by providing evidence that compliance with DPE standards can be met. This includes provisions for environmental, social and economic impacts (covered in detail in Section 8 and 9.
b) Encourage industry to select suitable sites for projects to reduce the likelihood and extent of land use conflicts and environmental and social impacts.	Suitable site selection is set out in Section 3 and addresses the Large-Scale Solar Energy Guideline for State Significant Development (DPIE, 2018). In summary the site selected for the development of the Blind Creek Solar Farm is suitable for solar installation due to be following favourable conditions: 1. Optimal Solar Resources 2. Suitable existing land condition 3. High potential for site rehabilitation 4. Community support 5. Proximity to the electrical network 6. Connection capacity.
c) Facilitate better on-ground outcomes by promoting early identification of potential impacts.	Early identification of potential impacts were considered as part of the Scoping Report for the Blind Creek Solar Farm (NGH, 2021). The scoping report included a constraints map to guide the Proponents Development site and Development footprint. The scoping report assessed the major potential impacts of the Project prior to the issuing of the DPE's solar farm potential impact specific SEARs. This EIS provides the full analysis of the Project's environmental impacts and sets out specific mitigation strategies (including aspects of the Project which have been altered to avoid and minimise impacts).
d) Promote meaningful, respectful and effective community and stakeholder engagement.	The Proponent has a dedicated team that engages in community and stakeholder engagement. The NSW Large-scale Solar Energy Guideline requirements ensure that all relevant community groups, government agency stakeholders and other interested parties such as mineral

Objective/s	Response
	title holders are aware and involved in the design and development of the proposal prior to its on ground development. To date the Proponent has undertaken consultation with agencies, mineral title holders, the local aboriginal community and engaged with community stakeholders including residents surrounding the Development site. Consultation completed to date is discussed further in Section 6.
e) ***Support the development of a sustainable solar industry in NSW by providing a clear, consistent and responsive policy framework.***	Development of large-scale solar farm projects provide an opportunity to contribute directly to the NSW goal of net-zero emissions by 2050. For this the NSW government has developed a Climate Change Policy Framework to be followed as the state adopts sustainable solar energy (NSW Government, 2016). Strategic needs are detailed in Section 2.2, planning context detailed in Section 5 and other relevant policies and matter in this Section, 5.4. The proposal has addressed the requirements of the guidelines through the assessment of environmental impacts (Sections 8 and 9), site suitability (Section 3.2), community and agency consultation (Section 6) and planning context (Section 5).

5.5 Approvals and licences

Table 5-10 Summary of licences and approvals required for the proposal

Legal instrument	Approving authority	Approval or licence
Environmental Planning and Assessment Act 1979 (Part 4)	DPE	State significant development applications require approval from the Minister for Planning or the Independent Planning Commission. This EIS has been prepared in accordance with the requirements of the Secretary of the DPE.
Roads Act 1993 (Section 138)	Queanbeyan-Palerang Regional Council and Crown Land	Any works to public or classified roads require consent under this Act from the road's authority. Queanbeyan-Palerang Regional Council are the road authorities for Tarago Road.
Crown Lands Management Act 2016	DPE - Land	Works on Crown Land Including Crown Roads.

Note, if it is determined that additional licences or approvals are required, the Proponent would obtain these prior to commencement of relevant activities.

6. Consultation

6.1 Agency consultation

SEARs were provided by DPE on 11 February 2021. The table in Appendix A provides a summary of the SEARs and cross references where specific issues are addressed within this EIS.

Additional consultation was undertaken with several of the Agencies to clarify some of the issues raised in the SEARs or seek further advice. Section 6.1.1 provides a summary of this additional consultation.

6.1.1 Agencies' additional comments and consultation

During the preparation of this EIS, a number of agencies have been consulted to:

- Ensure the SEARs requirements were fully understood. Appendix D.1 includes all correspondence with Agencies.
- Seek input into key issues, prior to finalising the impact assessment.

Table 6-1 summarises the correspondence received from Agencies.

Table 6-1 Agency consultation results

Agency	Response Date/s	Consultation comments
NSW Environment Protection Authority	26/08/2021	The EPA noted that solar farms are not classified as a scheduled activity under Schedule 1 of the Protection of the Environment Operations Act 1997 (POEO Act). In that regard, they advised the EPA do not have a regulatory role in the Project.
DPI Crown Lands	25/08/2021	Crown Roads are present within the Development site. Crown Lands provided a map showing the location of these Crown Roads. Crown Lands requested Landowners Consent Application forms for closing these Crown roads be completed and returned to Crown Lands for assessment. Applications have been lodged refer to Section 5.2 and Appendix C.4.8.
DPE Water/NRAR	2/08/2021	NGH provided a Project updated to DPE Water and the NRAR following the SEARs. DPE water advised they had no feedback at the time and would review the EIS when exhibited. The Proponent undertook direct consultation with DPE Water and NRAR, regarding the management of Wrights Creek that occurs within the Development footprint. DPE Water requested the design consider the geomorphology of the site and connectivity of the Creek. A hydrological assessment for flood risk was completed to this effect and provided to DPE Water on 25 November 2021. No further comment was received.
TfNSW	n/a	As part of the Traffic Impact Assessment, Amber traffic consultants undertook consultation with the road managers. As Tarago Road is managed by Council, and Blind Creek Road Entrance and the portion of Currandooley to be utilised are privately owned, consultation with TfNSW for the TIA was not required.
Transgrid	30/3/2021	Transgrid has provided a Preliminary Impact Assessment (PIA) for the Project which indicated that the Project is likely to be able connect to the transmission system at the location proposed. As is the case with all large projects, an ‘offer to connect’ can only come following the completion of a Full Impact Assessment (FIA). The Proponent will continue to work with TransGrid on the FIA and modelling required for the high voltage connection and connection application during the course of the Project.

Agency	Response Date/s	Consultation comments
Biodiversity and Conservation Division (BCD)	Multiple email exchanges and site visit	NGH held many discussions with Mallory Barnes (Senior Regional Biodiversity Conservation Officer) to discuss the following key topics. BCD also independently visited the site, to confirm the conclusions of the LCA. Email correspondence and further details of these consultation outcomes are provided in the Appendices of the BDAR, refer to Appendix G of this EIS. Key topics: 1. Early BCD concerns about threatened fauna. • Frogs surveys. • Grassland habitat (many rapid assessments thrown into grassland areas to demonstrate poor quality, non-tussock grass). • Golden Sun moth (as per above, no habitat). • Little whip snake (as per above plus tile surveys). 2. Definition of the Subject Land v Development Footprint – for this BDAR the Development footprint is the Subject Land, according to their policy team. 3. Require White Fronted Chat surveys and prescribed impact assessment for this species (ongoing). 4. BCD's site visit and their conclusions, namely • They agreed with all PCT and Cat1 classifications. • Tile survey locations were well selected. • Recommend WFC survey. • Consider mapping an area of veg as a separate zone (an extra BAM plot was done). • Consider mapping outside of the current Subject Land near the powerline easement. • Confirm with Stride Renewables that there will not be any further impacts to the east within the Powerline easement, i.e., no upgrades to the transmission line which would result in further impacts in the powerline easement outside of the current Development footprint.
Queanbeyan-Palerang Local	01/10/2021	Council advised at a Council meeting on the 28/07/2012, a unanimous vote agreed in principle to proceeding with a

Agency	Response Date/s	Consultation comments
Council (Council)		planning agreement with the Proponent based on approval of the Project. BCSF Pty Ltd met with Council in relation to the proposed Voluntary Planning Agreement. Council noted that groundwater impacts from the Project are unlikely to be substantial however the impact on the Bungendore Town Water Supply and other groundwater effects should be considered. As part of the TIA, Amber traffic consultants consulted with Council via a phone call on 08/07/2021 to discuss access recommendations, intersection treatments and sealing of roads next to residential dwellings. It was noted in the meeting that Currandooley Road was not listed in their road hierarchy and they would like to see consultation with the relevant stakeholders. Amber discussed the proposed BAL/BAR treatment and expected traffic volumes. Council noted they would be considering sight distance and road surface conditions as part of their final assessment. Council recommended that the unsealed access road be sealed in the vicinity of the dwelling. No further recommendations or objections/concerns were provided by Council at this time.
NSW Rural Fire Service	03/09/2021	NGH provided a consultation letter to NSW RFS who advised they did not receive the SEARs for the proposed development. NSW RFS advised a Bushfire hazard assessment should be prepared for the Project. A meeting was held on 17/01/2022 between NSW RFS, NGH and BCSF Pty Ltd to discuss Asset Protection Zone (APZ) management across the proposal area (namely under the solar array), with regard to the operation of Blind Creek Solar Farm as an Agri-solar site. NSW RFS advised the Development footprint must be managed as an APZ, with grass height under solar panels no greater than 10cm, and that RFS does not stipulate how to manage grass height on the site, it is up to the developer and bushfire planner.
Airservices Australia	25/08/2021	Airservices does not need an assessment of the solar panels. given the distance of the solar farm from Airservices operated control towers and Communications/Navigation/Surveillance (CNS) Facilities.
CASA	25/08/2021	CASA reviewed the Scoping Study for the proposed solar farm and noted the study addresses the hazards and risks of glint and glare. CASA noted the proposed Blind Creek Solar Farm will be at least 25km from Canberra Airport, not aligned with the runway and will not impact the Air Traffic Controllers or pilots approaching Canberra Airport. As such CASA did not require an aviation specific solar glare analysis by a specialist consultant as part of the EIS.

6.2 Aboriginal community consultation

6.2.1 Consultation undertaken by NGH

The consultation with Aboriginal stakeholders was undertaken in accordance with Section 60 of the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2019 following the consultation steps outlined in the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRP) guide. The guide outlines a four-stage process of consultation as follows:

- Stage 1 – Notification of project proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed project.
- Stage 3 – Gathering information about cultural significance.
- Stage 4 – Review of draft cultural heritage assessment report

Stage 1

Letters outlining the development proposal and the need to carry out an ACHA were sent to the Ngambri Local Aboriginal Land Council and various statutory authorities including Heritage NSW, as identified under Section 4.1.2 of the ACHCRP. An advertisement was placed in the local newspaper, the *Canberra Times*, on 25 February 2021 seeking registrations of interest from Aboriginal people and organisations. Letters were then sent to all Aboriginal organisations identified by the relevant authorities (primarily Heritage NSW), with a request for all interest parties to register. In each instance, the closing date for submission was 14 days from receipt of the letter.

As a result of this process, 17 Aboriginal groups registered their interest in the proposal.

The Aboriginal community groups who registered an interest in the project were:

- Ngambri LALC.
- Buru Ngunawal Aboriginal Corporation.
- Didge Ngunawal Clan.
- Ngunawal Heritage Aboriginal Corporation.
- PD Ngunawal Consultancy.
- Kalari Ngunnawal Pajong Wallabalooa Descendants.
- Karlari Ngunnawal Descendants.
- Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation.
- Freeman and Marx.
- Muragadi Heritage Indigenous Corporation.
- Murri Bidgee Mullangari Aboriginal Corporation.
- Merrigarn Indigenous Corporation.
- Yurwang Gundana Consultancy Cultural Heritage Services.
- Oak Hill Enterprises.

- Corroboree Aboriginal Corporation.
- Gunjeewong Cultural Heritage Aboriginal Corporation.
- Konanggo Aboriginal Cultural Heritage Services.

Stage 2

On 11 June 2021, an *Assessment Methodology* document for the proposed Blind Creek Solar Farm was sent to the 17 of the Registered Aboriginal Parties (RAPs) listed above. This document provided details of the background to the proposal, a summary of previous archaeological surveys, and the proposed heritage assessment methodology for the proposal. The document invited comments regarding the proposed methodology and sought any information regarding known Aboriginal cultural values associated with the Development site and/or any Aboriginal objects contained therein. A minimum of 28 days was allowed for a response to the document.

None of the registered parties raised any objections to the methodology and all expressed interest in participating in fieldwork

Stage 3a

The *Assessment Methodology* outlined in Stage 2 included a written request to provide any information that may be relevant to the cultural heritage assessment of the study area. It was noted that sensitive information would be treated as confidential. No response regarding cultural information was received in response to the methodology.

The survey and testing fieldwork was undertaken from 22 July 2021 to 6 August 2021, and six of the 17 registered groups were selected for fieldwork participation by the Proponent based on local knowledge, connection and experience. The groups who participated in the fieldwork included:

- Buru Ngunawal Aboriginal Corporation.
- Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation.
- Yurwang Gundana Consultancy Cultural Heritage Services.
- Ngambri LALC.
- Freeman and Marx Pty Ltd.
- Didge Ngunawal Clan.

The preliminary results of the fieldwork led to the Proponent to seek to minimise impact to identified archaeological sites and sensitivity by altering the Development site and the Development footprint to allow the opportunity of installing solar arrays within areas of archaeological sensitivity that had been previously disturbed by historical sand quarrying. As a result, alterations to the original Development site were made and a new methodology was sent out to RAPs.

Stage 3b

On 16 September 2021, an addendum letter to the *Assessment Methodology* document for the proposed Blind Creek Solar Farm was sent to the RAPs listed above. This letter provided all RAPs with an update on the status of the proposed solar farm, including the changes that had occurred to the Development site as a result of the preliminary results from the July/August fieldwork. The document invited comments regarding the updated proposed methodology and changes to the Development site and sought any information regarding known Aboriginal cultural significance values associated with the updated Development site and/or any Aboriginal objects contained therein. A date for the proposed additional fieldwork was also provided to RAPs within the letter. A minimum of 28 days was allowed for a response to the document.

None of the registered parties raised any objections to the methodology and all expressed interest in participating in fieldwork.

No response regarding cultural information was received in response to the letter and updated methodology.

Stage 3c

The second round of fieldwork for additional survey and testing was undertaken from 18-22 October 2021, and the same six of the 17 registered groups were selected for fieldwork participation by the Proponent. The groups who participated in the fieldwork included:

- Buru Ngunawal Aboriginal Corporation.
- Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation.
- Yurwang Gundana Consultancy Cultural Heritage Services.
- Ngambri LALC.
- Freeman and Marx Pty Ltd
- Didge Ngunawal Clan.

Stage 4

In December 2021, a draft version of the ACHA for the Project was forwarded to the RAPs inviting comment on the results, the significance assessment and the recommendations. The statutory minimum of 28 days was allowed for responses to the document but ten additional days were allocated due to the Christmas/New Year holidays. Two parties requested a further extension of seven days which was granted.

Aboriginal community feedback

In consultation with Aboriginal knowledge holders throughout this project, NGH has been informed that:

- Lake George and the surrounding hills form part of the moth songline.
- The woman of the lake withdraws the water when things are bad, and gives it back when things are good, the central part of the lake is very important to women.
- The formation of Lake George and the waterholes relate to a women's story – Wadbiliga.
- Women would camp at Lake George while the men were in the landscape, as groups were travelling songlines to gather for ceremonies.

- The escarpment on the western shore of the Lake is called Tidbiliga.
- Locations within the Lake sheltered from the westerly wind are important.
- Braidwood and Bungendore were permanent camps.
- Stone was distributed across the landscape by Tidbiliga, and the presence of the stone outcrops (as seen to the east of the Development site) are associated with the ancestors. Vegetation is an indicator of this too – pines are associated with the stone outcrops, which are associated with the ancestors. People didn't camp among these areas. On the western side of the lake at the foot of the hills, there are many burial sites and sacred sites.
- There are a number of cultural sites to the north of Lake George (no specification). One cultural site was identified outside the Blind Creek Solar Farm Development site but within proximity of works (outside of Development footprint).
- Furthermore, NGH was also informed that the "Ngunawal people are in the process of lodging a Native Title blanket claim of traditional country including Ngungara (Lake George)". This application is still in progress, and as such, the Consultation Requirements still apply and consultation has therefore included all RAPs. It should be noted that should the Native Title claim be approved it will need to be factored into the future CHMP for the Blind Creek Solar Farm.

6.2.2 Indigenous community consultation undertaken by the Proponent

In addition to the Archaeological Heritage work undertaken with Registered Aboriginal Peoples, the founders have been in contact with the relevant local Indigenous Elders and Indigenous representatives since December 2020.

During the Archaeological Heritage process, the founders were able to spend time with some of the RAPs to discuss the Project and to seek feedback and input into additional ways that traditional ownership could be recognised and celebrated.

In terms of project benefits, discussions are underway between the landowner and the RAPs regarding the potential for making a 2km^2 area available as an Indigenous Cultural and Heritage and Learning Zone (ICHLZ) if the Project proceeds. This area has been identified by the project archaeologists and the Indigenous community as having Indigenous heritage. The CBSS would fund an annual Open Day to allow Indigenous Elders to educate Indigenous communities and the local community of Bungendore and school children about the area. The area is between the proposed edge of the solar farm and Weereewa / Lake Ngungara / Lake George. This will provide access to the lake from the eastern shore for the first time in over 150 years for Indigenous peoples and for the wider community and a significant barrier between the Project and the lake (Refer Appendix D.3).

The Founder engaged a local Indigenous man who grew up on the property to intern during the archaeological studies. He has now commenced working on archaeological digs in the region and has recorded a Welcome To Country for the BCSF Project.

6.3 Community consultation

The proponent has managed and delivered all aspects of the community engagement process to date for the BCSF. This Section summarises the:

- Project's engagement philosophy and guidelines considered.
- Key stakeholders for the project.
- Engagement actions undertaken to date (including dispersing information, obtaining feedback and engaging one on one on key matters).
- Community feedback so far collected (including by topic).
- How the BCSF has responded to feedback received.
- Future engagement activities planned for the project.

Detailed consideration of the issues raised by the community is included in the relevant sections of the EIS impact assessment chapters.

The full community engagement results are included from Appendix D.2 to D.4 (which includes the detailed results obtained to date, copies of media releases and advertised events, as well as the project's Community and Stakeholder Engagement Strategy (CSES).

6.3.1 Engagement philosophy

The consultation team is drawn from the founders / Landholders (founders) of BCSF, who also make up the majority landholders and live on the Development site. They have unique insight and connection to the local community as well as extensive experience in best practice renewable energy engagement and were keen to apply this experience to their own project (refer to team credentials and experience, Appendix D.5. This has assisted to genuinely map and evaluate the social impacts of the project and manage a meaningful consultation process.

As part of the local community the founders are committed to respectful, transparent, and meaningful consultation with their neighbours and the wider community. To date, the key focus of engagement has been to understand the concerns of the closest neighbours with a potential for an impact from the Project, to ensure they had a high level of understanding of the Project and to maximise benefits of the Project to the key stakeholder groups. However, the activities have also captured residents further from the project and addressed their concerns as well as interested members in the broader community.

In terms of implementing the community consultation process, the consultation has met all requirements of the SEARs and been in line with:

- DPE's *Guidelines for Major Project Community Consultation* (October 2007), *Community and Stakeholder Engagement: Draft Environmental Impact Assessment Guidance* Series June 2017.
- Guideline 6, *NSW Large-scale Solar Energy Guideline for State Significant Development* December 2018.
- Australian Renewable Energy Agency's (ARENA's) *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry* (ARENA n.d.).

Consultation was also informed by the DPIE (2020) draft *Social Impact Guidelines for State Significant Projects*; and Beyond Public Meetings: Connecting community engagement with decision making (Twyford Consulting, 2007).

6.3.2 Defining the stakeholder groups

The founders undertook extensive research of previous renewable energy projects to understand the possible impacts, concerns and benefits to communities and applied those findings to their local community. The stakeholders can be divided into the following groups which were targeted separately:

- Aboriginal community.
- Government agencies.
- Broader community.
- Specific stakeholder groups, defined by their potential to be impacted by the BCSF.
- Representative bodies (Council, RFS, community groups and Business community).

Aboriginal community consultation (Section 6.2) required under the National Parks and Wildlife Act and consultation with government agencies is detailed in Section 6.1. Consultation with the broader community, representative bodies and specific stakeholder groups has been undertaken exclusively by the founders and is summarised below and provided in more detail in Appendix D.3.

Note: At an early stage of the Project, the founders considered all residences and landholdings up to 7km from the Project to determine which residences could have a possible impact. Those stakeholders whom it was considered had the potential for an impact were grouped for the purposes of targeted engagement, in advance of the detailed assessment of impacts. While specific stakeholder groups were defined by their potential to be impacted by the BCSF, this preceded the final impact ratings as determined, for example, by the visual assessment (refer to Section 8.1 for impact assessment conclusions). The engagement groupings were identified as follows and mapped on Figure 6-1. Specific stakeholder groups defined by their potential to be impacted by the BCSF were identified as follows (listed from most to least impact)

- Stakeholder Group 1 - immediate neighbours and residences with potential for close views.
- Stakeholder Group 2 - a residential development approximately 2.7km with potential for limited view from two residences but will have potential construction traffic impacts.
- Stakeholder Group 3 –low lying residences on the western side of Weereewa / Lake Ngungara / Lake George between; 5km and 7km west of the proposed solar farm with a potential for low lying views.
- Stakeholder Group 4 - residences between 6km and 7.km with a potential for elevated views from the Lake George escarpment.
- Close proximity Stakeholders with no likely visibility of BCSF - people who live in the vicinity of the proposed solar farm whom we believe are unlikely to have a visual or operational impact but but may be impacted during construction.

Groups 1 – 4 are mapped below.

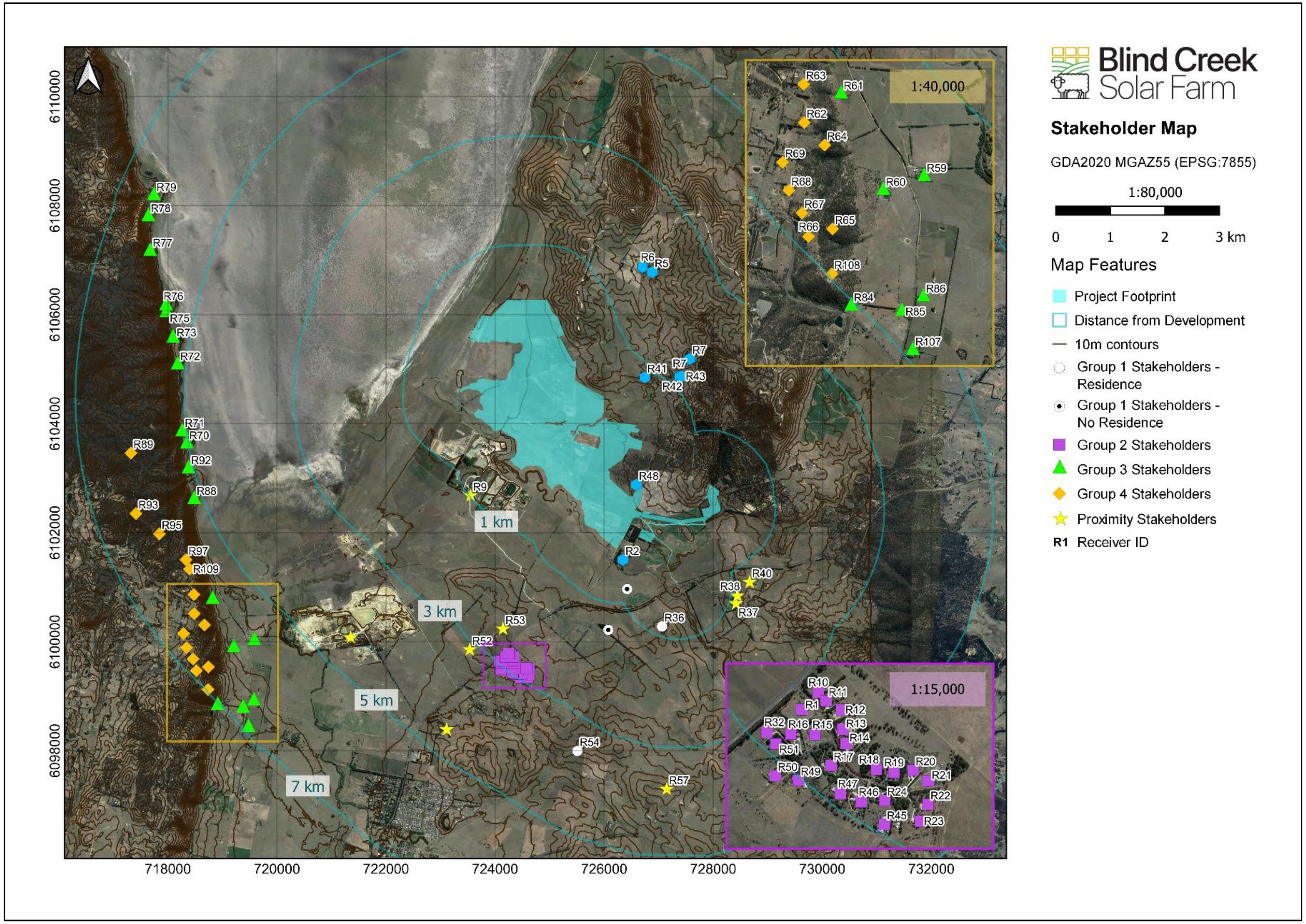


Figure 6-1 Map of Stakeholder groups with potential for impacts

6.3.3 Summary of engagement activities

As members of the local community, the founders of BCSF have undertaken extensive consultation with their near neighbours and residents. This has included:

- Face to face meetings and presentations.
- On site visits, presentations and discussion sessions.
- Emails, texts, telephone calls.
- BCSF project website.
- Dedicated freecall number.
- Dedicated email address.
- Media releases.
- Online Community Information Sessions.
- Open Days.
- Specific stakeholder group on site meetings and discussion sessions.

The BCSF website www.blindcreeksolarfarm.com.au was launched in December 2020.The website includes the following information:

- Project overview.
- About BCSF.
- Approval Process.
- Study Area.
- Founder / Farmer statement.
- Agri-solar.
- Contact information.
- Benefits to local economy.
- Community consultation.
- Sharing the benefits.
- Glare & Reflection Executive Summary.
- News articles.
- FAQ.
- Event Register.

6.3.4 Specific consultation activities, by stakeholder group

Specific activities undertaken with each stakeholder group are summarised below and detailed further in Appendix D.3 Unless otherwise stated below, all consultation has been undertaken by the founders who are local farmers. All key stakeholders had an open invitation to visit the site and discuss the Project with the founders. Two stakeholders requested not to be contact nor arrange visual images from their residence.

Broader community

This group was expected to be generally interested but we do not consider they will be directly impacted by the project. The following activities were undertaken to ensure sufficient information for the broader community.

- 10 December 2020 - website launched www.blindcreeksolarfarm.com.au, dedicated email, and Freecall.
- 16 December 2020- media release issued in local newspaper Regional Independent announcing local farmer led solar project (refer to Appendix D.4)
- 29 September & 6 October 2021 - media release about the Project and the online community information sessions plus quarter page advertisements promoting online community information sessions in the local newspaper (refer to Appendix D.4)
- 10 & 11 October 2020 - 2 x one hour online community information sessions plus Q&A / feedback segment (Covid lockdown measure)
- 1 November 2021 - Flyer drop to 2000 residents promoting Open Day and how to find more information about BCSF. Attendees asked to RSVP (refer to Appendix D.4)
- 3 & 6 November 2021 - ¼ page advertisement in Regional Independent promoting Open Day on 13 November (refer to Appendix D.4). Attendees were asked to RSVP via the BCSF website in case of flooding
- 6 November 2021 e-news to subscribers promoting open day (refer to Appendix D.4)
- 13 November 2021 - Open Day cancelled due to flooding. Emails sent to all people who expressed interest in attending - they were offered 3 further open day opportunities to visit BCSF in November and December.

Stakeholder Group 1

This group includes four properties 850m - 3.7km, two of which have residences. These four properties we consider could have the most impact from the Development Footprint. In addition to invitations to the broader community events including Open Days and Community Information sessions, the founders have met with these property owners multiple times separately and as a group including:

- 19 November 2020 - the Founder contacted close neighbours to set up a time to meet and explain the Project location and size and hear initial concerns. Meetings took place during November and December 2020.
- 10 December 2020 - close neighbours were invited to a site visit of BCSF followed by PowerPoint presentation and explanation of CBSS, Q&A session and discussion about concerns and an opportunity to provide input to the Project.
- February 2021 - advised BCSF had received SEARS.
- May 2021 - Took visual images from the houses at nominated viewing points.
- 14 April 2021 - Site meeting at BCSF followed by PowerPoint presentation, Q&A and discussion about CBSS and recapped on the Project plus input and feedback opportunity.
- May 2021 - Meeting at neighbours' houses to take updated images from the site they selected.

- June - October 2021 - ongoing discussions with close neighbours during Covid lockdown.
- November - December 2021 individual meetings to show visual imagery and discuss CBSS.

Stakeholder Group 2

A rural lifestyle residential estate which includes 50 dwellings. The closest house is 2.7km from the Development Footprint. There are two houses on the north-eastern corner of the Estate we consider could have a broken view of the Project. In addition to invitations to the general community events including Open Days and Community Information sessions specific events were organised for this group including:

- 16 November 2020 - contacted the Executive Committee to arrange to meet and explain BCSF and hear concerns from residents.
- 25 November 2020 - PowerPoint presentation to Residential Estate Executive Committee. Committee also invited residents from the north end of the Estate. Presentation followed by Q&A.
- 13 February 2021 - Advise Executive Committee of SEARS.
- 12 May 2021 - Took photos of site from a house on southern end with a possible visual impact.
- 16 May 2021 - All interested residents were invited by the Executive Committee to a presentation by the BCSF team at the Estate community hall with updated information followed by Q&A. 12 residents attended. PowerPoint presentation presented to the residents. Aims of meeting were:
    - Recap on Project – including What we heard from you at the last meeting.
    - Develop ideas for investment in the community – share the financial benefits.
    - Encourage feedback from residents.
- 21 May 2021 - Provided updated information about the Project and CBSS for AGM plus information about governance of CBSS and glare study.
- May-Dec 2021 - Ongoing discussions regarding the CBSS.

Stakeholder Group 3

This group includes residences we consider could be impacted from 5-7km. The residences are sited along the low road on the opposite side of Weereewa / Lake Ngungara / Lake George. In addition to invitations to the general community events including Open Days and Community Information sessions specific events organised for this group included:

- 19 November 2020 - phone calls and texts to introduce the project and invite residents to a presentation and discussion.
- 23 November 2020 - PowerPoint presentation to this community followed by lengthy discussion / Q&A.
- 13 February 2021 - Advise of receipt of SEARS.
- April 2021 - Arranged visual imagery for several residents.
- 30 May 2021 - on site visit plus PowerPoint presentation and Q&A session.

- 29 June 2021 - provided further information about Project and CBSS for this stakeholder group plus information about governance and information about the development application process.
- 3 December 2021 - on-site visit and two hour discussion session at Open Day marquee.
- 20 December 2021 - provided feedback to a list of questions received as a result of a meeting held by this group of residents in late November and questions asked at 3 Dec site visit.

Following these events, two additional stakeholders (R84 & R77) have been identified. The proponent is currently consulting with them to ensure they understand the project location, details and approval process.

Stakeholder Group 4

This group includes specific residences we consider could be impacted about 6-7km from the Development footprint along two specific roads on top of the escarpment overlooking the wider valley and Lake George / Weereewa / Lake Ngungara. It will have varying degrees of visibility of the Project ranging from minimal to expansive view. In addition to invitations to the general community events including Open Days and Community Information sessions, specific events organised for this group include:

- November - December - door knocked to meet residents, introduce the Project and seek additional contacts.
- 13 February 2021 - Advised SEARS had been received.
- April 2021 - Arranged visual imagery for several residents.
- 29 May 2021 - on-site meeting and PowerPoint presentation, Q&A session with residents to hear concerns.
- August 2021 - follow up visual imagery meetings.
- July - Dec 2021 - ongoing emails and discussions regarding CBSS.

Representative bodies

QPRC Council were consulted as follows:

- 16-19 November 2020 - The founders emailed all QPRC Councillors to advise them of the Project and offered to meet.
- 10 December 2020 - The founders met with QPRC staff to present the Project and discuss concerns.
- 27 May 2021 - The founders presented to QPRC staff and outlined the BCSF Community Benefits Sharing Scheme, detailing the amount involved with identified stakeholder groups. Discussion on Voluntary Planning Agreement (VPA).
- 28 July 2021 - Founder Presented VPA to full QPRC Council and gave overview of project. Council adopted a recommendation to agree in principle with a planning agreement based on the BCSF presentation and authorised the CEO to continue negotiations.
- 16 August - Zoom meeting to confirm QPRC Council resolution.

- 23 August zoom meeting with CEO and staff of QPRC re VPA.

The founders consulted with the RFS:

- 16-18 November 2020 - Contacted Bungendore, Mount Fairy, and Taylor's Creek RFS Fire Captains and offered to organise a site visit. Emailed information pack on BCSF Project.
- November - January 2021 - Met individual Fire Captains on-site to discuss project and project concerns.

Community groups and representatives of the business community were consulted as follows:

- 22 November 2020 - Bungendore Climate Action Group met on property. Introduced project.
- 8 December 2020 - Phoned Bungendore Chamber of Commerce to introduce the BCSF project.
- 17 November 2020 - Contacted Tarago Progress Association to inform them of the BCSF project.

In addition, the founders of BCSF have spoken to the Chamber of Commerce and key local businesses that could potentially benefit from BCSF construction and operations. All expressed support in the Project (refer to Appendix D.3). A strategy will be developed to ensure the local community, wider community and Indigenous networks are aware of jobs and opportunities related to BCSF. This will include a Community information session to ensure the community fully understands the opportunities and local residents, businesses and services are able to register interest in being involved in or benefit from the project.

6.3.5 Key results and responses provided

The engagement process has been extensive, commencing in November 2020, steadily implementing activities taking into account Covid restrictions throughout the detailed environmental assessment and further refinement of the project.

The engagement and feedback has been most consistent from stakeholder Group 3. At 5–7km from the project, this group has consistently expressed a strong interest in the visual impacts of the project on the landscape character which is of very high value to this group.

The closer receivers (groups 1 and 2) have been more engaged around the CCBS and residence specific impacts and their mitigation.

Throughout the consultation process the project has evolved and been refined in consideration of community concerns and impacts. The Development footprint is now much smaller than the Development Site initially presented to the public. In addition, more specifics have been able to be developed around the type and effectiveness of mitigation strategies since around mid-2021.

The broader community has shown higher than anticipated levels of interest and general support around the contribution to renewable energy transition. Those who attended open days or the on-line community information sessions to discuss the project directly showing keen interest in the positive potential of the project.

Online Community Information Sessions

The online community information sessions were run during Covid lockdown and attracted 27 attendees mostly from the broader community as the landholders in stakeholder groups 1-4 had already been invited on-site and provided the BCSF details.

The results of a survey at the end of the session on 10 October showed respondents were interested to know more about:

- Agrisolar aspects of the Project 20.7% of respondents.
- Jobs and local economy 14.2% of respondents.
- Community Benefit Share Scheme 10.3% of respondents.
- Biodiversity studies 10.3% of respondents.
- I have enough information 10.3% of respondents.
- Location and visual aspects 10.3% of respondents.
- Renewable energy 6.8% of respondents.
- Glare 6.8% of respondents.
- Bushfires 6.8% of respondents.
- Archaeology & heritage 3. 5% of respondents.

Open Day Feedback summary

21 individuals attended the Open Days - 17 attendees filled in feedback forms (refer to Appendix D.3) and responded as follows to the key questions asked:

Question 1 What did you most like about Blind Creek Solar Farm? (most preferred responses only):

- 100% of respondents liked the fact the Project was renewable energy.
- 93% of respondents liked the fact the Project was Agri-solar.
- 87% of respondents liked the fact the Project was lead by local farmers.
- 69% of the respondents liked the Indigenous and cultural learning zone.

Question 2 Did you receive enough information today? 100% of respondents said they had received enough information at the Open Day.

Question 3 Do you have any concerns about Blind Creek Solar Farm? 100% of respondents said No.

Direct approaches to residents

The households and landholders up to 6.5km that we consider could be an impacted by the Project were provided with the private email address and personal phone number of the Founder as well as an open invitation to visit the site and to meet. They were also advised of the Project email address and website and invited to multiple on-site meetings. The founders have met or been in touch multiple times with all but three of the residents (two asked not to be contacted and one not able to be contacted). 28 residents with a visual or other verified impact have visited the Development site (some multiple times).

The key issues raised during these direct approaches are summarized in Table 6-2 below. The issues have been ranked in terms of how concerned residents were (low to high). The EIS has investigated these issues in detail to ensure all impacts have been identified and mitigated appropriately with regard to these specific concerns. The direct responses provided to residents in relation to key issues are provided, in Appendix M.1.

Table 6-2 Key issues raised by residents and where further detail is provided in the EIS

Level of concern	Issue raised	EIS Chapter where feedback is addressed
High	Location; Scale; Visual impacts; Glare; Land values; Lake George / Lake Ngungara / Weereewa; CBSS.	S 1.2.2; S 3.2; S 8.2; S 8.3; S 6.5 and S 2.3.3; S 9.5; S 4.7.
Medium	Screening; Use productive agricultural land.	S 8.2; S 2.3.3 & S 9.3.
Low	Bushfires; Substation; Trig Station, Ownership; Renewable Energy Zones; Energy Supply; Climate change.	S 9.8; S 8; S 9.6; S 1.2.1; S 2; S 2; S2.

6.3.6 How the consultation process has shaped the BCSF project

Community Benefit Sharing Scheme (CBSS)

A formalised Community Benefit Sharing Scheme (CBSS) has been developed for this project and is central to the BCSF engagement philosophy. The founders of BCSF live in the community and believe it is fair to share the financial benefits of the Project with their community.

Pending project approval, a Scheme will be established which will contribute $3.5m based on a 350MW Project (final contribution would be based on installed MW) over the lifetime of the Project to key Stakeholder Groups and the local community, including $1,235,000 to the Bungendore swimming pool. The theme of the CBSS is environmental sustainability, agricultural resilience and community building. Supported activities could include tree planting, stock water improvements, agricultural sustainability measures, solar panels, battery energy storage, weed management, bushfire mitigation, water tanks, etc. Equally beneficiaries can donate the money to a local community group and the Project is recommending the Bungendore Community Foundation. The guidelines for the CBSS stipulate that wherever possible the funds should be spent at local businesses, to further extend the financial benefits to the local community. The Proponent will provide a legal agreement to the recipients which binds BCSF to deliver on the CBSS.

It is noted that some stakeholders in Stakeholder Group 3 expressed concern that acceptance of funds from the CBSS would be viewed by the DPE as tacit consent to the project. The founder wishes to notify the community and DPE that this is not the case. All eligible stakeholders have been told they can accept the funds and still participate fully in the

Planning Approval Process. The legal agreements that would be entered into make it clear that there are no restrictions on participants, including if they wish to object to the Project. Participation in the CBSS does not place any restrictions on the participants. Participation does not constitute a form of 'negotiated agreement' to accept the impacts of the Project.

Additional initiatives

In addition to the CBSS, specific ideas raised during the consultation process have now been incorporated into how the project would be implemented. The following ideas have been adopted for the BCSF project, shown by the stakeholder group that raised the idea.

Table 6-3 Ideas adopted as a result of community input

Stakeholder Group	Ideas that arose during discussions with stakeholders	Outcome
Stakeholder Group 1	A stakeholder asked if The Bungendore Community Foundation could be considered in the CBSS.	The Bungendore Community Foundation has been recommended to residents who are part of the CBSS but would prefer to donate the funds to a charity. Eligible recipients of the CBSS who do not want to receive funds have been notified that BCSF will donate their funds to the Bungendore Community Foundation.
Stakeholder Group 1	Project footprint should be more organic in shape	This recommendation was agreed to however, the Project will, by virtue of existing topography and environmental constraints, be organic in shape.
Stakeholder Group 3	Tree planting along Butmaroo (Deep) Creek	Incorporated into landscape design.
Stakeholder Group 3	Tree planting on northern corner of the Project	Incorporated into the landscape design.
Stakeholder Group 3	Eliminate panels from the northern, elevated section.	Suggestion accommodated.
Stakeholder Group 3	Requested that we inform the Department that not all of the recipients of the CBSS approved of the Project.	Suggestion accommodated.
Stakeholder Groups	Stakeholder groups asked for CBSS	Project accommodated this request.

Stakeholder Group	Ideas that arose during discussions with stakeholders	Outcome
3&4	payments to be made to individuals with a potential view of the Project rather than a community project.	
QPRC Council	QPRC Council suggested funds be allocated to the Sports Hub in Bungendore.	The Proponent intends to accommodate this request through the VPA.
Wider community member	Locals prioritised for jobs and services.	The Proponent agrees to prioritise locals jobs and services wherever possible. The CBSS also states that participants are encouraged to spend the funds from the CBSS in town to ensure money flows back to the local community.

6.3.7 Future consultation activities planned for BCSF

BCSF will continue to engage with the wider community of Bungendore and stakeholder groups during all stages of the project development. Neighbours, stakeholders and agencies will be regularly informed of any milestones including the exhibition period and open day. The Project founders will continue to be involved and available to stakeholders and the community for feedback and input into the Project. The website will be maintained with up to date information (refer to Appendix D.2).

Exhibition

During the Exhibition Period the public will be able to view the EIS and associated specialist studies and make formal submissions on the proposal. Issues raised in submissions will be addressed by BCSF in a Response to Submission report. Any issues raised by the community will be addressed during this period. BCSF will host an on-site community drop-in information session over a weekend. This event will enable the community to view the Project on-site, ask questions and provide feedback. Notice of this session will be widely publicised to ensure maximum attendance from the wider community and stakeholders.

Pre-construction phase

Pending project approval, a community consultation will continue to be implemented to manage any concerns of stakeholders and impacts on landholders. This will include:

- Liaison with QPRC Council
- Develop the following protocols:
  - Protocols to keep the community and stakeholders informed about the progress of the project.

  - Protocols to inform relevant stakeholders of potential impacts of construction activities.
  - Protocols to allow the community to make complaints or identify any concerns with the project.

As part of the pre-construction phase, consultation to maximise local employment benefits would be undertaken. The founders are familiar with the local businesses and service providers and will work with the proponent to develop a strategy to ensure the local community, wider community and Aboriginal networks are aware of jobs and opportunities related to BCSF. This will include a Community Information Session to ensure the community fully understands the opportunities and to encourage local residents, businesses and services to register interest in being involved in or benefit from the project.

Construction phase

During construction of the project, the CSES will be implemented to manage the concerns of stakeholders and any impacts on local landowners. The plan will include but not be limited to protocols to provide updated information regarding the project, including information regarding the Project's program and proposed construction activities, potential impacts to nearby residents and potential changes to local traffic conditions, the complaint process, and communication channels.

Operation phase

During operation of the Project, the CSES will be implemented to manage the concerns of stakeholders and any impacts on local landowners. The plan will include (but not be limited to) the following:

- Protocols to keep the community and stakeholders updated about the operation of the project and its benefits.
- Protocols to inform relevant stakeholders of potential impacts of scheduled site activities outside of typical operation.
- Protocols to allow the community to make complaints or identify any concerns with the project.
- Protocols for managing complaints, queries and feedback in a timely manner.
- Protocols to keep the community and stakeholders updated about the operation of the project and its benefits.

Information on how local workers, contractors or service providers can express an interest in the operation of the project will be displayed on the project website. Efforts will be made to engage with local schools, universities and community groups who may be interested in visiting the site or learning more about renewable energy.

7. Impact assessment

7.1 Required flexibility built into assessment approach

As set out in Section 3.2, in detailing areas that would be impacted by the Blind Creek Solar Farm (Development footprint) and setting out the required infrastructure components (including sizes, quantities and construction methodologies), a conservative or upper limit has been presented.

This concept follows through into the impact assessment approach adopted for the project. The worst-case impact footprint and infrastructure parameters has been assessed in the following chapters ensures that:

- All impacts that may result from the project have been identified and assessed.
- The risks and impacts presented may be higher (an overestimate) compared to actual impacts that will result from the project.
- The mitigation strategies committed to for their management will be robust to any minor changes required.

This 'worst-case' assessment approach ensures there is flexibility for the detailed design, construction and operation of the Project. This approach will allow innovation and efficiencies to be achieved as the Project progresses, subject to approval. It will minimise the need for modifications to the development consent during this process.

The key issues below are those identified in the Scoping Report (NGH, 2021) and SEARs as requiring more detailed investigation:

- Visual amenity.
- Biodiversity.
- Aboriginal heritage.
- Hydrology and flooding.
- Noise and vibration.

For each key issue, the approach (usually by specialist assessment), the existing environment, an assessment of construction and operational impacts and recommendations considered to be required to manage each impact is detailed. The management recommendations form commitments of the project, pending project approval, and are summarised in Section 10.

The remaining issues, assessed generally by desktop assessment and have been verified to be highly manageable, are set out more briefly in Section 9. Where required, management recommendations for these issues are also included in Section 10.

8. Assessment of key issues

8.1 Visual amenity

A Landscape Visual Impact Assessment (LVIA) was undertaken by Moir Landscape Architecture Pty Ltd (Appendix E). The LVIA provides a full assessment of the visual impacts associated with the Project, including:

- Landscape character and scenic vistas in the locality.
- Stakeholder values regarding visual amenity.
- Potential impacts on representative viewpoints, including residences and road corridors.

The purpose of the LVIA was to identify the nature and degree of visual change that would be introduced into the landscape by the Project, assess whether it is an adverse or beneficial change, evaluate its significance and recommend mitigation measures where appropriate. For the purposes of this assessment, references made to the 'VIA Study Area' is generally defined as the land up to 2km from the Development footprint.

8.1.1 Approach

The LVIA identifies and determines the landscape character, key landscape features and sensitivity of viewers. The potential visual impact of the Project is then assessed based on the relationship between the visual sensitivity and visual magnitude. The assessment was undertaken as follows:

- Objective assessment of the relative aesthetic value of the landscape; defined as visual quality and expressed as high, medium or low. This assessment generally relates to variety, uniqueness, prominence and naturalness of the landform, vegetation and water forms within each character type.
- Determination of the landscape sensitivity and its ability to absorb different types of development on the basis of physical and environmental character.
- An assessment of viewer sensitivity to change. This includes how different groups of people view the landscape (for example, a resident as opposed to a tourist), and how many people are viewing the Project and from how far away.
- Viewpoint analysis to identify areas likely to be affected by development of the site and a photographic survey using a digital camera and a handheld GPS unit to record position and altitude.
- Preparation of photomontages depicting the Project.
- Assessment of visual impacts. Suggestions are made for suitable development patterns that would maintain the area's visual quality.

Assessment method

Visual sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different areas. The assessment is based on the number of people affected, land use, and the distance of the viewer from the Project (EDAW, 2000). Sensitivity ratings are defined as high, moderate or low and are shown in Table 8-1 below.

Table 8-1 Visual sensitivity rating

Land use	Distance from Development Footprint				
	0 - 1km	1 - 2km	2 - 4.5km	4–5 - 7km	> 7km
Township	High	High	High	Moderate	Low
Recreational Reserve	High	High	High	Moderate	Low
Homestead	High	High	High	Moderate	Low
Rural Township	High	High	Moderate	Low	Nil
Main Highway	Moderate	Moderate	Low	Low	Nil-Low
Local Road	Moderate	Moderate	Low	Low	Nil-Low
Farm Road	Low	Low	Nil-Low	Nil-Low	Nil
Agricultural Land	Low	Low	Nil-Low	Nil-Low	Nil

Visual magnitude

Visual magnitude refers to the extent of change that will be experienced by receptors. Factors that are considered when assessing the magnitude of change include:

- The proportion of the view / landscape affected.
- Extent of the area over which the change occurs.
- The size and scale of the change.
- The rate and duration of the change.
- The level of contrast and compatibility.

Source: (AILA, 2018)

Visual impact

Visual impact is the combined effect of visual sensitivity and visual magnitude. Various combinations of visual sensitivity and visual magnitude would result in high, moderate and low overall visual impacts as suggested in Table 8-2 (URBIS, 2009).

Table 8-2 Visual impact rating

Visual sensitivity	Visual magnitude			
	High	**Moderate**	**Low**	**Negligible**
High	High	High-moderate	Moderate	Negligible
Moderate	High-moderate	Moderate	Moderate-low	Negligible
Low	Moderate	Moderate-low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Zone of visual influence

The Zone of Visual Influence (ZVI) represents the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM). The ZVI is a desktop tool intended to make the fieldwork more efficient by clearly excluding areas that are screened by topography. Considerable field assessment is then undertaken predominantly within the areas where potential for impact exists. Figure 8-1 illustrates that sensitive receivers within the VIA Study Area would have 75-100% potential visibility towards the Project. In reality the zone of visibility of the Blind Creek Solar Farm is far less than that shown in the ZVI Map.

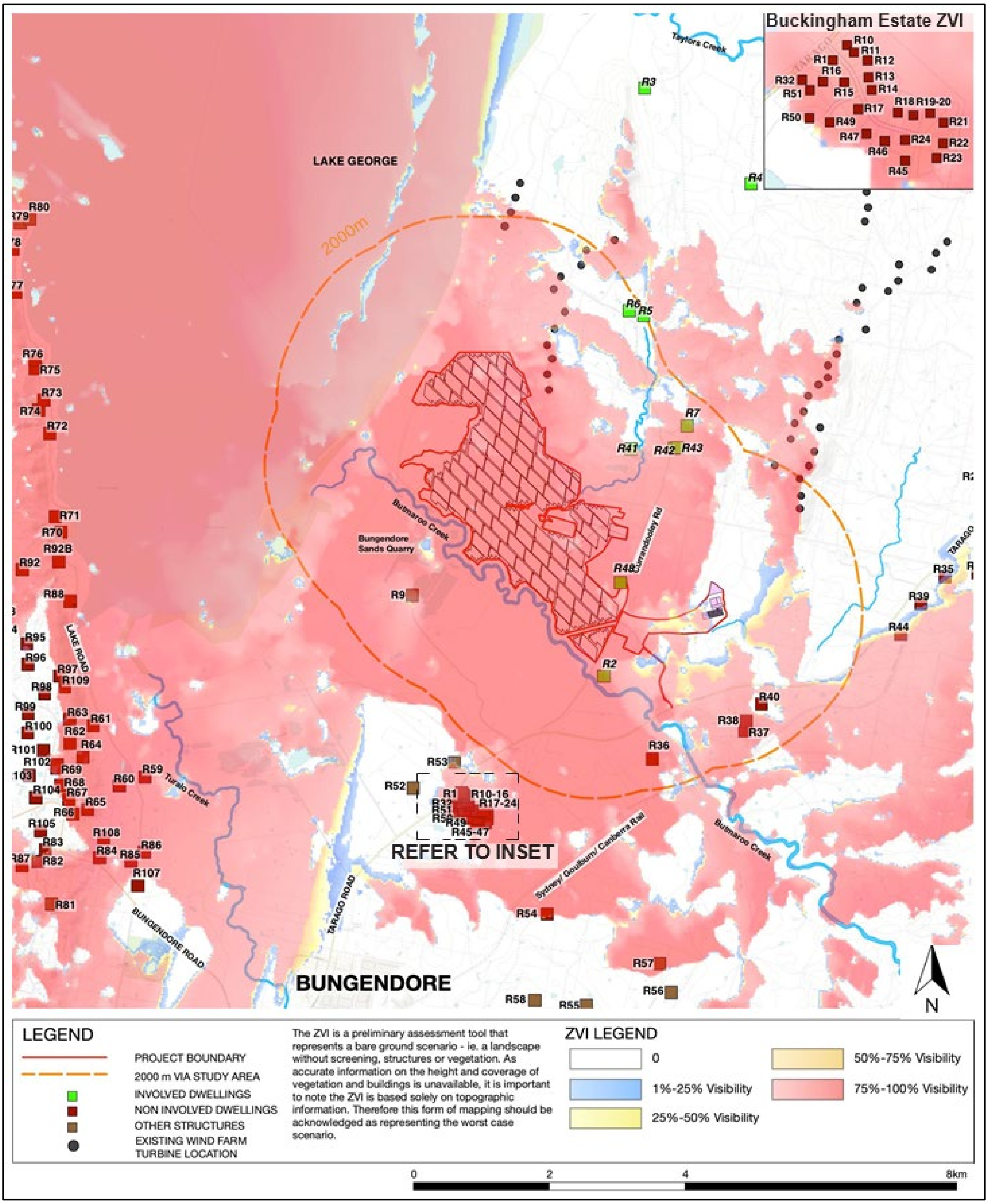


Figure 8-1 Zone of visual influence map (vegetation ignored).

8.1.2 Existing Environment

General landscape attributes have been described in section 4.1.1. Landscape characteristics that are pertinent to the LVIA include:

- **Infrastructure**: The Development site is in close proximity to Iberdrola Australia’s operational Capital Wind Farm with approximately 280m distance to the closest turbine towards the North. Part of the proposed Capital 2 Wind Farm project also occupies part of the land within the Development site. If approved, the host landowners will revoke the nine approved turbines within the Development site.
- **Vegetation**: Most of the Development site has been cleared of native vegetation (see Figure 8-2). Pockets of mature vegetation are visible predominantly outside the Development site on the eastern edge. A cluster of snow gum woodland (Eucalyptus pauciflora) is within the Development site and will be retained. Elm trees (non-native) are found in several locations within the Development site and will also be retained.
- **Topography**: The Subject land is generally flat, bordered by undulating hills with some granite outcrops. Site elevation ranges from approximately 670m to 720m. Surrounding areas rise up to form elevated undulating ridges to an elevation of 870m overlooking the Development site. Capital Wind Farm is on higher elevation, approximately 740-870m, and overlooks the Development site (see Figure 8-3). Several dwellings are located on higher elevation overlooking the Development site to the south and southwest, and to the northeast of the Project. The closest of these, to the north, are associated residences.

Figure 8-2 Existing land use visible in the background

Figure 8-3 Typical landscape character of the Study Area visible from higher ground approximately 6.4km south of the Development site

8.1.3 Potential impacts

Viewpoint analysis

Based on the results of the ZVI analysis, topographical maps, field work observations, landscape character and the popularity of vantage points 19 viewpoints, have been selected to be representative of the range of views surrounding the VIA Study Area, refer to Figure 8-4. The general viewing direction of each viewpoint is identified in the figures in Section 6 of the LVIA report provided in Appendix E.

It is important to note that all viewpoints for this study have been taken from accessible public land (typically gates, walking tracks, roads, recreation reserves and lookouts) and residential dwellings (with permission from landowners) which were identified as having a potentially high visual impact through the desktop review process.

Table 8-3 below evaluates the potential visual impact based on visual sensitivity and magnitude. Of the 19 viewpoints assessed as part of this LVIA, nine (9) received a visual impact rating of 'Negligible', four (4) were rated as 'Low', five (5) of the viewpoints were rated as 'Moderate-Low', and one (1) of the viewpoints was rated as 'Moderate' (being a viewpoint with no receiver). Generally, there are very limited opportunities to view the Project. The viewpoints which were rated as having potential views to the Development site were taken within close proximity of the Project or located on higher elevation than the Development site where there was an absence of existing vegetation to screen views to the Project.

Two (2) photomontages are provided Figure 8-5 and Figure 8-6. These photomontages represent the viewpoints determined to have the greatest potential for visibility of the Project and the highest visual impact for a non – associated receiver located beyond the 2km buffer of the Development footprint.

A third photomontage, Figure 8-7, represents the viewpoint from the closest non-associated receivers within 2km of the Development footprint. The visual impact rating at this viewpoint VP04 is negligible.

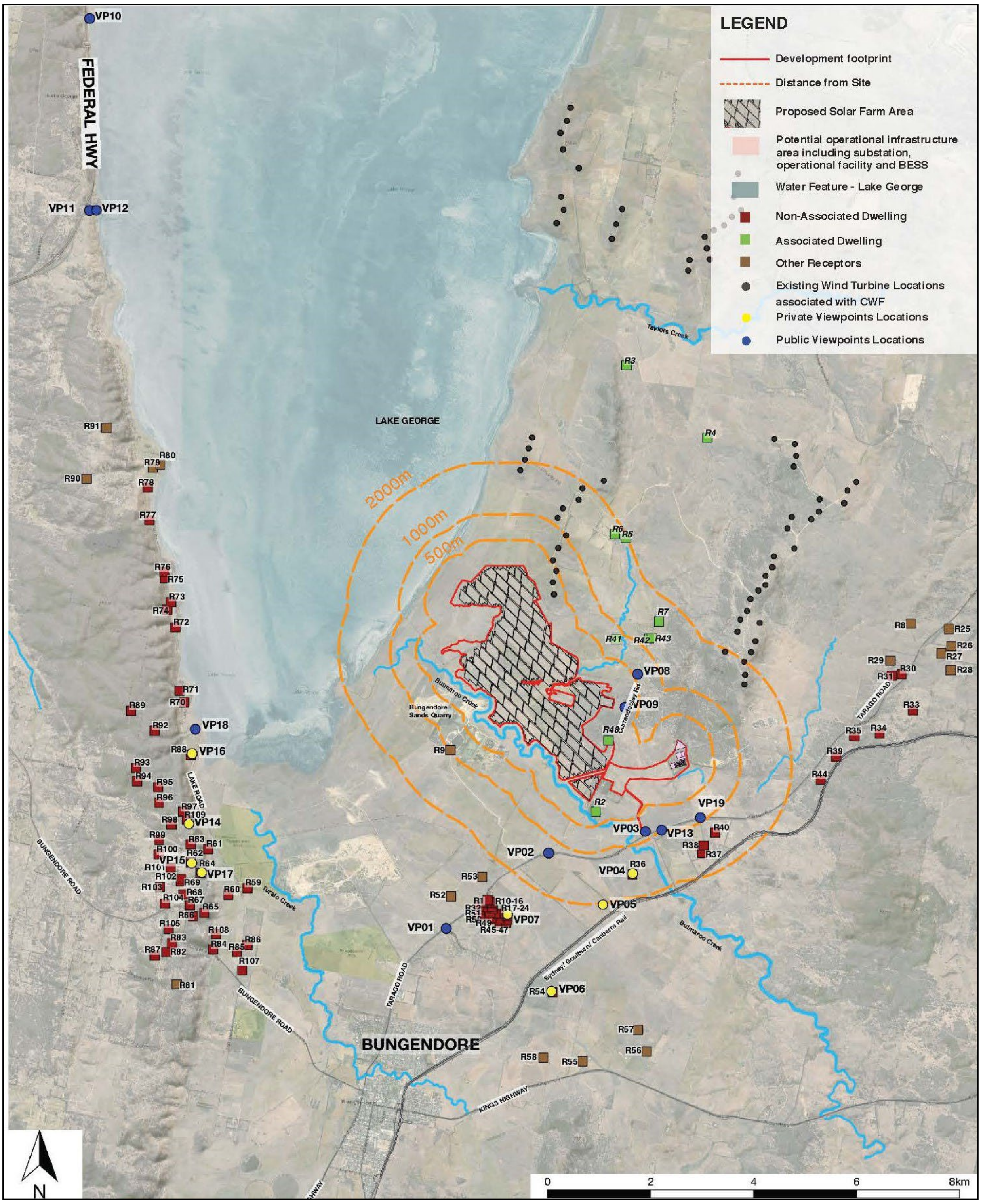


Figure 8-4 Viewpoint assessment locations

Table 8-3 Viewpoint analysis

Viewpoint	Location	Visual sensitivity	Visual impact	Potential Visual Impact
VP01	Tarago Road	Moderate	Negligible	Negligible
VP02	Currandooley Road	Moderate	Low	Low
VP03	Off Tarago Road	Moderate	Moderate	Moderate
VP04	800 Tarago Road	High	Negligible	Negligible
VP05	656 Tarago Road	Low	Negligible	Negligible
VP06	4586 Kings Hwy	Low	Low	Low
VP07	55 Hope Drive	Low	Low	Low
VP08	Currandooley Road	Low	Moderate	Moderate-low
VP09	Currandooley Road	Low	Moderate	Moderate-low
VP10	Federal Hwy	Negligible	Negligible	Negligible
VP11	Federal Hwy	Negligible	Negligible	Negligible
VP12	Federal Hwy	Negligible	Negligible	Negligible
VP13	866 Tarago Road	Negligible	Negligible	Negligible
VP14	152 The Forest Road	Moderate	Low	Moderate-low
VP15	92 The Forest Road	Moderate	Low	Low
VP16	449 Lake Road	Moderate	Low	Moderate-low
VP17	68 The Forest Road	Low	Low	Moderate-low
VP18	Lake Road	Low	Negligible	Negligible
VP22	Tarago Road	Negligible	Negligible	Negligible

Photomontage 01 (Viewpoint VP14)

180º Proposed View

180º Proposed View with mitigation

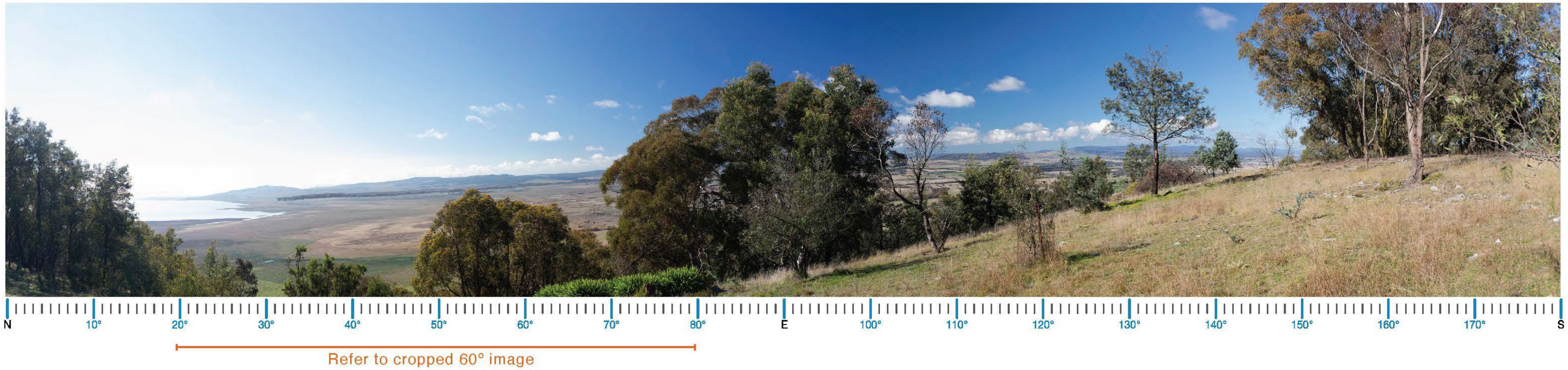


Figure 8-5 Photomontage 1 VP14

Photomontage 02 (Viewpoint VP16)

180° Proposed View

180° Proposed View with mitigation

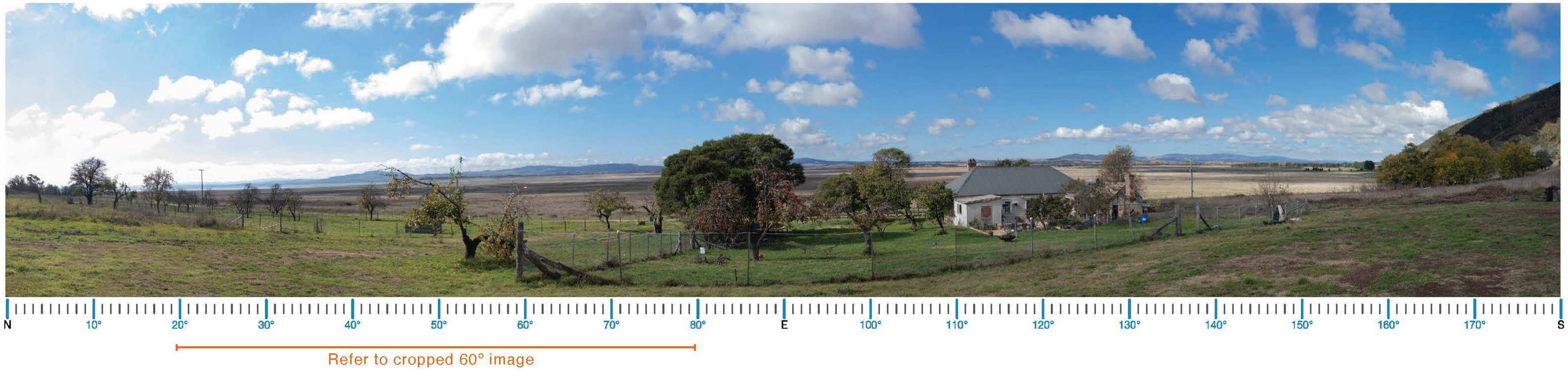


Figure 8-6 Photomontage 2 VP16

Photomontage 03 (Viewpoint VP04)

180º Existing View

180º Proposed View

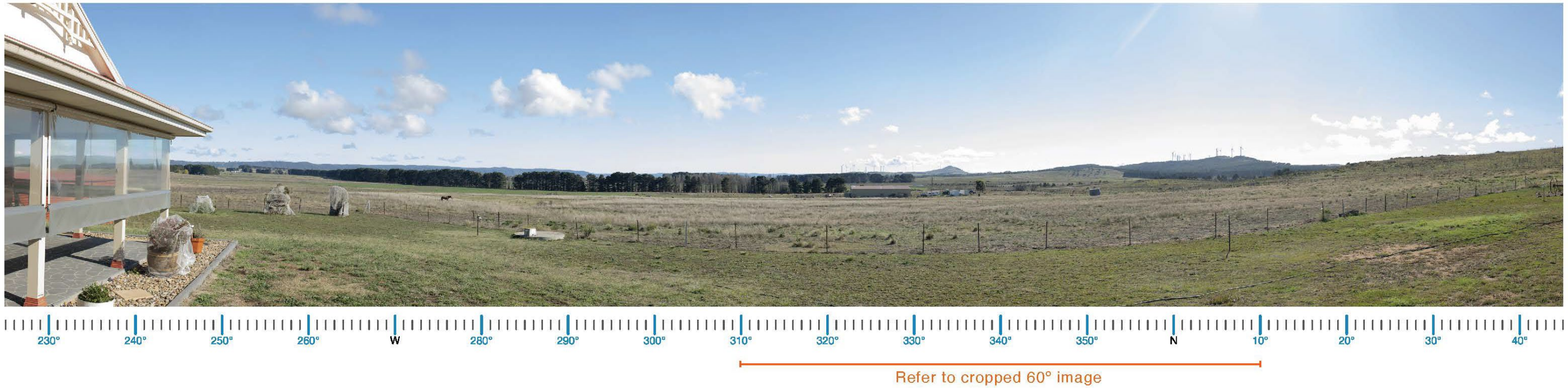


Figure 8-7 Photomontage 3 VP04

Visual impact from public land

Overall, the Project will result in minor modifications to the existing visual landscape. Due to the relatively small vertical scale of the solar arrays, existing landscape features including roadside vegetation and topography screen the Project from the majority of locations within the Study Area.

There is no publicly accessible land within proximity to the Development site, as such, there aren't any publicly accessible viewing locations within proximity to Development site. Roadside vegetation along Tarago Road and direction of travel along this road would limit opportunities to view the Project from the road. Fleeting views of the Development site may be available along the existing cleared transmission line easement when travelling in a north direction along Tarago Road.

Due to the existing land use of grazing and modified pasture, land is largely cleared of vegetation, and proposed tree clearing for the Project is limited to dying or dead pine trees planted for wind break. As such, within the context of the broader landscape this activity would have a minimal visual impact.

Following completion of construction, new built elements and increased linear and vertical intrusions will be visible throughout the landscape. Until the mitigation methods have been established, views of the Development site, although limited, will appear inconsistent with the surrounding landscape character.

The site will use agricultural-style approximately 1m high perimeter fencing, which is less visible than chain link security fencing. The switchyard, 330kV substation and O&M facilities would be enclosed by a higher security fence to prevent human intrusion on high security grid assets.

Upon decommissioning the visual landscape has the capacity to return to the current state.

Visual impact for dwellings within 2km of the Development footprint

The highest potential visual impact is likely to be experienced from dwellings within close proximity to the Development footprint. The assessment identified a total of 12 dwellings located within 2km of the Development footprint. Eight (8) of these dwellings are associated residences and only four (4) are non-associated (R36, R37, R38, R40). These receivers would not be visually impacted by the Project, due to existing vegetation screening, and recent planting of at least 5,000 trees between 2013 and 2020, that will provide significant further visual screening to receivers R36-R40 and the view from Tarago Road directly to the east. Refer to Figure 8-8.

Visual impact for dwellings greater than 2km from the Development footprint

The visual impact of the Project on the residences in the Estate (Hope Drive) would be negligible to nil visual.

Dwellings along Forest Road in Bywong (6-7km west of the Project), are elevated and would perceive the majority of the Project (Visible in Photomontage 01 and 03). However, the magnitude of the impact would be negligible. With the implementation of vegetation screening as shown in Figure 8-8, the visual impact would be further reduced.

Night lighting

Due to the relatively isolated location of the Project, very few existing sources of light (e.g., dwelling and vehicle lights) are currently present in the night-time landscape of the Study Area. As such, isolated receptors within the Study Area experience a dark night sky with minimal light.

Night lighting around the buildings and in the high voltage substation will be installed to comply with Australian/New Zealand *Standard AS/NZS 4282:2019 – Control of Obtrusive Effects of Outdoor Lighting*, or its latest version, but will only be used for maintenance and emergency purposes. Task lighting will be installed at PCUs. Lighting will be able to be remotely controlled as required.

The impact of night lighting is unlikely to be experienced from inside a dwelling as internal lights reflect on windows and limit views to the exterior at night-time.

The proposed ancillary infrastructure has been carefully sited to minimise visibility from existing residences and publicly accessible viewpoints. As such, it is unlikely the proposed night lighting would create a noticeable impact on the existing night-time landscape.

Assessment of associated infrastructure

The proposed substation and BESS location are all situated at the eastern end of the Development footprint, in an isolated location, with existing rows of mature pine trees screening views from the south. The existing 330kV transmission line is immediately to the north of this area. The nominal height of the substation infrastructure would be less than 10m high, with the possible exception of the point for the cut in on the existing 330kV transmission line. With the implementation of the mitigation methods outlined in Section 8.1.4 the visual impact will be negligible.

Transmission lines, power poles and communication towers feature in the existing landscape and form part of the existing landscape character of the area. The Project would require MV electrical reticulation to connect the solar farm inverter stations to the substation. The majority of such cabling would be underground and as such its visual impact would be negligible. Overhead reticulation is proposed next to the BESS and substation, as this area is already screened by existing rows of mature pines, the visual impact would be minor.

Existing private access roads would be used to access the Project and ancillary areas. These roads are used by the existing dwellings and quarries in the immediate surrounds and some are already suitable for construction and operation traffic. Upgrading and widening of some sections of these existing roads and creation of new sections will be required in some places. Minor maintenance and upgrade of the intersection at Tarago Road would be required. These works would occur within the existing cleared road corridor and would not add any vertical elements or intrusions. Furthermore, no vegetation clearing would be required. As such no visual impact would occur.

Facilities for the operation of the Project include an O&M facility, staff office, amenities, storage facilities, workshops and car parking facilities. These facilities would be adjacent to the substation and would therefore be screened by the above-mentioned existing rows of planted pines. The appearance of the O&M facility buildings would be designed to be consistent with existing farm structures within the landscape, where possible.

Table 8-4 Overview of non-associated dwellings

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
Non-associated dwellings within 2000m of the Development site						
R36	800 Tarago Road Lake George	1651m	The project is located north west of this dwelling. Majority of the proposed development will likely be contained by roadside vegetation along Tarago road. Planting of 5000 native trees between 2018 - 2020 will also assist in filtering the views.	**Negligible**	**Not Required**	**Negligible**
R37	866 Tarago Road Lake George	1719m	The project is located north west of this dwelling. Majority of the proposed development will likely be hidden by surrounding vegetation associated with this dwelling	Nil	Not Required	Nil
R38	866 Tarago Road Lake George	1446m	The project is located north west of this dwelling. Majority of the proposed development will likely be hidden by surrounding vegetation associated with this dwelling and roadside vegetation along Tarago road	Nil	Not Required	Nil
R40	996 Tarago Road Lake George	1326m	The project is located to the north west of this dwelling. A low rise in the topography and surrounding vegetation will screen the views to the project from this dwelling.	Nil	Not Required	Nil

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
Non-associated dwellings within 2000m of the Study area (Hope Drive Cluster)						
R1	6 Hope Drive Bungendore	2840 m	The project is located north of this dwelling. Majority of the project will be hidden behind a low rise in topography. Surrounding vegetation and other dwellings make indiscernible from this dwelling	Nil	Not Required	Nil
R10	7 Hope Drive Bungendore	2762 m	The project is located north of this dwelling. Majority of the project will be hidden behind a low rise in topography. Surrounding and roadside vegetation along Tarago road will fragment views of the Development from this dwelling.	Nil	Not Required	Nil
R11	11 Hope Drive Bungendore	2751 m	The project is located north of this dwelling. Majority of the project will be hidden behind a low rise in topography. Surrounding vegetation will fragment views of the project from this dwelling.	**Negligible**	**Not Required**	**Negligible**
R12	13 Hope Drive Bungendore	2741 m	The project is located north of this dwelling. Majority of the project will be hidden behind the undulating topography. Surrounding vegetation will fragment views of the project from this dwelling. Fleeting views of the project will be visible to the northeast	**Negligible**	**Proposed planting along the south-western edge of the**	**Nil**

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
			of this dwelling.		**Development site**	
R13	21 Hope Drive Bungendore	2792 m	The project is located north of this dwelling. Majority of the project will be hidden behind the undulating topography. Surrounding vegetation will fragment Views of the project from this dwelling.	**Negligible**	**Not Required**	**Negligible**
R14	23 Hope Drive Bungendore	2831 m	The project is located north of this dwelling. Majority of the project will be hidden behind the dense surrounding vegetation of this dwelling.	Nil	Not Required	Nil
R15	2 Duncan Avenue Bungendore	2873m	The Project is located north of this dwelling. Majority of the Project will be hidden behind the undulating topography. Surrounding vegetation will minimise views of the Project from this dwelling.	Nil	Not Required	Nil
R16	10 Duncan Avenue Bungendore	2927m	The Project is located north of this dwelling. Due to the dense surrounding vegetation associated with this dwelling, views of the Project will be limited.	Nil	Not Required	Nil

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
R17	3 Duncan Avenue Bungendore	2917m	The Project is located north of this dwelling. Due to the dense surrounding vegetation associated with this dwelling, views of the Project will be limited.	Nil	Not Required	Nil
R18	43 Hope Drive Bungendore	2882m	The project is located north of this dwelling. Surrounding vegetation will fragment views of the project from this dwelling.	Nil	Not Required	Nil
R19	45 Hope Drive Bungendore	2786m	The Project is located north of this dwelling. Majority of the Project will be hidden behind the dense surrounding vegetation of this dwelling.	Nil	Not Required	Nil
R20	53 Hope Drive Bungendore	2741m	The Project is located north of this dwelling. Views to majority of the project will be fragmented by vegetation to the north of this dwelling. The project will be discernible mostly towards the east of this dwelling.	**Low - Moderate**	**Perimeter barrier north of the property**	**Nil**
R21	55 Hope Drive Bungendore	2739m	The Project is located north of this dwelling. Majority of the project will be concealed by vegetation	**Negligible**	**Proposed planting along the south-**	**Negligible**

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
			associated with adjoining dwellings. Scattered row of trees to the north will filter views of the Project.		**western edge of the Development site**	
R22	56 Hope Drive Bungendore	2808m	The Project is located north of this dwelling. The dense surrounding vegetation will make the Project indiscernible from this dwelling.	Nil	Not Required	Nil
R23	54 Hope Drive Bungendore	2877m	The Project is located north of this dwelling. Due to the dense surrounding vegetation associated with adjoining properties views to the Project will be restricted from this dwelling.	Nil	Not Required	Nil
R24	48 Hope Drive Bungendore	2887m	The Project is located north of this dwelling. Due to the dense surrounding vegetation views to the Project will be filtered from this dwelling.	Nil	Not Required	Nil
R32	12 Duncan Avenue Bungendore	2979m	The Project is located north of this dwelling. Majority views of the Project will be contained by the dense surrounding and roadside vegetation in close proximity to this dwelling.	Nil	Not Required	Nil

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
R45	42 Hope Drive Bungendore	2960m	The Project is located north of this dwelling. Majority of the views to the Project will be restricted by vegetation and buildings associated with the adjacent dwellings (R24).	Nil	Not Required	Nil
R46	40 Hope Drive Bungendore	2936m	The Project is located north of this dwelling. Majority of the views to the Project will be contained by vegetation and structures associated with the dwelling opposite Hope Drive (R18).	Nil	Not Required	Nil
R47	34 Hope Drive Bungendore	2966m	The Project is located north of this dwelling. Due to the dense surrounding vegetation associated with this dwelling, views of the Project will be limited.	Nil	Not Required	Nil
R49	17 Duncan Avenue Bungendore	3025m	The Project is located north of this dwelling. Majority of the Project will be hidden behind the undulating topography. Surrounding vegetation will limit views of the Project from this dwelling.	Nil	Not Required	Nil

Dwelling	Location	Distance to Development footprint	Visual Assessment	Visual Impact Rating	Recommended mitigation measures	Visual Impact Rating post mitigation
R50	16 Duncan Avenue Bungendore	3070m	The Project is located north of this dwelling. Due to the dense surrounding vegetation associated with this dwelling, views towards the Project will be contained.	Nil	Not Required	Nil
R51	14 Duncan Avenue Bungendore	2984	The Project is located north of this dwelling. Due to the dense surrounding vegetation associated with this dwelling, views of the Project will be limited.	Nil	Not Required	Nil
R92B	519 Lake Road Lake George	5558 m	The Project lies east of this dwelling. This is a newly constructed dwelling with views of Lake George. The Project will have very low visual impact on the dwelling due to the distance of the Project.	**Negligible**	**Proposed planting along Butmaroo Creek will limit visual impact from the Project**	**Nil**

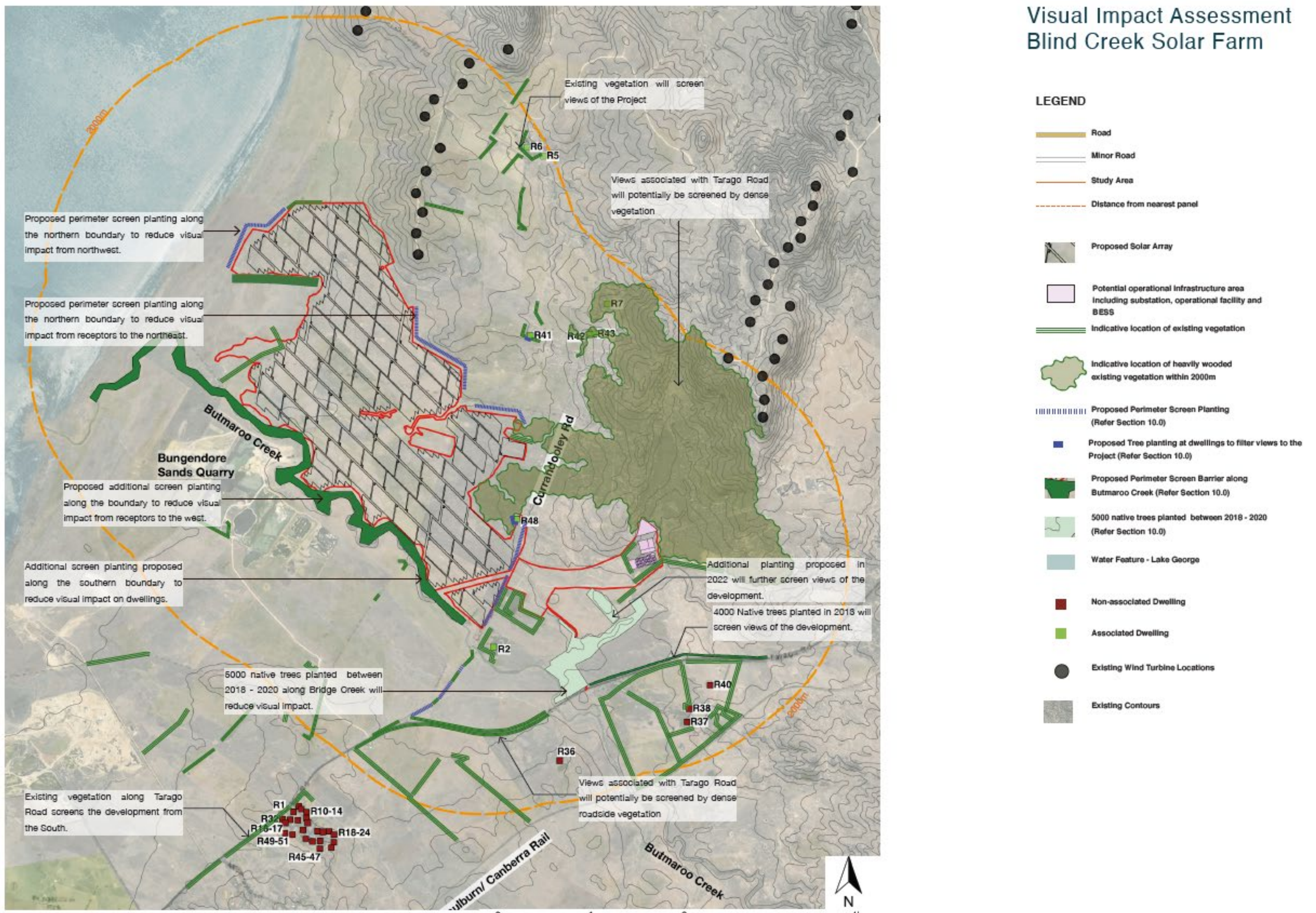


Figure 7 Visual Impact Assessment (Map source: Six Maps)

Figure 8-8 Visual Impact and proposed vegetation screening

8.1.4 Mitigation measures

No.	Mitigation measures	Phase
V1	A Landscape Management Plan (LMP) is recommended to address the 'as built' visual impacts of the proposed solar farm. The plan should include: • On-site vegetation screening generally in accordance with Figure 8-8. This would include details of selected species aimed at 'breaking up' not blocking views of onsite infrastructure. • Vegetation screening along Butmaroo would avoid Archaeological and ecological sensitive areas. Consultation with the RAPS will be undertaken to inform the location of this vegetation screening. • Location of planting locations, generally expected to be between the security fencing and the property boundary. • Band width, generally expected to be approximately 6m with three (3) rows of vegetation in high visual impact areas and two (2) rows in low / moderate visual impact areas • Maintenance schedule for a period of 24 months. Maintenance should generally include the removal of weeds and replacement of dead or non-performing plants The plan would be implemented nearing completion of construction and would be subject to agreement with the relevant landowner.	Design Construction
V2	To ensure that the screen planting integrates into the existing landscape character, the bands will be planted with fast growing small trees and bushes, and low-lying vegetation to ensure a naturalistic effect whilst providing habitat and movement corridors for the native fauna.	Design
V3	Consult with landowners where landscaping has been proposed, in order to receive their feedback and adjust the mitigation measures accordingly.	Design
V4	Plantings from the following species will be selected, as they match the Plant community type generally present at the site: • *Eucalyptus pauciflora* 12m • *Eucalyptus mannifera* 10-20m • *Eucalyptus viminalis* 50m • *Eucalyptus stellulata* 15m • *Casuarina cunninghamiana* 10-15m	Design

No.	Mitigation measures	Phase
	• *Cassinia aculeata* 1.0-2.6m • *Hakea laurina* 5m • *Dodonea viscosa subsiata* 2m	
V5	Consideration will be given to the colours, type and height of the PCUs, the battery facility, O&M facility buildings and storage shed to ensure minimal contrast and to help blend into the surrounding landscape to the extent practicable.	Design
V6	Existing vegetation generally present around the site, and specifically to the eastern and southern boundary will be mostly retained and protected to maintain the existing level of screening.	Design Construction
V7	External lighting would be installed to comply with Australian/New Zealand Standard AS/NZS 4282:2019 – Control of Obtrusive Effects of Outdoor Lighting, or its latest version. All external operational lighting would be low intensity lighting (except where required for safety or emergency purposes) and would not shine above the horizontal	Design Operation

8.2 Reflective glare

This section summarises the specialist Reflective Glare Assessment (Glare Assessment) prepared by SLR Consulting Australia Pty Ltd (SLR), refer to Appendix F for the full version of the report. The specialist assessment has considered the operational impacts from daytime reflective glare, in relation to the PV modules mounted on single axis trackers.

8.2.1 Approach

The following potential glare conditions have been considered in this assessment:

- Daytime Reflective glare (and glint) arising from the solar PV panels within the facility:
  - Aviation Sector Reflective Glare
  - Motorist and Rail Operator "Disability" and Pedestrian "Discomfort" Reflective Glare
  - Industrial Machinery Operator "Disability" Reflective Glare
  - Residential "Nuisance" Glare.
- Night-time illumination glare for operational security or maintenance lighting that may be required in the event of emergencies or incident response.

Glare acceptability criteria

Criteria to evaluate the impact of glare on identified receivers is discussed in detail in the Glare Assessment. The criteria considered include:

- **Aviation Sector Reflective Glare.** The assessment has implemented the US Federal Aviation Authority (FAA) Technical Guidance Policy in 2010 (updated in 2028) and a subsequent (and over-riding) Interim Policy in 2013, and the SGHAT software for measuring the potential ocular impact of any proposed solar Project on a federally obligated airport.
- "Glare and Pedestrian "Discomfort" Glare. Threshold Increment (TI) Value of reflection criteria commonly used by Australian Local Government Authorities to assess the acceptability or otherwise of potential adverse **Motorist "Disability** reflections from glazed systems onto surrounding roadways and pedestrian crossings.
- **Rail Operators Reflective Glare**. Australian Rail Authorities guidelines covering glare.
- **Residential "Nuisance" Glare**. Pedestrian Discomfort Glare criteria in the absence of Australian national or state guideline in Australia governing the acceptability of residential nuisance glare for solar PV.
- **Industrial Critical Machinery Operations**. Traffic Disability Glare criteria in the absence of Australian national or state guidelines governing the acceptability of reflective glare for industrial sites.

- **Night-Time Illumination Glare**. Australian Standard AS 4282-2019 governs the effect of light spill from outdoor lighting impacting on residents, transport users, transport signalling systems and astronomical observations.

The Study area has been divided into 6 ID areas as shown in Figure 8-9.

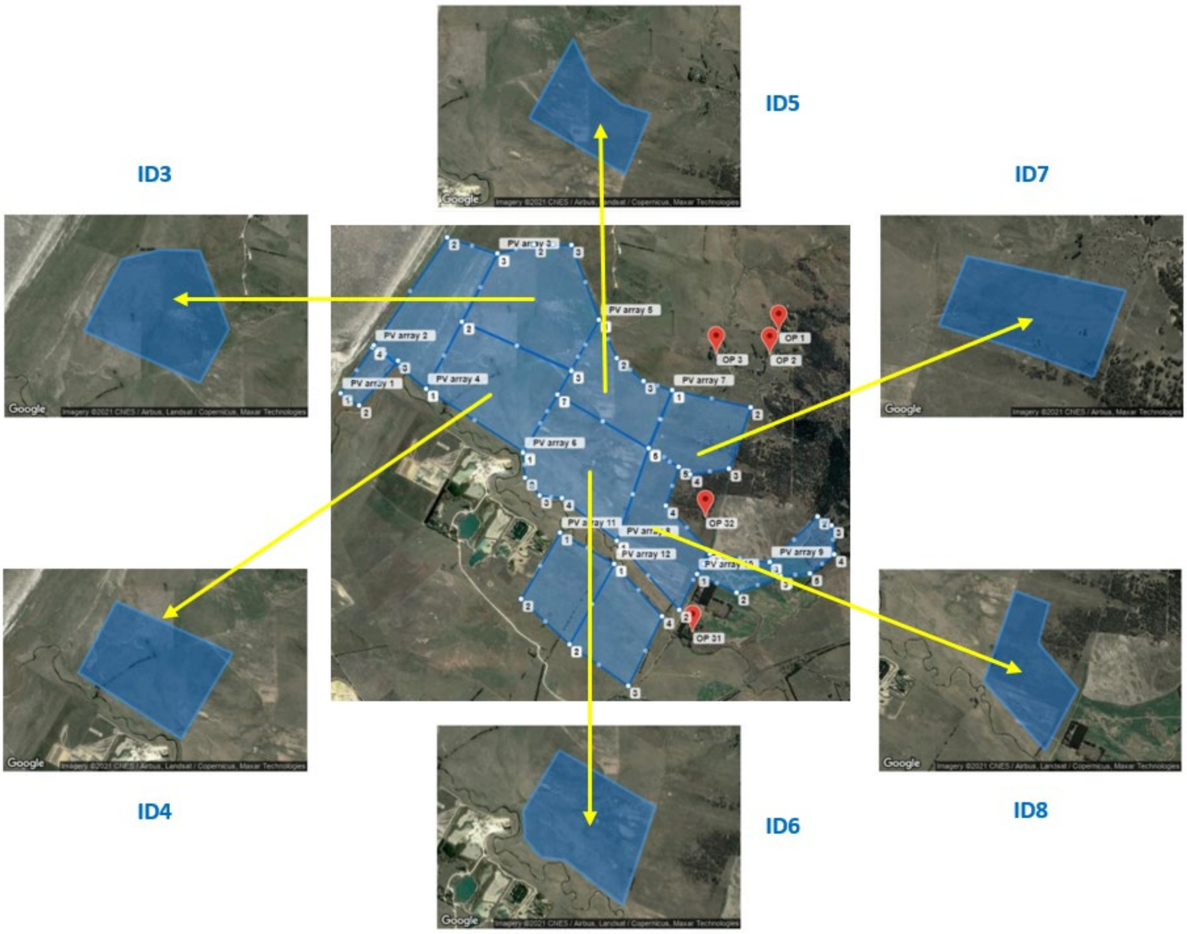


Figure 8-9 Blind Creek Solar Farm Analysis Zones – Panel Array Zone ID Identifiers. Note of the original 12 zones identified, the study focuses on the above six zones which comprise the Development footprint.

8.2.2 Existing environment

Receivers of interest relevant to the Project are shown in the following figures:

- Figure 8-10 Nearest aerodrome.
- Figure 8-11 Surrounding road network.
- Figure 8-12 Nearest Industrial Critical Machinery Operators.
- Figure 1-3 Nearest representative residential receivers.

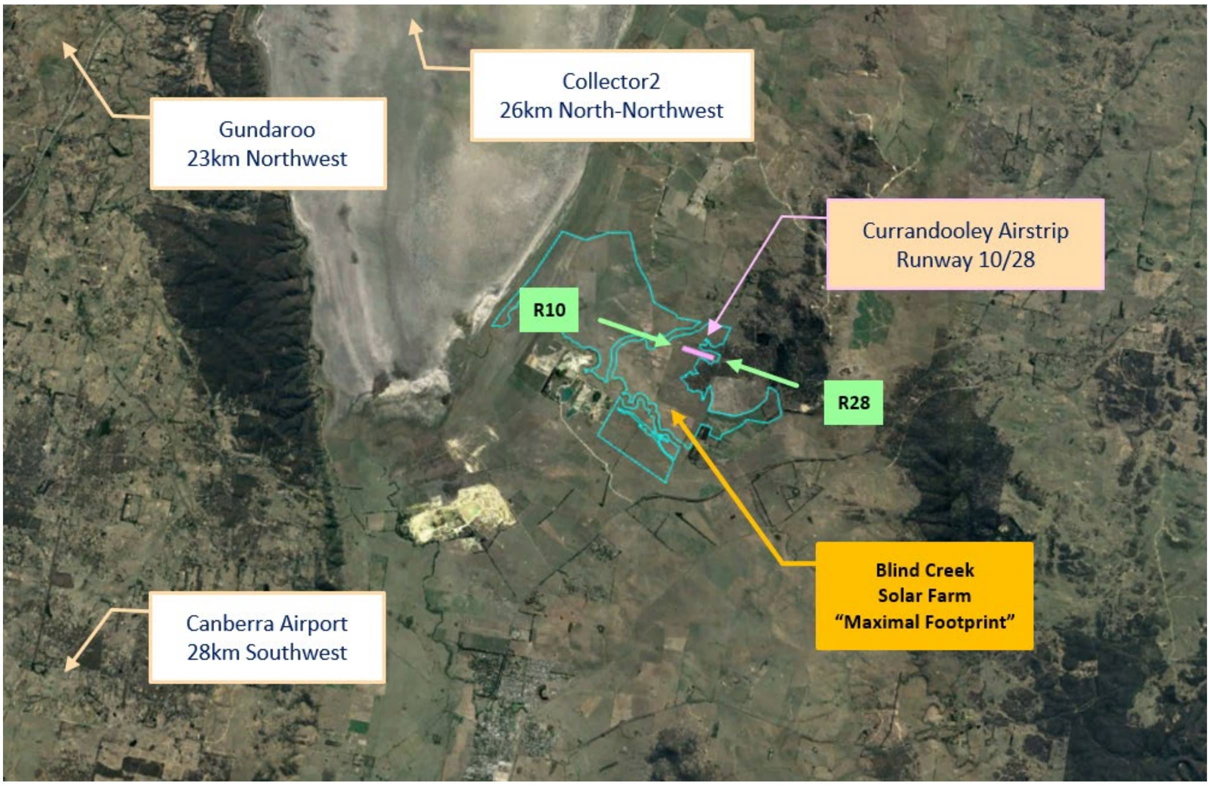


Figure 8-10 Nearest Aerodrome to the Study area, source SLR 2021

The nearest aerodromes to the site are:

- Gundaroo Airport - 23km northwest of the site.
- Collector2 Airport - 26km north-northwest of the site.
- Canberra Airport - 28km southwest of the site.
- Currandooley airstrip (privately owned, within the Development footprint).

Currandooley airstrip will be permanently closed if the Project enters construction, and the final design cannot safely accommodate its use (which is considered the likely outcome).

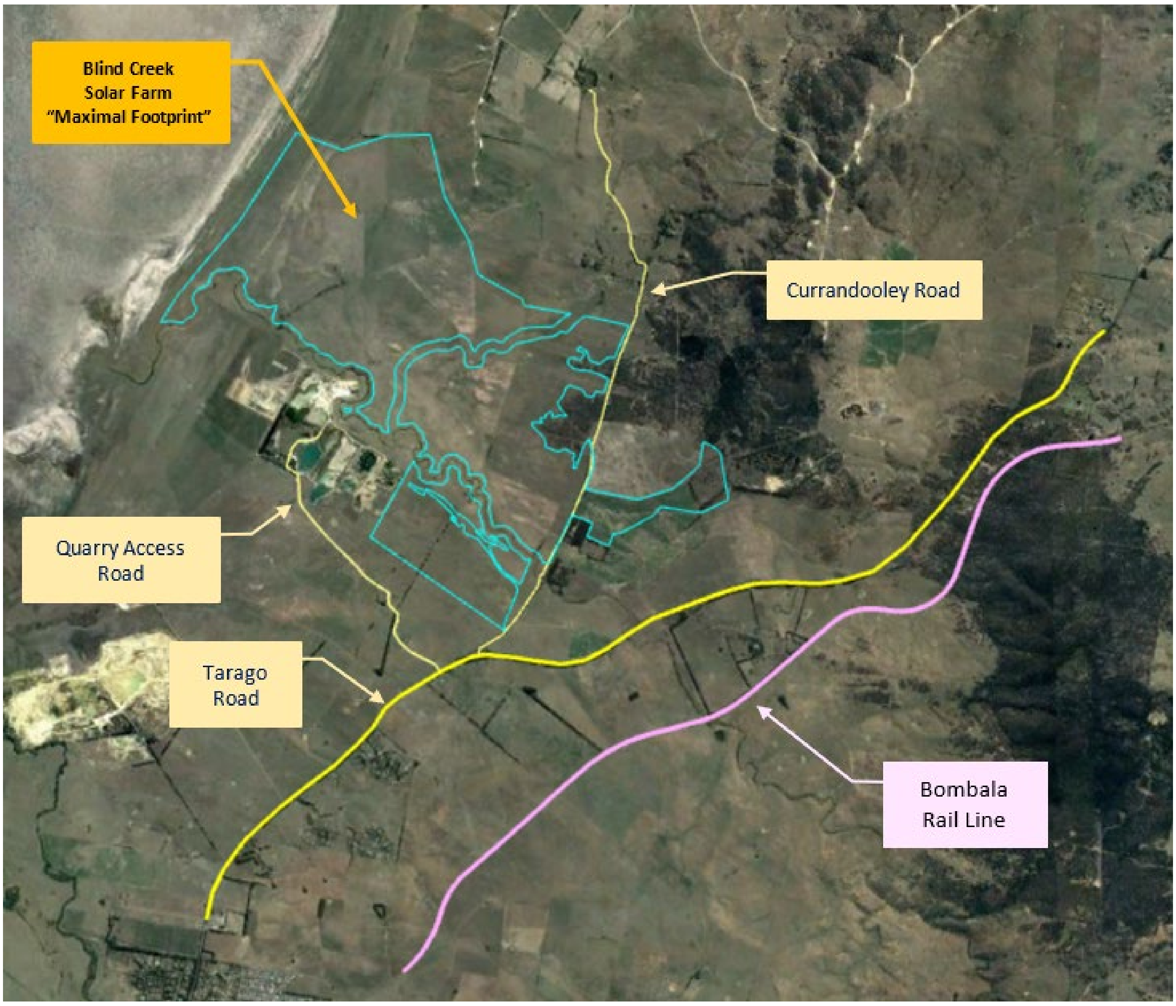


Figure 8-11 Surrounding Road and rail Network (with potential line of sight to Blind Creek Solar Farm reflections) source SLR 2021

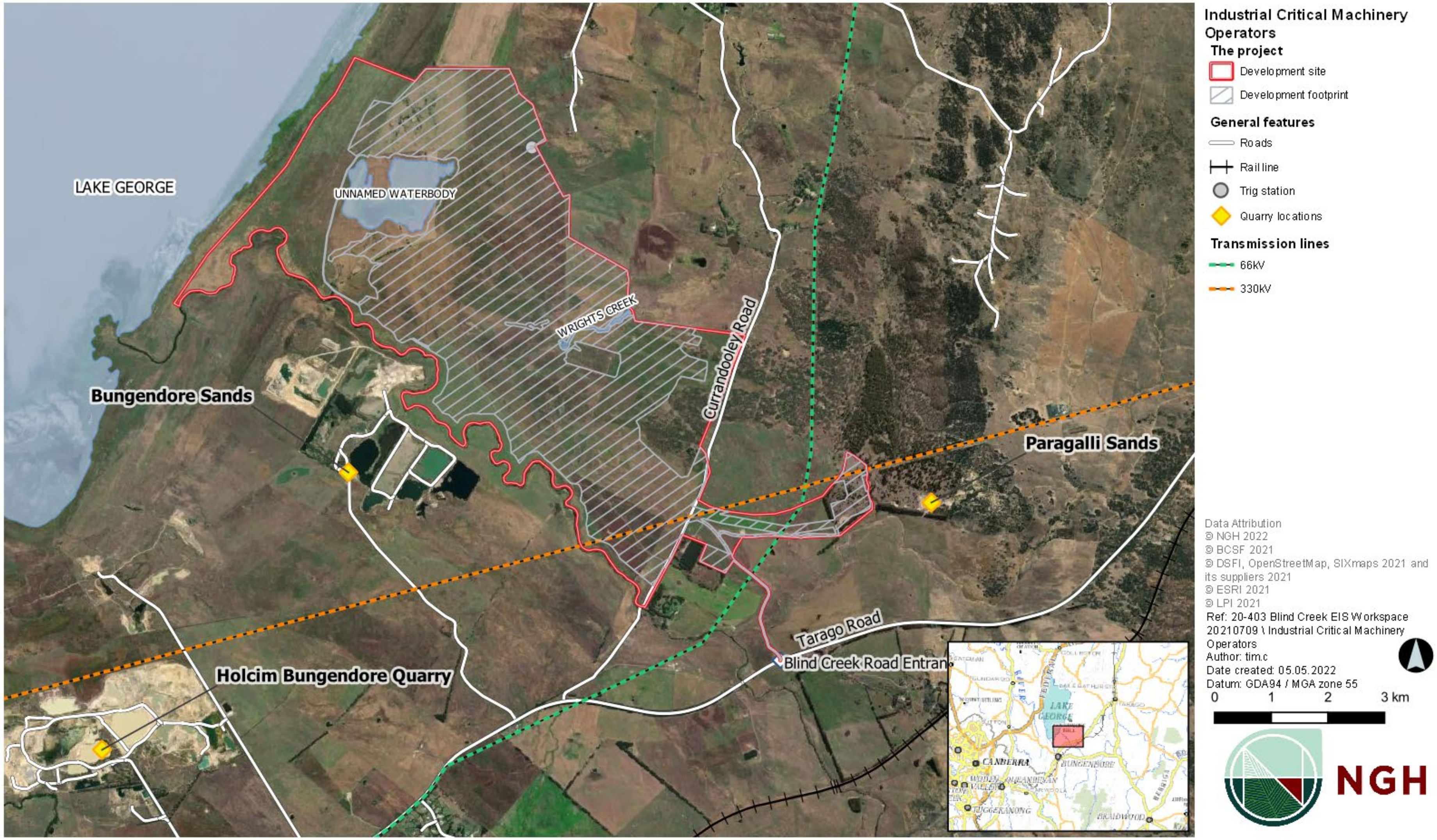


Figure 8-12 Industrial Critical Machinery Operators

At the commencement of this Glare Assessment, a list of all 110 potential sensitive receivers and locations (lat,long) were provided to SLR. Of these 110 receivers, a representative set of 15 receivers were chosen for analysis, on the basis of the following considerations:

- Receivers located very close to each other were grouped under one representative receiver at the closest and most exposed location for the group.
- Receivers obstructed from any view of the Project's Study area by topography (i.e., intervening hills, etc) were excluded from the analysis.
- It should be noted that receivers who may be potentially shielded from the Study area by intervening landscaping (vegetation, trees, etc) were NOT excluded from the analysis. In other words, no advantage was taken in terms of surrounding landscaping in the subsequent analysis.

The receivers assessed for glare impacts are shown in Table 7 of the SLR report and Figure 1-3 of this EIS.

8.2.3 Potential impact

Residential "nuisance" glare

Glare will not be visible by residential receivers surrounding the facility under normal ±62 degree tracking operations. If panels are left parked in a horizontal or near horizontal position, panel reflections from the proposed facility may be visible for short periods of time in the early morning or late afternoon for certain months of the year. However, the potential for nuisance glare is considered low to minimal when considering the following factors:

- Local obstruction to many receivers from surrounding vegetation and trees.
- Distance of receiver positioned west of the Project.
- Low angle differences between incoming solar rays and their accompanying reflections.

Mitigation measures presented in Section 8.2.4 would entirely eliminate these glare impacts.

Night-time illumination glare

The only potential for any night-time illumination glare would be associated with the nearest thoroughfares and residential receivers to the Project. Lighting is required at the Project for operational purposes to enable and facilitate any nighttime emergency works or incident response management. The assessment has determined there would be negligible impact, assuming the lighting design is in accordance with AS 4282-1997 *Control of the Obtrusive Effect of Outdoor Lighting*. This would also address any potential adverse eco-lighting issues in relation to nocturnal fauna within and surrounding the Study area.

Aviation sector reflective glare

Due to the distances involved, the Project would not pose a potential glare issue for the identified nearest aerodromes. The Currandooley airstrip is likely to be closed but in the unlikely event it can remain operational, the report recommends not using the strip for the short periods of time when glare may occur for pilots.

Motorist and rail driver "disability" glare

Nil glare is expected during normal ±62 degree tilt of the panels. Equally, there is nil glare potential along Tarago Road, Quarry Access Road and Bombala Rail Line.

There is glare potential along Currandooley Road if the panels are left parked in a horizontal position or with a slight eastwards tilt (less than 25 degrees from horizontal) – which could occur during construction, maintenance and/or when panels are angled to avoid inter-row shading in the early morning and late afternoon (referred to as Back-Tracking). Mitigation measures are presented in Section 8.2.4 for eliminating motorist disability glare, with combinations of operational mode restrictions and/or perimeter barriers (e.g., vegetation).

Industrial critical machinery operators

Nil glare is expected at the nearby Bungendore Sand Mine and Paragalli Sands operation.

8.2.4 Mitigation measures

No.	Mitigation measures	Phase
R1	General methods to reduce visual impact of buildings will centre on the colour and materials of infrastructure, to reduce the overall visual contrast and reflectivity of the Project.	Design Construction
R2	Back-Tracking software can address all of the identified potential reflection glare and/or visibility during operational, specifically, by avoiding the horizontal position of panels at the very start and end of each day. The precise limiting angle should be established during commissioning.	Operation
R3	Avoid very low tilt angles either East or West.	Construction Operation
R4	Potential glare conditions at ID7 and 8 will be addressed via vegetation screening or avoid low angle fixed tilt east (avoid tilt position less than 25 degrees east).	Design Construction
R5	Lighting design AS 4282-1997 *Control of the Obtrusive Effect of Outdoor Lighting* will be implemented for lighting at the Project. • Lights will be directed downward as much as possible and luminaires that are designed to minimise light spill will be used, e.g., full cut-off luminaires where no light is emitted above the horizontal plane, ideally keeping the main beam angle less than 70°. Less spill-light means that more of the light output can be used to illuminate the area and a lower power output can be used, with corresponding energy consumption benefits, but without reducing the illuminance of the area.	Design Operation

No.	Mitigation measures	Phase
	• Wherever possible use floodlights with asymmetric beams that permit the front glazing will be kept at or near parallel to the surface being lit.	

8.3 Biodiversity

An assessment of the biodiversity impacts of the Project was undertaken by NGH in the form of a Biodiversity Development Assessment Report (BDAR). It was undertaken in accordance with the SEARs and the *Biodiversity Conservation Act 2016* (BC Act). It also addresses the Commonwealth Matters of National Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The purpose of the BDAR is to identify how the Blind Creek Solar Farm proposes to avoid and minimise impacts to biodiversity arising from the Project, identify any potential impact that could be characterised as serious and irreversible, and characterise the offset obligation required to offset biodiversity impacts which cannot be avoided. It includes a detailed set of environmental safeguards that now form commitments of the project, included as mitigation measures at the end of this section.

The full report is included in Appendix G and is summarised below.

8.3.1 Approach (NSW)

The BDAR was carried out using the Biodiversity Assessment Methodology (BAM) 2020, in consultation with the Biodiversity Conservation Division (BCD), where required (refer to Section 6.1). The BDAR was prepared by BAM accredited assessors and uses a precautionary approach to address uncertainty. The assessment is supported by comprehensive field survey and mapping. It has been undertaken concurrent with early planning stages of the Project and, as such, key areas of avoidance have now been excised from the Development footprint now presented in this EIS.

Definitions

The BAM is legislated under the BC Act and as such, terminology is prescribed and sometimes differs from the terms used in the EIS. Key terms are consistent, however:

Development footprint: the upper-most area of land that will be directly impacted. This is the area that has been used to calculate the offset obligation; 700ha.

Development site: the broader area surrounding the Development footprint; 1,026ha. Surveys extended into these areas and indirect impacts into these areas are also considered.

Land Category Assessment

Prior to commencing the biodiversity assessment, a Land Category Assessment (LCA) was undertaken. LCAs are a desktop examination of aerial imagery that can be undertaken as a review of land categorisation under the *Local Land Services Act 2013*. Land that can be categorised as Category 1 (Cat 1) land equates to areas historically cultivated and thereby retaining low to no ecological value. Once endorsed by BCD, these Cat 1 areas are mostly exempt from the BAM.

The LCA was submitted with the Blind Creek Scoping Report (NGH 2020) but has been updated following further consultation with BCD. It forms an appendix of the BDAR and Cat 1 areas excluded from the BAM are clearly mapped in the BDAR.

8.3.2 Existing environment

Landscape context

The Development site occurs within the South Eastern Highlands Interim Biogeographical Regionalisation for Australia (IBRA) bioregion. The dominant Mitchell Landscape is Lake George Complex, but it also includes smaller areas of Gundary Plains. In terms of native vegetation extent in the locality, it is estimated that around 349ha of native vegetation occurs in the surrounding 1,500m buffer area (out of a total area of 4,044ha); or 9%.

Development site features

The Development Site is also dominated by non-native vegetation. Habitat is highly modified by a long agricultural history of grazing and cropping. While native woodlands occur to the site's east, the eastern portion of the site features exotic tree species.

Key habitat features of the Development site today include:

- Small agricultural sheds and structures.
- Large areas of sown exotic grasses and a high cover of exotic weeds.
- Areas of highly disturbed native grasslands.
- Areas of grassy woodland to the east.
- Stands of exotic trees including pines and elms.
- Technical Tributaries of the Murrumbidgee River (actually discharging into Lake George) including one first, fourth, fifth and a sixth order watercourse and a large ephemeral wetland area in the north-west.

As the biodiversity assessment has progressed, areas of the Development site have been excised from the Development footprint, to avoid areas of higher habitat value. These include:

- Butmaroo Creek and its riparian corridor.
- The large ephemeral wetland area in the north-west.
- Areas of grassy woodland to the east..

Survey methods and effort

Surveys included:

- Floristic surveys in November 2020, and July, November, and December 2021. BAM accredited ecologists completed 18 plot-based vegetation integrity surveys (BAM plots) in total across the Development site to verify the existing PCT mapping, assign new PCTs where relevant, and stratify the vegetation within the site.
- Frog surveys in January and February 2021 (4 nights). Targeted species included:
    - Green and Golden Bell Frog (Litoria aurea).
    - Southern Bell Frog *(Litoria raniformis).*
    - Yellow-spotted Tree Frog *(Litoria castanea).*

- Reptile tile surveys; artificial shelters installed in September 2021 and surveyed in October, November and December 2021. A total of 245 tiles were checked every 1-2 weeks, totalling 1,225 trap days. Targeted species included:
  - Striped Legless Lizard (Delma impar).
  - Little Whip Snake *(Suta flagellum).*
- Microbat acoustic surveys in January 2021 (3 nights). Targeted species:
  - Southern Myotis *(Myotis macropus).*
- White-fronted Chat targeted survey December 2021. Walked transect of 1,300m (in one direction); 120 minutes of survey.
- Targeted flora surveys November 2021. For the 0.87ha of suitable habitat, 10m spaced transects equated to 90 minutes of survey targeting:
  - Buttercup Doubletail (*Diuris aequalis*).
  - Hoary Sunray (*Leucochrysum albicans var. tricolor*).
  - Tarengo Leek Orchid (*Prasophyllum petilum*).
  - Silky Swainson-pea (*Swainsona sericea*).
  - Austral Toadflax (*Thesium australe*).
  - Aromatic Peppercress (*Lepidium hyssopifolium*).
  - Button Wrinklewort (*Rutidosis leptorrhynchoides*).
- Targeted flora surveys March 2022: For the 0.87ha of suitable habitat, 10m spaced transects equated to 40 minutes of survey targeting:
  - Trailing Monotoca (*Monotoca rotundifolia*).
- Targeted flora surveys March 2022: for the 9.06ha of suitable habitat, 10m spaced transects equated to 270 minutes of survey targeting:
  - Rough Eyebright (*Euphrasia scabra*).
  - Baeuerlen's Gentian (*Gentiana baeuerlenii*).

Plant Community Types (PCTs)

Two Plant Community Types (PCTs) were identified in the Development site:

- 1100 - Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion.
- 1110 - River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion.

Despite the majority of the Development footprint being dominated by exotic vegetation, all Category 2 Land requires a PCT designation under the BAM. A precautionary approach was taken, and the Development footprint has been mapped as PCT 1110.

PCTs within the Development site are shown in Table 8-5 and Figure 8-13 below. Vegetation integrity scores are derived from the plot data collected and precisely indicate the condition of the vegetation (to a maximum score of 100, indicating pristine structure, composition and function of the zone).

Table 8-5 PCT condition and impact areas

Zone #	PCT	Zone name	Area (ha)		Required no. plots (BAM)	No. plots undertaken	Patch size (ha)
			Dev. footprint	Dev. site[1]l			
1	1110 - River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion	1110_grassland_poor	635.38	808.57	7	9	101
2	1100 - Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	1100_grassland_poor	0.87	0.87	1	1	101
-	1100 - Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	1100_woodland_moderate	0	38.22	0	-2	-
-	1110 - River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion	1110_wetland_poor	0	38.58	0	1	-
-	1110 – River Tussock – Tall Sedge – Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion	1110_creekline_poor	0	18.535	0	1-	-

[1] The Development site includes the area covered by the Development footprint.

Threatened Ecological Communities (TECs)

PCT 1100 is associated with three BC listed Threatened Ecological Communities (TECs):

- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (Endangered under the BC Act).
- Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (Critically Endangered under the BC Act).
- Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (Critically Endangered under the BC Act).

An area of *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion* TEC was identified within the broader Development site. However, this has now been avoided by the Development footprint and can be protected from any indirect impacts from the Development.

In addition, PCT 1110 is associated with one Commonwealth listed TEC:

- Natural Temperate Grassland of the South Eastern Highlands (Critically endangered under the EPBC Act – see Chapter 5.2).

No vegetation within the Development footprint would qualify as Commonwealth listed TEC.

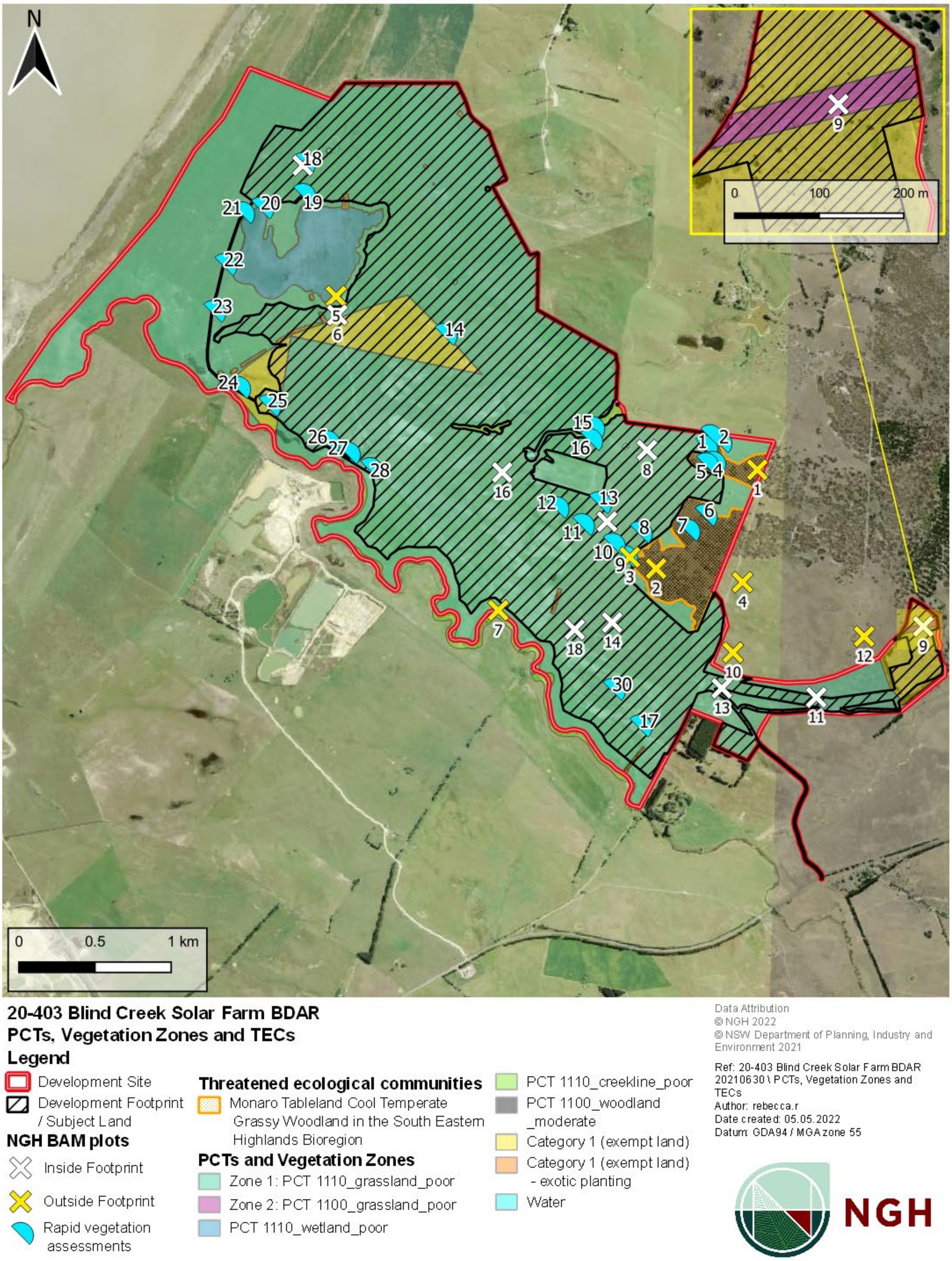


Figure 8-13 PCTs, vegetation zones, and location of BAM plots within the Development footprint and Development site

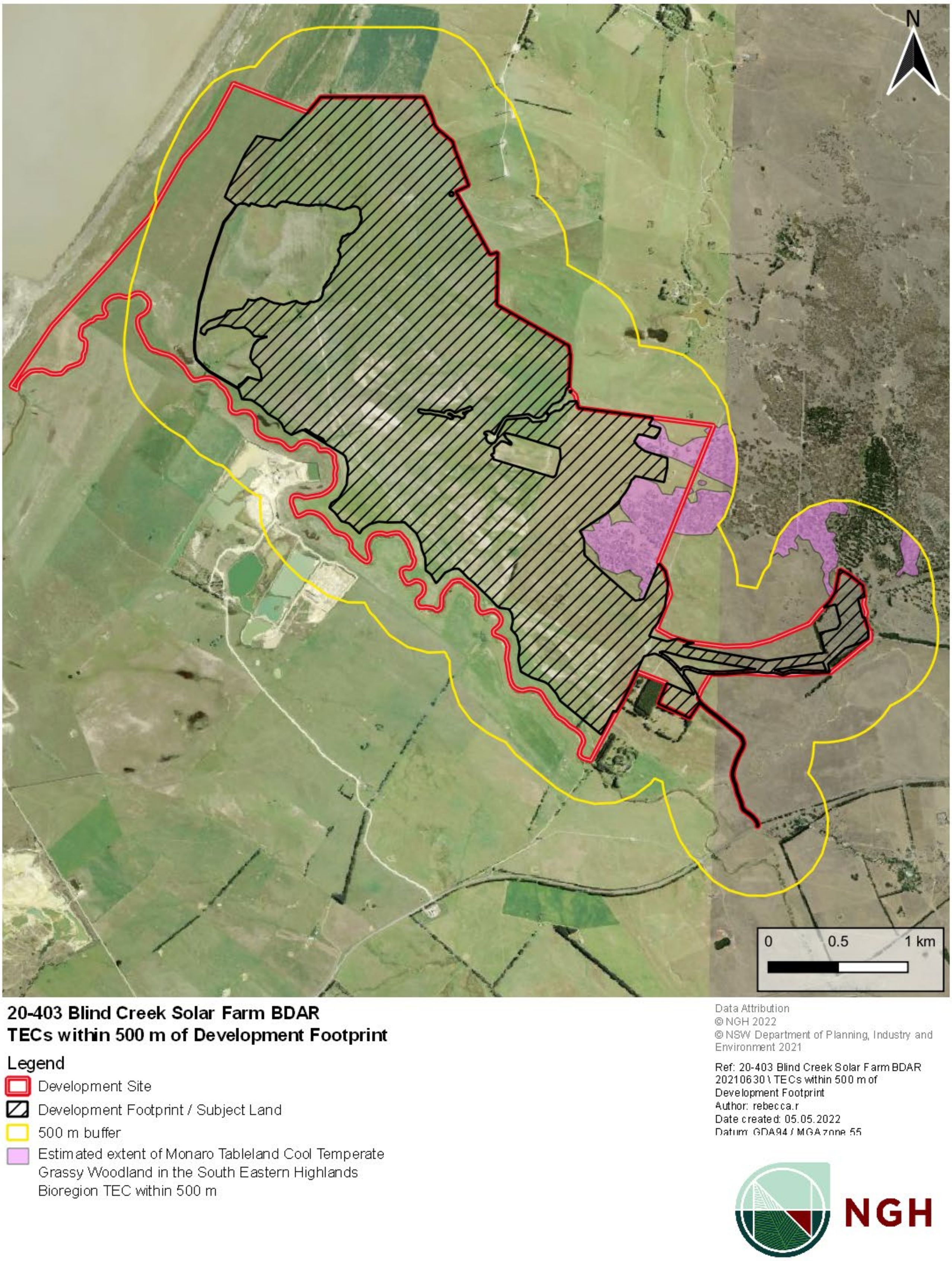


Figure 8-14 Estimated extent of Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion TEC within 500m of the Development footprint

Threatened species identified onsite or assumed to occur

The BAM Calculator predicted the presence of 27 species credit species. Under the BAM, these are assumed to occur and generate additional species credits unless:

1. They are excluded because specific habitat constraints required are not present onsite, or
2. Habitat quality is sufficiently degraded such that they could not occur, or
3. Survey effort has demonstrated they are not present.

Species excluded based on Criteria 1 or 2 are shown in Table 8-6 below. The results of the targeted survey program addressing Criteria 3 are shown in Table 8-7, including defining areas of suitable habitat (species polygons) where relevant. These species polygons are used to derive the offset obligation for species credit species.

In summary, one fauna species was identified through surveys:

- Southern Myotis (*Myotis Macropus*) – via an unresolved recording but was assumed present as a precaution. The wetland area and Butmaroo Creek, buffered to 200m within the Development footprint, was defined as a species polygon.

Table 8-6 Species excluded using Criteria 1 or 2

Species	NSW	Cwth	Habitat constraints and/or geographic restrictions (BAM-C)	Reason for inclusion or exclusion
Regent Honeyeater (*Anthochaera phyrigia*) (Breeding)	Critically Endangered	Critically Endangered	Breeding habitat is geographically restricted – in NSW, breeding areas are confined to two known locations.	Development footprint is not within known breeding areas.
Pink-tailed Legless Lizard (*Aprasia parapulchella*)	Vulnerable	Vulnerable	Habitat consists of rocky areas, or within 50m of rocky areas	Associated with PCT 1110. Rocky habitat present within the Development footprint, however rocks are too large and too deeply embedded to constitute suitable habitat.
Thick Lip Spider Orchid (*Caladenia tessellata*)	Endangered	Vulnerable	None	Habitat degraded. Associated with PCT 1100. However, favoured habitat consists of low, dry sclerophyll woodland with a heathy or sometimes grassy understorey on clay loams or sandy soils, not present within the Development footprint. Area of PCT 1100 under the powerline easement has been cleared, and clearing maintained, since at least 1985 (see Land Category Assessment, Appendix G).

Species	NSW	Cwth	Habitat constraints and/or geographic restrictions (BAM-C)	Reason for inclusion or exclusion
Mauve Burr-daisy (*Calotis glandulosa*)	Vulnerable	Vulnerable	Geographically restricted to areas south of Michelago	Development Footprint is not within known geographic range.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (Breeding)	Vulnerable	Not listed	Requires hollow bearing trees, living or dead, with hollows >15cm diameter and >8m above the ground for breeding	Hollow bearing trees are not present within Development footprint.
Dwarf Kerrawang (*Commersonia prostrata*)	Endangered	Endangered	None	Associated with PCT 1110. Occurs on sandy, sometimes peaty soils in a wide variety of habitats, mostly woodland and open forest. appears to respond positively to some forms of disturbance, e.g. some Victorian records are from gravel road surfaces and the Tomago population is on an area previously subject to sandmining, however the extreme disturbance to the PCT 1110 vegetation within the Development Footprint through long term and ongoing agricultural use make it highly unlikely that the species would persist in this landscape.
Black Gum (*Eucalyptus aggregata*)	Vulnerable	Vulnerable	Geographically restricted to areas east of a line that runs north to south about 5km west of Bungendore	Associated with PCTs 1100 and 1110. However, woodland area of PCT 1100 has been excluded from the Development Footprint, and there are no trees within the grassland area of 1100. It is not present in any of the grassland areas of 1110. Is also on the cusp of being outside of the known geographic range.
Paddys River Box, Camden Woollybutt *(Eucalyptus macarthurii)*	Endangered	Endangered	None	Associated with PCT 1100. Habitat degraded; no Eucalypts remaining within PCT 1100 within the Development Footprint.

Species	NSW	Cwth	Habitat constraints and/or geographic restrictions (BAM-C)	Reason for inclusion or exclusion
Silver-leafed Gum (*Eucalyptus pulverulenta*)	Vulnerable	Vulnerable	Geographically restricted to areas south of Tinderry Range.	Development footprint is not within known geographic range.
Swift Parrot (*Lathamus discolor*) (Breeding)	Endangered	Critically Endangered	Breeding habitat is geographically restricted – breeds only in Tasmania	Development Footprint is not within known breeding area.
Large Bent-winged Bat (*Miniopterus orianae oceanensis)* (Breeding)	Vulnerable	Not listed	Habitat includes caves, tunnels, mines, culverts and other structures	Breeding habitat not present within the Development Footprint.
Koala (*Phascolarctos cinereus*) (Breeding)	Vulnerable	Vulnerable	Habitat includes areas identified via survey as important habitat.	Habitat is not present within the Development footprint.
Prasophyllum sandrae (*Prasophyllum sandrae*)	Critically Endangered	Not listed	Geographically restricted to areas south of Braidwood.	Development footprint is not within known geographic range.
Grey-headed Flying-fox (*Pteropus poliocephalus*) (Breeding)	Vulnerable	Vulnerable	Breeding occurs in camps.	No breeding camps present within the Development footprint.

Table 8-7 Results of targeted surveys for remaining species (Criteria 3)

Species credit species	Survey	Present (or assumed) on site?	Relevant vegetation zone	Calculation of species polygon
Striped Legless Lizard (*Delma impar*)	Surveyed – October to December 2021	No	N/A	N/A
Buttercup Doubletail (*Diuris aequalis*)	Surveyed – November 2021	No	N/A	N/A
Rough Eyebright (*Euphrasia scabra*)	1110_grassland_poor: 9.06 ha surveyed in April 2022. Species not detected	No	N/A	N/A
Baeuerlen's Gentian (*Gentiana baeuerlenii*)	1110_grassland_poor: 9.06 ha surveyed in April 2022. Species not detected	No	N/A	N/A
White-bellied Sea-Eagle *(Haliaeetus leucogaster)* - breeding	Surveyed – July, November December 2021	No	N/A	N/A
[1]Hoary Sunray (*Leucochrysum albicans var. tricolor*)	Yes	No	N/A	N/A
Green and Golden Bell Frog (*Litoria aurea*)	Surveyed - January 2021	No	N/A	N/A
Southern Bell Frog (*Litoria raniformis*)	Surveyed – January 2021	No	N/A	N/A
Trailing Monotoca (*Monotoca rotundifolia*)	1100_grassland_poor: **1 ha** surveyed in April 2022.	No	N/A	N/A

Species credit species	Survey	Present (or assumed) on site?	Relevant vegetation zone	Calculation of species polygon
	Species not detected			
Southern Myotis (*Myotis Macropus*)	Surveyed – January 2021	Yes	1110_grassland_ poor: **81.38 ha**	The wetland area and Butmaroo Creek buffered to 200m within the Development footprint, as per NSW *Species credit' threatened bats and their habitats* guidelines.
Tarengo Leek Orchid (*Prasophyllum petilum*)	Surveyed – November 2021	No	N/A	N/A
Silky Swainson-pea (*Swainsona sericea*)	Surveyed – November 2021	No	N/A	N/A
Austral Toadflax (*Thesium australe*)	Surveyed – November 2021	No	N/A	N/A

8.3.3 Potential impacts

Direct and indirect impact types

Despite the significant work completed to date to avoid and minimise impacts on sensitive areas of the Development site, the construction and operational phases of the Project will have the following unavoidable direct impacts:

- Clearing of native vegetation and habitat (limited to direct impacts only).
- Noise and disturbance from clearing and construction (temporary and short term impacts).
- Infrastructure barriers to fauna movement (limited to security fencing only).

The following potential indirect impacts relevant to the construction and operational phases of the Project were also identified:

- Transport of weeds and pathogens from project site to adjacent vegetation.
- Starvation risk of White-footed Chat from due to exposure and loss of shade or shelter due to vegetation clearance.
- Loss of breeding habitat due to vegetation clearance.
- Rubbish dumping due to improper management of waste.
- Wood collection.
- Removal and disturbance of rock, including bush rock.

- Increase in predators due to increasing access.
- Increase in pest animal populations due to increased human activity.
- Changed fire regimes due to increased use of vehicles and machinery.
- Disturbance to specialist breeding and foraging habitat.

Prescribed impacts

Only one prescribed biodiversity impact has been identified as relevant to the development:

- Impacts of clearing non-native vegetation that serves as breeding and/or foraging habitat for the White-fronted Chat (*Epthianura albifrons*) an ecosystem credit species listed as Vulnerable under the BC Act.

The majority of the Development footprint is situated within regulated Category 2 Land and while must be designated as a PCT, it is dominated by non-native plant species that offer breeding and/or foraging habitat. Based on the conservative assumption that all vegetation and habitat will be removed within the Development footprint it is likely that breeding and foraging habitat of the White Fronted Chat's will be impacted.

While the Chat's general breeding and/or foraging habitat requirements might mean that a large area of the Development footprint constitutes suitable habitat, it therefore follows that a large area of vegetation outside of the direct impact area will remain intact and available for use by any individuals or flocks of Chats within the locality.

Impacts to Matters of National Environmental Significance

Threatened Ecological Communities

The EPBC Protected Matters Report identified the following two Critically Endangered Ecological Communities as likely to occur in the search area:

- *Natural* Temperate Grassland of the South Eastern Highlands (Critically Endangered under the EPBC Act).
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered under the EPBC Act).

Neither were identified within the Development footprint. No other Commonwealth listed TECs were identified within the Development footprint.

Threatened species

The EPBC Protected Matters Report identified 41 threatened species with the potential to occur within the search area. Of these species, four were considered likely to utilise habitat found within the Development footprint:

- Striped Legless Lizard (*Delma impar*) – Vulnerable.
- Basalt Pepper-cress (*Lepidium hyssopifolium*) – Endangered.
- Hoary Sunray (*Leucochrysum albicans subsp. tricolor*) – Endangered.
- Button Wrinklewort (*Rutidosis leptorhynchoides)* – Endangered.

Targeted surveys confirmed that these species are absent from the Development footprint.

Migratory species

The EPBC Protected Matters Report identified 14 listed migratory species with the potential to occur within the search area. None of these species are considered likely to utilise habitat found within the Development footprint.

Potential Serious and Irreversible Impact (SAII) entities

Monaro Tableland Cool Temperate Grassy Woodland in *the South Eastern Highlands Bioregion* identified in association with PCT1100. It is a SAII candidate. Impacts to this Serious and Irreversible Impact (SAII) TEC have been avoided by its exclusion from the Development footprint. As such, no areas of this PCT will be subject to direct impacts from the Development.

Three threatened species potentially at risk of a SAII were returned by the BAM-C. NGH has demonstrated through targeted surveys they do not occur onsite:

- Rough Eyebright (*Euphrasia scabra*)
- Baeuerlen's Gentian (*Gentiana baeuerlenii*)
- Trailing Monotoca (Monotoca rotundifolia)

Offset requirement

The PCTs identified in the Development footprint are degraded to the extent that they do not generate an offset requirement (VI scores are less than 15). One species generates an offset requirement, refer Table 8-8. No Commonwealth offsets are required. The full Biodiversity Credit Report is provided in Appendix A of the BDAR (Appendix G).

Table 8-8 Offset requirement for the Project: species credits only

Species	Species credits required
Southern Myotis (*Myotis Macropus*) assumed present	97

Further targeted surveys are planned to continue concurrent with the public exhibition of the EIS. If species presumed present cannot be ruled out by targeted surveys prior to the Project's determination, then the retirement of the credits for all four species will be carried out in accordance with the NSW Biodiversity Offsets Scheme (BOS), and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme based on the like-for-like rules, or
b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
c) Funding a biodiversity action that benefits the threaten entities impacted by the development.

8.3.4 Mitigation measures

Detailed mitigation measures are set out in the BDAR Chapter 10 (Appendix G) and summarised below.

No.	Mitigation measure	Phase
B1	Preparation and implementation of a Biodiversity Management Plan (BMP) for the site to include: • How to remove and dispose of vegetation and topsoil containing weeds declared under the *Biosecurity Act 2015* during and after construction. • Identification and protection of biodiversity exclusion zones during construction and operation.	Pre-construction Construction Operations
B2	Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecologist or licensed trained spotter catcher during clearing events, construction and maintenance activities for human-made structures and non-native vegetation	Pre-construction Construction
B3	Relocating habitat features (fallen timber, hollow logs and embedded rock) from within the Development footprint.	Pre-construction Construction
B4	Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance: • Staff training and site briefing to communicate environmental features to be protected and measures to be implemented • Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing • No stockpiling or storage within dripline of any mature trees No stockpiling or storage within riparian buffers.	Pre-construction Construction
B5	Adopt clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed: • Documented clearance protocols to mark and protect vegetation to be retained • Use handheld machinery where possible and have elevated work platform check hollows prior to tree felling.	Pre-construction Construction
B6	Use noise barriers, or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Construction
B7	Light shields or daily/seasonal timing of construction and operational	Construction

No.	Mitigation measure	Phase
	activities to reduce impacts of light spill	
B8	Using adaptive dust management and monitoring programs to control air quality	Construction Operations
B9	Install temporary fencing to protect significant environmental features such as riparian zones, karst, caves, rock outcrops and water bodies: • Prior to construction commencing, exclusion fences and signage would be installed around identified exclusion zones.	Pre-construction Construction
B10	Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Construction Operations
B11	Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed Project	Construction
B12	Scheduling the timing of construction activities to avoid critical life cycle events (e.g. timing construction activities to avoid migratory species on site, or using the site)	Construction
B13	Using sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment	Construction
B14	Ecological restoration, rehabilitation actions and/or maintenance of retained native vegetation on, or adjacent to, the Development footprint	Construction

8.4 Aboriginal heritage

In accordance with the SEARs, an Aboriginal Cultural Heritage Assessment (ACHA) has been prepared to assess the presence or absence of Aboriginal objects, their significance and the potential for the Project to impact these sites. Aboriginal heritage sites are found to be present within the Study area (referred to as the Project site boundary in the specialist report and figures). As such, the Project will likely impact on Aboriginal heritage sites and objects which are protected under the NSW National Parks and Wildlife Act 1974 (EP&A Act).

8.4.1 Approach

A specialist ACHA was undertaken by NGH (Appendix H) to provide an assessment of the Aboriginal cultural values associated with the Blind Creek Solar Farm (BCSF) Study area and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded.

The full report is provided in Appendix H and is summarised below. Note: unless stated otherwise, the assessment below considers the full scope of works proposed as per the Development footprint provided by BCSF.

The ACHA Report was prepared in line with the following:

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

Consultation with Aboriginal stakeholders was undertaken in accordance with Clause 60 of the *National Parks and Wildlife Amendment Regulation 2019* following the consultation steps outlined in the ACHCRP. A comprehensive account of the consultation steps undertaken to comply with the guide, as well as a summary of the actions completed by NGH and responses received from Registered Aboriginal Parties (RAPs) are provided in Appendix A of the ACHAR. As a result of this process, seventeen Aboriginal groups registered interest in the proposal, and were as follows.

- Ngambri LALC.
- Buru Ngunawal Aboriginal Corporation.
- Didge Ngunawal Clan.
- Ngunawal Heritage Aboriginal Corporation.
- PD Ngunawal Consultancy.
- Kalari Ngunnawal Pajong Wallabalooa Descendants.
- Karlari Ngunnawal Descendants.
- Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation.
- Freeman and Marx.
- Muragadi Heritage Indigenous Corporation.
- Murri Bidgee Mullangari Aboriginal Corporation.
- Merrigarn Indigenous Corporation.
- Yurwang Gundana Consultancy Cultural Heritage Services.

- Oak Hill Enterprises.

There were three groups who wished that they not be named in public documentation.

The project methodology included two stages and was agreed upon with the RAPs before any commencement of archaeological survey. Stage one occurred on 22 July to 6 August and stage two between 18 to 22 October 2021. The fieldwork components of this assessment included the participation of six Aboriginal community representatives from the RAPs. Field survey of the Study area, in conjunction with identifying and mapping landform characteristics including topography, archaeological modelling and consideration of the comments from the RAPs resulted in the identification of an undisturbed "strandline" landform of high cultural value and archaeological sensitivity. The proponent both before and after stage 1 field work decided to remove highly sensitive landform areas like the "strandline" and other highly significant landforms from the proposed Development footprint to avoid impacts or reduce the anticipated impact to the Aboriginal heritage resource.

On completion of the survey and findings a copy of the draft ACHA report was provided to the registered Aboriginal parties for review and comment and any comments received have been incorporated into the final ACHA report.

8.4.2 Archaeological context

This assessment includes a review of relevant background information relating to the proposed solar farm location, a review of previous archaeological studies undertaken in the local and regional area, as well as an overview of the existing environmental context and studies undertaken within the Study area. A search of the AHIMS database also formed part of the background analysis.

Of the 103 registered sites within the search parameters on the Aboriginal Heritage Information Management System (AHIMS), 18 archaeological sites are within the Study area, including one Potential Archaeological Deposit (PAD) with artefacts, one PAD with no artefacts and 10 artefact scatter sites and six isolated artefact locations.

The results of a number of previous archaeological surveys in the region show that the project site is located within an archaeologically sensitive and well researched area. Sites and artefacts are common throughout the landscape surrounding Lake George especially in proximity to elevated landforms, and semi-permanent and permanent water sources. Additionally, there also appears to be a pattern of site location relating to sand deposits that are likely to be associated with former lake levels.

Studies also suggest that overwhelmingly most site types in the region are comprised of isolated artefacts and artefact scatters, with significant potential for subsurface archaeological deposits on unmodified landforms. Historical AHIMS sites in the region and within the Study area support this conclusion. The presence of Butmaroo Creek, Wrights Creek, and associated elevated sand landforms within the current Study area – as well as the proximity to the shores of Lake George and Blind Creek to the south – significantly increases likelihood of encountering Aboriginal heritage sites within the Study area.

8.4.3 Results

An archaeological survey and subsurface testing were undertaken of the Study area in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW

2010a). The survey and testing conducted for the purposes of this assessment were undertaken on 22 July to 6 August and 18 to 22 October 2021. The Study area was divided into unique landforms based on a combination of characteristics and then categorised into classes of High, Medium or Low archaeological sensitivity (Figure 8-15). These categories of predicted archaeological sensitivity were based on desktop analysis of previous regional and local archaeological studies and the mapped areas were then refined through field ground truthing.

The results of both surface and subsurface investigation are also compared to the proposed Development footprint for the BCSF in Figure 8-16to Figure 8-18 and Figure 8-19to Figure 8-23.

Surface survey

While attempts were made to relocate the previously recorded AHIMS sites within the Study area, the limited ground visibility from thick vegetation in the wake of La Nina weather patterns prevented their relocation. Despite low visibility a total of 38 new surface sites, comprised of 11 isolated finds and 27 artefact scatters, were identified. The landform group categorised as highly sensitive had 19 locations with a ratio of 16.2 sites per hectare of effective survey coverage. This is considered a very high ratio and supports the landform-based approach to assessment and its accuracy. It also shows that some landforms are demonstrably more sensitive than others for the presence of archaeological sites, such as compared to the density of sites in the low sensitive landforms of only 2.2 sites per hectare or effective survey coverage. As a result, the modelling that those landforms with a classification of high significance are likely to contain the majority of evidence for Aboriginal occupation in the region.

Subsurface testing

A total of 127 test pits were excavated during the subsurface testing programme undertaken for the Blind Creek Solar Farm within the Study area. A total of 16 Clusters, 7 Transects, and 6 Isolated Pits were excavated during the July and October excavation periods. From the 127 test pits excavated across the 10 landforms within the Study area a total of 409 stone artefacts were recovered from a total of 61 test pits. In total 21 areas contained subsurface artefacts and were recorded as sites and registered on AHIMS. Subsurface testing results also support the Landform-based approach to assessment as discussed above, with average artefact densities ranging from 5.12/m^2 in low sensitivity landforms to 18.89/m^2 (and up to 43.47/m^2) in the high sensitivity landforms.

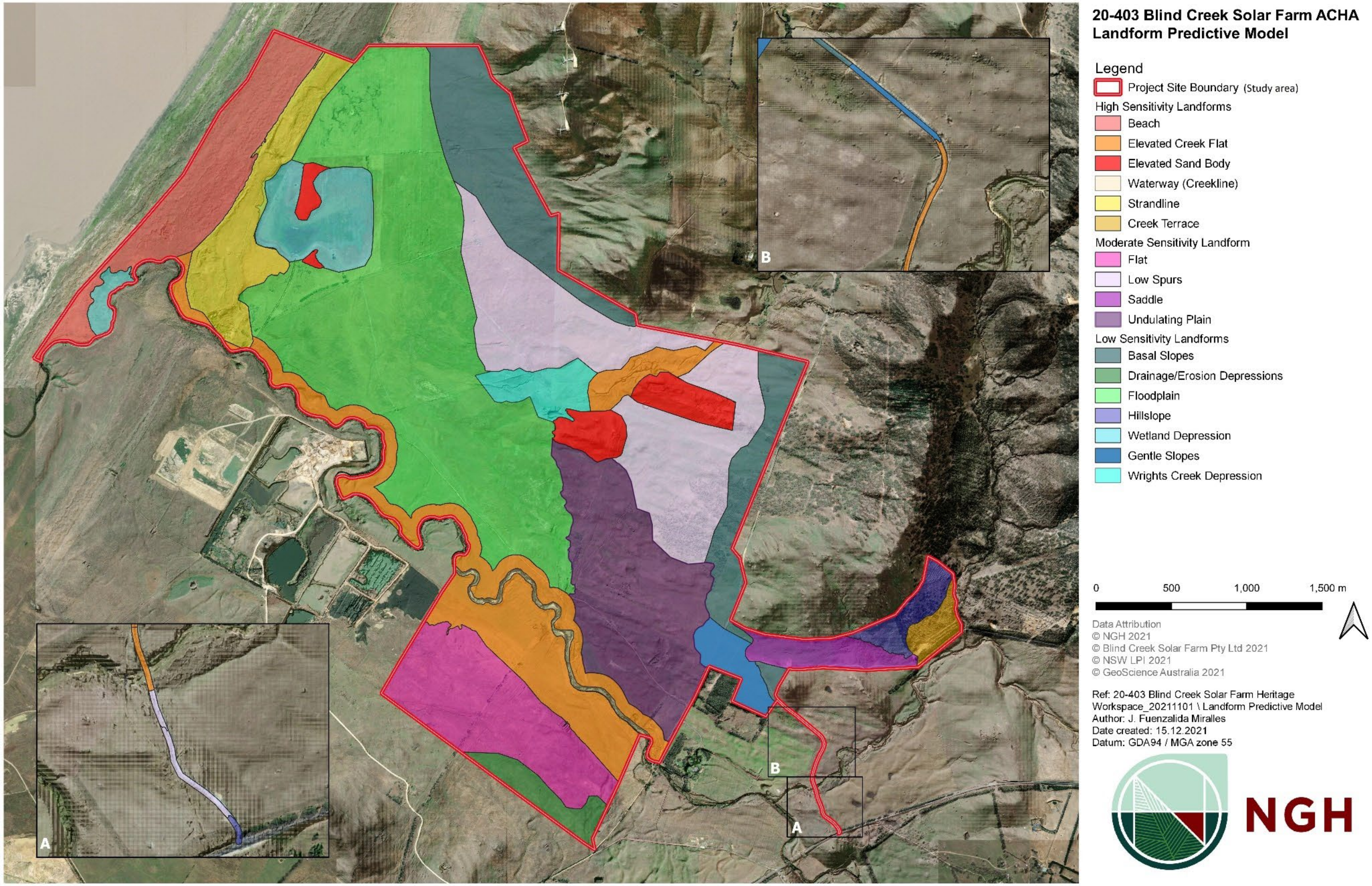


Figure 8-15 Updated landform predictive model post NGH (2021) survey

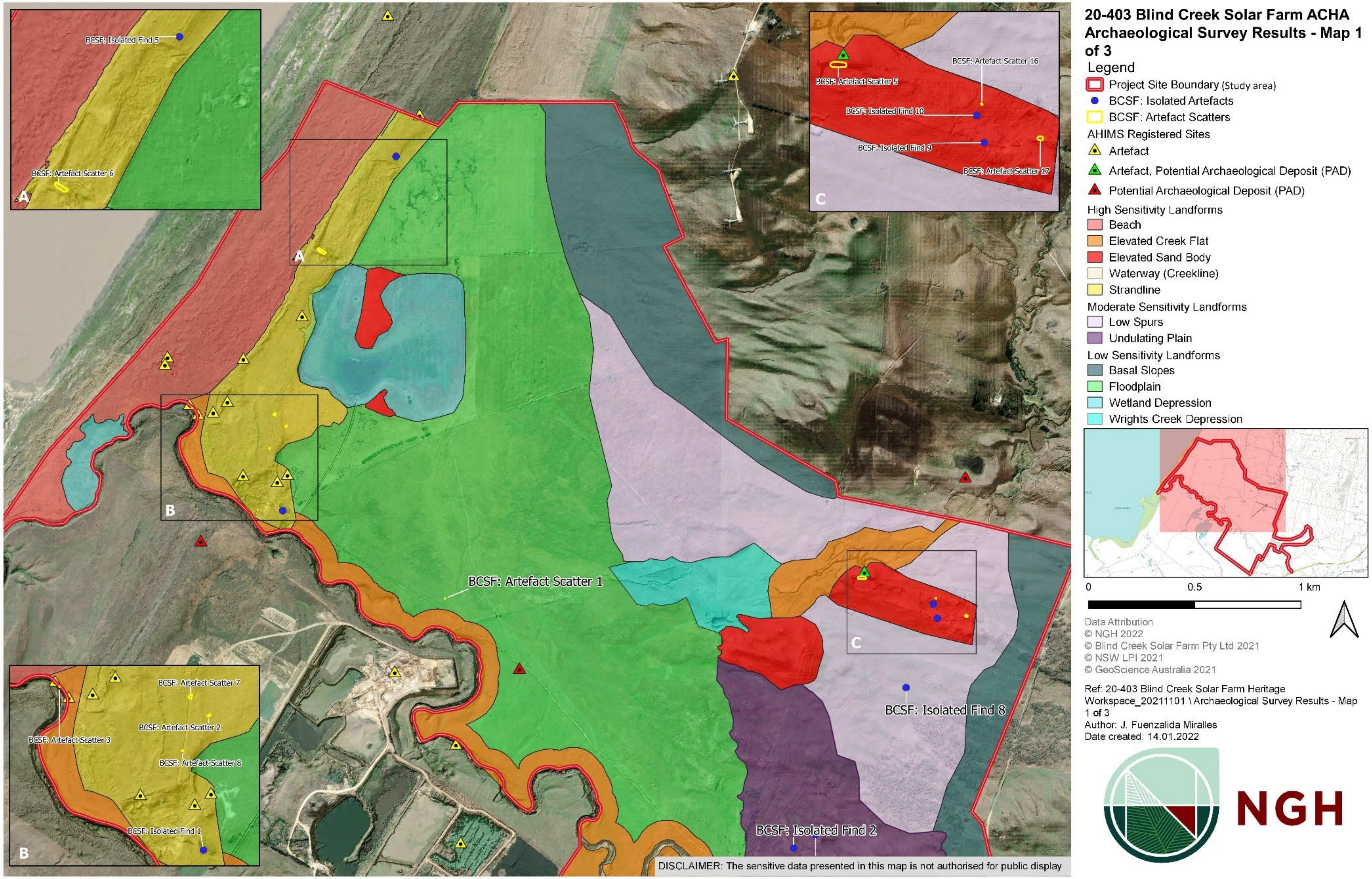
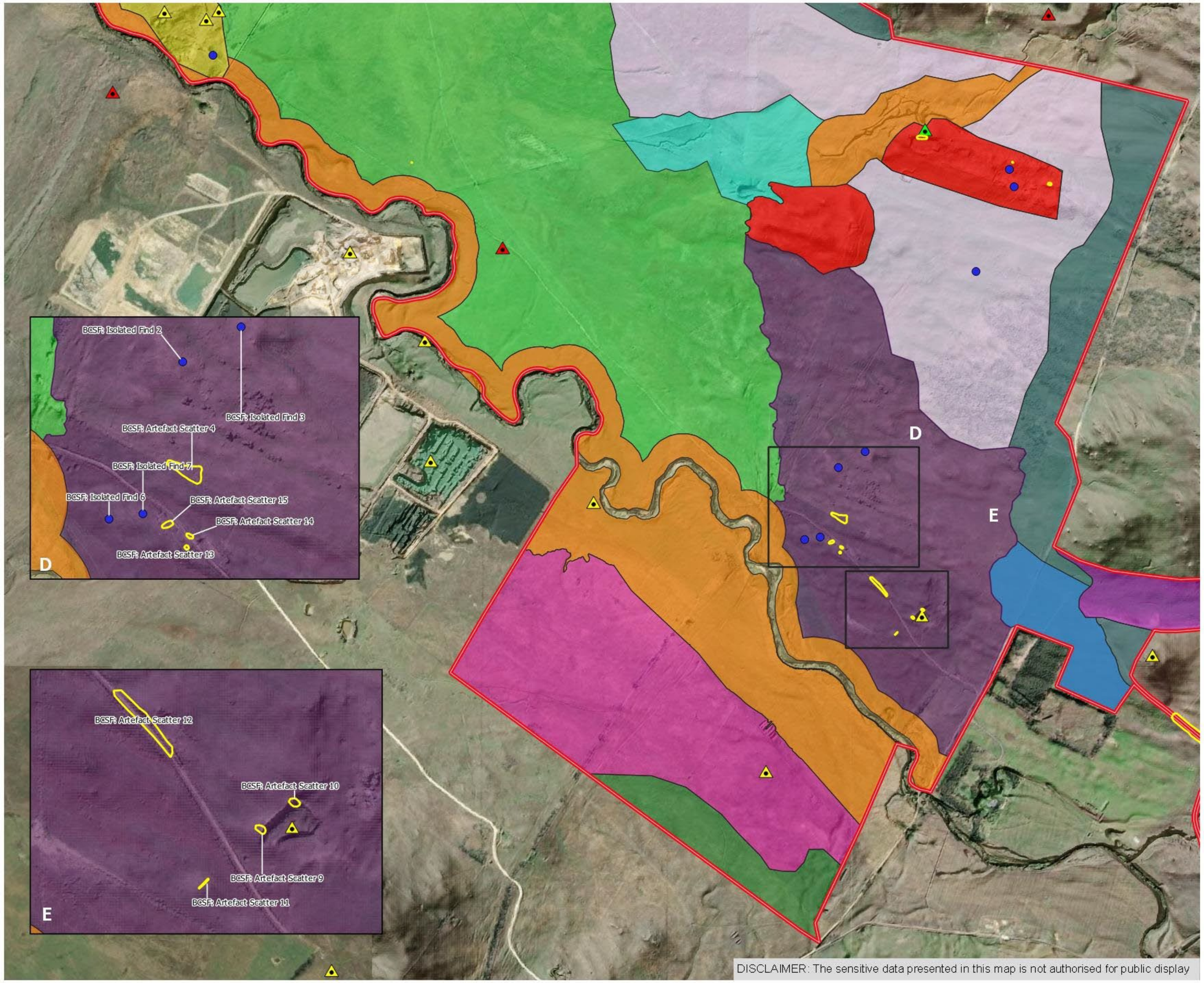


Figure 8-16 Archaeological Survey Results – Map 1 of 3



20-403 Blind Creek Solar Farm ACHA Archaeological Survey Results - Map 2 of 3

Legend

- Project Site Boundary (Study area)
- BCSF: Isolated Artefacts
- BCSF: Artefact Scatters

AHIMS Registered Sites

- Artefact
- Artefact, Potential Archaeological Deposit (PAD
- Potential Archaeological Deposit (PAD)

High Sensitivity Landforms

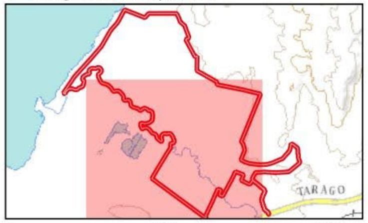
- Elevated Creek Flat
- Elevated Sand Body

Moderate Sensitivity Landforms

- Flat
- Low Spurs
- Undulating Plain

Low Sensitivity Landforms

- Basal Slopes
- Drainage/Erosion Depressions
- Floodplain
- Gentle Slopes
- Wrights Creek Depression



0 0.5 1 km

Data Attribution
©NGH 2021
©Blind Creek Solar Farm Pty Ltd 2021
©NSW LPI 2021
©GeoScience Australia 2021

Ref: 20-403 Blind Creek Solar Farm Heritage Workspace_20211101 \Archaeological Survey Results - Map 2 of 3
Author: J. Fuenzalida Miralles
Date created: 20.12.2021

NGH

Figure 8-17 Archaeological Survey Results – Map 2 of 3

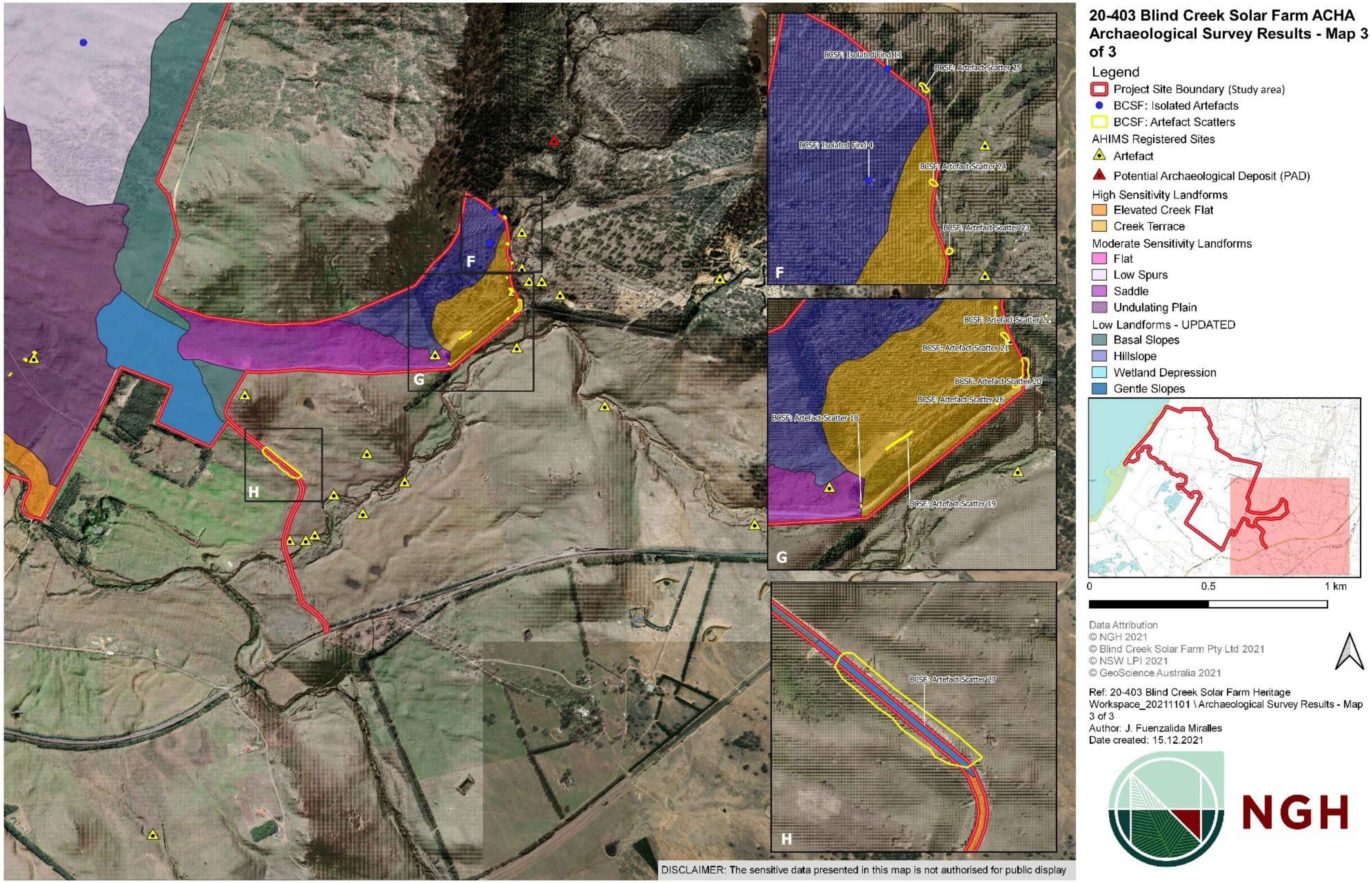


Figure 8-18 Archaeological Survey Results - Map 3 of 3

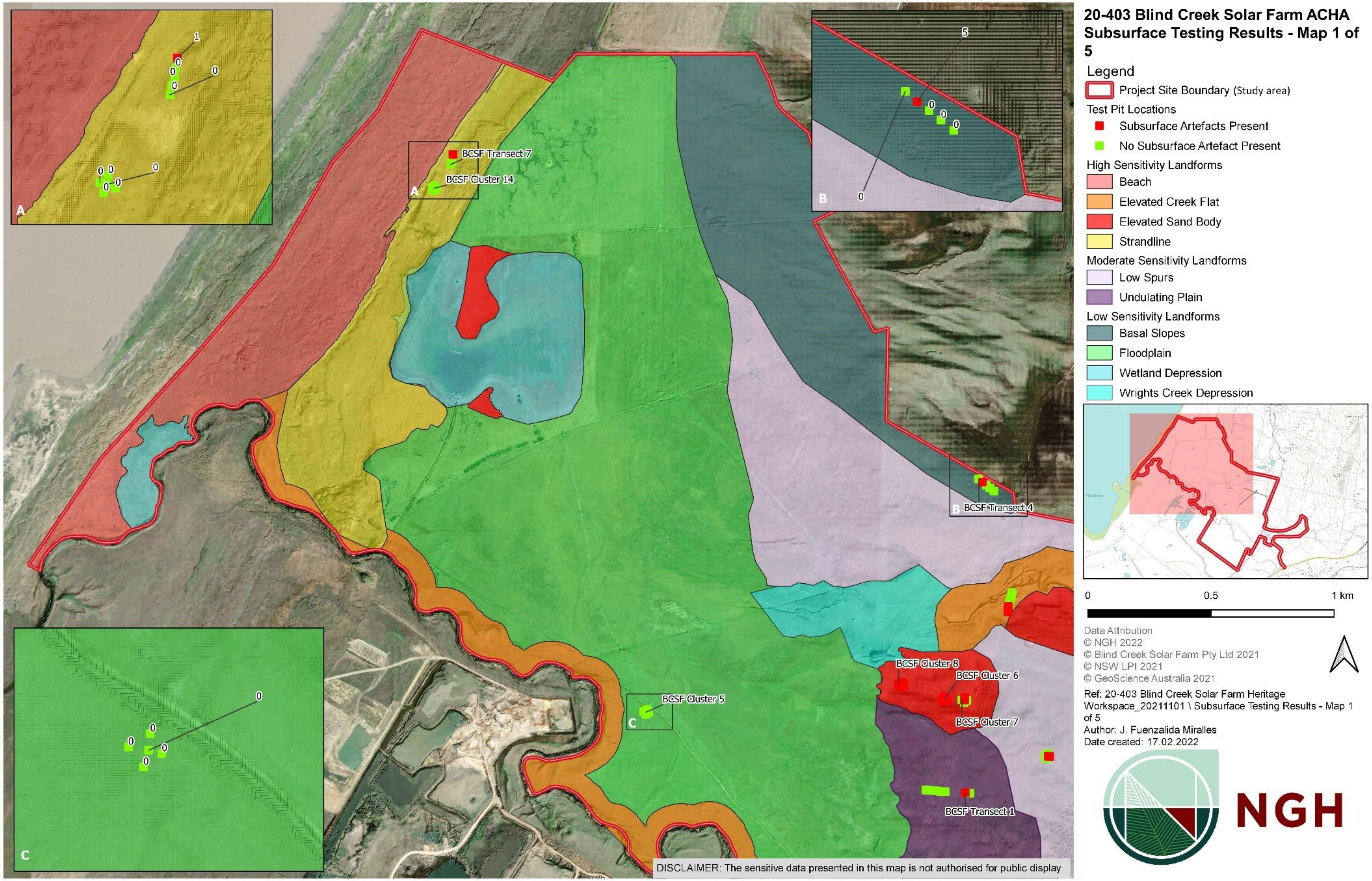


Figure 8-19 Overview of test pits with subsurface archaeological material within the northern portions of the Study area – Map 1 of 5

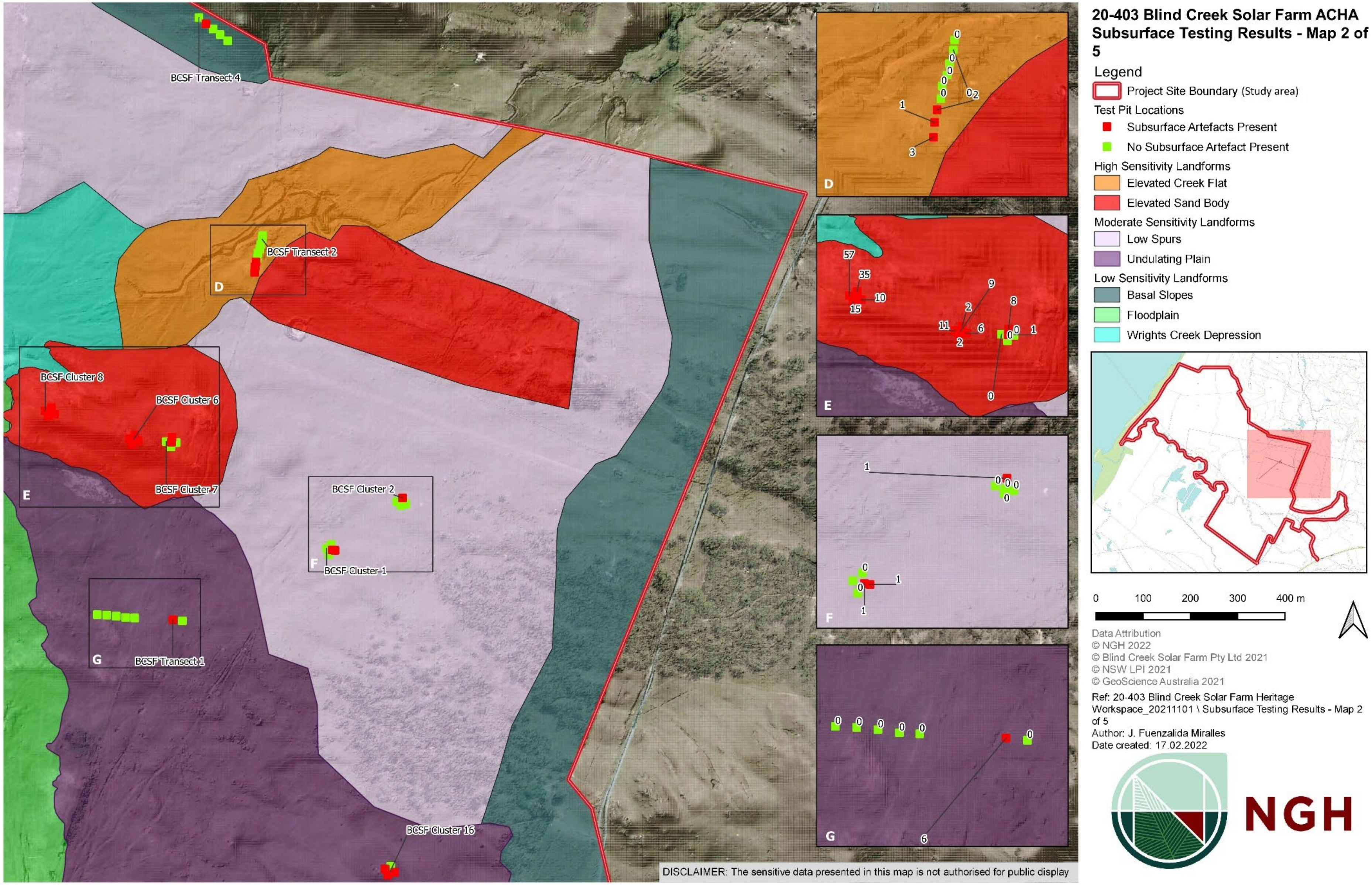


Figure 8-20 Overview of test pits with subsurface archaeological material within the northern portions of the Study area – Map 2 of 5

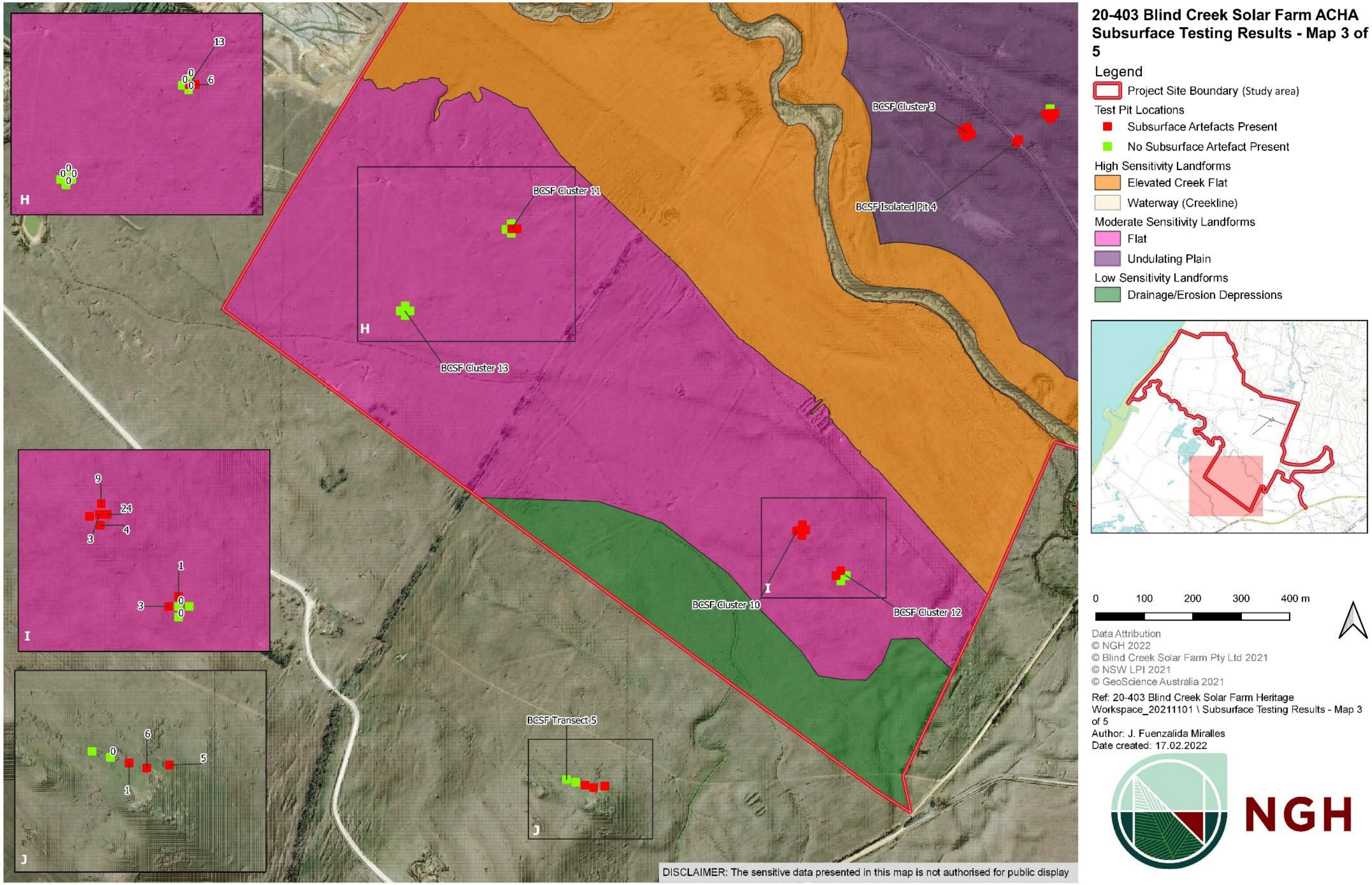


Figure 8-21 Overview of test pits with subsurface archaeological material within the northern portions of the Study area – Map 3 of 5

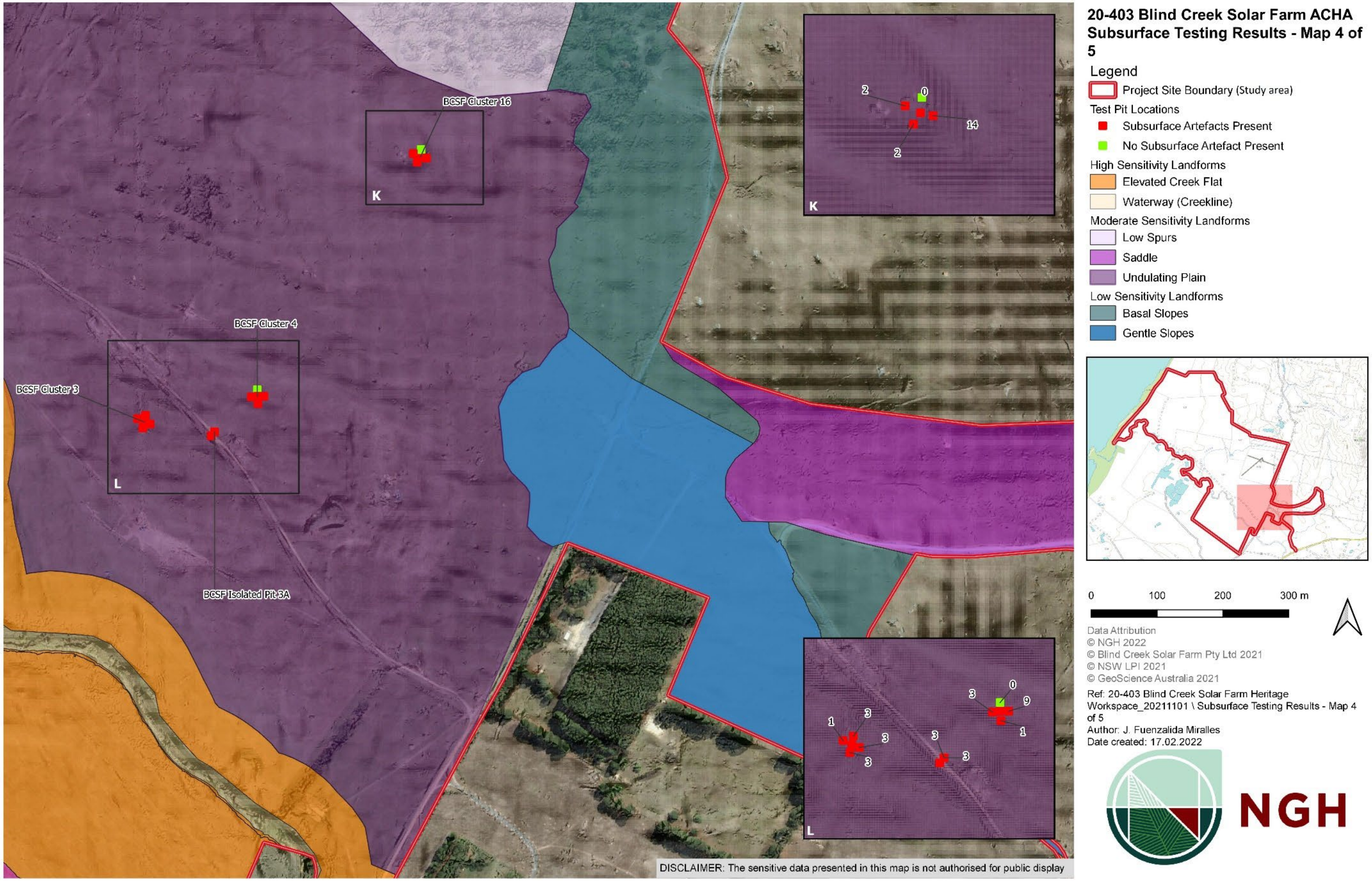


Figure 8-22 Overview of test pits with subsurface archaeological material within the northern portions of the Study area – Map 4 of 5

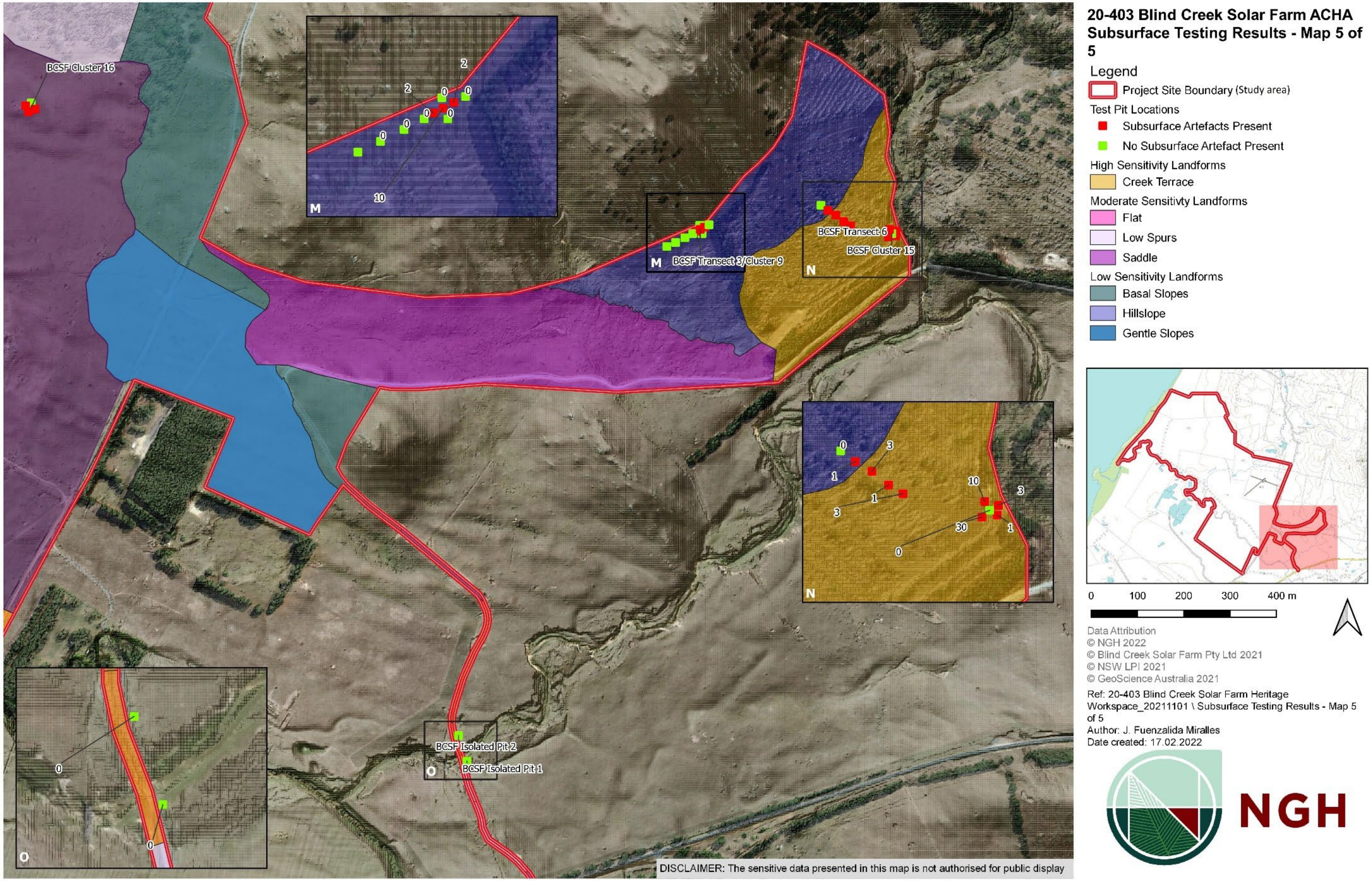


Figure 8-23 Overview of test pits with subsurface archaeological material within the northern portions of the Study area – Map 5 of 5

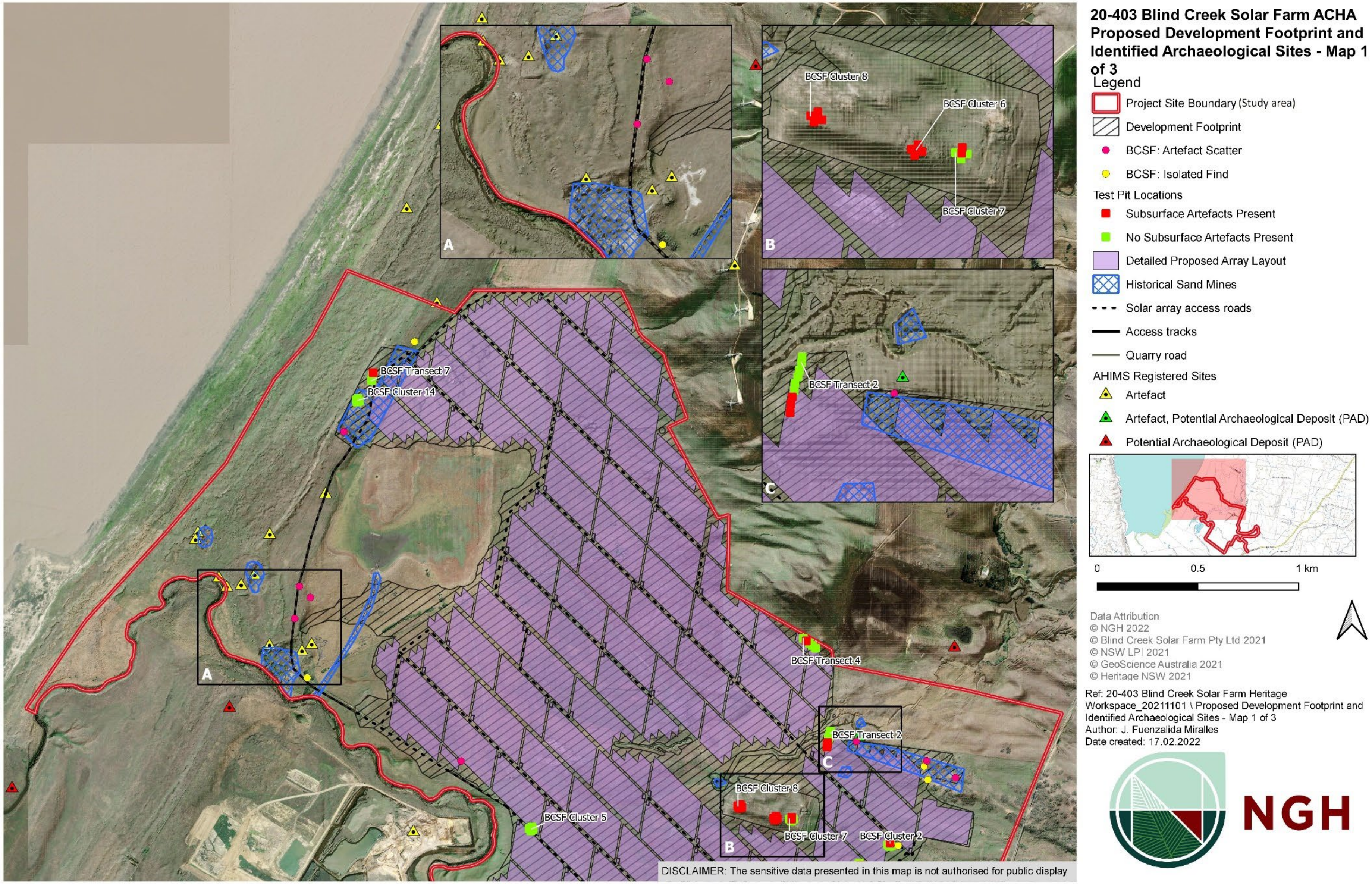


Figure 8-24 Proposed Development footprint and identified archaeological sites - Map 1 of 3

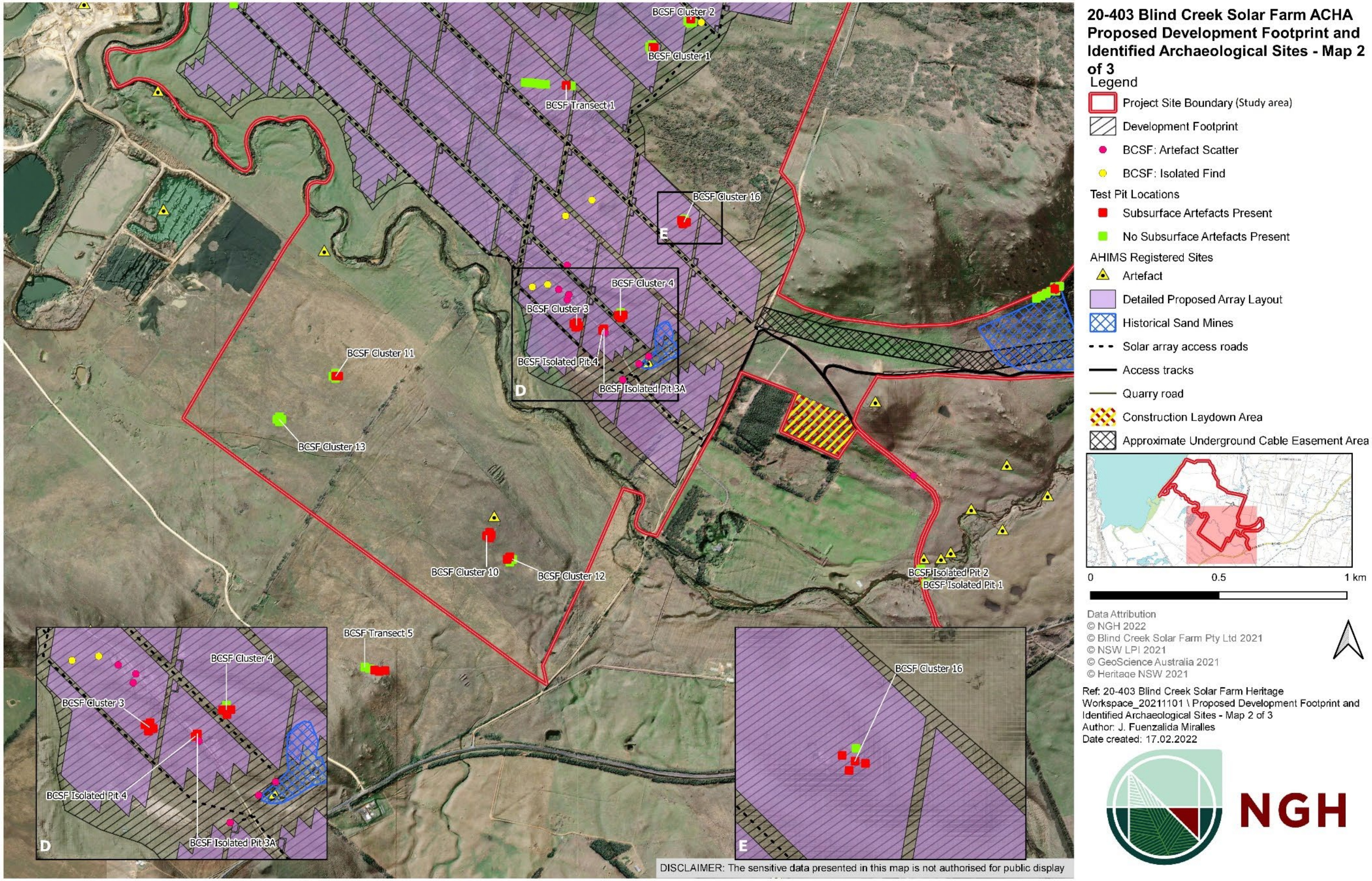


Figure 8-25 Proposed Development footprint and identified archaeological sites - Map 2 of 3

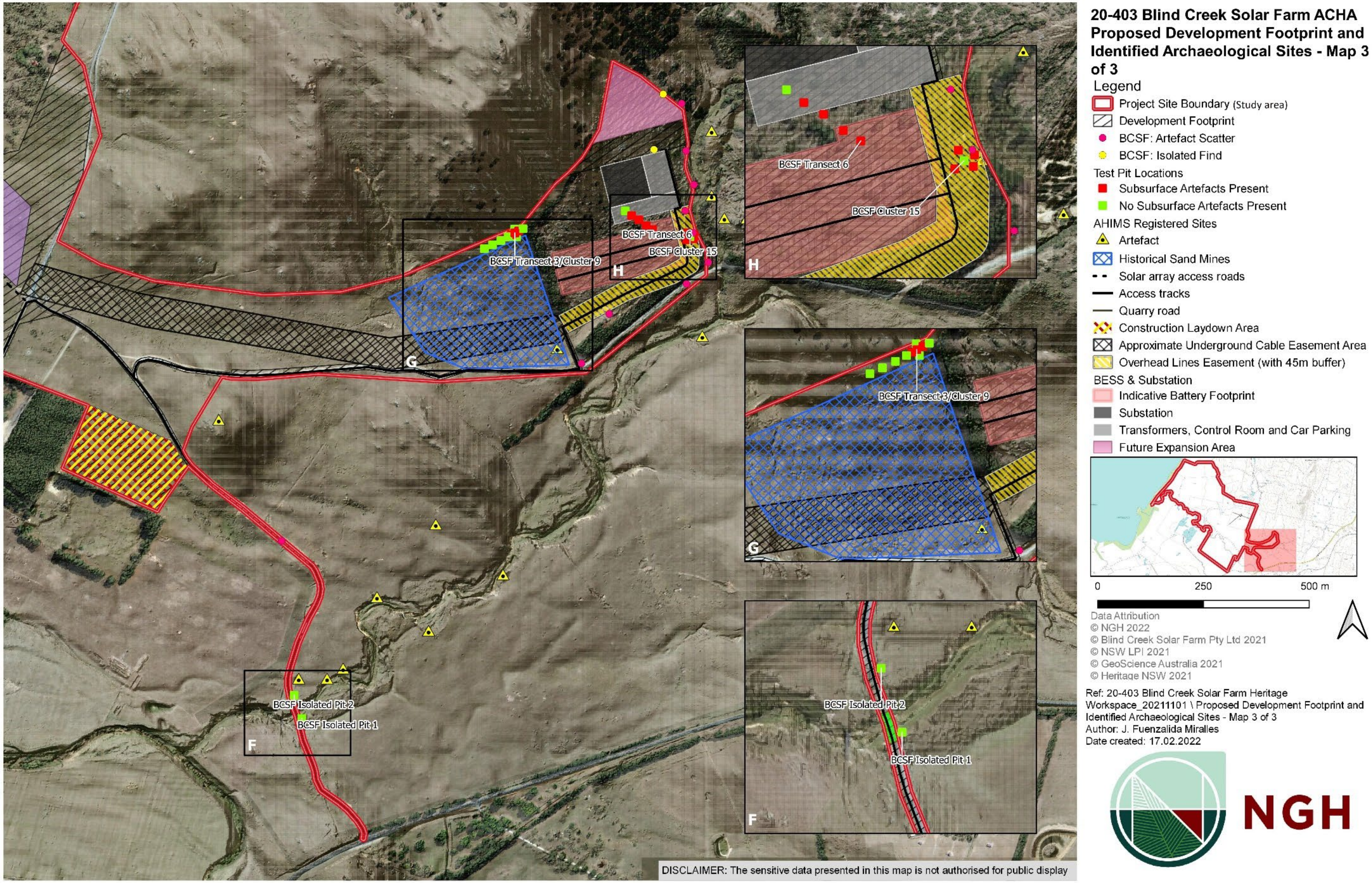


Figure 8-26 Proposed Development footprint and identified archaeological sites - Map 3 of 3

8.4.4 Potential impacts

The installation of solar modules mounted on single axis tracking tables will involve ground surface disturbance for the location of piles, constructing facilities, access tracks and temporary construction laydown and offices along with fencing and revegetation. Tracking tables can be installed in two configurations (1P or 2P, see section3.4.2), which impact the pile density and therefore the total ground disturbance from piles. Conservatively NGH has taken the upper limit which would result in a total area of ground surface disturbance of 0.3-0.6ha. In addition, trenching for infrastructure, access tracks and facilities will also cause ground disturbance to some extent with an overall impact from these activities of approximately 6% of the Development footprint (less than 4% of the site area).

In total 77 individual Aboriginal heritage sites within the Study area, which include 18 previously registered AHIMS sites, 38 isolated artefacts and artefact scatter sites recorded by NGH, and 21 areas containing subsurface artefacts were recorded by NGH during the fieldwork for this assessment. Three out of 18 previously recorded AHIMS, 17 of the 27 BCSF artefact scatter sites and 9 of the 11 BCSF isolated finds are situated within the Development footprint of the proposed transmission line, solar arrays, tracks, cables, office parking and temporary facilities. The most likely cause of harm to the artefacts will be through ground preparation activities such as vegetation clearance, installation of the solar array piles, tracks and underground cabling.

Table 8-9 provides an assessment of the scientific significance of sites within the Study area as well as an assessment of impacts to the sites and an estimate of the level of harm posed by the impact.

Table 8-9 Site impact assessment and significance

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
1	57-2-0059	Lakelands;	Undulating Plain	Active	Moderate	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection.
2	57-2-0020	Currandooly 2; Lake George;	Flat	Active	Moderate	No Impact Proposed	-	-	-	Excise area from proposed works
3	57-2-0702	CWF2-IF-02	Beach	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
4	57-2-0703	CWF2-IF-03	Strandline	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
5	57-2-0704	CWF2-IF-04	Strandline	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
6	57-2-0707	CWF2-IF-07	Strandline	Active	Low	Track maintenance	Direct	Total surface	Total Loss of Value	Surface collection
7	57-2-0708	CWF2-IF-08	Strandline	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
8	57-2-0790	West Creek Dairy PAD 1	Floodplain	Archaeological disturbance	Nil	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	No further work required.

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
9	57-2-0917	Willow Sands	Elevated Sand Body	Active. Eroding	High	No Impact Proposed	-	-	-	Excise area from proposed works
10	57-2-0642	Grantham Park 3	Elevated Creek Flat	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
11	57-2-0732	CWF2-S-01	Strandline	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
12	57-2-0733	CWF2-S-02	Strandline	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
13	57-2-0734	CWF2-S-03	Elevated Creek Flat	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
14	57-2-0735	CWF2-S-04	Beach	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
15	57-2-0736	CWF2-S-05	Strandline	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
16	57-3-0213	Blind Creek/Currandooly	Saddle	Active	Low	No Impact Proposed	-	-	-	Excise area from proposed works
17	57-3-0458	Bridge Ck SU2/L1	Creek Terrace	Active	Low	Overhead transmission line works	Direct	Total surface. Partial	Total loss of surface value.	Surface collection

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
								subsurface	Partial loss of subsurface value	
18	57-2-1155	BCSF: Isolated Find 1	Strandline	Disturbed	Low	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
19	57-2-1156	BCSF: Isolated Find 2	Undulating Plain	Disturbed	Low	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
20	57-2-1157	BCSF: Isolated Find 3	Undulating Plain	Disturbed	Low	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
21	57-3-0480	BCSF: Isolated Find 4	Hillslope	Disturbed	Low	Substation construction	Direct-	Total surface, partial subsurface	Partial Loss of Value	Avoid/Salvage
22	57-2-1158	BCSF: Isolated Find 5	Strandline	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
23	57-2-1159	BCSF: Isolated Find 6	Undulating Plain	Disturbed	Low	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
24	57-2-1160	BCSF: Isolated Find 7	Undulating Plain	Disturbed	Low	Panel construction	Partial	Partial surface.	Assumed Total Loss	Surface collection

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
								Minimal subsurface	of Value	
25	57-2-1161	BCSF: Isolated Find 8	Low Spurs	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
26	57-2-1162	BCSF: Isolated Find 9	Elevated Sand Body	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
27	57-2-1175	BCSF: Isolated Find 10	Elevated Sand Body	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
28	57-3-0489	BCSF: Isolated Find 11	Hillslope	Disturbed	Low	Future development zone (associated with substation/solar farm infrastructure)	Total	Total surface. Partial subsurface	Partial Loss of Value	Surface collection
29	57-2-1176	BCSF: Artefact Scatter 1	Floodplain	Disturbed	Low	Panel construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
30	57-2-1177	BCSF: Artefact Scatter 2	Strandline	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
31	57-2-1178	BCSF: Artefact Scatter 3	Elevated Creek Flat	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
32	57-2-1179	BCSF: Artefact Scatter 4	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
33	57-2-1180	BCSF: Artefact Scatter 5	Elevated Sand Body	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
34	57-2-1181	BCSF: Artefact Scatter 6	Strandline	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
35	57-2-1163	BCSF: Artefact Scatter 7	Strandline	Disturbed	Low	Track maintenance	Direct	Total surface	Total Loss of Value	Surface collection
36	57-2-1164	BCSF: Artefact Scatter 8	Strandline	Disturbed	Low	Track maintenance	Direct	Total surface	Total Loss of Value	Surface collection
37	57-2-1165	BCSF: Artefact Scatter 9	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
38	57-2-1166	BCSF: Artefact Scatter 10	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
39	57-2-1167	BCSF: Artefact Scatter 11	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
40	57-2-1168	BCSF: Artefact Scatter 12	Undulating Plain	Disturbed	Moderate	Track maintenance	Direct	Total surface	Total loss of value	Surface collection
41	57-2-1169	BCSF: Artefact Scatter 13	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
42	57-2-1170	BCSF: Artefact Scatter 14	Undulating Plain	Disturbed	Moderate	Track maintenance	Direct	Total surface	Total loss of value	Surface collection
43	57-2-1171	BCSF: Artefact Scatter 15	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial surface. Minimal subsurface	Assumed Total Loss of Value	Surface collection
44	57-2-1172	BCSF: Artefact Scatter 16	Elevated Sand Body	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
45	57-2-1174	BCSF: Artefact Scatter 17	Elevated Sand Body	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
46	57-3-0481	BCSF: Artefact Scatter 18	Saddle	Disturbed	Low	Track maintenance	Direct	Total surface	Total loss of value	Surface collection
47	57-3-0482	BCSF: Artefact Scatter 19	Creek Terrace	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
48	57-3-0483	BCSF: Artefact Scatter 20	Creek Terrace	Disturbed	Moderate	No Impact Proposed	-	-	-	Excise area from proposed works

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
49	57-3-0484	BCSF: Artefact Scatter 21	Creek Terrace	Disturbed	Moderate	Overhead transmission line works	Direct	Total surface. Partial subsurface	Total loss of surface value. Partial loss of subsurface value	Surface collection
50	57-3-0485	BCSF: Artefact Scatter 22	Creek Terrace	Disturbed	Moderate	Overhead transmission line works	Direct	Total surface. Partial subsurface	Total loss of surface value. Partial loss of subsurface value	Surface collection
51	57-3-0490	BCSF: Artefact Scatter 23	Creek Terrace	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
52	57-3-0486	BCSF: Artefact Scatter 24	Creek Terrace	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
53	57-3-0487	BCSF: Artefact Scatter 25	Hillslope	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
54	57-3-0488	BCSF: Artefact Scatter 26	Creek Terrace	Disturbed	Low	Continued use of quarry haul road	Direct	Total surface	Total loss of value	Surface collection
55	57-2-1173	BCSF: Artefact Scatter 27	Gentle Slopes	Disturbed	Moderate	Continued use of quarry haul road	Direct	Partial surface	Partial loss of value	Surface collection

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
56	57-2-1185	BCSF: Cluster 1	Low Spurs	Disturbed	Low	Panel Construction	Partial	Partial subsurface	Partial loss of value	No further subsurface archaeological works are required
57	57-2-1190	BCSF: Cluster 2	Low Spurs	Disturbed	Low	Panel Construction	Partial	Partial subsurface	Partial loss of value	No further subsurface archaeological works are required
58	57-2-1196	BCSF: Cluster 3	Undulating Plain	Disturbed	High	Panel and Track Construction	Partial	Partial subsurface	Partial loss of value	Open area subsurface excavation within representative area of undulating plain landform
59	57-2-1197	BCSF: Cluster 4 (BCSF Hearth)	Undulating Plain	Disturbed	High	Panel and Track Construction	Partial	Partial subsurface	Partial loss of value	Open area subsurface excavation within representative area of undulating plain landform
60	57-2-1191	BCSF: Cluster 6	Elevated Sand Body	Disturbed	High	No Impact Proposed	-	-	-	Excise area from proposed works
61	57-2-	BCSF: Cluster 7	Elevated Sandy	Disturbed	High	No Impact	-	-	-	Excise area from proposed

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
	1199					Proposed				works
62	57-2-1153	BCSF: Cluster 8	Elevated Sand Body	Disturbed	High	No Impact Proposed	-	-	-	Excise area from proposed works
63	57-2-1200	BCSF: Cluster 9/BCSF:Transect 3	Hillslope	Disturbed	Low	No Impact Proposed	-	-	-	Excise area from proposed works
64	57-2-1188	BCSF: Cluster 10	Flat	Disturbed	High	No Impact Proposed	-	-	-	Excise area from proposed works
65	57-2-1186	BCSF: Cluster 11	Flat	Disturbed	Moderate	No Impact Proposed	-	-	-	Excise area from proposed works
66	57-2-1187	BCSF: Cluster 12	Flat	Disturbed	Moderate	No Impact Proposed	-	-	-	Excise area from proposed works
67	57-3-0491	BCSF: Cluster 15	Creek Terrace	Disturbed	High	Substation Works	Direct	Total subsurface	Total loss of value	Open area subsurface excavation within representative area of creek terrace landform.
68	57-2-1189	BCSF: Cluster 16	Undulating Plain	Disturbed	Moderate	Panel Construction	Partial	Partial subsurface	Partial loss of value	Open area subsurface excavation within representative

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
										area of undulating plain landform.
69	57-2-1184	BCSF: Transect 1	Undulating Plain	Disturbed	Low	Panel Construction	Partial	Partial subsurface	Partial loss of value	Open area subsurface excavation within representative area of undulating plain landform.
70	57-2-1201	BCSF: Transect 2	Elevated Creek Flat	Disturbed	Low	Panel Construction	Partial	Partial subsurface	Partial loss of value	No further subsurface archaeological works are required
72	57-2-1194	BCSF: Transect 4	Basal Slopes	Disturbed	Low	Panel Construction	Partial	Partial subsurface	Partial loss of value	No further subsurface archaeological works are required
73	57-2-1198	BCSF: Transect 5	Basal Slopes	Disturbed	Medium	No Impact Proposed	-	-	-	Excise area from proposed works
74	57-3-0492	BCSF: Transect 6	Creek Terrace/Hillslopes	Disturbed	Medium	Substation Works	Direct	Total subsurface	Total loss of value	Open area subsurface excavation within representative area of creek terrace

No.	AHMIS #	Site name	Landform	Site integrity	Scientific significance	Impact Activity	Type of harm	Degree of harm	Consequence of harm	Recommendation
										landform. No further works required on the hillslope landform.
75	57-2-1193	BCSF: Transect 7	Strandline	Disturbed	Low	Track maintenance	Partial	Partial subsurface	Partial loss of value	No further subsurface archaeological works are required within historical sand mining area of strandline
77	57-2-1195	BCSF: Isolated Pit 3 (A to C)	Undulating Plain	Disturbed	Low	Panel and Track Construction	Partial	Partial subsurface	Partial loss of value	Open area subsurface excavation within representative area of undulating plain landform.
78	57-2-1192	BCSF: Isolated Pit 4	Undulating Plain	Disturbed	Low	Panel and Track Construction	Partial	Partial subsurface	Partial loss of value	Open area subsurface excavation within representative area of undulating plain landform.

8.4.5 Mitigation measures

There are varying degrees of archaeological sensitivity across the Study area, avoidance of all sites and areas of sensitivity is not possible for the overall viability of the project. However, avoiding harm to areas with high archaeological sensitivity has been achieved throughout the project design process by excising these areas from the proposed Development footprint.

Removal of highly archaeologically sensitive landforms, namely the previously undisturbed strandline and large portions of elevated sand bodies, and a buffer zone along riparian corridors has resulted in the preservation of the following Aboriginal sites within the BCSF Study area:

- 14 out of 18 previously registered AHIMS sites
- 10 out 27 NGH recorded artefact scatters
- 2 out of 11 NGH recorded isolated artefacts
- Protection of any potential and subsurface deposits within these archaeologically sensitive landforms.

Based on the assessment of the significance of these landforms, these sites are also likely to represent sites with higher scientific research value.

A combination of avoidance, salvage through surface collection of artefacts, additional open area excavations and stop work measures for significant finds would minimise the potential impact upon existing sites, potential sites, and research opportunities to an acceptable level.

The following Figure 8-27 below shows the proposed impact mitigation measures recommended for the Study area, along with recommendations provided in Table 8-10 below.

Table 8-10 List of Mitigation measures for Aboriginal heritage

No.	Mitigation measures	Phase
AH1	The proponent must prepare a Cultural Heritage Management Plan (CHMP) to outline management steps and requirements for ongoing management of cultural heritage values within the construction, operation and decommissioning stages of the project. The CHMP may include some of the following elements, with agreement of relevant stakeholders. 1. Management of known sites. 2. Management of high sensitivity areas excluded from the project footprint. 3. Management of unexpected finds, and 4. Ongoing consultation and engagement with the local Aboriginal community.	Pre-construction Construction Operation Decommissioning
AH2	All cultural material recovered from the subsurface testing	Pre and post

No.	Mitigation measures	Phase
	programme which is currently in temporary care at the NGH Canberra office be reburied in accordance with Requirement 26 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* in an appropriate location within the Development site as agreed with the registered Aboriginal parties. The reburial location must be submitted to the AHIMS database and will not be impacted in the future.	construction
AH3	Any recorded surface artefacts that cannot be avoided by the Development footprint must be salvaged by community collection prior to the commencement of ground disturbing works. The collection and relocation of the artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties in accordance with Requirement 26 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. The map shown in Figure 8-27 must be used as a guide for undertaking community collections. The artefacts should be collected and moved to a safe area within the property that will not be subject to any ground disturbance.	Pre-construction
AH4	All objects salvaged must have their reburial location submitted to the AHIMS database. An Aboriginal Site Impact Recording Form must be completed and submitted to AHIMS following harm for each site collected or destroyed from salvage and/or construction works.	Post construction
AH5	A Cultural Smoking Ceremony should be considered if requested by the Aboriginal community to take place to cleanse any artefacts salvaged during the reburial.	Pre-construction
AH6	Representative subsurface salvage excavations should be undertaken within the following landforms where significant ground disturbance works such as cabling or infrastructure is proposed. • Elevated Sand Body • Undulating Plains • Creek Terrace The excavations would be undertaken within relatively undisturbed deposits (or deposits assumed to be undisturbed) and be aimed at retrieving important scientific information about the nature and age of the sites. The detailed research aims should be guided by those identified in this assessment and other researchers. This includes detailed analysis of the stone artefact technology and landuse.	Pre-construction
AH7	A selection of salvaged artefacts could be stored securely on-site (within the Cultural Learning Zone, for example) for easy access by	

No.	Mitigation measures	Phase
	the local Aboriginal community for education and cultural purposes such as Open Days, (contingent upon the consensus of comments received from RAPs on this ACHA report).	
AH8	The Proponent continue to consult with the Aboriginal community should the proposal receive approval regarding any conditions of consent concerning Aboriginal cultural heritage.	Pre-construction Construction Operation Decommissioning
AH9	In the event that human remains are discovered during the works, all work must cease in the immediate vicinity. Heritage NSW and the local police should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal. Should the remains be identified as Aboriginal in origin, Heritage NSW will identify the appropriate course of action.	Pre-construction Construction Operation Decommissioning
AH10	Any changes to the proposed Development footprint that has not been assessed by this report should be subject to further assessment.	Pre-construction Construction Operation Decommissioning

The provision of an ICHLZ, planned to be set aside by the landowners to provide the Aboriginal community access to the shore of the lake to engage in cultural practices on Country and as a place to teach and learn Aboriginal cultural connection and heritage is potentially an important educational opportunity of this project. The educational value may be in either relation to the local Aboriginal community and teaching young people or could be more broadly applied to the population in terms of Aboriginal history of the region. While this has not been listed specifically as a mitigation measure for any impact to cultural heritage values it is aligned and promotes the principles of Ecologically Sustainable Development (ESD) utilised in the development process.

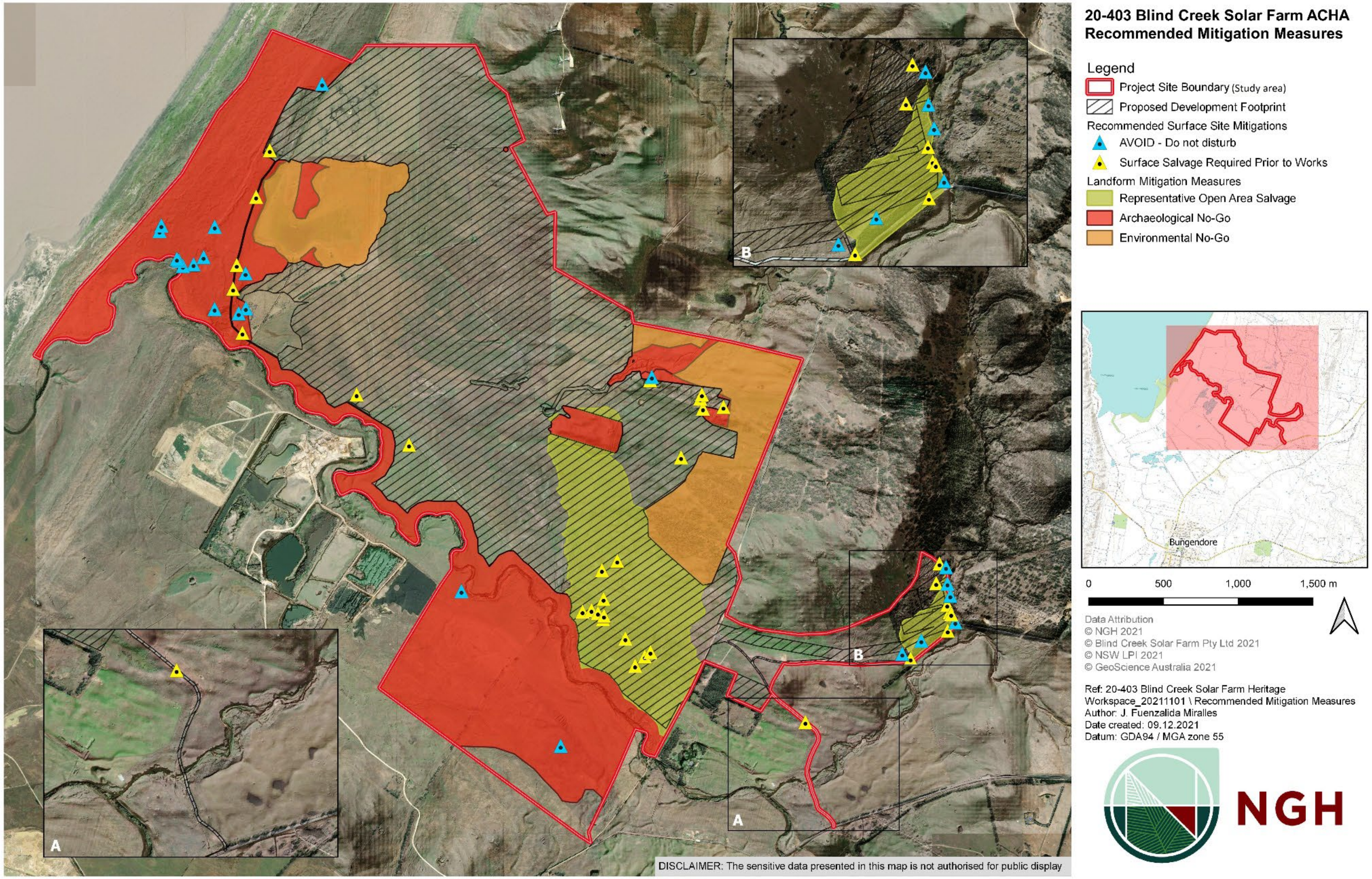


Figure 8-27 Proposed mitigation measures

8.5 Hydrology and flooding

Footprint Sustainable Engineering Pty Ltd (Footprint) completed an assessment of hydrological impacts of the Project. The purpose of the assessment was to ensure that infrastructure:

- Would be located in areas that would not be at an unacceptable risk of flooding.
- Would not cause changes to local hydrology or exacerbate erosion.

The report has been provided as Appendix I and is summarised below. It is supplemented by a characterisation of the local catchment and waterways (provided in the Existing environment Section 4.1.1 by NGH).

8.5.1 Approach

For the broader Study area, the existing hydrology and flood behaviour was characterised. This included modelling flood depths in terms of 'hazard vulnerability'. This assisted, early in the planning states of the project, to define the Development Footprint within which infrastructure would be located.

Flood depths were modelled both at a 1% and 5% Annual Exceedance Probability (AEP; used to describe how likely a flood is to occur in a given year[6]). The model was re-run, assuming infrastructure would be located in the Development Footprint, to see how this affected the predicted flooding events.

The results were used to guide the design with respect to management of the floodplain, including locating critical infrastructure outside the floodplain and provision of riparian corridors and other protocols to ensure the impacts of the project are well managed. These form commitments of the project and are stated at the end of this chapter.

8.5.2 Existing environment

Catchment area and water ways

The Development site is located within the Lake George Catchment which is approximately 950km^2 with the lake itself occupying 16% of the total catchment area (DPIE, 2021). The Lake George Catchment is located within the Murrumbidgee Catchment Area. The Murrumbidgee Catchment is part of the Murray Darling Basin (Table 8-11 and Figure 8-28) located within the southern reaches of the Basin.

---

[6] For example, a 1% AEP flood represents a 1% risk this flood level will be exceeded, in any one year.

Table 8-11 Murrumbidgee Catchment attributes (MDBA, 2021)

Item	Description
Catchment area	84,000km2 (8% of the Murray-Darling Basin)
Contribution to basin water	16%
Annual stream flow	4,000 GL per year
Key water uses	Irrigation agriculture, hydroelectricity, and urban water supply

Lake George is a ‘closed lake system’, meaning water is not contributed to the Murrumbidgee or Murray-Darling system but instead is lost through evaporation and underground seepage.

The lake is fed by six (6) major tributaries from the surrounding hillslopes. There are four (4) main waterways located within or around the Development site, refer to Table 8-12 and Figure 8-29. There are approximately 16 dams and/or ephemeral wetlands within the Development site.

Table 8-12 Waterways within and surrounding the Development site

Waterway	Stream order (Strahler)	Tributary of / drains into	Indicative location
Butmaroo Creek	6	Lake George	Southern boundary and section of site
Blind Creek (also known as Bridge Creek)	5	Butmaroo Creek	Blind Creek Road Entrance site access road near Tarago Road, and adjacent to substation and BESS areas
Wrights Creek	4 (*this is incorrectly mapped, please refer to discussion in this section)*	Butmaroo Creek	Mid-section of site
Unnamed waterway	1	Blind Creek	Traverses eastern arm of site

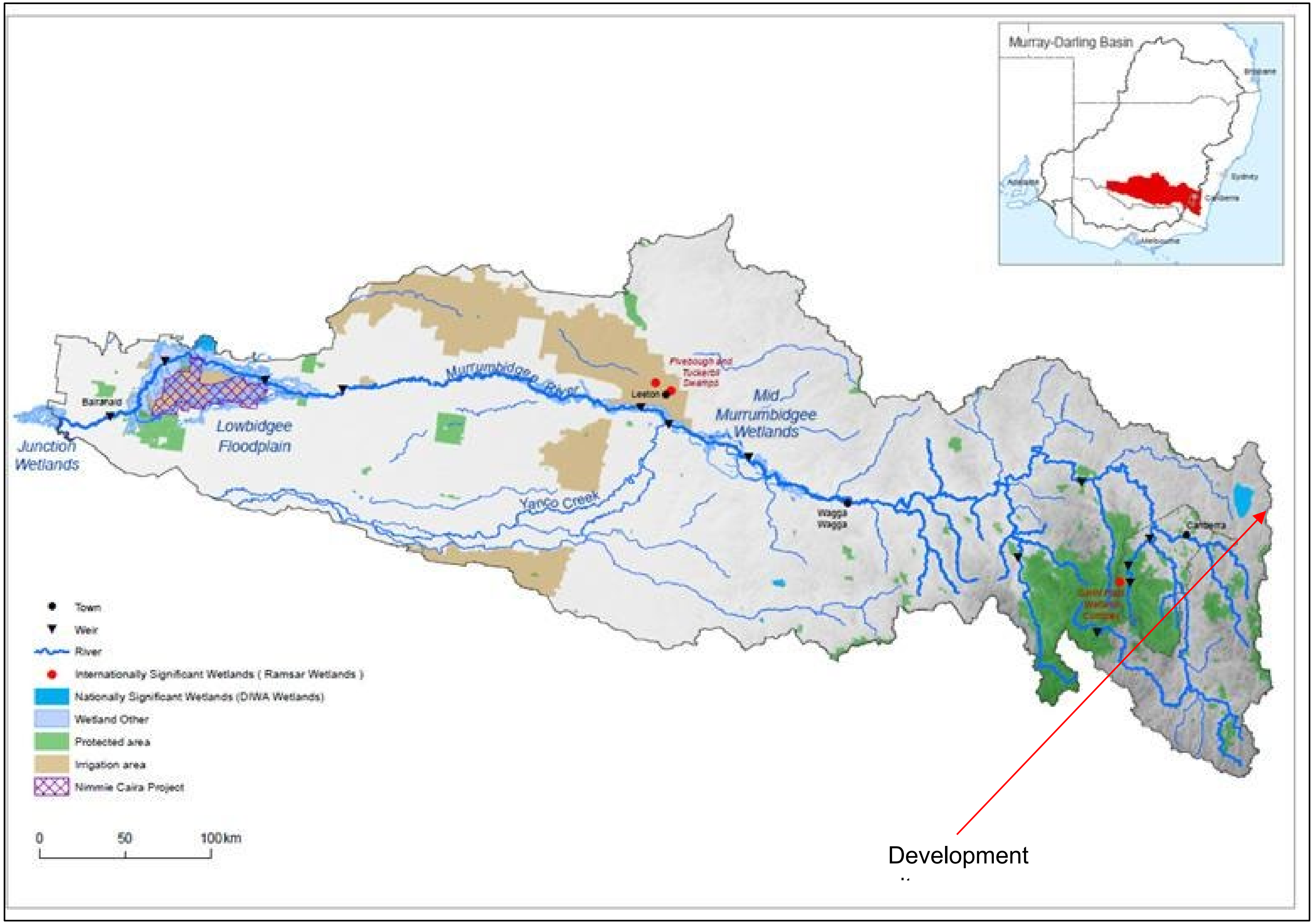


Figure 8-28 Murrumbidgee Catchment area, source Department of Agriculture, Water and the Environment 2021

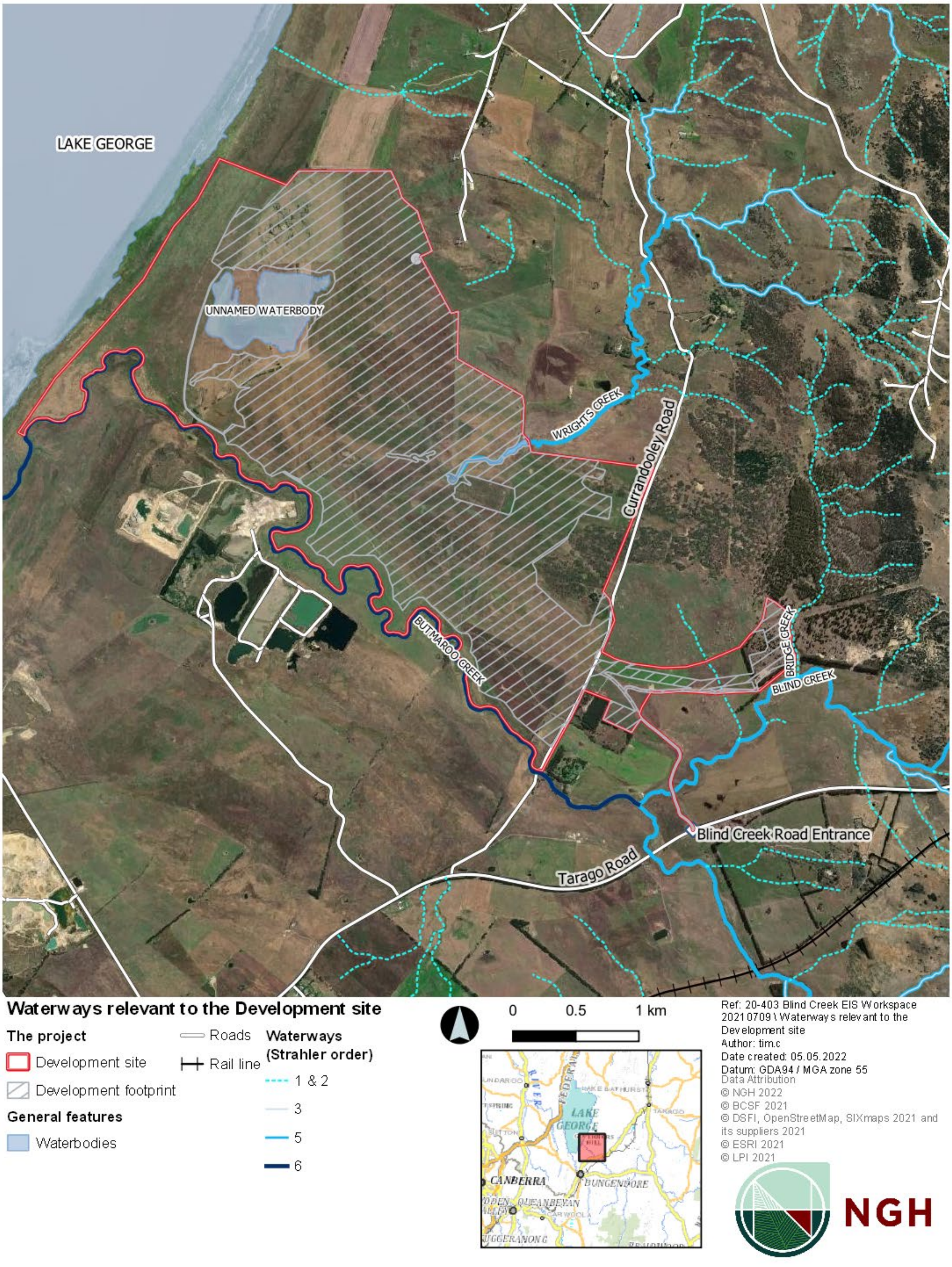


Figure 8-29 Waterways relevant to the Development site (showing erroneous mapping of Butmaroo watercourse confluence, eastern portion of Development Site)

Butmaroo Creek

Butmaroo Creek is a major waterway within the local context with a catchment of $61km^2$ and a catchment length of 18km (BOM, 2020). Butmaroo Creek is located along the south boundary and runs along the southern section of the Development site. The creek water levels are lowest in the summer and autumn, and the August 2021 mean water level was 0.538m at gauge station 411003. Water flow records over the period 1971 to 2021 indicate the mean peak annual discharge is 1,244 ML/day (WaterNSW, 2021) and the average annual flow volume is 4.91ML (BOM, 2020). Annual streamflow is variable as shown in Figure 8-30. A representative section of Butmaroo Creek is shown in Figure 8-31.

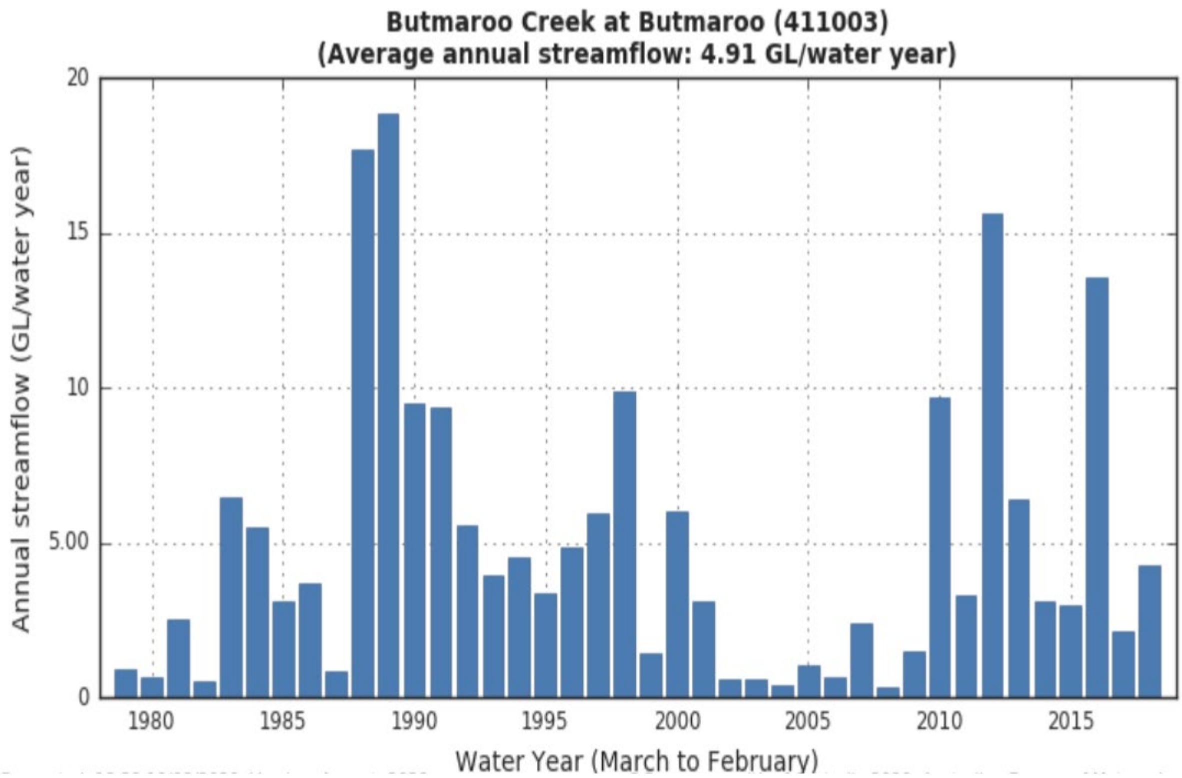


Figure 8-30 Butmaroo Creek Annual Stream Flow (BOM, 2020)

Figure 8-31 Representative sections of Butmaroo Creek

Wrights Creek

Wrights Creek bisects the site from the north-east. Although Wrights Creek has been mapped (NSW Hydroline Dataset) as a tributary of Butmaroo Creek with a confluence within the western edge of the Development Site, ground truthing shows that there is no direct discharge into Butmaroo Creek via a defined watercourse. Isolated channels occur in three locations in the east of the Development site (refer to Figure 8-32). These channels are well vegetated and relatively stable (evidenced by the historic aerial imagery showing there have been no significant changes since 1959). No other areas within the floodplain within the vicinity of the mapped watercourse exhibited the typical attributes of a watercourse (i.e. defined bed and banks). Specifically, the western section of the mapped watercourse, where it is shown to join Butmaroo Creek, does not appear accurate. The bed and banks of Wrights Creek are not discernible or distinguishable from the surrounding landscape, refer to Figure

8-33. As such there is no evidence of surface flow and Wrights Creek does not discharge into Butmaroo Creek.

The longitudinal connectivity between upstream and downstream habitats of Wrights Creek and Butmaroo Creek only occurs intermittently following heavy rains and/or flooding. Approximately 190 years of agricultural activities; comprising of grazing and cropping; may have modified the topography of the site but it is more likely that mapping conducted in the 1980s failed to appreciate that Wrights Creek drained onto a very flat floodplain and attempted to make sense of poor resolution imagery via a somewhat arbitrary drainage line.

Figure 8-32 Wrights Creek bed and bank formation with some ponding (upstream section, eastern portion of Development Site)

Figure 8-33 Wrights Creek, no discernible bed or bank formations (western portion of Development Site)

Large ephemeral wetland

It is also noted that a large ephemeral wetland is located in the north section of the Development site, between the proposed PV array and Lake George, refer to Figure 8-34. The wetland drains into Butmaroo Creek via man-made channel during high water level events.

Based on these topographical and landscape features, overland flows following rain events disperse across the Development site and would infiltrate into the wetland via dispersed overland flows and groundwater seepage. From there the former waters of Wrights Creek drain via the man-made channel into Butmaroo Creek.

Figure 8-34 Wetland within the Development site after significant rainfall

Blind Creek

Blind Creek (known on maps as Bridge Creek), a fifth order stream, flows east to west across the Development site's main access road, joining Butmaroo Creek. The existing road crossing over the creek is a low-level causeway that floods after periods of high rainfall. Figure 8-35 depicts Blind Creek crossing following heavy rains and flooding.

Figure 8-35 Blind Creek crossing

Key Fish Habitat

Lake George, Butmaroo Creek, and the unnamed wetland are identified as Key Fish Habitat within the Development site. First and second order streams that flow for short periods after rain are generally excluded, as are farm dams constructed on such systems. Wholly artificial waterbodies such as irrigation channels, dams, ponds, salt and evaporation ponds are also excluded except where they are known to support populations of threatened fish or invertebrates. Wrights Creek, has been incorrectly mapped as a 4th order stream, as such it is not considered KFH. It should be noted that the wetland and the overland portion of Wrights Creek are dry for most of the year and have been grazed and cropped.

Degree of disturbance

Hydrology, landform and soils have been heavily modified by paddock development and erosion (potentially exacerbated by grazing and the rabbit plagues) and sand quarrying activities. Five small dams are located within the Development footprint, which are mainly used by grazing sheep and cattle. However, due to the high permeability of the sandy soils these dams have poor reliability and have mainly been superseded by piped reticulation. No irrigation channels run through the Development site.

Existing hydrological function (pre development)

Footprint undertook modelling to characterise the local hydrology of the Study area in its current condition. In a 1% Annual Exceedance Probability (AEP) event, the hydrological and hydraulic modelling shows that flood depths (>1m) are expected to occur within Butmaroo Creek and Blind Creek with a maximum flood velocity of 2m/s, but these are located outside the Development footprint.

Flow depths within a short section of Wrights Creek, within the Development footprint, can exceed 1m however, they are predominately less than 0.2m in the 1% AEP event and velocity is predominately 0.5m/s to 1.5m/s (refer to 'pre development' modelling, Figure 8-36 and Figure 8-37).

Existing hazard vulnerability (pre development)

Footprint mapped the flood hazard vulnerability over the Study area in accordance with Table 6.7.4 of Australian Rainfall and Runoff (Geoscience Australia, 2019). Australian Rainfall and Runoff describes the hazard thresholds for community interaction with floodwaters, these are summarised in Table 8-13. This assisted to define the Development footprint now proposed (discussed under Potential impacts; refer to post development modelling, Figure 8-38).

Table 8-13 Hazard vulnerability classification

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles, children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

The mapping shows that flooding within the Study area is generally classified as a H1 or H2 hazard vulnerability in the 5% AEP and 1% AEP events, except for flooding within Butmaroo and Blind Creeks which reaches H6. As expected, hazard increases considerably over the study area in the Probably Maximum Flood (extreme) event, with approximately half of the study area classified as H5 or H6. Refer to Figure 8-38 to Figure 8-40 for the 1% AEP and Probable Maximum Flood events (Figure 2.3 in Appendix I shows the 5% AEP events).

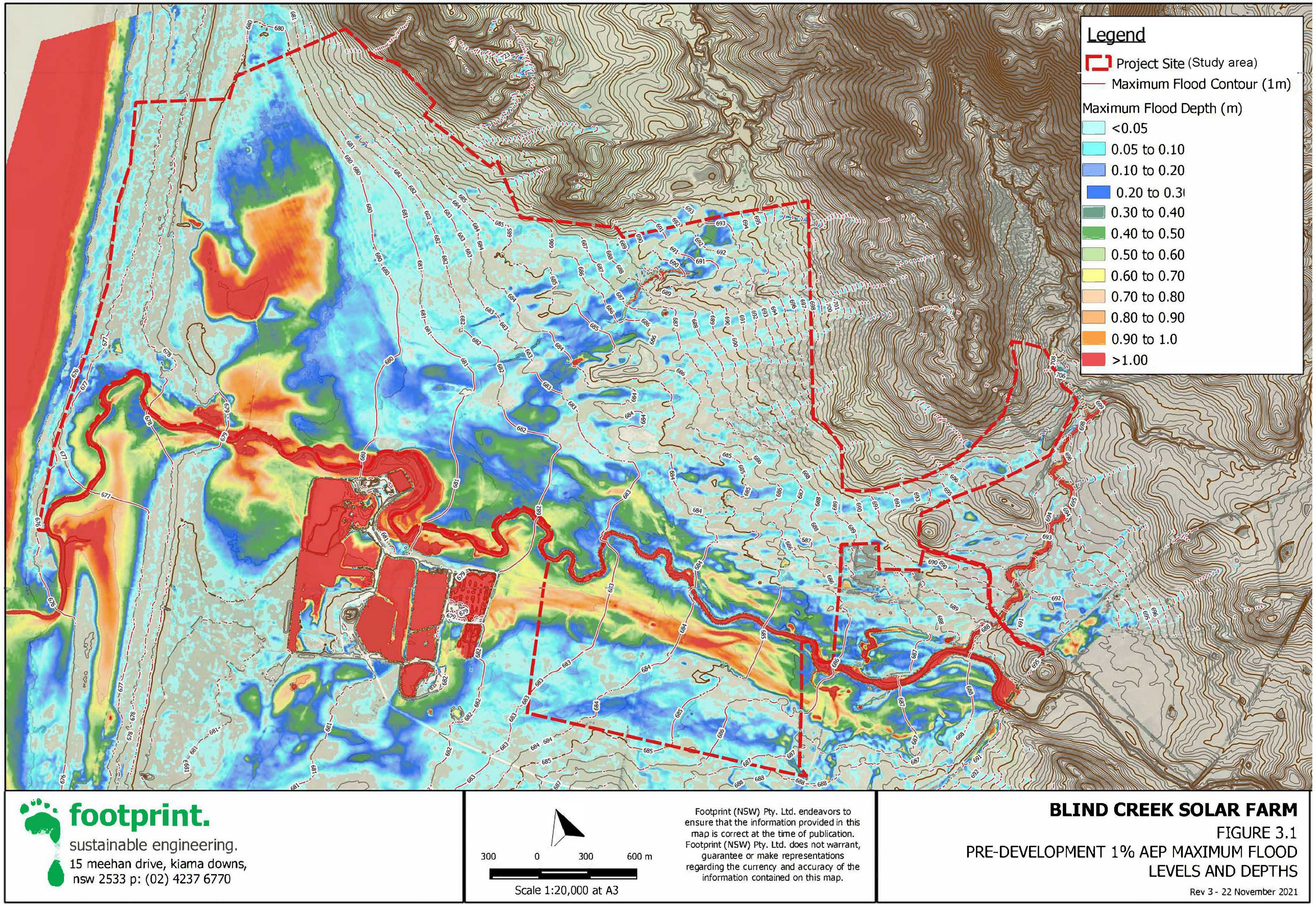


Figure 8-36 Pre-development 1% AEP maximum flood depth

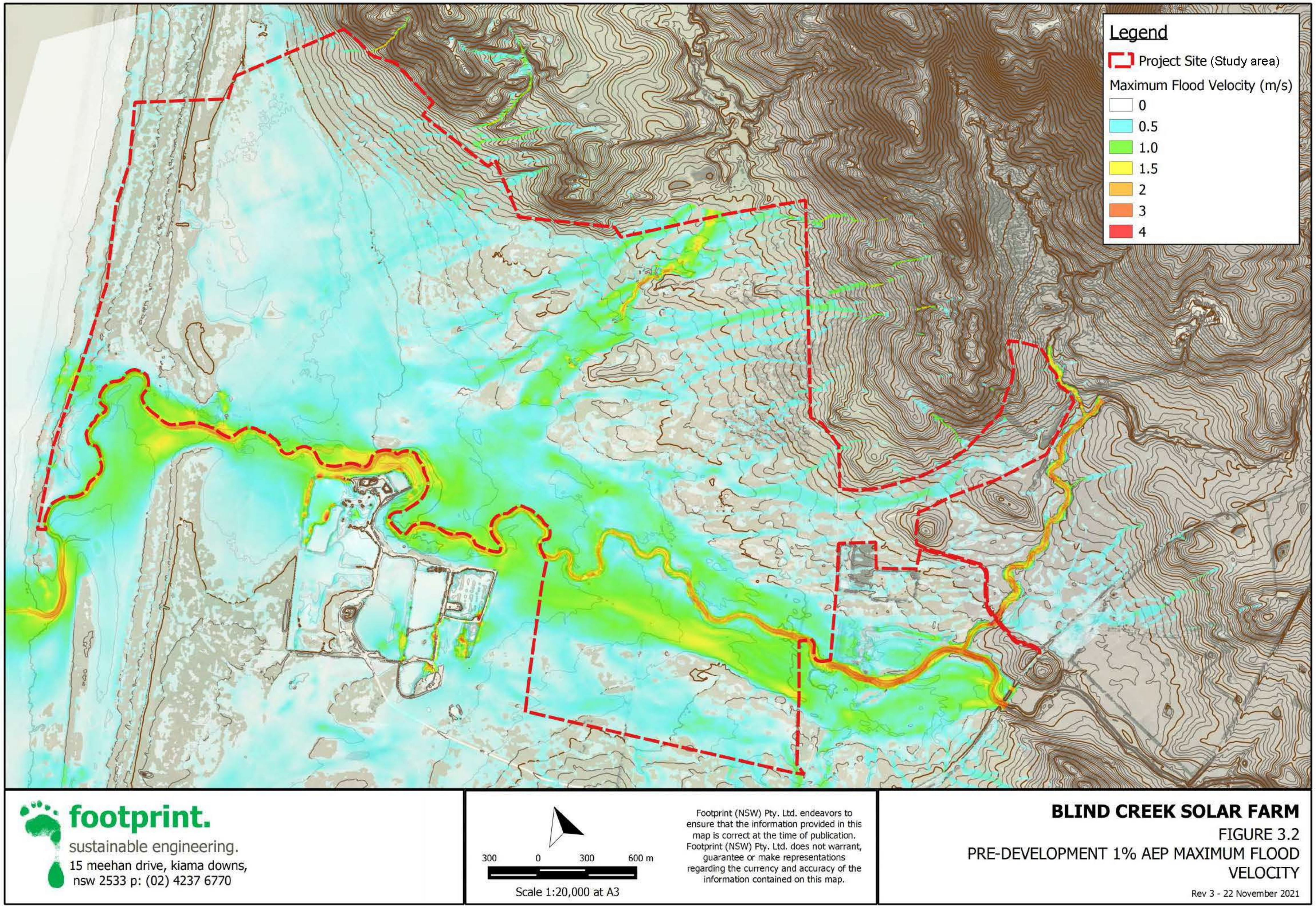


Figure 8-37 Pre-development 1% AEP maximum flood velocity

8.5.3 Potential impacts

Construction and decommissioning

The construction and decommissioning stage of the project can increase the impacts on waterways during flooding events. Activities such as excavation and stock piling of materials in particular, may exacerbate:

- Pollution risks from leakage of stored pollutants (hydrocarbons, pesticides, solvents).
- Physical damage from the mobilisation of components in flood waters.

Furthermore, electrical hazards to works may result during this stage.

Generally, these risks are addressed by locating the Development footprint in accordance with the flood hazard mapping (refer to operational impacts), implementing design measures with regard to infrastructure components and by adherence to project specific:

- Soil and water management protocols.
- Ground cover management protocols.
- Emergency response protocols.

These stipulations of the hydrology assessment are carried over into the mitigation measures at the end of this chapter and form commitments of the project.

Operation

During operation, the location of permanent infrastructure in areas susceptible to flooding can:

- Increase the risk of flood occurrence or severity, where they impede flow paths,
- Create hazards in the event of a flood to workers onsite, and as for construction and decommissioning,
- Cause pollution risks from leakage of stored pollutants (hydrocarbons, pesticides, solvents) or
- Physical damage from the mobilisation of components in flood waters.

Based on the hydraulic modelling of the proposed Development footprint, there is not predicted to be a significant impact on flood behaviour for the 1% AEP, with flood levels, depths, velocities and hazards shown to remain largely unchanged. This is demonstrated in Figure 8-41 and Figure 8-42 which show the change in maximum flood level and peak velocity resulting from the proposed development. This is due primarily to most of the infrastructure being located outside high hazard areas of the floodplain.

Some minor increases in flood levels of up to 50mm are shown to occur within the Butmaroo Creek northern overbank area and within the Wrights Creek floodplain however these changes are very localised and are largely contained within the Development site. Some minor (up to 20mm) increases are anticipated within the adjacent quarry pits however these areas are already subject to flood depth more than 2m so this marginal increase should not create any adverse impact.

Further, velocities over the Study area are shown to be contained in the range of plus or minus 0.25m/s when compared to pre-development velocities and therefore should not result in any adverse impact to the stability of the bed and banks of existing waterways or contribute to degradation of the land by erosive flood forces.

As above, by locating the Development footprint in accordance with the flood hazard mapping (as is shown below) and implementing design measures with regard to infrastructure components, the project would not adversely affect local hydrology or erosion. All stipulations of the hydrology assessment are carried over into the mitigation measures below and form commitments of the project.

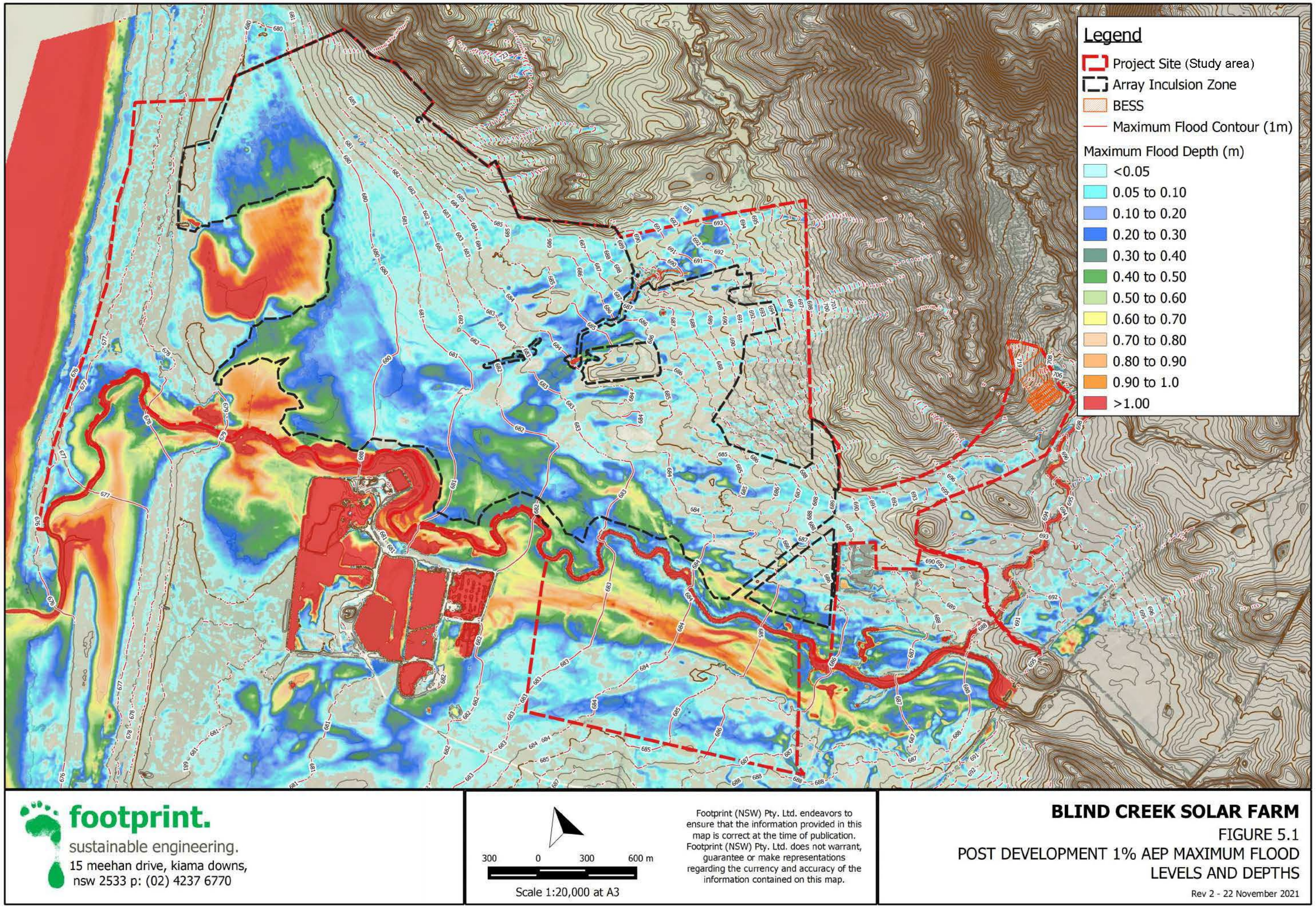


Figure 8-38 Post development 1% AEP maximum flood levels and depths

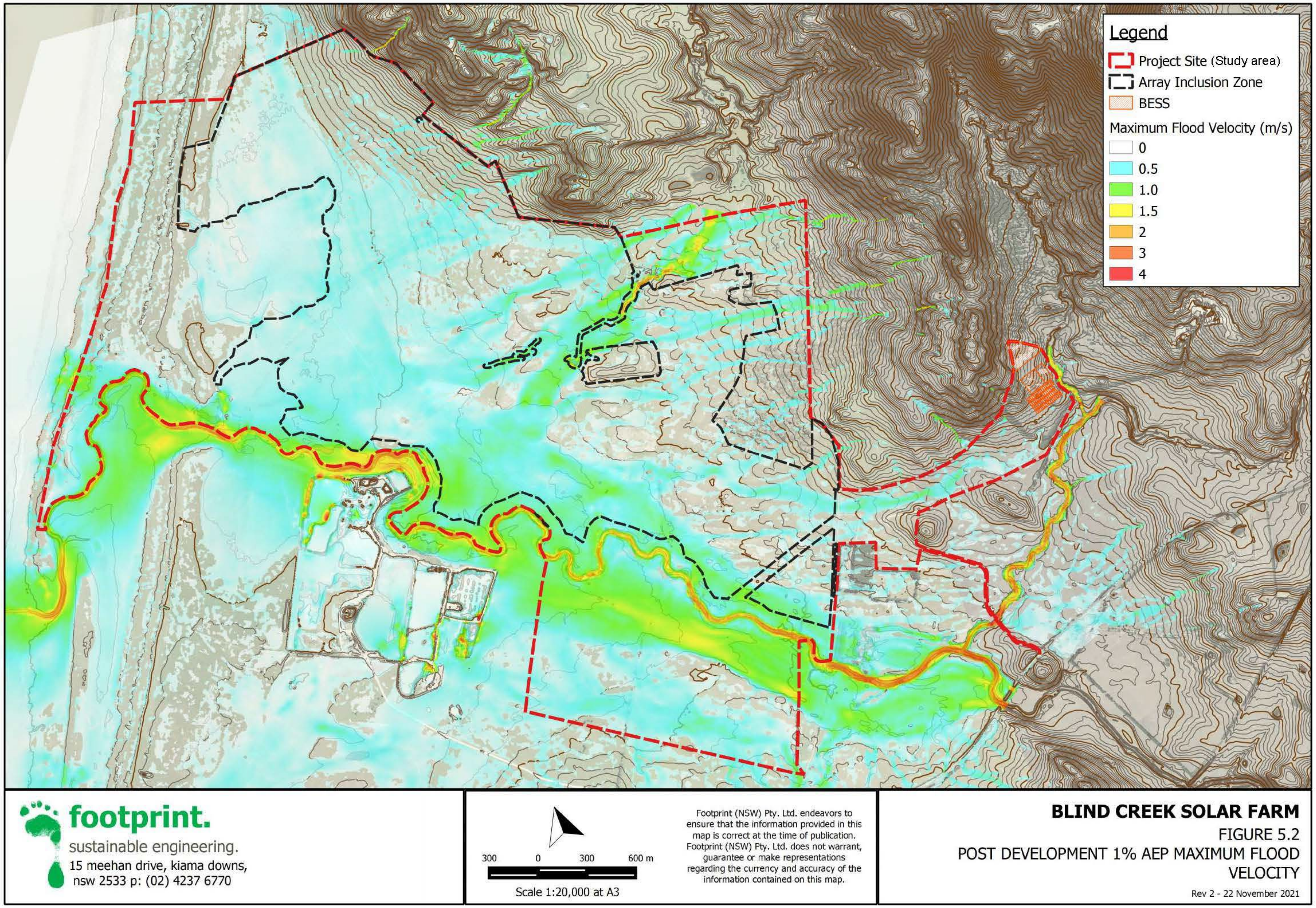


Figure 8-39 Post development 1% AEP Maximum flood velocity

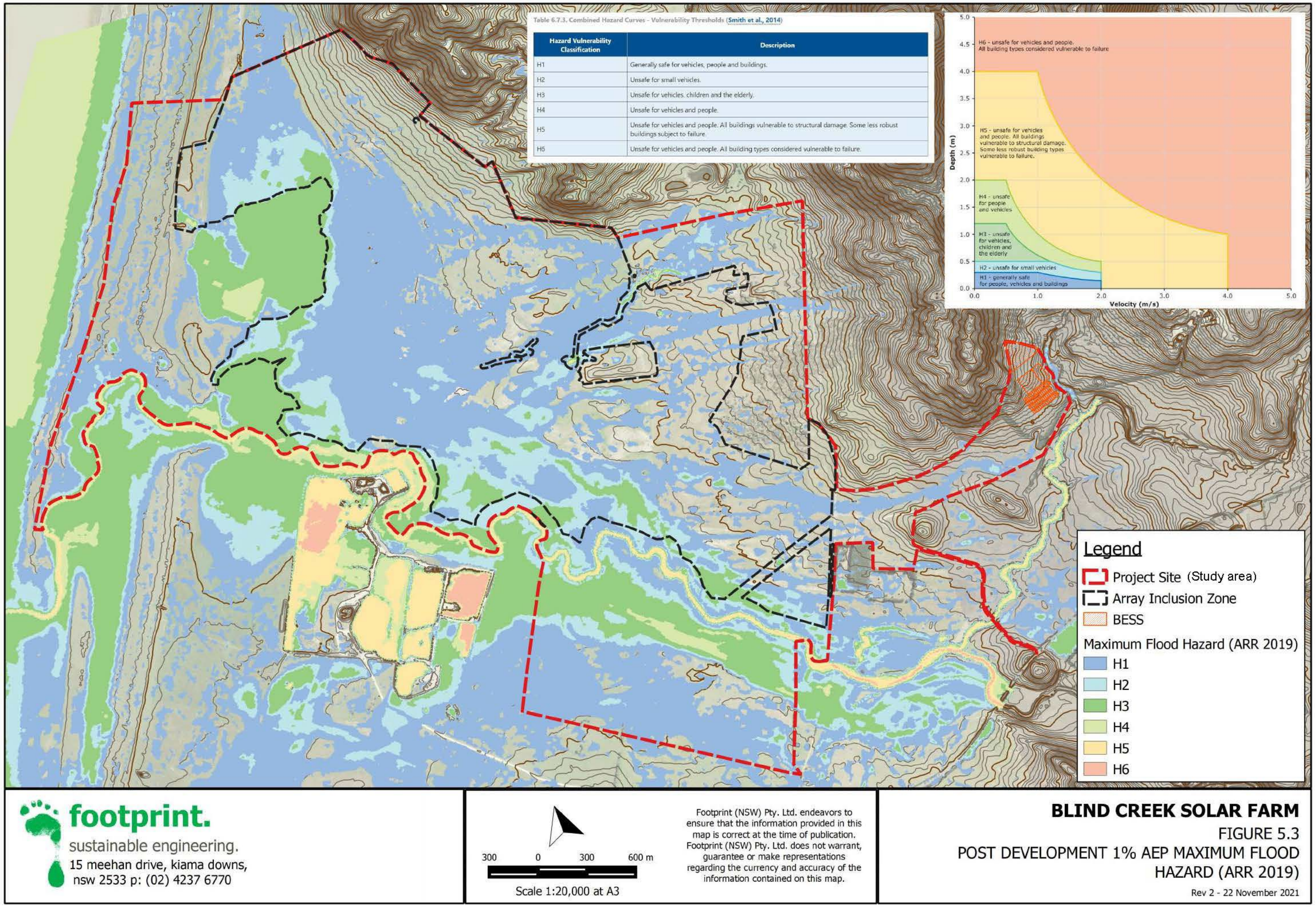


Figure 8-40 Post development 1% AEP maximum flood hazard

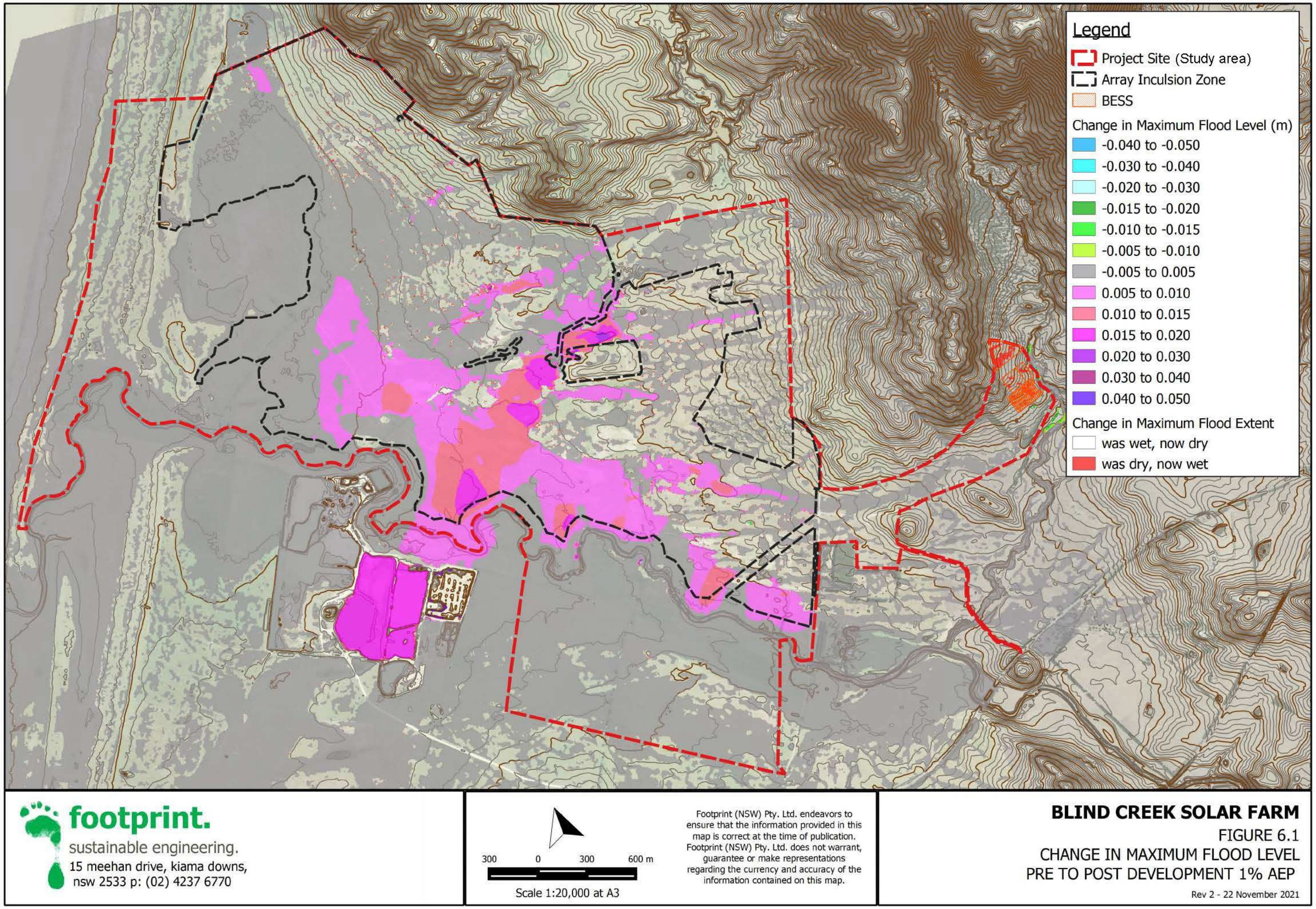


Figure 8-41 Change in maximum flood level pre to post development 1% AEP

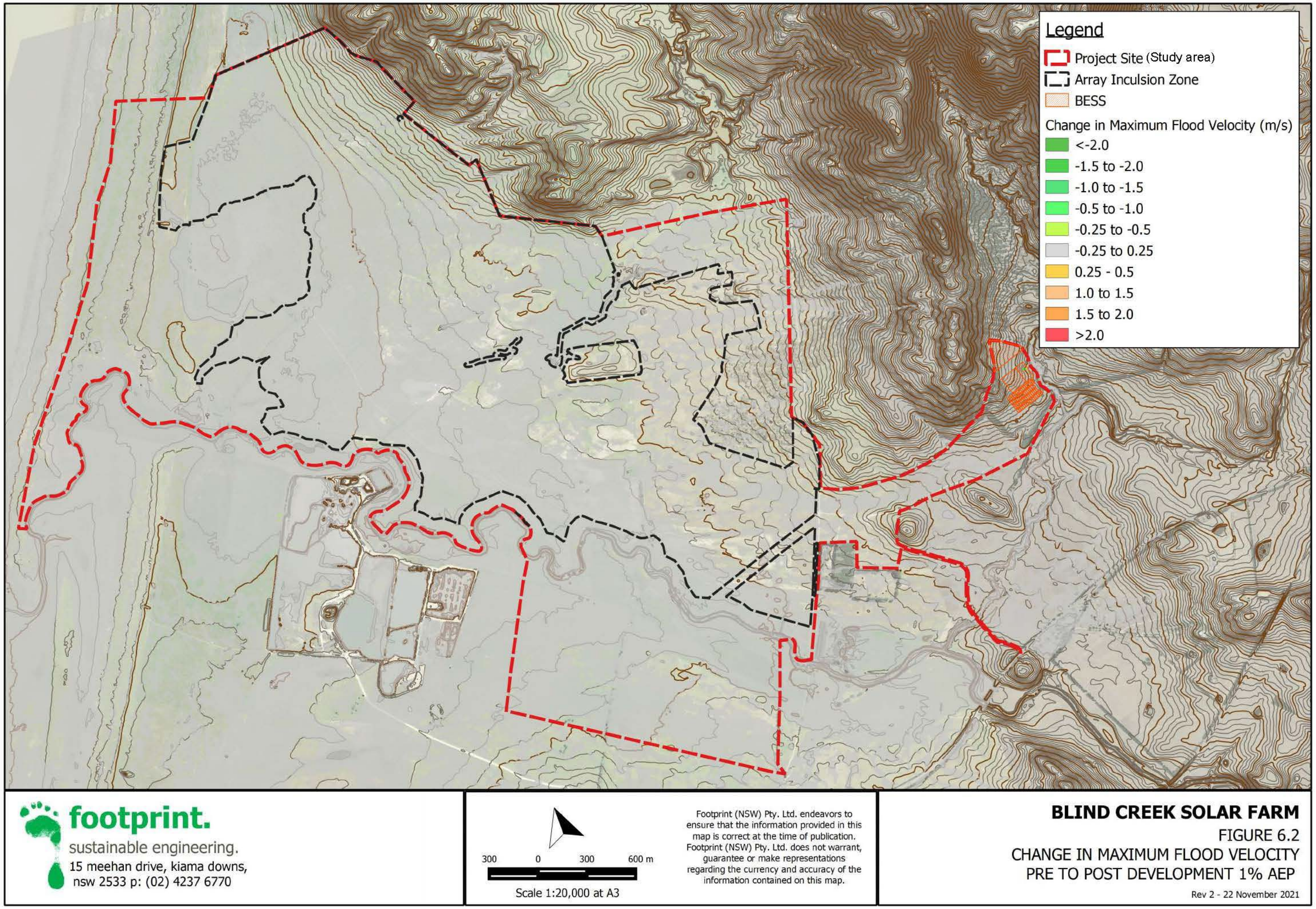


Figure 8-42 Change in maximum flood velocity pre to post development 1% AEP

8.5.4 Mitigation measures

No.	Mitigation measures	Phase
H1	Ensure appropriate erosion and sediment controls are incorporated into the design and should be implemented before works commence and maintained for the duration of the construction and until soil is stabilised after construction.	Design Construction Operations Decommissioning
H2	The Flood Response Plan prepared as part of the Emergency Response Plan would include: • Detail who will be responsible for monitoring the flood threat and how this is to be done. • Detail specific response measures to ensure site safety and environmental protection. • Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level). • Consider site access in the event that some tracks become flooded. • Establish an evacuation point. • Define communication protocols with emergency services agencies.	Construction Operations Decommissioning
H3	All buildings and structures (including solar arrays) associated with the proposal should be located outside high hazard areas (H5 and above) where they may be vulnerable to structural damage and have significant impact on flood behaviour.	Design Construction
H4	The finished floor level of all buildings should be a minimum of 500mm above the 1% AEP flood level, whilst critical infrastructure such as the electrical substation, control room and battery storage areas (i.e. BESS infrastructure) should be a minimum of 500mm above the PMF flood level in the adjacent Blind Creek.	Design Construction
H5	For proposed crossing structures over any watercourses that will likely be rendered impassable during significant flood events it is recommended that: • Flood warning signs and flood level indicators should be placed on each approach to the proposed crossings. • A Business Floodsafe Plan be prepared for the development to ensure the safety of employees during flood events in general accordance with the NSW SES "Business Floodsafe Toolkit and Plan"	Design Construction

No.	Mitigation measures	Phase
H6	For solar tracking modules, the tracking axis should be located above the 1% AEP flood level plus 500mm freeboard, and the modules rotated to the horizontal during significant flood events to provide maximum clearance to the predicted flood level.	Design Construction
H7	Where located in the floodplain the solar array mounting piers should be designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event, giving regard to the depth and velocity of floodwaters. Post development 1% AEP flood levels and velocities are shown in Figure 8-38 and Figure 8-39.	Design Construction
H8	All electrical infrastructure, including power conversion stations (PCUs) and the proposed substation, should be located above the 1% AEP flood level plus appropriate freeboard (minimum 500mm).	Design Construction
H9	Where electrical cabling is required to be constructed below the 1% AEP flood level it should be capable of continuous submergence in water.	Design Construction
H10	Wherever possible security fencing within the floodplain should be avoided or minimised. Where required security fencing should be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater or collapse in a controlled manner to prevent impediment to floodwater.	Design Construction
H11	Any fencing across Butmaroo, Blind and Wrights Creeks should be avoided in preference to creating separate fenced compounds on either side of the creeks.	Design Construction
H12	All proposed infrastructure associated with the proposed development should be setback from existing watercourses at the recommended riparian corridor widths specified in Table 1 of the Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012) as provided below. In accordance with the guidelines the width of the vegetated riparian zone (VRZ) should be measured from the top of the highest bank on both sides of the watercourse.	Design Construction

<table>
<tr><th>No.</th><th>Mitigation measures</th><th>Phase</th></tr>
<tr><td></td><td>
Table 1. Recommended riparian corridor (RC) widths
<table>
<tr><th>Watercourse type</th><th>VRZ width
(each side of watercourse)</th><th>Total RC width</th></tr>
<tr><td>1st order</td><td>10 metres</td><td>20 m + channel width</td></tr>
<tr><td>2nd order</td><td>20 metres</td><td>40 m + channel width</td></tr>
<tr><td>3rd order</td><td>30 metres</td><td>60 m + channel width</td></tr>
<tr><td>4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)</td><td>40 metres</td><td>80 m + channel width</td></tr>
</table>
</td><td></td></tr>
<tr><td>H13</td><td>Non-riparian corridor works may be authorised in the outer riparian corridor, so long as where appropriate 50 percent of the outer vegetated riparian zone width may be used for non-riparian uses including asset protection zones, recreational areas, roads, development lots and infrastructure. However an equivalent area connected to the riparian corridor must be offset on the site and the inner 50 percent of the vegetated riparian zone must be fully protected and vegetated with native endemic riparian plant species.</td><td>Design
Construction</td></tr>
<tr><td>H14</td><td>Any road crossing of existing watercourses associated with the proposed development should be of the type defined in Table 2 of the Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012) and Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land (NSW DPI, 2012).
Based on a preliminary assessment under the Strahler System defined in the Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012) all three watercourses of the Development site would be classified as having a stream order of four or greater.</td><td>Design
Construction</td></tr>
<tr><td>H15</td><td>Within the floodplain access roads should be constructed as close to natural ground levels as possible so as not to form an obstruction to floodwaters, unless otherwise supported by modelling to demonstrate no adverse flooding impacts during the detailed design phase.
The surface treatment of roads should be designed giving regard to the velocity of floodwaters to minimise potential for scouring during flood events, which could include the use of stabilised gravels or grassed surfaces for roads within the floodplain.</td><td>Design
Construction</td></tr>
<tr><td>H16</td><td>Any areas of existing erosion within the proposed Development footprint</td><td>Construction</td></tr>
</table>

No.	Mitigation measures	Phase
	should be appropriately treated prior to the erection of solar array modules to ensure their ongoing stability. For further information refer to Saving Soil: A Landowners Guide to Preventing and Repairing Soil Erosion, NSW DPI (2009) available at https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/270881/saving-soil-complete.pdf	

8.6 Noise and vibration

8.6.1 Approach

Renzo Tonin & Associates prepared a specialist noise and vibration impact assessment (Noise Assessment) of the Project in response to the SEARs and the EPA's consultation submission for the Project (Renzo Tonin & Associates, 2021). The assessment considered the noise and vibration impacts from construction and operation activities, including cumulative impacts. The results are summarised in this section and the specialist report is provided in Appendix J.

Noise and vibration impacts have been assessed in accordance with a number of policies, guidelines and standards, including:

- NSW 'Interim Construction Noise Guideline' (ICNG) (DECC, 2009).
- NSW 'Noise Policy for Industry' (NPfI) (NSW EPA, 2017).
- 'Assessing Vibration: A Technical Guideline' (DECC, 2006) .
- NSW 'Road Noise Policy' (DECCW, 2011).

8.6.2 Existing environment

The locality is sparsely populated with the existing noise sources being from the land uses on and adjacent to the Development site. These generally consist of:

- Road traffic noise from local roads including Currandooley Road and Tarago Road.
- Bungendore Sands quarry located approximately 240m southwest of the Development site (closest point).
- Paragalli Sands quarry, located approximately 524m east of the Development site (closest point).
- Goulburn Bombala Railway approximately 2km northeast to southwest of the Development site.
- Capital wind farm 1, 280m north.
- Spraying, cultivation and harvesting of crops.
- Livestock grazing and management.

Onsite and on adjacent properties, existing noise generating equipment or activities include tractors, headers, bailers, grain and livestock transport, quad bikes, light vehicles, and heavy vehicles (farm and sand quarry). These land uses characterise much of the background noise within the area. Noise levels from farm activities are concentrated at peak times during the year such as seeding and harvesting whereas noise from local roads and the sand quarries is more continuous throughout the year.

The Development site is generally flat with elevation ranging from to 670 to 720m AHD. The majority of non-associated receivers within 2km of the Project are at 710m elevation to the Development site.

The nearest potential noise affected receivers were identified through aerial maps and are listed below. There are six non-associated receivers within 2km of the Development footprint. The residents of Buckingham Estate are not within the 2km buffer of the Development footprint, but they are just within the 2km buffer of the Study area. These residents are located along Hope Drive and Duncan Avenue, refer to Figure 1-3 and Table 8-4. Of the six non-associated receivers, two are industrial receivers: Bungendore Sand Mine (R9), and Paragalli Sand Quarry (R106).

Background noise varies over the course of any 24-hour period, typically from a minimum at 3am in the morning to a maximum during morning and afternoon traffic peak hours. The NPfI requires that the level of background and ambient noise be assessed separately for day, evening and night periods.

The NPfI defines these periods as:

- Day: 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- Evening: 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- Night: 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

The identified receivers (except R9 and R106) surrounding the Study area are all classified as rural under the NPfI guidelines.

The applicable minimum Rating Background Levels (RBLs) used for the noise assessment based on a conservative assessment are presented in Table 8-14.

Table 8-14 Applicable RBLs, dB(A)

Time of Day	Applicable RBL, dB(A)
Day	**35**
Evening	**30**
Night	**30**

8.6.3 Construction noise impact assessment

Criteria

A quantitative construction noise assessment has been undertaken, consistent with the ICNG requirements.

Table 8-15 sets out the noise management levels (NMLs) to be applied for residential receivers.

Table 8-15 NMLs at residential receivers, dB(A)

Time of Day	Management Level LAeq (15 min)
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)
	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected RBL + 5dB(A)

Table 8-16 presents the construction NMLs established for the nearest noise sensitive residential receivers and other land uses based upon the nominated RBLs presented in Table 8-14, proposed construction hours and ICNG requirements. As construction works are only to occur in the day, only the daytime period has been assessed.

Table 8-16 Construction NMLs at residential receivers and other noise sensitive land uses, dB(A)

Location Description	Day LA90 Background Noise Level (RBL)	Day NML LAeq(15min)
All residential receivers	35[1]	**45**
Industrial premises	N/A	**75 (when are is in use only)**
Note: Construction works occur during the daytime period only; hence, only the day period is assessed		

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using the CadnaA noise modelling computer program.

The resulting construction noise levels for each non-associated receiver is provided in Table 8-17.

The full noise modelling results, which includes the associated receivers is provided in Table 4.5 of Appendix J.

Table 8-17 Predicted LAeq(15min) Construction Noise Levels at non- associated receiver locations, dB(A)

Plant Description	Predicted L_{Aeq} (15min) Construction Noise Levels										
	Non associated receiver										
	R1 R11 R13 R14 R15 R18 R19 R22 R24	**R51 R45 R49 R50**	**R10 R12 R20 R21**	**R15 R23**	**R17 R46 R47**	**R32**	**R36**	**R37**	**R38 R40**	**R9**	**R106**
NML	*45*									75	
Small pile driving rig	<20-20	<20	<20-20	<20	<20	<20	<20-27	<20-28	<20-29	<20-33	<20-38
Crane	<20	<20	<20	<20	<20	<20	<20-23	<20-24	<20-25	<20-29	<20-34
Drum roller	<20	<20	<20	<20	<20	<20	<20-22	<20-23	<20-24	<20-28	<20-33
Padfoot roller	<20	<20	<20	<20	<20	<20	<20-22	<20-23	<20-24	<20-28	<20-33
Wheeled loader	<20	<20	<20	<20	<20	<20	<20-22	<20-23	<20-24	<20-28	<20-33
Dump truck	<20	<20	<20	<20	<20	<20	<20-21	<20-22	<20-23	<20-27	<20-32
30t Excavator	<20	<20	<20	<20	<20	<20	<20-20	<20-21	<20-22	<20-26	<20-31
Grader	<20	<20	<20	<20	<20	<20	<20-20	<20-21	<20-22	<20-26	<20-31
Chain trencher	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20-23	<20-28
Water truck	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20-23	<20-28
Telehandler	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20-22
Forklift	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Up to 3 (noisiest) plant operating concurrently	<20-22	<20	<20-23	<20-21	<20-22	<20-16	<20-29	<20-30	<20-31	<20-35	<20-41

Predicted construction noise levels at all non-associated receivers (residential and industrial) will comply with the construction noise management levels. Furthermore, construction noise levels at all receivers are predicted to be below the highly noise affected level of 75dB(A).

With regards to associated (associated) receivers, the construction management level would be exceeded at R2 and R48, by about 2-3 dB(A) for small pile driving rig and up to 3 noisiest plant operating concurrently.

8.6.4 Operational noise assessment

In accordance with the NPfI the project noise trigger level, which is the lower (ie. more stringent) value of the project intrusiveness noise level and project amenity noise level, has been determined and reproduced in Table 8-18.

Table 8-18 Project noise trigger levels, dB(A)

Receiver Location	LAeq,15min Project Noise Trigger Levels		
	Day	Evening	Night
Associated Receivers: R2, R5, R6, R7, R41, R42, R43, R48	40	35	35
Non-associated Receivers: R1, R10 to R24, R32, R36 to R38, R40, R45 to R47, R49 to R51	40	35	35
Industrial receivers (R59, R106)	68 (when in use)		

Table 8-19 lists the associated plant and equipment likely to be used during operation of the solar farm and their corresponding sound power levels.

Table 8-19 Typical operational plant and equipment and sound power levels

Plant Item	Plant Description	LAeq Sound Power Levels, dB(A) re. 1pW
1	Tracker motor (2,400 in total)	81 (each)[1]
2	Inverters (85 in total)	91 (each)[1]
3	Batteries (array inclusion zone) (170 in total)	86 (each)[1]
4	Converters (1020 in total)	92 (each)[1]
5	Batteries (battery storage system area) (200 in total)	86 (each)[1]

6	150MVA Transformers (3 in total)	95 (each)[1]
7	Light vehicle (5 in total)	88 (each)[1]
Notes: 1 Based on sound power level data from manufacturer's data, past projects and/or RT&A's acoustic database		

The noise from the inverters and transformers are considered to be tonal in nature. Therefore, a 5dB(A) penalty has been applied to the predicted noise contributions from the inverters and transformers as per the NPfI.

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using the CadnaA noise modelling computer program. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

CadnaA noise modelling predicted noise levels for the worst case scenario based on concurrent operation of all plant and equipment, and the results are shown in Table 8-20 for all receivers.

Table 8-20 Predicted LAeq,15min operational noise levels at all receiver locations, dB(A)

Project Noise Trigger Levels				**Predicted Operational Noise Levels**			**Comply? (Yes/No)**
Receiver Location	Day	Evening	Night	Calm & Isothermal Conditions	Slight to Gentle Breeze	Moderate Temperature Inversion[1]	
Associated receivers							
R2	40	35	35	**39**	**40**	**40**	**No**
R5	40	35	35	<20	<20	<20	Yes
R6	40	35	35	20	20	20	Yes
R7	40	35	35	32	32	32	Yes
R41	40	35	35	32	32	32	Yes
R42	40	35	35	33	33	33	Yes
R43	40	35	35	32	33	33	Yes
R48	40	35	35	**46**	**47**	**47**	**No**
Non -associated receivers							
R1	40	35	35	24	24	24	Yes
R9	68 (when in use)			37	38	38	Yes

Project Noise Trigger Levels				Predicted Operational Noise Levels			Comply? (Yes/No)
Receiver Location	Day	Evening	Night	Calm & Isothermal Conditions	Slight to Gentle Breeze	Moderate Temperature Inversion[1]	
R10	40	35	35	25	25	25	Yes
R11	40	35	35	25	25	25	Yes
R12	40	35	35	26	26	26	Yes
R13	40	35	35	26	26	26	Yes
R14	40	35	35	26	26	26	Yes
R15	40	35	35	26	26	26	Yes
R16	40	35	35	24	24	24	Yes
R17	40	35	35	27	27	27	Yes
R18	40	35	35	25	25	25	Yes
R19	40	35	35	25	25	25	Yes
R20	40	35	35	26	26	26	Yes
R21	40	35	35	26	26	26	Yes
R22	40	35	35	26	26	26	Yes
R23	40	35	35	26	26	26	Yes
R24	40	35	35	24	24	24	Yes
R32	40	35	35	27	27	27	Yes
R36	40	35	35	25	25	25	Yes
R37	40	35	35	25	25	25	Yes
R38	40	35	35	26	26	26	Yes
R40	40	35	35	26	26	26	Yes
R45	40	35	35	26	26	26	Yes
R46	40	35	35	27	27	27	Yes

Project Noise Trigger Levels				Predicted Operational Noise Levels			Comply? (Yes/No)
Receiver Location	Day	Evening	Night	Calm & Isothermal Conditions	Slight to Gentle Breeze	Moderate Temperature Inversion[1]	
R47	40	35	35	27	27	27	Yes
R49	40	35	35	22	22	22	Yes
R50	40	35	35	22	22	22	Yes
R51	40	35	35	23	23	23	Yes
R106	68 (when in use)			38	39	39	Yes
Notes: Applicable for the night time period only. Bold font represents exceedance of the project noise trigger level							

Table 8-20 indicates that the operational noise levels are exceeded at two associated (associated) receiver locations, however complies with the Project noise trigger levels for all time periods for all non-associated receiver locations.

8.6.5 Sleep disturbance assessment

To assess the likelihood of sleep disturbance, the potential of maximum noise level events from premises during the night-time period was considered. In accordance with the NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- LAFmax 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

During the night time period only mechanical plant would be operating. Noise emissions from these plant items are considered to be continuous with no potential for high peak noise level events, therefore, the L_{Amax} noise levels experienced at the identified receivers will be similar to the predicted $L_{Aeq,15min}$ noise levels shown in Table 8-20. Therefore, it is expected that both the $L_{Aeq,15min}$ and L_{AFmax} will be well below the nominated sleep disturbance criteria of 40dB(A) and 52dB(A), respectively, at all non-associated receiver locations.

8.6.6 Vibrational assessment

Vibration generating activities would occur only during the construction phase of the Project. There are no vibration generating activities expected during the operational phase. As the nearest non-associated receivers are between 850m and 1.3km from the Study area, structural damage due to vibration is not expected. Assessment for construction vibration impact on human comfort is assessed in accordance with the EPA's *Assessing Vibration: a technical guideline* (DECC, 2006).

The preferred and maximum values for continuous and impulsive vibration presented in Table 8-21 for the applicable receivers.

Table 8-21 Preferred and maximum levels for human comfort

Location	Assessment Period[1]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s², 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Workshops	Day or night time	0.04	0.029	0.080	0.058
Impulsive vibration (weighted RMS acceleration, m/s², 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Workshops	Day or night time	0.64	0.46	1.28	0.92

The acceptable vibration dose values (VDV) for intermittent vibration is presented in Table 8-22 for the applicable receiver type.

Table 8-22 Acceptable vibration dose values for intermittent vibration (m/s1.75)

Location	Daytime[1]		Night-time[1]	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.13	0.26
Workshops	0.80	1.60	0.80	1.60

Based on the proposed construction plant items and the potential vibration impacts are summarised in Table 8-23.

Table 8-23 Potential vibration impacts for identified receivers

Receiver Location	Approx. Distance to Nearest Buildings from Works	Type of Nearest Sensitive Buildings	Assessment on Potential Vibration Impacts	Vibration Monitoring
R2	250m	Residential	Very low risk of adverse comments	Not required
R9	950m	Industrial	Very low risk of adverse comments	Not required
R41	850m	Residential	Very low risk of adverse comments	Not required
R48	200m	Residential	Very low risk of adverse comments	Not required
R106	524m	Industrial	Very low risk of adverse comments	Not required
R1, R10 to R24, R32, R36 to R38, R40 to R43, R45 to R51	>1,000m	Residential	Very low risk of adverse comments	Not required

The potential for adverse comments to vibration impacts during the construction works was determined to be very low due to the large distances between the receiver locations and the construction activities. Therefore, additional vibration mitigation measures and vibration monitoring are not required at the receiver locations during construction works.

8.6.7 Road traffic noise assessment

Noise impact from the potential increase in traffic on the surrounding road network due to construction and operational activities is assessed against the RNP (DECCW, 2011).

A TIA was undertaken by Amber (Amber, 2021) (Appendix J), which presented 2021 traffic volume data for Tarago Road and the peak vehicle movements for the Project. A summary of 2021 traffic volumes for Tarago Road is presented in Table 8-24.

Table 8-24 Summary of 2021 traffic volume data for Tarago Road

Road	Daily Traffic Volume		Percentage Heavy Vehicle	Posted Speed (km/h)
	15hr (7am to 10pm)	9hr (10pm to 7am)		
Tarago Road	688	122	9%	100

The peak vehicle movements during the construction stage of the project are presented in Table 4-8. Vehicle movements will only occur during the day time period when construction works would occur.

During the operational stage, vehicle access to the site would be limited to maintenance vans or delivery trucks which would occur on an irregular basis. Traffic noise impacts during the operational stage of the Project would be negligible, and therefore has not been assessed further.

Access to the site will be provided via the Blind Creek Road Entrance. For existing residences affected by additional traffic on existing arterial roads and local roads generated by land use developments, the RNP road traffic noise criteria in Table 8-25 would apply.

Table 8-25 RNP road traffic noise criteria, dB(A)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Freeway/arterial/sub-arterial roads	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq,(15 hour) 60 (external)	LAeq,(9 hour) 55 (external)

Further to the above, the RNP states the following for land use developments generating additional traffic:

> "*For existing residences and other sensitive land uses affected by* ***additional traffic on existing roads generated by land use development****, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*"

Results of the road traffic noise predictions are presented in Table 8-26.

Table 8-26 Predicted road traffic noise contribution levels along public roads, dB(A) $_{LAeq(15\ Hour)}$

Receiver	Criteria	Traffic Movements	Posted Speed (km/h)	Distance to Road[1]	Predicted Noise Level without Project	Predicted Noise Level with Project	Increase in Noise Level with Project	Exceed?
Residences on Tarago Road	LAeq, (15 hour) 60	As per Table 9-18 and Table 9-19	100	20m	55.1	56.9	1.8	No

Notes:

1. Based on closest typical distance frlade of dwelling to the road.

Table 8-26 shows that road traffic noise level contributions from the vehicle movements associated with the construction works are within the applicable noise criteria based on dwellings being at the closest typical distance from the roads. Given residential properties are located within a rural environment, distances between the road and the majority of dwellings are likely to be greater than 20m.

Furthermore, the construction vehicles would result in an increase in the existing traffic noise levels of 1.8dB(A) which is within the allowable increase limit of 2dB(A). Therefore, traffic noise levels as a result of the construction works for the project would not adversely contribute to the existing traffic noise levels at the most affected residences along Tarago Road.

8.6.8 Mitigation measures

The Noise and Vibration Assessment determined that only during construction was there potential for the Project to exceed noise criteria. However this exceedance would be at two associated receivers (R2 and R48). Both of these are the property of a project Founder and principal landowner. Due to the size of the site and Project type, the predicted noise exceedances are anticipated to be of short duration and manageable through the implementation of a Noise Management Plan (NMP) during construction.

Operational noise levels from the Project would comply with the noise criteria. The Project noise level will also be well below the nominated sleep disturbance criteria. The Project is very low risk for potential vibration impacts.

The proposal's noise commitments are set out below

.No.	Mitigation measures	Phase
N1	A Noise Management Plan (NMP) would be developed as part of the CEMP. The plan would include, but not be limited to: • Use less noisy plant and equipment where feasible and reasonable. • Plant and equipment will be properly maintained. • Use and maintain 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended. • Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel. • Avoid any unnecessary noise when carrying out manual operations and when operating plant. • Any equipment not in use for extended periods during construction work will be switched off • Implement a complaints procedure to manage noise complaints that may arise from construction activities. Each complaint will need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits. • Establish good relations with people living in the vicinity of the site at the beginning of Project. Keep people informed, deal with complaints seriously and expeditiously. The community liaison member of staff should be adequately experienced.	Construction Decommissioning
N2	Potential noise impacts to associated receivers R2 and R48, will be managed in consultation with the homeowner and may include the following: • Time restrictions and/or providing periods of respite for residents, where feasible and reasonable e.g., between 10am and 3pm (with one-hour break for lunch between 12pm and 1pm). • Allowing the construction activities to proceed, despite the noise exceedance, may be the preferred method in order to complete the works expeditiously, with noise exceedances occurring over only two to three days. • These residents will be consulted to determine appropriate	Construction

.No.	Mitigation measures	Phase
	respite periods and will be notified of the potential noise impact during this time period so that they can organise their day around the noisy period.	
N3	Works will be undertaken during standard working hours only (except for works that can be performed without noise nuisance): No work on Sundays or public holidays. Construction • Monday – Friday 7am to 6pm. • Saturday 8am to 1pm. • No work on Sundays or public holidays. Operation • Monday – Friday 7am to 6pm. • Saturday 8am to 1pm.	Construction Operation Decommissioning
N14	All staff on-site should be informed of procedures to operate plant and equipment in a quiet and efficient manner where possible.	Construction Operation Decommissioning

9. Assessment of additional issues

9.1 Access and traffic

Amber Organisation Pty Ltd (2021) prepared a Traffic Impact Assessment (TIA) for the proposed construction, operation and decommissioning of Blind Creek Solar Farm. The report is summarised below and provided in full in Appendix K.

For the Project, key traffic and transport impacts relate to haulage during construction. Increased vehicle numbers, particularly heavy vehicles, can equate to increased traffic collision risk, cause damage to roads and indirect impacts such as noise and dust to other motorists and nearby receivers.

Transport for New South Wales (TfNSW) identified issues relating to traffic, transport and road safety as important during the development of the SEARs. Specific issues raised are addressed in this section with mitigation measures outlined in Section 9.1.4.

9.1.1 Approach

The TIA has been prepared in accordance with the guidelines contained within the following publications:

- Austroads Guide to Traffic Management Part 12 and TfNSW supplement.
- Austroads Guide to Road Design and TfNSW supplements.
- TfNSW (RMS) Guide to Traffic Generating Developments.
- Unsealed Roads Manual: Guidelines to Good Practice (2009).

The TIA approach included:

- Details of both light and heavy vehicle traffic volumes and proposed transport routes.
- An assessment of the potential traffic impacts of the Project on road network function and safety.
- An assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the Project.
- Details of measures to mitigate and / or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes.
- Details of access roads and how these connect to the existing road network and ongoing operational maintenance.
- Consultation with Queanbeyan-Palerang Regional Council (refer to Section 6.1).

9.1.2 Existing environment

Road network

All solar farm equipment will be transported from the direction of Sydney and Wollongong. The proposed construction traffic access route to the site would be via Hume Highway, Braidwood Road, Bungendore Road and Tarago Road. Access to the Project would be via Blind Creek Road Entrance and Currandooley Road. The preferred haulage route from Sydney to the Blind Creek

Road Entrance is shown in Figure 9-1. Construction workers and operational staff will primarily be located in Bungendore and Queanbeyan (and possibly some in Tarago and Goulburn). Deliveries of construction materials, such as concrete, will be from regional areas and from any direction. The final haulage route would be further detailed in the Traffic Management Plan (TMP).

Hume Highway and Braidwood Road are State Roads under the care and management of Transport for New South Wales (TfNSW). While Bungendore Road and Tarago Road are local roads under the management of Queanbeyan-Palerang Regional Council. Each road part of the proposed haulage route for the Blind Creek Solar Farm is described in Table 9-1.

The State roads are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map provided. Accordingly, the access route is able to accommodate the loads and type of vehicle movement to be generated during construction of the Project. Bungendore Road and Tarago Road are currently used for a variety of purposes and already carry heavy vehicles for local sand mines, waste to Veolia's Woodlawn landfill site, agricultural transport, and coastal traffic via Nerriga.

Blind Creek Road Entrance and Currandooley Road are private roads. Any upgrades or maintenance of these roads for and during construction and operation will be negotiated with the relevant landowners. As such, for the purposes of this proposal the assessment of traffic impact and recommendation of mitigation measures focuses on Agency managed roads only.

Table 9-1 Blind Creek Solar Farm road descriptions and authorities

Name	Road Authority	Description
Hume Highway	State road (TfNSW)	Connects Sydney to Melbourne in a west/southwest direction, passing north of the Australian Capital Territory.
Braidwood Road	State road (TfNSW)	Connects Gouldburn to Tarago and Bungendore via the Kings Highway.
Bungendore Road	Queanbeyan-Palerang Regional Council	Local road that connects Tarago to Bungendore in northeast-southwest alignment. It has a sealed carriageway which accommodates one lane of traffic in each direction. Wide grassed berms are provided on both sides of the road and it has a posted speed limit of 100km/hr.
Tarago Road	Queanbeyan-Palerang Regional Council.	Tarago Road runs in a general northeast-southwest alignment extending from its continuation as Bungendore Road northeast of Mount Fairy Road to its continuation as Molonglo Street south of the Turallo Creek Bridge. It has a sealed carriageway width of approximately 7m in the vicinity of the site which accommodates one lane of traffic in each direction. Wide grassed berms are provided on both sides of the road and it has a posted speed limit of 100km/hr.

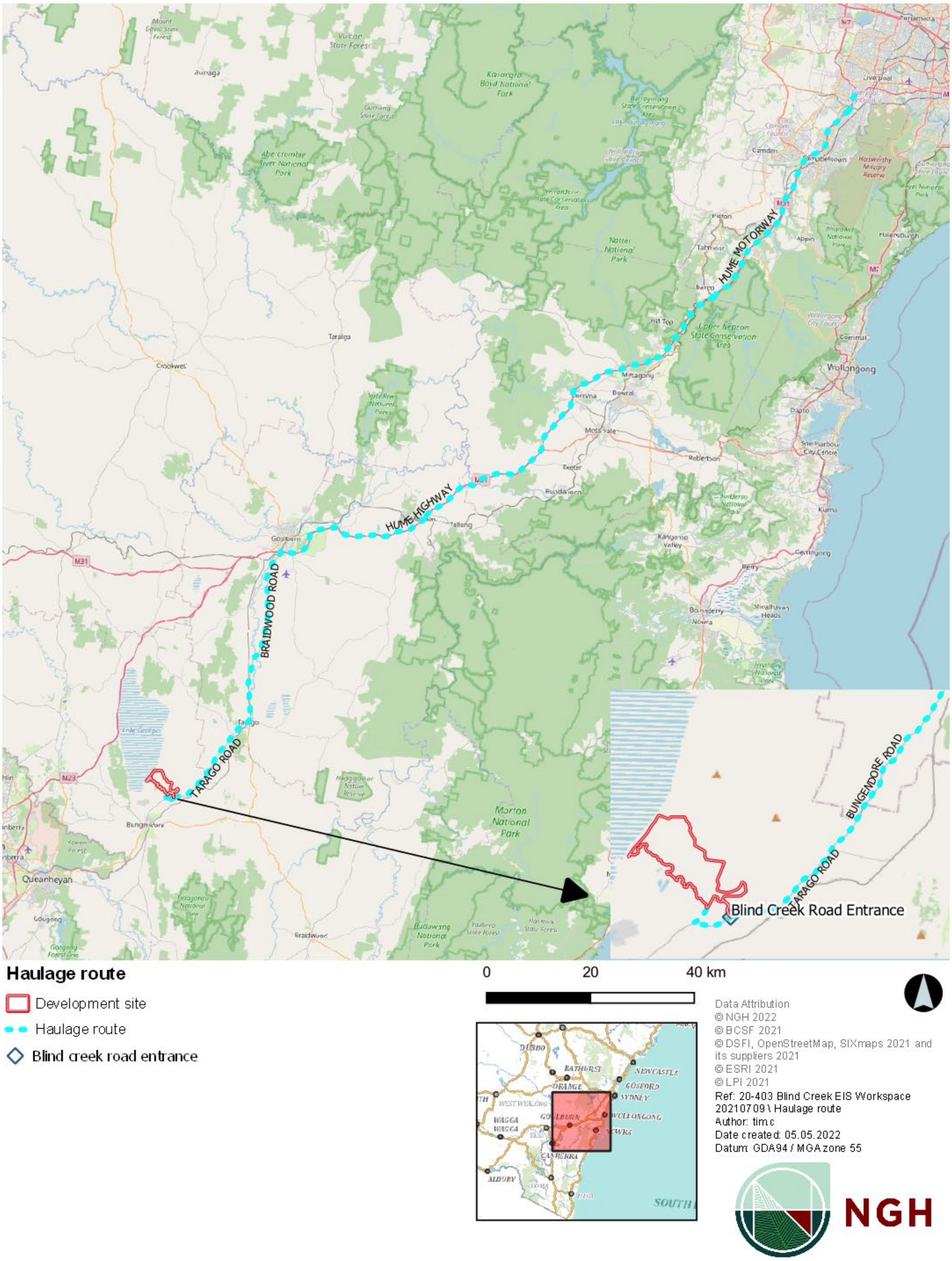


Figure 9-1 Preferred haulage route from Sydney to Blind Creek Solar Farm

Vehicle volumes

Traffic volume data for Tarago Road was obtained from the TfNSW traffic volume viewer. The closest available data was located 1.73km west of Bungendore Road and is summarised in Table 9-2. A growth rate has been applied to calculate the current traffic volumes for 2021.

Table 9-2 Barton Highway Traffic Volume Data, source (Amber, 2021)

Road	Survey Location	Survey Year	Recorded Volume	Peak Hour	Growth Factor	Current Traffic Volume
Tarago Road	1.73km west of Bungendore Road	2008	658 vpd 91% light 9% heavy	–M - 45 vph –M - 58 vph	1.5%	810 vpd 53 vph (AM) 71 vph (PM)

The 2021 traffic volumes have also been calculated for each hour and separated into north and southbound movements. The traffic volumes are shown below inFigure 9-2 .

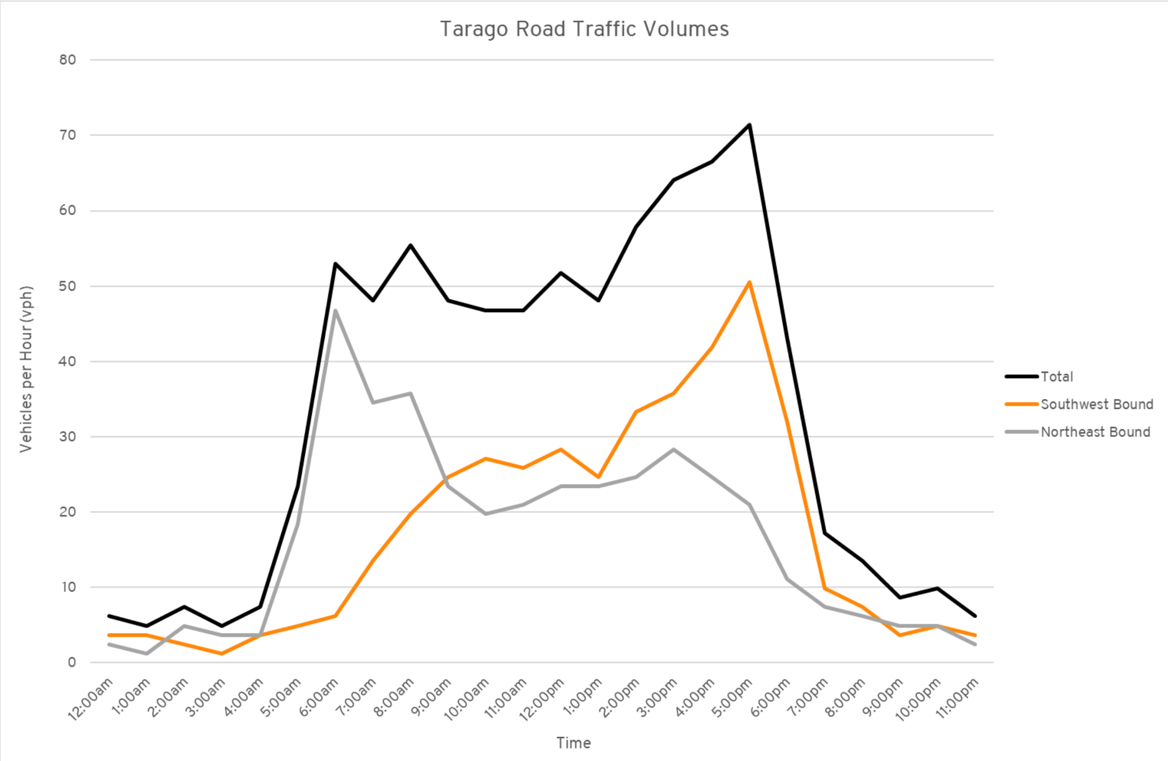


Figure 9-2 Tarago Road Traffic Volume Data Calculated 2021, source (Amber, 2021)

The TfNSW survey data indicates that Tarago Road accommodates a modest level of traffic. Peak traffic movements are northeast bound in the morning and southwest bound in the evening, with slightly high hourly vehicle movements in the evening peak.

Restricted vehicle access

The TfNSW Restricted Vehicle Access Map for the surrounding area is provided within

Figure 9-3. The green lines indicate B-Double routes while the black lines represent approved routes with travel conditions. As can be seen from the figure the State roads within the vicinity of the site are approved routes. Tarago Road is generally specified as an approved route with travel conditions with some sections near Bungendore and Mount Fairy Road being unclassified.

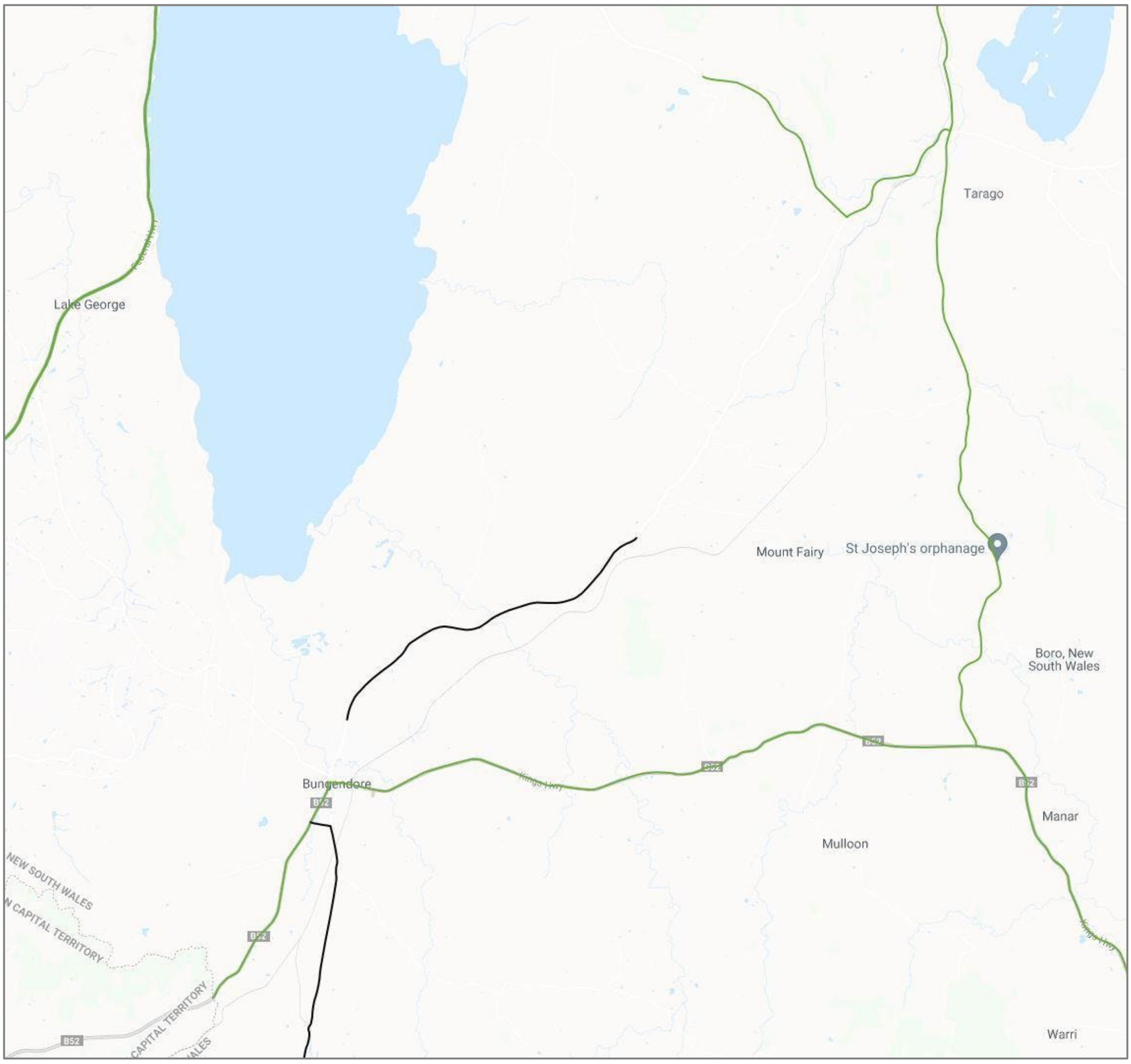


Figure 9-3 TfNSW Restricted Vehicle Access Map, (source: TfNSW Restricted Vehicle Access Map)

Crash data

Amber conducted a review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes along the full length of Tarago Road (approximately 4.75km) for a five-year period from 2015 to 2019. The crash search indicates that there are no discernible crash trends within the surrounding road network. It is also noted that only 3 crashes were recorded in the past 3 years of data. As such, it is concluded that the road network is currently operating in a relatively safe manner.

Public transport

No public transport services are provided within the vicinity of the Project.

9.1.3 Potential impacts

Construction

Increased traffic generation

In general, work would not occur outside the standard working hours, on Sundays or on public holidays. However, in exceptional circumstances or in the event of an emergency, asset inspection and/or maintenance programs may be undertaken outside standard construction hours. If this is required, then the local council and surrounding landholders would be notified if the works are expected to exceed the relevant noise criteria at neighbouring dwellings.

Construction traffic generated by the solar farm can be broadly separated into the following three categories:

- Light vehicles associated with transporting staff to/from the site, with most staff being located in Bungendore and travelling to/from the south.
- Medium and Heavy Rigid Trucks (MRV and HRV as defined within AS 2890.2:2018) will be used to deliver raw materials and smaller plant, with most movements to/from the north, and
- Articulated Vehicles (AV as defined within AS 2890.2:2018) and B-Doubles will be used to transport larger plant via Sydney and Wollongong (to/from the north).

Restricted Access Vehicles / oversized and overmass (OSOM) vehicles will be required for the delivery of larger plant to the site, such as the substation transformer and earthwork machinery, and are subject to separate permit applications and regulations.

Table 4-9 summarises the traffic movements generated during the construction period of the Project. Figure 9-4 provides a breakdown of the monthly number of construction vehicle movements. The site is expected to generate approximately:

- 57 vehicle movements in the peak hour during peak construction periods.
- Up to 170 vehicle movements per day during peak construction times, including 70 truck movements.

Peak traffic would occur at the start and end of each working day when staff are transported to/from site. Heavy vehicle movements would be distributed throughout the day.

During peak construction, traffic volumes along Tarago Road are expected to increase from the existing 53-71 vehicles per hour during peak morning and evening periods, to 110 and 128 vehicle movements per hour. These traffic volumes can be readily accommodated on the road network and Tarago Road is expected to continue to operate with a good level of service based on the Level of Service classification outlined within the *RTA Guide to Traffic Generating Developments*. The existing site access (Blind Creek Road) currently generates a low level of traffic which includes approximately two vehicle movements in each of the peak hours. As such, the intersection of the access with Tarago Road is expected to operate with a good level of service.

The road network is able to accommodate the traffic generated by the development during the construction phase. The impact would be moderate and short term. Measure to mitigate the impact are detailed in Section 9.1.4.

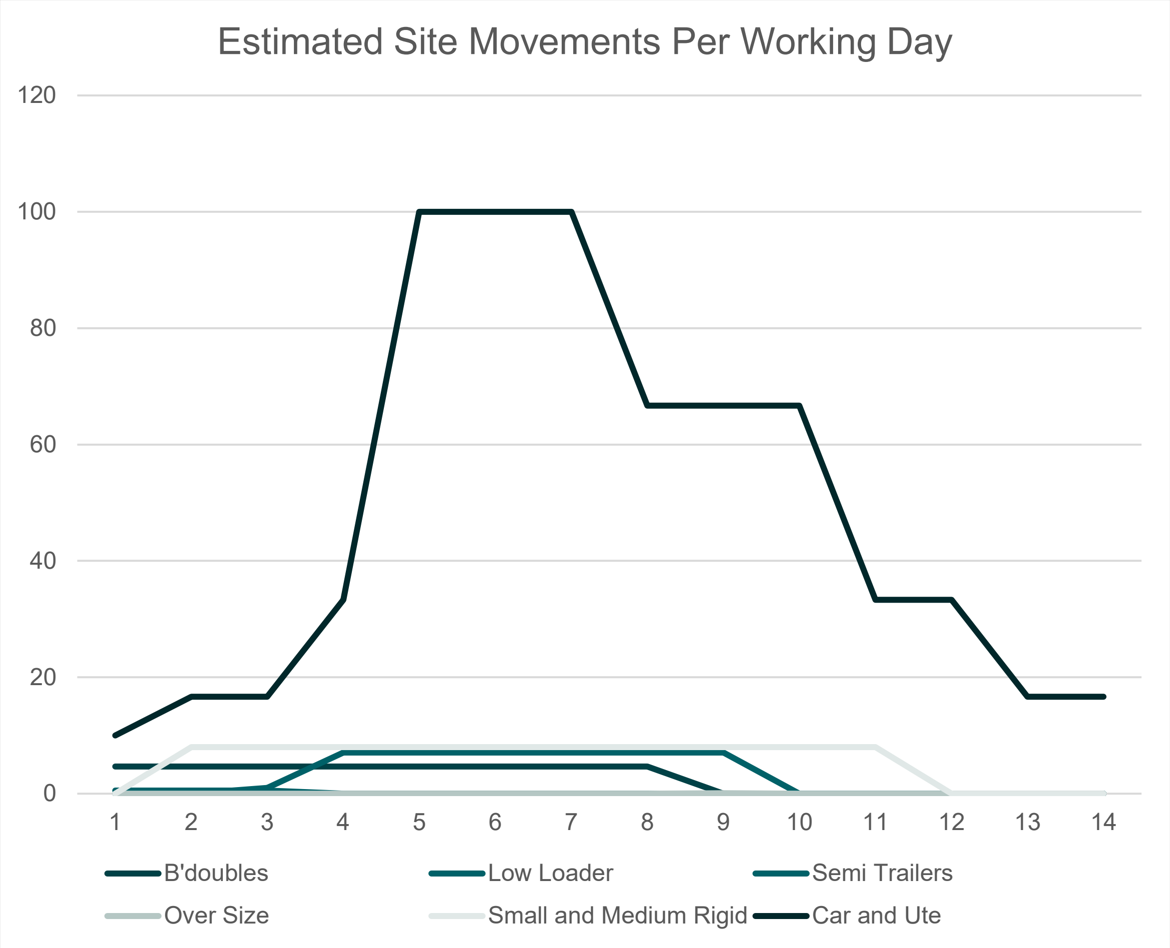


Figure 9-4 Expected Site Traffic Volumes

Intersection Assessment

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 9-5 specifies the required turn treatments on the major road intersections for a design speed of greater than or equal to 100km/hr.

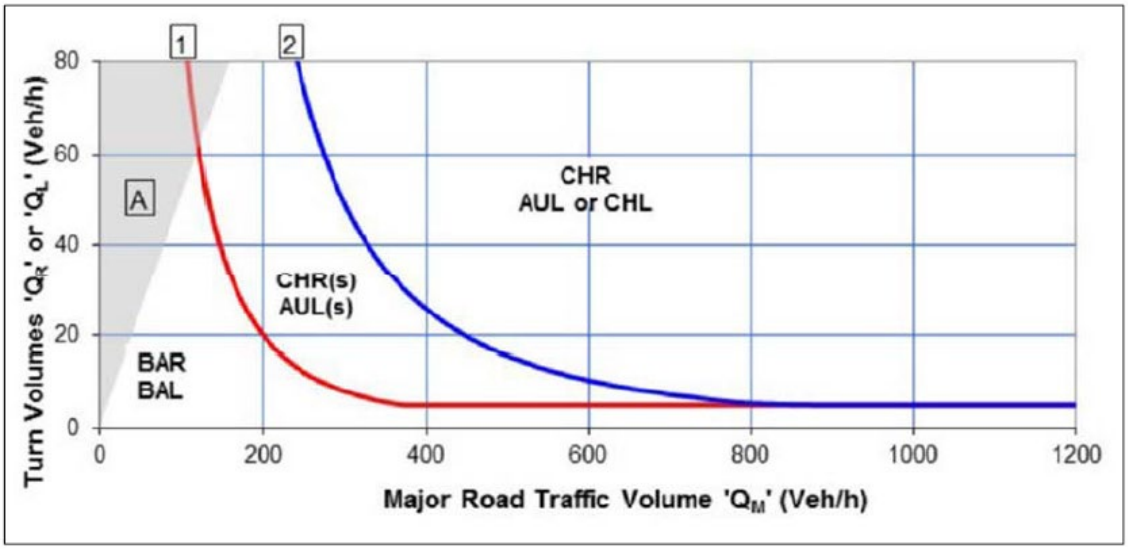


Figure 9-5 Figure 2.26 Austroads Guide to Traffic Management Part 6

The peak hour turning volumes will predominantly be generated by staff accessing the site in the morning, between 6:00am and 7:00am. Table 9-3 identifies the required turning treatments based on the expected traffic volumes at the proposed intersections of Blind Creek Road and Tarago Road.

Table 9-3 Turning Volumes for Turn Treatment Calculations

Turning Treatment	Traffic Volume (vph)		Requirement
	Turn Volume	Major Road	
Right Turn	7	53	BAR
Left Turn	50	6	BAL

The intersection is already provided with Basic Right Turn (BAR) associated with the existing quarry but is not provided with a Basic Left Turn (BAL) treatment. A swept path assessment using the AutoTrack vehicle tracking software confirmed that additional widening is required in the north-eastern corner of the intersection to allow B-Doubles to exit the site to the north. As such, the left turn facilities at this intersection will need to be upgraded in accordance with the *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections for a Basic Left Turn facility* in order to accommodate the traffic generated by the solar farm in a safe manner.

OSOM Vehicle Access

A swept path assessment has been prepared for the site access based on the largest transport vehicle e expected to access the site. The vehicle has been determined based on the expected weight and dimensions dimensions of the transformer however, the actual vehicle utilised for transport of the component may vary at the time of construction. The swept path assessment is provided within Appendix C of the TIA (Appendix K) and shows that the vehicle is able to enter and exit the site in a suitable manner. The vehicle will be required to utilise the full width of Tarago Road which can be managed with traffic management measures that will determined at the time of seeking the permit for the transport of the transformer.

Sight Distance

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections specifies the Safe Intersection Sight Distance (SISD) as the minimum sight distance which should be provided along the major road at any intersection. The available sight distance at the Tarago Road and Blind Creek Road Entrance intersection greatly exceeds the Austroads requirements.

Haulage assessment

The proposed TfNSW roads that will be used for haulage are designated for B-Double vehicles, as such the proposed route is able to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm. OSOM vehicles that would be used to deliver larger plant to the site are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known.

Operation

During operation the Project is expected to generate a minimal level of traffic (up to 10 vehicle movements per day) for maintenance and operation services. As such, the operation of the Project would result in a negligible change to the traffic environment. Some emergency responses are likely to occur outside of standard operating hours, however such movements would be kept to a minimum.

Additional transport may be required in the case of battery replacement for the BESS. It is unlikely that additional traffic during this period would require special consideration beyond what has been considered during the initial construction. Any requirement for OSOM vehicle use during operation would require a permit following the same process that will be included in the OEMP.

During emergency events e.g. fire and flood, the proposed access points may be unusable, therefore an emergency access has been provided (refer to section 4.3.7). Use and notification of this route is provided in the mitigation measures of section 9.7.

Decommissioning

At the end of the operational life of the Project all above ground infrastructure will be dismantled and removed from the Development footprint. Internal roads, if not required for ongoing farming purposes or fire access, would be removed and the site reinstated as close as possible to its original state.

Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive TMP would be prepared prior to decommissioning phase in conjunction with the relevant road authorities. This would aim to ensure adequate road safety and road network operations are maintained.

9.1.4 Mitigation measures

The potential traffic, transport and road safety impacts associated with the proposal are higher during construction than operation and decommissioning due primarily to the increased numbers of vehicles on the road network. The mitigation measures outlined below are to be implemented to reduce the risk of collision, damage to road infrastructure and disruption to services through design of road infrastructure and preparation and implementation of management plans.

No.	Mitigation measures	Phase
AT1	A Traffic Management Plan (TMP) will be developed as part of the CEMP, OEMP and DEMP, in continued consultation with Council and TfNSW. The plan would include: • Neighbours of the solar farm will be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access. • Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time. • All vehicles will enter and exit the site in a forward direction. • Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site: o Utilisation of only the designated transport routes. o Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities. • Implementation of a proactive erosion and sediment control plan	Preconstruction Construction Decommissioning

No.	Mitigation measures	Phase
	for on-site roads, hardstands and laydown areas. • All permits for working within the road reserve will be received from the relevant authority prior to works commencing. • A map of the primary haulage routes highlighting critical locations. • An induction process for vehicle operators and regular toolbox meetings. • A complaint resolution and disciplinary procedure. • Local climatic conditions that may impact road safety of employees throughout all project phases (e.g., fog, wet and significant dry, dusty weather).	
AT2	TfNSW education staff will be invited to provide information, guidance and discussion on fatigue management and road safety to site staff.	Preconstruction ConstructionDecommissioning
AT3	Stakeholders including TfNSW, Queanbeyan-Palerang Regional Council, local landholders and emergency services will continue to be consulted during construction and decommissioning to advise of any changes to road use and conditions.	Construction Decommissioning
AT4	The intersection of Blind Creek Road Entrance + and Tarago Road will be upgraded to accommodate a BAL treatment to allow B-Doubles to exit the track to the north.	Pre-construction

9.2 Land use

9.2.1 Approach and methods

The Development site was inspected and the landowners were interviewed to determine the land use values and history of the property. Information on the regional land use context of the property was also obtained from a range of sources. The potential for land use impacts arising from the proposed solar farm has been assessed with reference to:

- Queanbeyan-Palerang LEP land use zones.
- NSW Government MinView and SEED Portal databases.
- NSW DPI Land Use Conflict Risk Assessment Guide.
- Site inspection and discussion with landowner regarding historic land use and productivity.

9.2.2 Existing environment

Land uses

The Development site is located within the broader Capital region of NSW, which has strong and diverse agricultural industries. Agricultural land occupies 33,400 square kilometres, or 64% of the region (ABARES 2016). Grazing modified pastures is the dominant land use in the region.

The Development site is located in a rural agricultural area within the Queanbeyan-Palerang LGA in NSW, on land zoned RU1 Primary Production and C3 Environmental Management, under the Palerang Local Environmental Plan (LEP) 2014. The objectives of two zones identified in the LEP are presented in Section 5.3. RU1 aims to sustainable primary industry production and protect agricultural land and resources. C3 protects natural, cultural and visual values. The proposal is considered to be consistent with the objectives of these zones; refer Section 5.3.

Almost all of the Development site has been cleared and highly modified by historical farming practices, including cultivation and pasture improvement. The site is currently used for grazing sheep and cattle.

Land uses surrounding the Development site are shown in Figure 9-6. Most of the land in the Development site is classified as 'Grazing modified pastures'. Smaller areas of 'Grazing native vegetation' and other classifications are present within the Development site boundaries, as summarised in Table 9-4.

Table 9-4 Land use categories within the Development site (DPIE, 2017)

Land use category	Area (ha) within Development site
1.2.0 Managed Resource Protection	1.698
2.1.0 Grazing native vegetation	393.373
3.1.0 Plantation forests	17.301
3.2.0 Grazing modified pastures	600.033

Land use category	Area (ha) within Development site
5.2.0 Intensive animal production	0.278
5.7.0 Transport and communication	0.019
5.8.0 Mining	0.129
6.3.0 River	13.083

Adjacent land uses include 6.1.1 Lake Conservation (Lake George) to the west, 5.8.2. Quarries (Bungendore Sands) to the south-west, 3.2.0 Grazing modified pastures to the north and south, and 3.1.2 Softwood plantation forestry to the east of the Development site.

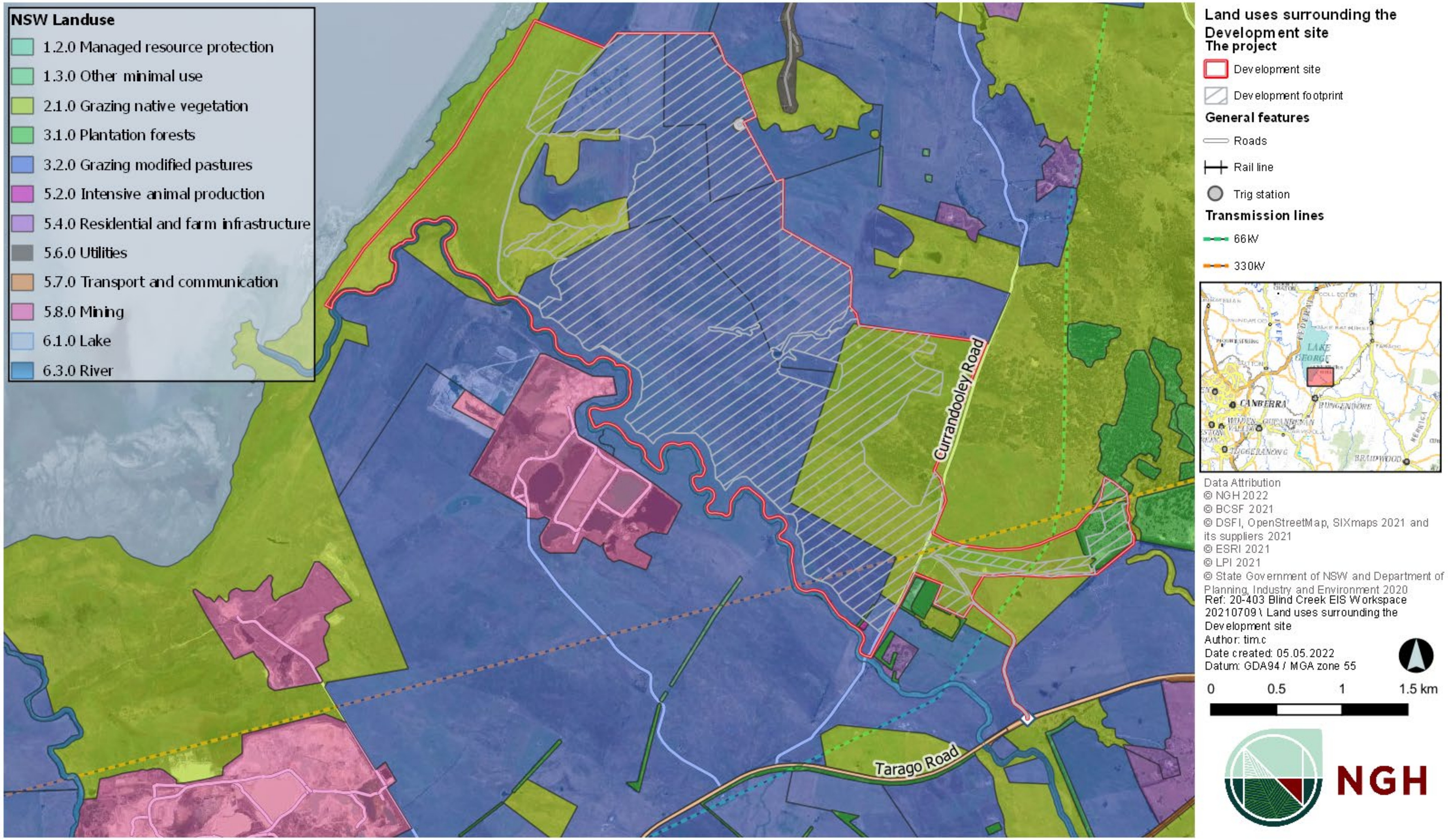


Figure 9-6 Land uses surrounding the Development site

Agriculture

The Development site is located within the South East and Tablelands region of NSW, which includes the Queanbeyan-Palerang Regional and eight other LGA’s. This region is a significant contributor to the wool production in NSW, supplying up to 18% of the state's production (DPI, 2020a). The region contains 11% of all farm businesses in NSW. Livestock grazing takes up 50% of agricultural land, refer to Table 9-5.

The Queanbeyan-Palerang Regional LGA is the third biggest distributor in the South East and Tablelands Region for beef ($23.15m), followed by wool ($5.28m) and lamb/mutton ($4.53m) with a gross value of agricultural production (GVP) of $37.3m, this is a 4.1% share of South East and Tablelands Region Agriculture GVP total.

Table 9-5 Agriculture industries in South East and Tablelands Region (source ABS 2015-2015-2016)

Industry	Gross Value of Production ($)	% share of region total	Number of businesses	% share of NSW
Beef	$238.6m	26.3%	1,984	9.3%
Wool	$171.5m	19%	1,902	18.2%
Lamb/mutton	$130.5m	14.4%	-	17.8%
Broadacre crops	$111.6m	12.3%	504	2.2%
Milk	$101.5m	10.2%	146	15.5%
All other	$161.0m	17.8%	-	5.0%
TOTAL	$906m	100%	2,866	6.9%

Crown land and paper roads

Crown Land is mapped within the Development site along Butmaroo Creek and small paper road within the centre of the site. Crown is land also present over Lake George, adjacent to the Development site on the western boundary. Refer to Section 5.1 and Appendix C.4.8 for further details regarding Crown Land

Reserves

There are no nature reserves within the Development site or in proximity to the Development site. The closest nature reserve is the Scott Nature Reserve located approximately 15km south-east which is too far for the Project to pose any potential impacts. However, the Development footprint is located approximately 600m southeast of Lake George which is listed as a wetland of national significance in the Directory of Important Wetlands in Australia, when flooded it is an important habitat for waterbirds, as well as several threatened species. It is also of significant historical, cultural and scientific value.

Service infrastructure

An existing TransGrid 330kV transmission line traverses the Development site. The proposed connection to the grid would be via construction of a new onsite substation and battery storage pad located adjacent to the existing TransGrid 330kV transmission line.

The main access to the Development site would be via Tarago Road. Refer to Section 9.1 for further details regarding roads and access.

Canberra is an important service centre for the ACT, Queanbeyan-Palerang LGA and the broader NSW Capital region. As the capital city of Australia, it provides a high-level of government services, health, education, and utilities.

Proximity to service infrastructure and accommodation and services for a construction workforce, make the area an attractive location for Blind Creek SF and other major renewable Projects as set out below.

Renewable energy projects

The following renewable energy projects also located in or near the Queanbeyan-Palerang LGA are listed on Major Projects NSW:

- Capital Wind Farm 1 – Operational.
- Capital 2 Wind Farm, Modification 1 – Approved.
- Capital Solar Farm – Approved.
- Woodlawn Bioreactor – Operational.
- Woodlawn Wind Farm – Operational.

The cumulative impacts these Projects on the local region are assessed in Section 9.12.

Aviation

Two airports are located in the vicinity of the Development site:

- Canberra International Airport, located approximately 26km southwest.
- Goulburn Regional Airport, located approximately 47km northeast.

As detailed in Section 4.1.1, the small (private) airstrip located within the Development site will be decommissioned prior to the construction of the Project.

Exploration licences and mining leases

A search of the Minview database (Resources and Geoscience, 2018) on 09 July 2021 indicated that there are no current mineral, petroleum or coal titles or applications relevant to the Development site.

9.2.3 Potential impacts

Construction and operation

Agriculture

The potential impacts of the Project on agriculture are identified and discussed in Table 9-6 below in accordance with *Primefact 1063: Infrastructure Projects on rural land* (DPI, 2013). The impacts on agriculture are expected to be highly localised and would not significantly affect agricultural production or the availability of agricultural land in the locality or region.

Although cultivation would no longer be possible throughout the construction, operation and decommissioning of the Project, grazing would continue. The economic benefits of the proposed Project are expected to exceed those of the current land use (refer Section 9.6). The Development site would be returned to its prior capability after the solar farm has been decommissioned, allowing agricultural production to resume.

Table 9-6 The impact of the Project on agricultural land

	Project impacts
Resource loss and fragmentation	*Infrastructure that fragments rural resource lands can permanently reduce the economic and environmental sustainability of the farming enterprise and constrain future development options*. • The Project may result in the alteration 680-700ha of agricultural land for the life of the solar farm (nominally 35 years or more). This represents 0.2% of the agricultural holdings within the Queanbeyan-Palerang LGA and does not significantly reduce the availability of land for primary production in the region. • It is intended that utility scale Agri-solar practices are applied at the site, including sheep grazing within the Project boundaries near proposed native vegetation screening. Refer to Australian Guide to Agrisolar for Large-scale Solar: For Proponents and farmers (CEC, 2021) for further discussion and case-studies. • The Development footprint has been designed to minimise the use of land with surplus land being used for agriculture and/or biodiversity offsets. • The Development site is bound by Crown Land associated with waterways along Lake George on the western boundary of the Development site. This minimises resource fragmentation of the surrounding land zoned as RU1 Primary Production. • Connection to the national electricity grid does not require additional power lines as the Project would connect via an existing 330kV transmission line that traverses the Development site. This reduces the potential for limiting ground clearance and impacting on safe movement of agricultural machinery. • Access to the site is anticipated to be via existing private roads. Access within the site will require approximately 25km of new tracks. Some of these may be kept in place following decommissioning to support agriculture activities. • To allow grazing to continue at the site, a gap of between 5-9m is required between panels, which accounts for the large land requirements for the Project. • Cabling for internal electricity reticulation would be primarily underground, and would not impede grazing or movement across the Development site.
Impacts on farming operations and livestock	*Infrastructure Projects can result in interruptions to internal or external farm access and to farm activities, services and facilities that may affect the efficient operation and sustainability of agricultural businesses*. a) Agricultural activities would temporarily cease upon commencement of construction in the Development site as well as areas involved with primary access to and across the Development site. b) Commercial sheep grazing will continue to be undertaken within the Development Site, which will also help to control grass and weed growth around the solar arrays for operational life of the solar farm. c) Adequate groundcover would be maintained to protect soil and water values (refer to Section 9.2 and 9.3).

	Project impacts
	d) The Project would not affect access or agricultural land uses on surrounding properties during the operation phase. The solar farm is compatible with neighbouring land uses and is not likely to create land use conflicts. e) Best practice waste and wastewater management, fuel storage and re-fuelling and chemical handling would be stringently applied to prevent soil and water pollution. f) Impacts on soils and erosion risk are assessed in Section 9.3, impacts on downstream water quality are assessed in Section 9.4 and impacts on local air quality are assessed in Section 9.10. These assessments conclude that the Project would not be likely to adversely affect land uses or activities on neighbouring properties or elsewhere in the locality, subject to identified mitigation measures. g) The conceptual and detailed design of the Project layout, such as the siting of facilities with respect to existing farm infrastructure, has been informed by consultation with the associated landholders. h) There is unlikely to be any construction impacts on aviation or aerial spraying during construction of the solar farm. The proposed infrastructure is low-lying with the substation being the tallest infrastructure associated with the Project. The installation of this infrastructure would not further impact on any flight paths or present a hazard to aircraft. The existing private airstrip located within the Development site will likely be decommissioned prior to construction. i) Existing agricultural land uses, or future agricultural land uses on the Development site or adjacent land are not anticipated to be impacted due to the highly reversible nature of the Project.
Biosecurity risks – pests, diseases and weeds	*Biosecurity for agriculture, including genetically modified crops, relies on limiting vehicle and people movements on rural properties and being able to trace vehicle, people and stock movements if any disease outbreaks arise.* • The increased movement of vehicles, machinery, and people within the Development site, particularly during construction and decommissioning poses the largest risk to property biosecurity. Weed seeds can be transported via the tyres and undercarriages of vehicles and clothing of staff resulting in a risk of weed spread to the Development site. Limiting vehicles and machinery movements to formed access tracks during all phases and implementing a wash down procedure for vehicles entering the Development site would mitigate weed risks. • Weeds may rapidly advance in disturbed areas such as post construction and decommissioning, and prior to rehabilitation activities being undertaken. • Preparation of a Weed Management Plan for the construction and decommissioning phases based on Queanbeyan-Palerang LGA and NSW DPI requirements would assist in the management of weeds. Management measures would focus on early identification of invasive weeds and effective management controls. • An Operational Weed Management Plan would also be prepared to manage impacts associated with weeds such as the risk of weed ingress along the boundary of the development site and the importation and spread of weeds through vehicle

	Project impacts
	movements. • A temporary construction site compound would be established with the aim of reducing pest animals at the Development site. • Risk of increasing pest animals (cats, dogs, rabbits and foxes) at the Development site during operation would be managed by ensuring waste from rubbish bins containing food are covered and regularly removed. Targeted pest management during the operational phase of the Project would control pest numbers. Resources and cover for pest species would be reduced by livestock grazing.
Site rehabilitation	*Rehabilitation is important to prevent erosion and the sedimentation of waterway or dams, limit weed germination and restore productive land use options*. • Following completion of the construction phase and post decommissioning of the solar farm, a Site Rehabilitation Plan would be prepared and implemented to guide full rehabilitation and restoration of agricultural potential and land use opportunities to their pre-disturbance state or better. This would occur in consultation with the associated landholders. This plan would include rehabilitation of the temporary laydown area following construction of the solar farm. This would be done in consultation with the landowner who may wish to retain a portion of the laydown area for future agricultural purposes. The plan would also include re-fencing property boundaries where impacted by the solar array. • All infrastructure to a depth of 500 millimetres and internal track surfacing would be removed, soils would be de-compacted as required, any required reinstatement of paddock levels, small dams and irrigation and drainage channels would be undertaken and a suitable grass species sown to stabilise the site (refer to Section 9.3). • Soil restoration and treatments would be guided by the findings of a pre-works soil survey conducted at the site (refer to Section 9.4) using: o *The Australian Soil and Land Survey Handbook* (CSIRO, 2009) o *The Guidelines for Surveying Soil and Land Resources* (CSIRO, 2008) o *The land and soil capability assessment scheme: second approximation* (OEH, 2012) • An Environmental Management Plan (refer Section 10) would be implemented to provide a guiding framework and would contain specific targeted measures to minimise and manage the impacts from weeds, erosion and sedimentation and waterway contamination during all Project stages, as well as providing for effective post-operation rehabilitation and return of land to full agricultural productivity.

Crown land

There is also a small portion of Crown land within Lot 2 DP 1154765, known as Enclosure Permit 49717. The landowner is in the process of purchasing this Crown land (Road Purchase Application No. W632123). There is also Crown Land within Lot 1 DP 456698 which the proponent is seeking to be able to cross with an easement for the purposes of underground cabling. Lake George and Butmaroo Creek are mapped as Crown waterways. Refer to Figure 9-7 and Appendix C.4.8 for further information.

The construction of the Project would not impact Crown lands, however there is potential for earthworks to cause sedimentation in Crown land waterways. Given the Development site has been heavily disturbed by agricultural activities, the impact of the proposed earthworks is expected to be minimal. Mitigation measures would be required to minimise any impacts from earthworks to Butmaroo Creek and Lake George, further discussed in Section 9.4.

Services

No impact on services is anticipated during the construction and operation of the Project. Consultation with TransGrid would ensure connection to the grid does not disrupt operation and maintenance of TransGrid assets (refer Section 6.1).

Minimal impact to the local road network is anticipated during construction; good sight lines and road conditions are present on Tarago Road and the intersection with Blind Creek Road Entrance.

Services for construction staff, including accommodation, recreation and other services are likely to be met within the Queanbeyan-Palerang LGA as well as the north-eastern districts of ACT, refer Section 9.6. Existing fluctuations in demand due to university terms, holiday periods and Parliament sittings in Canberra may be exacerbated by the construction program and would require consideration with local service providers.

Consultation undertaken with the Civil Aviation Safety Authority (CASA) notes the proposed Blind Creek Solar Farm will be at least 25km from Canberra Airport, not aligned with the runway and will not impact the Air Traffic Controllers or pilots approaching Canberra Airport. No impacts to aviation services are anticipated to arise from the Project.

Residential

Residences located near the Development site or along the primary access route may experience temporary noise, dust, and traffic impacts during the construction period. There is one non-associated receiver (R36) within proximity of the Development site (refer Figure 1-3). Impacts are considered manageable with the implementation of mitigation measures listed in Sections 8.6 and 9.1.

Subdivision

The proposal will not result in rural land fragmentation or alienation of resource lands as defined under the Primary Production SEPP. It is considered that the proposal would not generate any land use conflicts or have an impact on the nature of existing surrounding agricultural holdings given the proposal will not alter the existing environment. The proposed subdivision and consolidation of lots would help facilitate the management of the solar farm while ensuring surplus land remains as productive agricultural land.

Land use risk assessment

A Land Use Conflict Risk Assessment (LUCRA) has been carried out in accordance with the Department of Primary Industries *Land Use Conflict Risk Assessment Guide* (DPI, 2011). The assessment aims to identify and rank any potential land use conflicts so that they may be anticipated and avoided or mitigated.

The risk ranking in Table 9-7 has been determined using the risk ranking matrix shown in Table 9-8, and in accordance with the probability table and measure consequence table in the *Land Use Conflict Risk Assessment Guide* (DPI, 2011).

The matrix ranks the risk of impacts according to the probability of occurrence and the consequence of the impact. Probability of occurrence ranges from 'A', described as 'almost certain', to 'E', described as 'rare'. The level of consequence starts at 1 – Severe to 5 – Negligible. The risk ranking from 1 to 25 is a result of the probability and consequence. For example, a risk ranking of 25 is the highest magnitude of risk (DPI, 2011).

The risk ranking for each potential conflict, revised to account for management strategies, ranges from 3 to 9 for the Blind Creek Solar Farm project. These risks are considered acceptable and manageable, and land use conflicts during construction and operation are highly unlikely.

Table 9-7 Risk ranking matrix (DPI, 2011)

PROBABILITY	A	B	C	D	E
Consequence					
1	25	24	22	19	15
2	23	21	18	14	10
3	20	17	13	9	6
4	16	12	8	5	3
5	11	7	4	2	1

Table 9-8 Land use conflict risk assessment summary

Identified Potential Conflict	Risk Category and Ranking		Management Strategy	Revised Risk Ranking	
Agricultural land use					
Contaminated surface water runoff	B3	17	Implementation of a soil and water management plan and an erosion and sediment control plan would minimise the potential impact.	D4	5
Dust	B3	17	Dust generated during the construction and decommissioning stages to be managed using water carts when required.	C5	4

Identified Potential Conflict	Risk Category and Ranking		Management Strategy	Revised Risk Ranking	
			Dust is not expected to generate a significant land use conflict during operation.		
Fire/ Bushfire	C1	22	Vegetation management including intensive sheep grazing, would reduce the probability of solar farm operation starting a fire or a bushfire damaging the solar farm infrastructure. A Fire Response Plan would be implemented during construction and operation.	D3	9
Visual amenity	B5	7	Screen landscaping along boundaries where identified in Section 8.1 would mitigate expected impact on visual amenity.	B5	7
Noise	D4	5	Noise generated during construction and decommissioning stages would be minimised through the implementation of mitigation measures. Where regular maintenance practices are incorporated into operation, noise is not expected to generate a land use conflict	E3	3
Traffic generation and disruption	B3	17	Traffic generation and disruptions during construction and decommissioning stages are considered likely however the impact would be temporary and able to be managed (refer to Section 9.1). Traffic is not expected to generate a land use conflict during operation.	C4	8
Weed and pest control	A3	20	Implementation of Biodiversity Management Plan during construction and operation phases	D4	5

Figure 9-7 Crown Land within and near the Project

9.2.4 Mitigation measures

The potential impacts of the Project during construction on land uses at and surrounding the Development site are considered minimal given the temporary nature of the construction stage and the high confidence in the ability to mitigate impacts. The potential land use impacts of the Project during operation are considered manageable with implementation of mitigation measures provided in this EIS, and adequate site rehabilitation following the decommissioning of the solar farm.

No.	Mitigation measures	Phase
L1	Consultation would be ongoing with TransGrid regarding connection to the substation and design of electricity transmission infrastructure.	Preconstruction
L2	Consultation with adjacent landowners, to minimise impact of the Project on adjacent agricultural activities and access.	Preconstruction Construction
L3	Construction, operation and decommissioning to operate in accordance with the Traffic Management Plan (TMP), to minimise dust generation and disturbance to livestock.	Construction Operation Decommissioning
L4	Relevant landholders and residents would be consulted and notified to minimise, where possible, the noise, dust, traffic and other disturbance impacts	Preconstruction Construction
L5	Underground cabling and other works to remain in situ following decommissioning of the solar farm would be installed deeper than 500mm to allow cultivated cropping to resume following decommissioning.	Decommissioning
L6	Prior to construction, a license will be applied for to allow construction to commence within Crown roads on the Development site.	Preconstruction
L7	Consultation with representatives from nearby Major Projects, including Capital Wind Farm, Woodlawn Wind Farm, and Woodlawn Bioreactor would be undertaken to ensure cumulative traffic and pressure on local services are managed adequately	Preconstruction Construction
L8	A Decommissioning Environmental Management Plan (DEMP) would be prepared and submitted to DPE for approval prior to decommissioning. The DEMP would include a Site Rehabilitation Plan covering: • Criteria and indicators for the restoration of land capability and agricultural potential based on pre-works soil survey results • Details of rehabilitation actions such as removal of infrastructure, remediation of soils, reinstatement of dams and irrigation/drainage channels as required, reinstatement of property boundaries and establishment of suitable groundcover vegetation on bare areas	Pre-decommissioning

No.	Mitigation measures	Phase
	• A monitoring and assessment process to demonstrate that the target state has been achieved • An expected timeline for the rehabilitation program.	

9.3 Soils and landforms

9.3.1 Approach and methods

This section assesses the potential impacts to soil and landforms resulting from the construction, operation and decommissioning of the Project.

The construction phase may potentially increase the risk of contamination to soil through poor site and waste management. At the operational stage of the Project, the primary risk of contamination would be from hydrocarbon leaks over unsealed surfaces. Other general contamination risks are associated with the transport, handling, processing and storage of products where liquid waste and hazardous material can escape into the soil.

Topsoils are critical for agriculture and cannot be easily replaced within a human time scale. Adverse soil impacts can also have ecological impacts, affecting water quality and terrestrial and aquatic ecosystems. Risks to soils are influenced by landscape position, slope, soil type, hydrology and land use.

9.3.2 Existing environment

Topography

The Development site is located within the South Eastern Highlands Bioregion of NSW. This bioregion is bounded by the Australian Alps and the South Western Slopes Bioregion and includes most of the ACT and extends south into Victoria. This bioregion covers the dissected ranges and plateau of the Great Dividing Range and extends to the Great Escarpment in the east and to the western slopes of the inland drainage basins.

The topography of the Development site varies from east to west. Elevation ranges from 670-720m AHD in the west, with a local relief of less than 9m and forms part of the southern shores of Lake George. The east comprises undulating low hills and flats, with a local relief of 50-90m, elevation ranging from 670-870m AHD and a moderate incline in the hillslopes (5-10%).

Wrights Creek has been incorrectly mapped as having a defined course and a confluence with Butmaroo Creek on the site. Today it has no defined bed/bank formation through half the site. The remaining isolated channels (the age of which is unknown) have been excluded from agricultural activities and are now ephemeral wetlands.

Geology

The South Eastern Highlands Bioregion of NSW substrate is formed from Palaeozoic granites, metamorphosed sedimentary rocks and Tertiary basalts. The highlands form part of the Lachlan fold belt that runs through the eastern states as a complex series of metamorphosed Ordovician to Devonian sandstones, shales and volcanic rocks intruded by numerous granite bodies.

Further details of the geology within the Development site are discussed in the soil landscapes outlined in Section 9.3.

Soil Landscapes

Soils within the South East Highlands Bioregion of NSW vary in relation to altitude, temperate and rainfall. The three Australian Soil Classification (ASC) soil types that occur at the Development site are Rudosols, Sodosols and Kurosols (refer Figure 9-9 and Appendix O). The characteristics of these soil types include:

- Rudosols – young soils that have negligible pedologic formation.
- Sodosols – not acidic, poor draining capacity, highly erodible, poor structure, low permeability.
- Kurosols – acidic, duplex soils, low chemical fertility, sodic and low permeability.

A search of the NSW Planning Industry and Environment eSPADE database returned two soil landscapes within the Development site. The soil landscapes indicate that hydrosols and chromosols are also present on the shores of Lake George. Tenosols are found on crests or adjacent outcrops, and Kandosols and Chromosols are found within the upper and mid-slopes. The soil landscapes are mapped in Figure 9-8 and summarised descriptions are provided in Table 9-9.

Table 9-9 Soil landscapes

Soil landscape	Geology	Soils	Typical Soil erosion
Coopers (cp) Beach	Quaternary alluvium-gravel, sand, silt and clay.	Deep to very deep (>100cm), very poorly drained Hydrosols and Stratic Rudosols (Alluvial Soils) on Lake George. Moderately deep to very deep (>90cm), imperfectly drained Brown Chromosols (Yellow Podzolic Soils) on old beaches. Well-drained Stratic Rudosols (Siliceous Sands) on beach dunes. Moderately deep to very deep, poorly drained Stratic Rudosols (Alluvial Soils) on swales.	Soils are non-cohesive, infertile, highly erodible and have low available water holding capacity. Waterlogging (localised); groundwater pollution hazard; engineering hazard; poor moisture availability; seasonal waterlogging (localised); wind erosion hazard; run-on (localised); excessive drainage.
Taylors Creek (tc) Erosional	Ellenden Granite, consisting of pink-grey and porphyritic adamellite and granodiorite, with minor quartz plagioclase porphyry.	Extremely shallow (<40cm), well-drained Rudosols (Lithosols) and Tenosols (Earthy Sands) on crests or adjacent to outcrops. Moderately deep to shallow (<80cm), moderately well-drained Red Kandosols (Red Earths) and Red Chromosols (Red Podzolic Soils) on upper and midslopes. Moderately deep (<130cm), poorly drained Kurosols (Soloths) and Sodosols (Solodic Soils) on lower slopes and drainage lines.	Hard setting, infertile soils of low wet bearing strength and low water holding capacity. Seasonal waterlogging; gully erosion risk; sheet erosion risk (localised); shallow soil (localised); non cohesive soil (localised); rock outcrop (localised); run-on (localised).

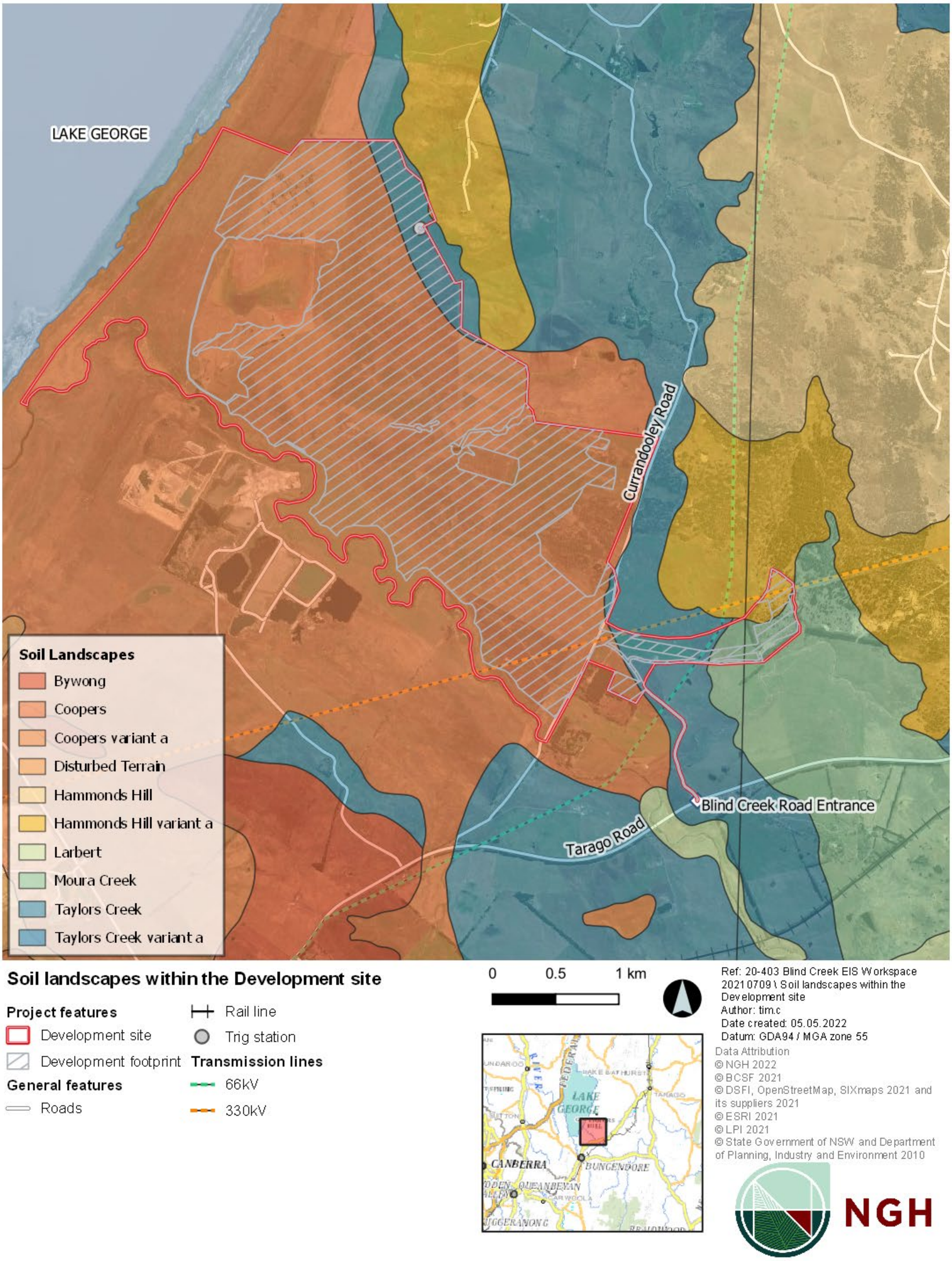


Figure 9-8 Soil landscapes within the Development site

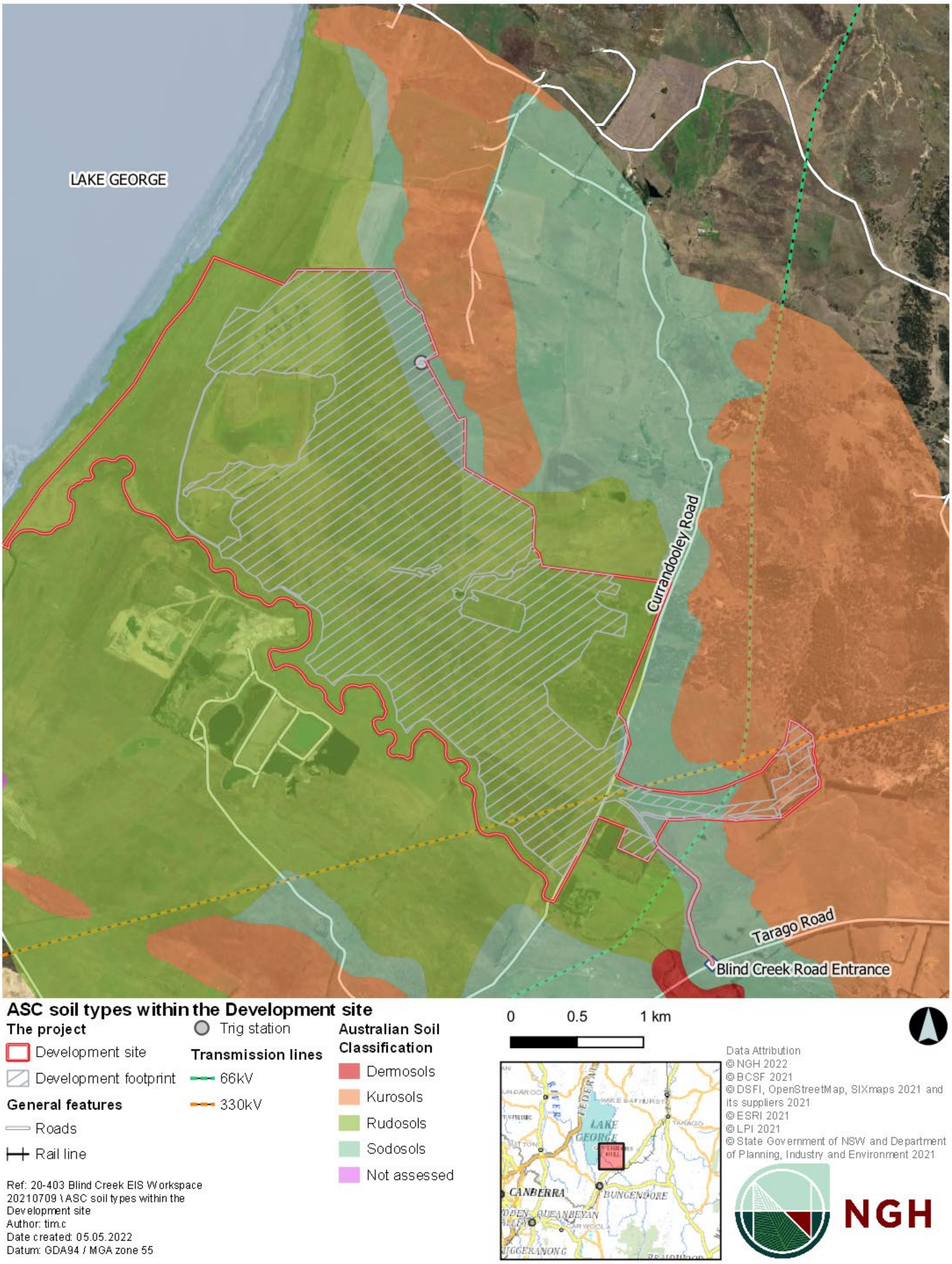


Figure 9-9 ASC soil types within the Project

Potential contamination

The Development site has been used for cropping and grazing for the past 190 years. Contaminants of potential concern associated with agricultural activities include pesticides, underground or above ground fuel storage tanks, buried waste, stockpiles of waste, sheep wash or dips, lead painted buildings, asbestos containing materials within buildings/structures etc. No site inspection or a Stage 1 Preliminary Site Investigation have been undertaken. This assessment is based on online desktop searches, outlined below.

A search of the Contaminated Land Record of Notices, Section 58 of the NSW *Contaminated Land Management Act 1997* (CLM Act) was undertaken on 15 July 2021 for the Queanbeyan-Palerang LGA. The search identified three sites listed with notices:

- Former Timber Treatment Plant, Corner of King Street and Butamaroo Street, Bungendore.
- Rail corridor adjacent to Lake George Mine, 1 Copper Creek Road Captains Flat.
- Waste Oil Storage, Mayfield Road Larbert.

These sites are all located more than 5km from the Development site and are not considered a risk to the proposed works. A search was of the List of Notified Sites, under Section 60 of the CLM Act was undertaken on 15 July 2021, for the suburbs of Lake George, Bungendore and Tarago. One site was listed under the suburb of Bungendore, one site under Tarago and no sites were listed under Lake George. The search indicated the following sites:

- Former Timber Treatment Plant, Corner of King Street and Butamaroo Street, Bungendore. Contamination formerly regulated under the CLM Act.
- Tarago Railway Sliding, Goulburn Street Tarago. Contamination currently regulated under CLM Act.

Both sites are greater than 5km from the Development site and are not considered a risk to the proposed works.

A search of the *Protection of the Environment Operations (POEO) Act*, 1997 was undertaken on 15 July 2021 for the suburb of Tarago. The search identified 40 results; refer Appendix O for the full list of results. The search identified two Environmental Protection Licences (EPL) located on Tarago Road, Bungendore:

- EPL 5524: Tylden Machinery Sales Pty Ltd, located on Lot 21 DP 715621, Lot 2 DP 830569 Tarago Road for extractive activities >100,000-500,000 tonnes per year.
- EPL 1306: Holcim Australia Pty Ltd, located on Lot 82 DP754876 with a POEO licence for extractive activities >100,000-500,000 tonnes per year.

Given these two sites are located within proximity to the Development site, there may be concerns with silica dust from the extractive activities. As part of the operating conditions O3.1, the premises must be maintained in a condition which minimises or prevents the emission of dust from the premises. The current Environmental Risk Level is level 1 for both sites. The Pollution Incident Management Plan was last tested in 2019 for Better Sands, and in 2021 for Holcim.

Acid sulfate soil

A search for acid sulphate soils was undertaken on 15 July 2021, via NSW Government online databases (NSW Planning Portal and eSPADE, refer Appendix O for full results). The Development site is not mapped within a known area of acid sulphate soils and the probability of encountering acid sulphate soils within this locality is extremely low.

Naturally occurring asbestos

A search Naturally Occurring Asbestos (NOA) was undertaken on 15 July 2021 NSW Government online databases (DPIE, 2021). There are small areas on the north-eastern edge of the Development site which are mapped as containing low asbestos potential (refer Figure 9-10). The full results of the search are provided in Appendix O.

Salinity

Salinity is the accumulation of salt in land and water that damages the natural and built environment. Many areas within Australia naturally have salinity, however human activities can cause these levels to rise. Aeolian processes (wind erosion) can transport dust and salt from soils and lake surfaces redistributing it across the adjacent landscapes. High salinity levels impact farms, wetlands, rivers, drinking water, building, roads, pipelines, sports grounds and increase the risk of acid sulphate soils.

Agricultural effects from salinity can decrease vegetation growth and reduce the quality of water, resulting in low crop yields and degraded stock water supplies. High salinity reduces the overall health of soil and productivity, killing vegetation and exposing soils prone to erosion.

Buildings, roads, and pipelines can be damaged by salinity resulting in a reduction of lifespan and, increasing maintenance costs.

A search for salinity was undertaken on the 29 July 2021, via NSW Government online databases (NSW Planning Portal and eSPADE). The search identified that the Development site is mapped within an area of high salinity and an overall moderate salinity hazard. Refer to Appendix O for results searches.

Biophysical strategic agricultural land

The NSW Government introduced a range of measures designed to deliver greater protection to agricultural land from the impacts of developments. These measures included the safeguarding of 2.8 million hectares of Biophysical Strategic Agricultural Land (BSAL) across the state, and Critical Industry Clusters (CIC). BSAL is land identified with high quality soil and water resources capable of sustaining high levels of productivity. 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 Development site is not mapped within an area classified as BSAL or CIC.

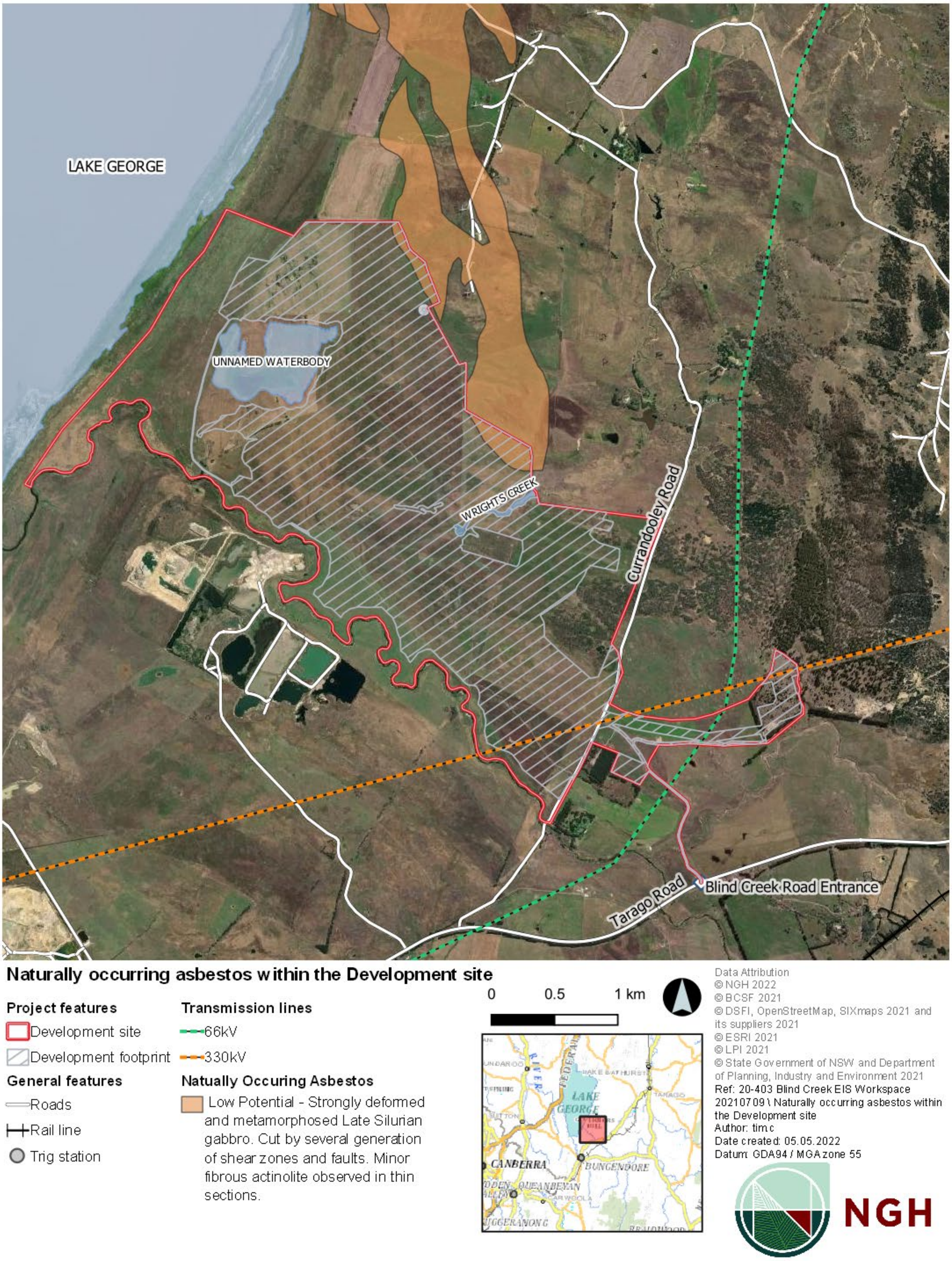


Figure 9-10 Naturally occurring asbestos within the Development site

Land and soil capability

Land and Soil Capability (LSC) is the inherent physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resources (OEH, 2012). The NSW land and soil capability assessment scheme (OEH, 2012) describes and maps eight land and soil capability classes. The classification is based on the biophysical features of the land and soil (including landform position, slope gradient, drainage, climate, soil type and soil characteristics) and susceptibility to hazards (including water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement).

The rural land within the region is primarily used for agriculture including cropping and grazing. The land is classed as follows under the LSC Assessment Scheme:

- Class 5: sloping lands (10–20% slope) with highly erodible soils and/or significant existing soil erosion, or land that will be subject to wind erosion when cultivated and left bare. Other limitations include shallow soils, stoniness, climatic limitations, acidification, potential for structure decline and salinity hazards.
- Class 6: steeply sloping lands (20–33% slope) that can erode severely even without cultivation, or land that will be subject to severe wind erosion when cultivated and left exposed. Land generally is suitable only for grazing with limitations and is not suitable for cultivation (OEH, 2012).

Class 5 land is considered Moderate-low Capability Land: Land that has high limitations for high-impact land uses. The land capability would largely restrict land use to grazing, some horticulture, forestry, and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.

Class 6 land is considered Low Capability Land: Land that has very high limitations for high-impact land uses and is restricted to low-impact land uses such as grazing, forestry and nature conservation.

The Development site is made up of the following classes under the LSC Assessment Scheme (OEH, 2012):

- Class 5 – 81.297 ha
- Class 6 – 944.589 ha

Refer to Figure 9-11 for the location of each land and soil capability class within the Development site.

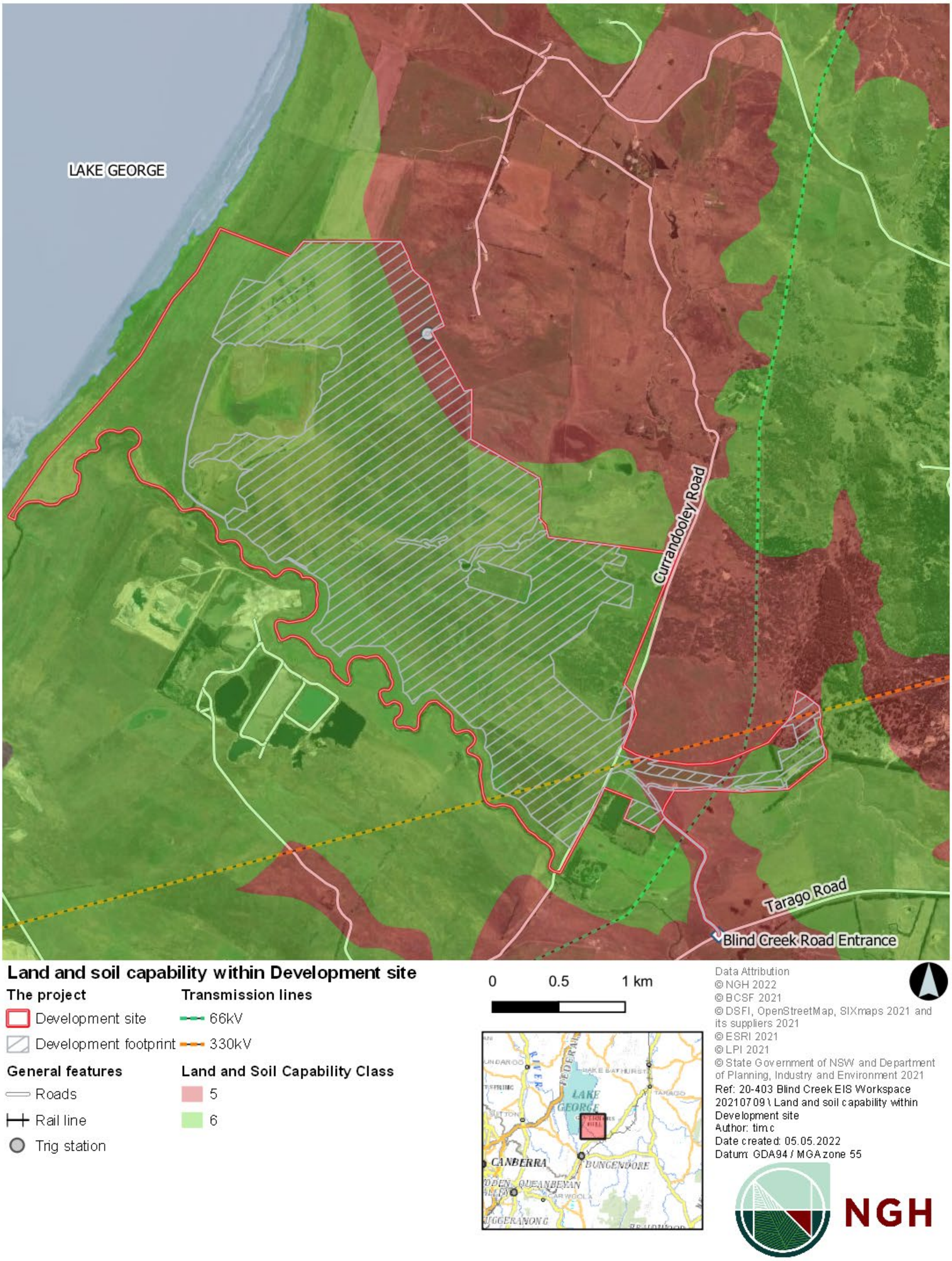


Figure 9-11 Land and soil capability within Development site

9.3.3 Potential impacts

Construction

Civil works and excavation activities

The proposed disturbance area for the Development footprint is approximately 680-700ha, which includes the infrastructure shown in Figure 1-6.

The construction of the Project would disturb soils through the following activities:

- Establishment of internal access tracks.
- Removal of existing fences.
- Foundations for the inverter stations, BESS, substation, and maintenance buildings.
- Establishment of temporary staff amenities and offices for construction.
- Levelling the ground for buildings and structures.
- Localised areas of earth work (cut and fill, grading and compacting) may be required in areas where there are sudden, significant changes in ground slope.
- Upgrades to internal tracks and the private Currandooley Road.
- Excavation of cable trenches up to at least 800mm deep and 0.8m wide (high voltage) following the relevant Australian Standard.
- Excavation of shallower DC cable trenches.
- Installation of mounting structures (pile driven or screwed to a depth of approximately 2.4m).
- Clearing of vegetation cover.

The soil disturbance has the potential to result in the following impacts:

- Reduce soil stability and increased susceptibility to erosion due to vegetation removal or soil exposure, especially if the subsoil is sodic and dispersive.
- Loss of topsoil and impacts on waterways due to increased erosion and sedimentation hazard.
- Reduced soil permeability and increased run-off as a result of soil compaction for internal access roads and hardstand areas.
- Risk of exposing buried contaminants (pesticides and hydrocarbons).

Soil disturbance is anticipated to be minimal due to the low relief nature of the topography within the Development site. The earthworks and excavations associated with the access tracks, buildings and cabling trenches would require removal of vegetation cover and soil disturbance in some areas. The pile driving of steel posts associated with installation of the arrays would have a small discrete footprint at the pole locations and is unlikely to result in substantial soil disturbance. Ground cover would be maintained where possible during the pre-construction and construction stages of the Project and would be rehabilitated upon decommissioning.

Erosion and sedimentation impacts that may arise as a result of construction and decommissioning works can be minimised by carrying out the activities in accordance with the provisions of the *Managing Urban Stormwater*: Soils and Construction series, in particular:

- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom, 2004) known known as ‘the Blue Book.’.
- Volume 2A Installation of Services (DECC, 2008).
- Volume 2C Unsealed Roads (DECC, 2008).

Soil compaction occurring as a result of hardstand and access road construction and vehicle movements would reduce soil permeability; this may increase runoff and the potential for concentrated flows across the Development site. Groundcover would be maintained beneath solar panels to protect soils during heavy rainfall events.

Spills and leaks

The works present a risk of accidental spills and leaks of hazardous products, such as oils, fuels, lubricants and sanitary wastewater. Such negative impacts may occur at the construction site’s storage areas or during transportation of hazardous products on and off the site. Inadequate procedures for storing, transferring, and handling may also result in spills to the ground and lead to soil contamination. Additionally, migration of the contaminants to groundwater may occur, with the potential for further spreading of pollutants through the groundwater system dependent on the physical and chemical properties of the contaminants and the interconnectivity of the groundwater system. Soil contamination risks from the use and storage of fuels and other chemicals would be managed using best practice storage, use and spill response procedures (refer to Section 9.3). Overall, these risks are low and considered readily manageable.

Inadequate waste management

Construction activities typically generate solid and liquid waste, including hazardous wastes. Although these types of wastes (used oil, machinery lubricants and sludge) represent a small proportion of the total amount of construction waste, inadequate handling, storage and disposal of these wastes, increases the risk of soil contamination. Overall, these risks are low and considered readily manageable.

Asbestos

Parts of the Development site are mapped as geological units with low potential NOA. Therefore, if earthworks during construction are likely to impact potential NOA, an Asbestos Management Plan is to be prepared prior to construction works refer to mitigation measures below.

If the works include relocation of existing utilities (none anticipated), such as underground electrical systems, these might impact asbestos containing materials. The conduits and insulation used in the electrical installations may pre-date the phasing out of asbestos. Inappropriate isolation and handling, as well as poor containment and waste management of asbestos materials could result with dispersion of asbestos fibres into the airshed of the works area. Asbestos is a health risk to workers and sensitive receivers and damages the lungs of victims who inhale the fibres, which may cause asbestosis. Asbestos is a hazardous material and the magnitude of impact from poor handling and management is high. Mitigation measures to identify and develop appropriate removal, handling and containment would reduce these risks to acceptable levels.

Operation

Soil disturbance

Impacts to soils during operation of the Project are expected to be minimal and acceptable using appropriate management practices.

Localised soil erosion under the panels may be caused by rainfall and cleaning water runoff if groundcover is not maintained. This is a risk if panels are fixed, but a lower risk if panels are tracking.

Some ongoing erosion from disturbed areas such as unsealed tracks and drainage structures is likely to occur. Appropriate design, drainage, maintenance and groundcover management would be adequate to ensure these risks are reduced to acceptable levels.

The potential for shading of the groundcover from the panels is considered to be low. As the panels would be tracking, panels would not provide continuous shading. The microclimate created under the panels (reduced surface air movement, evaporation, and ground temperatures) is expected to offset the negative impacts of shading. A species mix, which is tolerant of some shading and selected based on soil test results, would be used for the groundcover at the site. Potential responses to any persistent localised impacts under the array would include revegetation.

All areas disturbed during construction would be rehabilitated, and groundcover would be established, monitored, and maintained. As such, the risk of significant impacts to soils during operation is low. Soil stability and erosion throughout the site, including beneath the array, would be regularly monitored during the operation of the Project.

Sheep grazing would be limited to the area within the Development site as a maintenance strategy to reduce biomass and assist weed management. This would also provide an opportunity to rest, rehabilitate and improve land that has already been degraded by previous agricultural practices.

Decommissioning

When the Project is no longer viable, above ground infrastructure would be removed and decommissioning and rehabilitation of the site would commence. The solar arrays would be removed and the steel piles on which they are supported, would be removed. Both the steel piles and the solar panels would be recycled, where possible. All buildings would be removed, including the PCUs together with the associated footings. Cabling would be removed where practical and recycled. Any cabling greater than 500mm below the ground may be left in place since this would not impact on future agricultural activities on the site once the restoration is complete.

Vegetation management during decommissioning would follow the Groundcover Management Plan to ensure soils, vegetation and waterways are protected during the works.

Rehabilitation

Following decommissioning, rehabilitation of the site would be undertaken to restore the site to as close to its pre-existing condition as possible.

A Site Rehabilitation Plan would be developed and implemented with the objectives of:

- Returning the land to its pre-solar capability and improving the current state of the land.
- Soil resource management.
- Landform and land use areas.

- Development of completion criteria and monitoring reporting.
- Re-fencing impacted property boundaries (as required by the landowners).

The plan would be informed by soil information derived from a soil survey using:

- The *Australian Soil and Land Survey Handbook* (CSIRO, 2009).
- The Guidelines for Surveying Soil and Land Resources (CSIRO, 2008).
- The land and soil capability assessment scheme: second approximation (OEH, 2012).

9.3.4 Mitigation measures

No.	Mitigation measures	Phase
S1	The solar array would be designed and installed to optimise the capacity of the solar array and maintain perennial groundcover (subject to climatic conditions). Groundcover management details (including any stocking levels etc) and rehabilitation of civil work completed during construction are to be included in the Construction Environmental Management Plan and Operational Environmental Management Plan.	Preconstruction Construction Operation
S2	A Construction Environmental Management Plan (CEMP) would be implemented to manage runoff, soil erosion and sedimentation and pollution risks at the site. The CEMP would be prepared in accordance with the 'Blue Book' Volume 1 Managing Urban Stormwater: Soils and Construction (Landcom 2004), Volume 2A Installation of Services (DECC 2008a) and Volume 2C Unsealed Roads (DECC 2008b).	Pre-construction Construction
S3	As part of the CEMP, a Soil and Water Management Plan (incorporating a Site Drainage Plan and Erosion and Sediment Control Plan) would be prepared, implemented and monitored during the Project to minimise soil and water impacts. These plans would include provisions to: • Install, monitor and maintain erosion controls, • Identify and protect sensitive features such as native vegetation, dams and water courses, • Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads, • Manage topsoil: in all excavation activities, separate subsoils and topsoils to restore natural soil profiles and assist revegetation, guided by the findings of the pre-works soil survey. Topsoils stockpiled for extended periods would be managed to avoid contact with overland runoff, minimise weed risks, and maintain soil organic matter, soil structure and microbial activity, • Minimise the area of disturbance from excavation and compaction and rationalise vehicle movements to minimise soil impacts, • Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met as far as practicable, ensure excavations are not scheduled when heavy rainfall events are predicted, or soils are saturated.	Pre-construction Construction

No.	Mitigation measures	Phase
S4	Prior to commencement of construction, representative soil samples would be gathered as part of a specialist soil survey to establish baseline data on the existing agronomic characteristics of the soil. The survey would include sampling and analysis for soil texture and structure, nutrients, acidity, salinity, sodicity, dispersion and organic matter.	Pre-construction
S5	The Spill and Contamination Response Plan prepared as part of the Emergency Response Plan would include measures to: • Respond to the discovery of existing contaminants at the site (e.g., Pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements, • Manage the storage of any potential contaminants on-site, • Mitigate the effects of soil and water contamination by fuels or other chemicals (including emergency response and EPA notification procedures), • Ensure that machinery and materials arrive on site in a clean and secure condition, • Prevent contaminants affecting adjacent pastures, water courses, dams and native vegetation, • Monitor and maintain spill equipment including spill kits in relevant machinery, • Induct and train site staff, • Detail fuels, chemicals, and liquids storage locations that are at least 50m from any waterways or drainage lines, in an appropriate bunded area, • Disposal process for contaminated materials.	Construction Operation Decommissioning
S6	If earthworks during construction have a likelihood of impacting potential NOA an Asbestos Management Plan (AMP) is to be prepared prior to construction for identified or suspected areas of naturally occurring asbestos mapped by NSW Department of Planning, Industry & Environment. The AMP is to include the items outlined in the NSW SafeWork Naturally occurring asbestos factsheet, www.safework.nsw.gov.au.	Pre-construction Construction
S7	Any development that intersects mapped moderate to high salinity, a salinity soil survey is required.	Pre-construction
S8	Sodic soil amendment should be applied where sodic soils are present. Treatment with Gypsum should be applied. The application rate should be determined following soil testing (Clay content, ECEC and EC), and should be at a minimum rate of 10t/ha.	Pre-construction
S9	An unexpected finds protocol is to be prepared prior to construction including actions to be undertaken if contaminated soils and/or water are encountered during construction.	Pre-construction Construction

9.4 Water use and water quality

This section identifies the main issues associated with water pollution risks, water use and wastewater management, resulting from the construction and operational activities of the project.

9.4.1 Existing environment

Surface water and catchment area

The Development site is located within the Lake George catchment, being an area of approximately 950km^2 with Lake George itself comprising 16% of the total catchment - refer Figure 9-12 (DPIE, 2018). The catchment area supports the town of Bungendore located south of the catchment, and the village of Collector to the north. The major water uses within the catchment are stock water for grazing which accounts for 76% of all land use, domestic water for Bungendore, and a small amount of irrigation (historically turf farms servicing Canberra).

The Development site is located approximately 100m southeast of the ephemeral Lake George (the Development footprint is set back approximately 600 m). Lake George is 25km long, 10km wide, and very shallow. This natural drainage basin is fed by six (6) major tributaries that drain from the surrounding hilly country. These tributaries originally drained to the Yass River before they were cut off by the uplift of the Lake George Range some 5 million years ago. The northern part of the catchment is drained by Collector Creek, Tarago Creek and Currawang Creek, while the southern end of the catchment is drained by Taylor's Creek, Butmaroo Creek and Turallo Creek (DPIE, 2021).

The lake has no surface outflow and water loss is through evaporation and underground seepage. Therefore, it accumulates salt and nutrients from its catchment, making it one of the saltiest water bodies in inland NSW when flooded and the salinity increases as the lake evaporates. The lake also dries up during drought years and as such it cannot provide a secure water source to local users. Consequently, protecting water quality in the Lake's tributaries is important because once the water reaches the lake it becomes unusable (DPIE, 2021).

Lake George is listed as a wetland of national significance in the Directory of Important Wetlands in Australia. When flooded it is an important habitat for waterbirds, as well as several threatened species. It is also of significant historical, cultural and scientific value.

The Murrumbidgee and Lake George Water Quality Objectives (WQO) (NSW Government, 2021) have been developed to provide guideline levels to assist water quality planning and management. Considering the Development site is situated across tributaries that are 3rd order and above, meeting the WQO is vital for protecting the downstream ecosystems, environmental values, and human uses.

The corresponding WQO for the Murrumbidgee and Lake George include the following:

- Aquatic ecosystems.
- Visual amenity.
- Secondary contact recreation.
- Primary contact recreation.
- Livestock water supply.
- Irrigation water supply.
- Homestead water supply.

- Drinking water – Disinfection only, or
- Drinking water – Clarification and disinfection.
- Drinking water – Groundwater.
- Aquatic foods (cooked).
- Industrial water supplies.

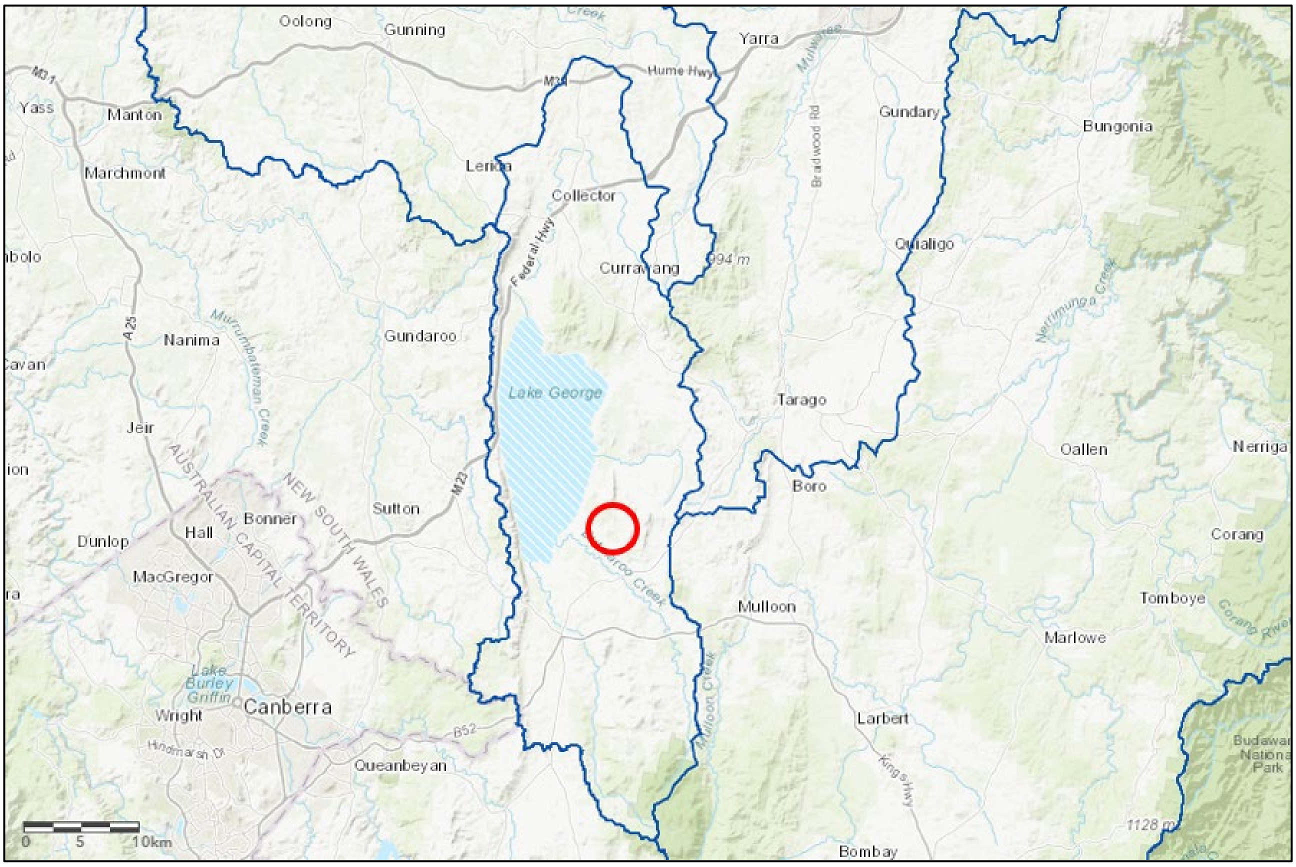


Figure 9-12 Project’s indicative location (red) within the Lake George Catchment (source: DPIE, 2018)

Groundwater and water entitlements

The Development site is situated on Lake George Alluvium which corresponds to the Bungendore alluvial groundwater source in the Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020. Alluvium beneath Lake George and across the Murrumbidgee basin floodplain accumulated in the Cenozoic Era (Pleistocene) and has a thickness ranging 15-60m and a total area of 150km^2.

A search of the Australian Groundwater Explorer (BOM, 2021) identified two installed groundwater bores with an unknown use within the Development site, and several along the boundary of the Development site for monitoring and water supply (Figure 9-13). The geology and standing water levels were not reported. The depths of the installed groundwater bores ranged from 134 to 11 m.

In accordance with the *Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020* for the Bungendore Alluvial Groundwater Source, the long term-average extraction limit is 127,500 ML/year. Available water determinations (AWDs) are made at the start of each water year for domestic and stock, local water utility, and salinity and water table management access licences (100% of the share component unless the minister determines otherwise). No trading rules are permitted.

Groundwater Dependant Ecosystems (GDEs)

The assessment of likelihood of groundwater dependent and inflow dependent ecosystems in the locality is based on the Bureau of Meteorology Groundwater Dependent Ecosystems Atlas (BOM, 2019). Groundwater Dependent Ecosystems (GDEs) include ecosystems which may rely on the surface expression of groundwater (including surface water ecosystems that may have a groundwater component) and ecosystems which may rely on the subsurface presence of groundwater (including vegetation ecosystems). Butmaroo Creek and Wrights Creek are mapped as High Potential aquatic GDE's (national assessment) and are located within the Development site (Figure 9-14). There are no listed terrestrial GDE's within the Development site (Figure 9-15).

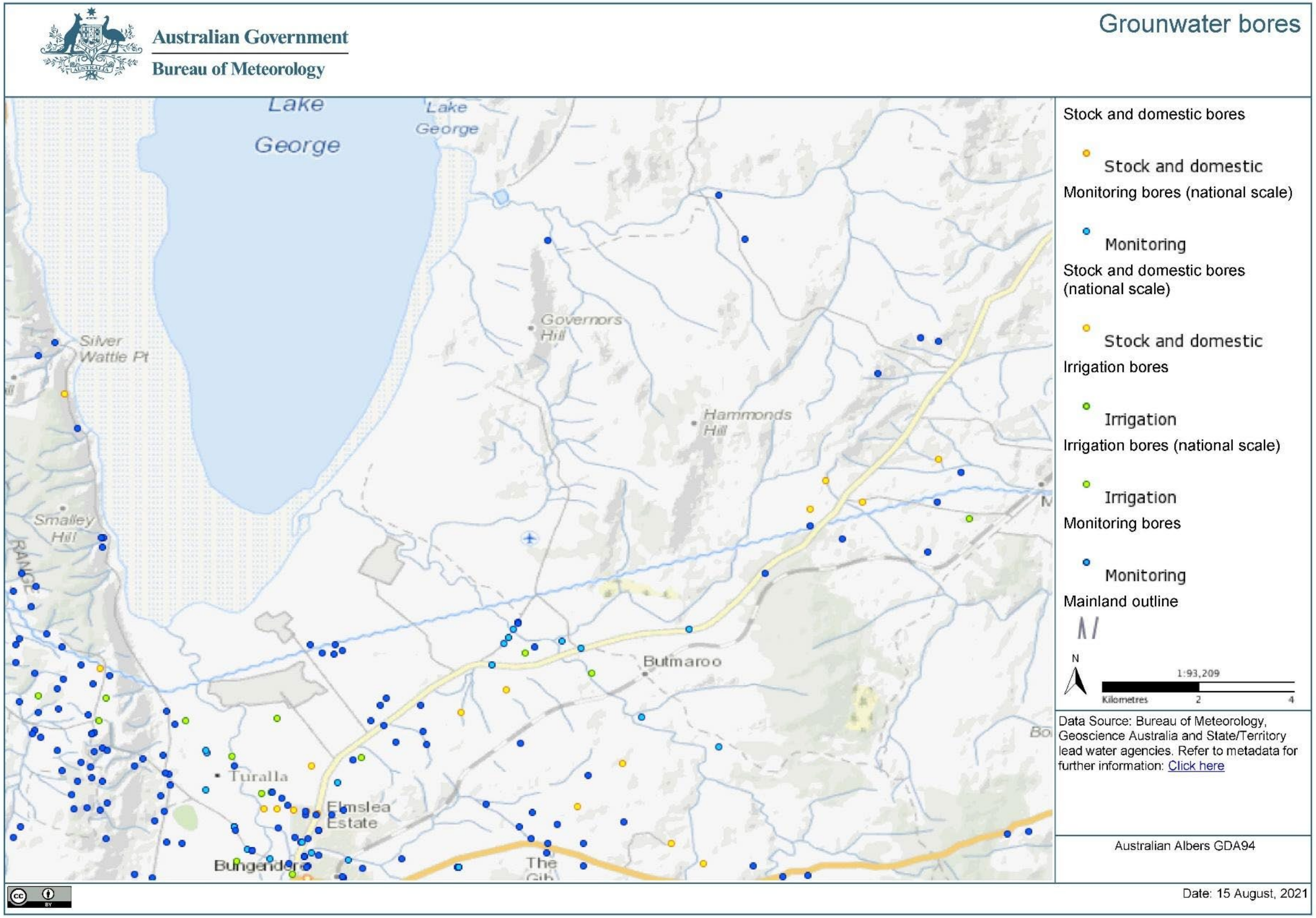


Figure 9-13 Groundwater boreholes in the locality of the Development site

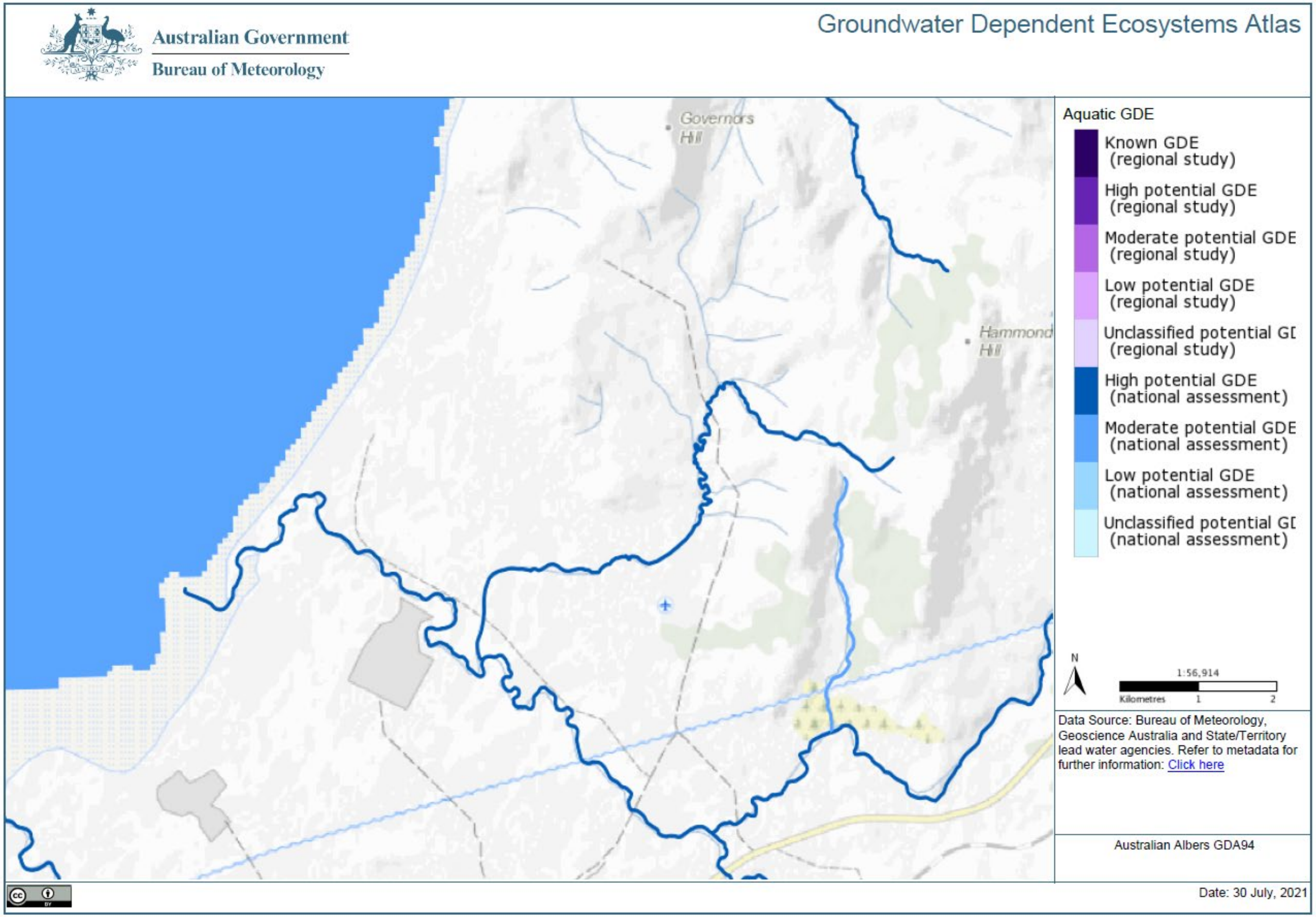


Figure 9-14 Aquatic GDE

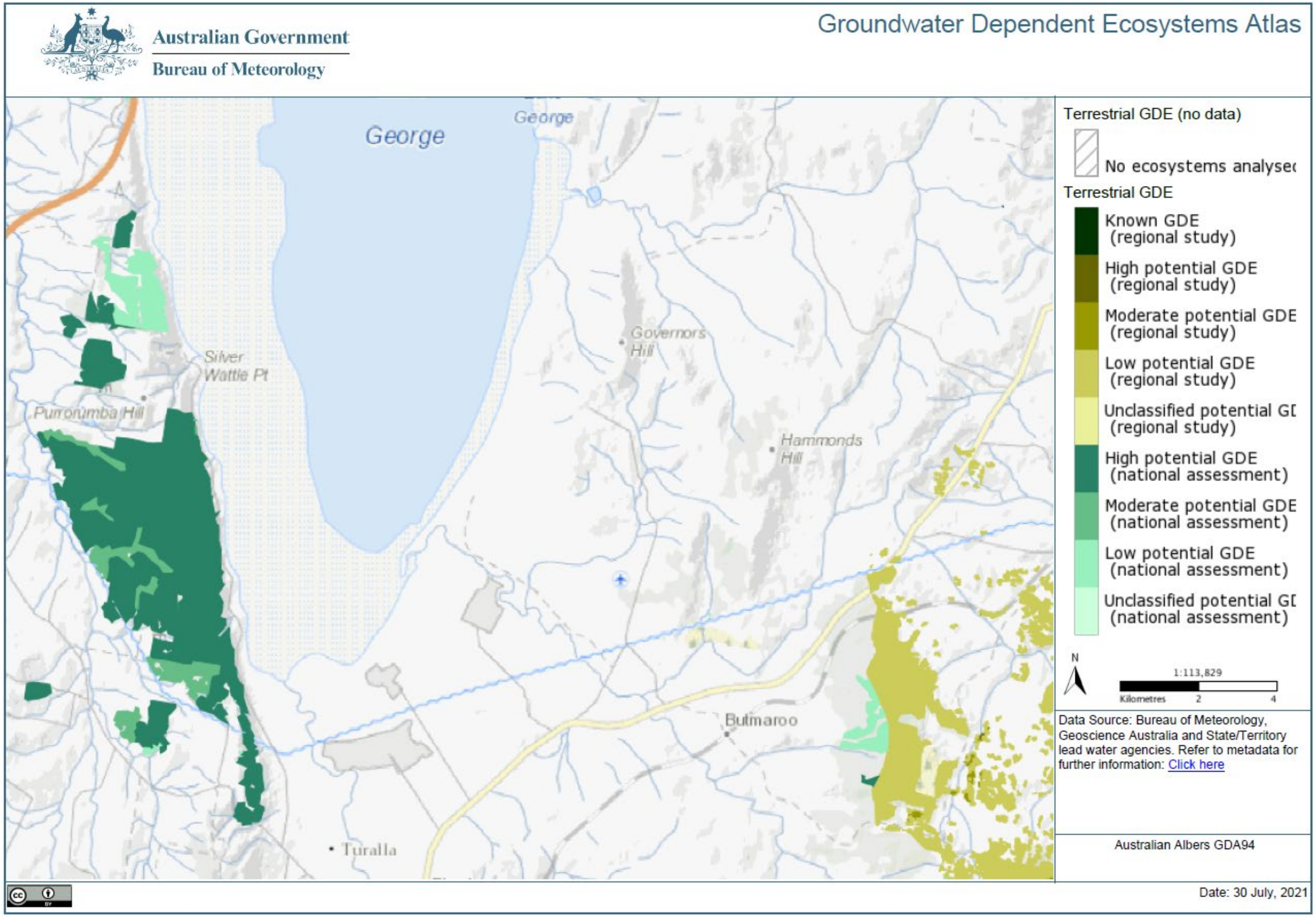


Figure 9-15 Terrestrial GDE

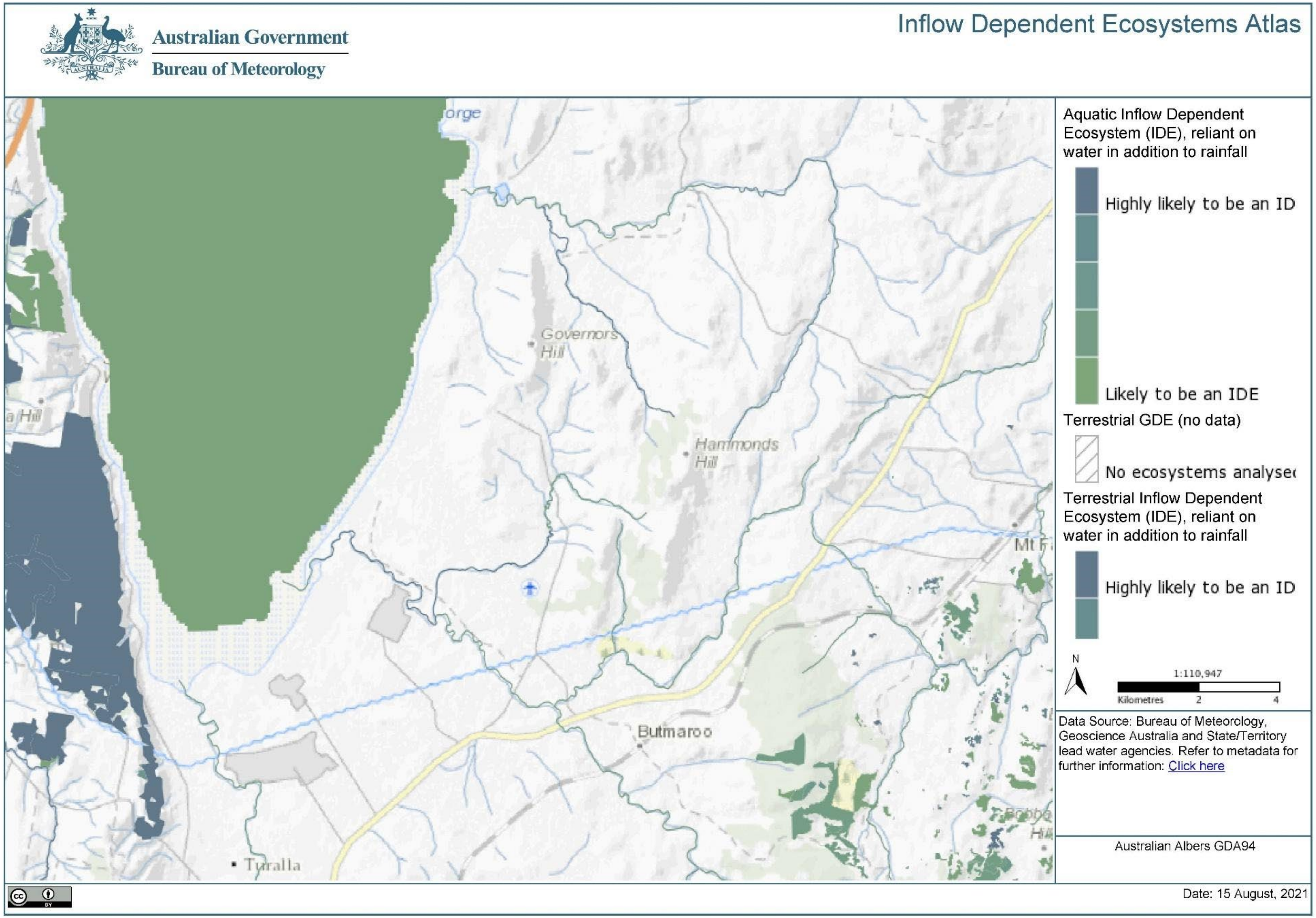


Figure 9-16 Inflow GDE

Water sharing plan

The water sharing plan for the Development site is governed by the NSW Murray-Darling Basin Fractured Rock Groundwater Source 2020 (NSW Legislation, 2021). Specifically, the water licences for the Development site are based on the Lake George and Yass Upper water sources.

Between these two sources, there are approximately 88 water licences, totalling 2,060.2ML of entitlements. Most of the licences are for unregulated rivers, the remainder are for Domestic and Stock. The water source for the town of Bungendore is Bungendore Alluvial Groundwater, and the town water entitlements for Bungendore is 472 ML/year (WaterNSW, 2021).

There has been an embargo on granting new water licences across NSW for unregulated catchments since 1995, and since 2008 for alluvial aquifers. However, it should be noted, that water is also extracted from watercourses and aquifers within the plan area through basic landholder rights, which do not require licences.

No high-priority water sources are identified in the vicinity of the Development site.

The location of irrigation bores in the vicinity of the Development site has been mapped in Figure 9-17. The mapping indicates two bores are located to the east of the Development site adjacent to Tarago Road and Butmaroo Creek.

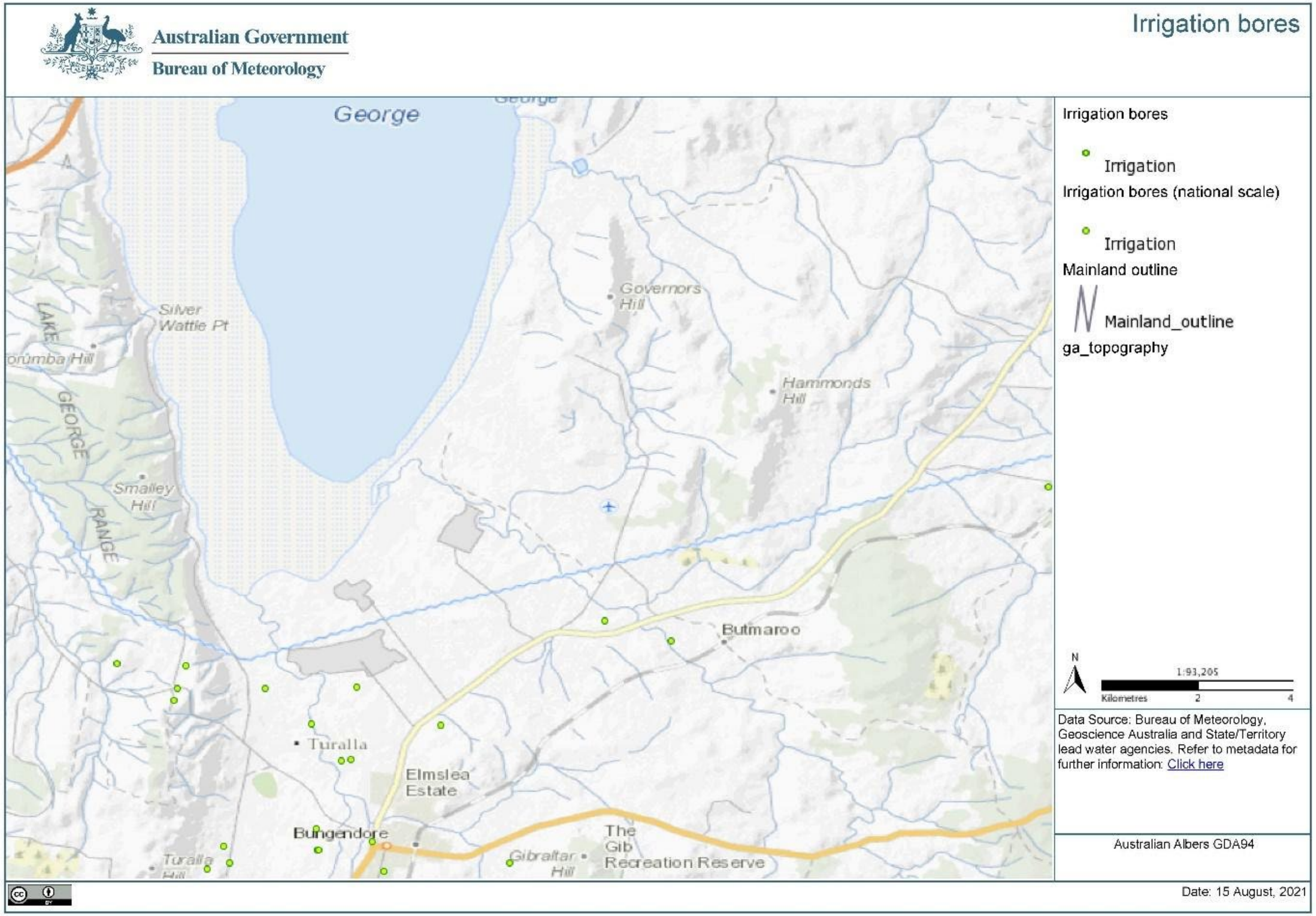


Figure 9-17 Irrigation bores in the Project's locality

9.4.2 Potential impacts

Construction and decommissioning

Water use

Water usage during construction would be approximately ≤ 70ML of non-potable water for road construction and dust suppression for the construction period, and ≤1ML of potable water over a 12-18 month construction period. Less water would be required if rainfall occurs during the construction period. The majority of this would be used for dust suppression and access track construction (refer Table 9-10). Lesser uses are cleaning, and landscaping. This equates to approximately 3,800kL per month or 130 KL/day, and three water trucks per day with a capacity of 44kL.

Potable water would be imported to the site during the construction period. The potable water supply would be augmented by rainwater collected in tanks installed beside site buildings as constructed. Any requirement for potable water would be limited and confined to the construction phase and would not place pressure on local drinking water supplies.

Water for concreting and on-site amenities requires potable water and this would arrive embedded in the premixed concrete or via truck from a potable water source. Concrete batching is available via nearby existing plants in Bungendore and Queanbeyan and a site-based batching facility is unlikely to be required.

However, in the unlikely event that a batching plant is required on site, the source of water would be identified in consultation with Council. The batching plant's water use minimisation policy provides for mechanisms and procedures to re-use the wastewater generated during the wash down of the concrete trucks. Such practices aim to re-use 100% of the wastewater, and only top up with new water lost to evaporation and concrete curing. As such over the entire construction period, the total demand on water resources from the concrete batching process would be minimal.

Table 9-10 Construction water usage

Water use purpose	Lower Estimate (KL)	Upper Estimate (KL)
Cement works	0 (off-site batching)	200 (onsite batching)
Dust control	15,000	30,000 (drier season)
Access Track Construction	15,000 (wetter season)	30,000 (drier season)
Onsite amenities	20	100
Landscaping	0 (wetter season)	1,000 (drier season)
Potable	1,000	1,000

Water sourcing

Lake George has 11 licences for unregulated river water with a total share component of 391.5ML in 2020-2021. Yass Upper has 67 licences for unregulated river water with a total share component of 1,605.2ML in 2020-2021.

The maximum water required for the Project (70ML) is 4% of the available unregulated water. In the 2020-2021 water use year 26.2ML was used from these allocations, which represented 1.3% of the available unregulated water. The impact of drawing the 250ML for 1 year is minor as over 1,700ML of remaining water is available in the system based on this year's figures.

Several water sources may be utilised during construction. Under the EP&A Act section 4.41(g), SSDs do not require 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 (refer to Section 5.2 and Appendix C.4.6). A permit for aquifer interference as per section 4.41(g) of the EP&A Act would be required to penetrate the aquifer if the establishment of a new groundwater bore as needed to supply water for the Project.

Aquifer water made available for the 2020/2021 year for the Yass Catchment Groundwater is 3,493.55ML. The water required for the Project construction (250ML) is 7.1% of the available aquifer water. In the 2020/2021 year, 22.8ML were used from this allocation, which represented 0.65% of the available aquifer water. The impact of drawing the worst case 70ML is negligible as sufficient remaining water is available in the system based on this year's figures.

The upper estimates above assume drought conditions, where water use may increase particularly with increased requirement for dust management and track construction. Given the construction period of 12-18 months and minimal water use required for construction, this is considered low risk. If water becomes hard to source during such periods, polymer dust suppression can be used as an alternative to water trucks but is not preferred by the Proponent. In the event unregulated water supply is insufficient during construction, water access can be secured through commercial arrangements with local water supply authorities.

Impacts on water use during decommissioning would be similar in nature but of a lesser volume to those during construction. They are considered low risk and manageable.

Water quality – turbid runoff and sedimentation

The construction phase of the Project involves a range of activities that would disturb soils and potentially lead to sediment-laden runoff, affecting local waterways. These risks and the relevant pollution control measures have been discussed in Section 9.3.

Water quality – chemical pollution risks

The construction phase would entail the following water chemical pollution risks:

- A hydrocarbon spill risk from use and re-fuelling of construction vehicles and machinery.
- On-site concreting for building and equipment foundations.
- Wash-off from curing asphalt pavement and road seal.
- Storage and use of paints, cleaning solvents and other chemicals.
- Pesticide storage and use for pest plant and animal control.
- Escape of fertilisers used for revegetation.
- Runoff from waste materials.

Construction activities at the site have minimal potential to degrade the water quality of Butmaroo Creek. The substation and associated facilities, which are sites of the main earthworks, are located approx. 1.5km from Butmaroo creek.

Bridge (Blind) Creek is located approximately 100m from the proposed Development footprint, outside the Development site. The existing causeway and road will be upgraded to facilitate construction of the Project. The proposed upgrade to the existing causeway would be approximately 5-6m wide at the road level. The pipes would be sized to facilitate crossings in normal flood conditions and will act to preserve upstream and downstream flow connectivity.

Wrights Creek flows through/onto the Development site. The Development footprint has been modified to reflect the hydrology and avoid the creek bed areas, to limit impacts to creek hydrology.

Erosion and sedimentation controls would be installed to impede any surface runoff resulting from earthworks and cable trenching around the footprint of the solar array.

There is no direct connection from the Development site to watercourses subject to the relevant Water Quality Objectives and River Flow Objectives identified for the Murrumbidgee and Lake George Catchment areas.

Contamination and spill risks (e.g. from oil filled transformers in the substation) would be managed using best practice and mitigation measures coordinated through the Environmental Management Plan. The limited excavation depths involved in the Project (up to 2.4 m) would avoid physical impacts to the groundwater resource. These areas of disturbance would be small and sparsely distributed, and the surrounding groundcover would be retained, helping to minimise runoff and protect soils on-site. Risks to water quality are considered low and manageable with standard sediment and erosion control safeguards.

Groundwater

Considering their relatively shallow depth, local groundwater resources could be impacted by deep excavations. Minimal excavation is proposed for slab footings, and the limited excavation depths involved in the Project (approximately 2.4 m) would avoid physical impacts to the groundwater resource. Similarly, contamination of groundwater with chemicals and fuels would be highly unlikely, subject to appropriate storage and handling, and formal spill procedures (spill management is discussed in Section 9.3).

Subject to the implementation of the Blue Book measures and additional safeguards presented in Section 9.2 and 9.3, the proposed works are not considered likely to significantly affect surface water quality at or downstream of the site, or groundwater quality in the shallow aquifer under the site.

Clearing of trees can impact on groundwater; saline groundwater can move up through the soil profile if there is a reduction in water uptake and transpiration by trees in the landscape. The clearing proposed during construction is very minor in this context. Most trees on the site would be retained; only some dead and near-dead pine trees would be removed. No operational impacts would be likely to affect groundwater at the site.

As the Project 's construction demand for groundwater resources is limited in duration (10 months) and the proportion of water-use relative to agriculture and farming water demand is minimal (<2%), the risks of impacts to GDE and Inflow Dependent Ecosystems systems are considered very low.

Additionally, it is noted that there are currently no high-priority GDEs at the Development site.

Impacts on groundwater during decommissioning would be similar or less than construction. These works are also considered low risk.

Operation

Water use

The operation of the solar farm would require approximately 200 KL per year of non-potable water, which would be used for:

- Staff amenities for up to five people at the O&M building.
- Cleaning of PV modules and other maintenance activities.

The solar farm would include washroom facilities for maintenance and administration workers. Sanitary/domestic wastewater requirements for the solar farm are anticipated to be no more than 100 litres per day per person. This is a conservative estimate as office consumption of water is significantly less than household consumption.

Potential contamination of soils and groundwater may occur if containment and disposal mechanisms are inadequately managed resulting in uncontrolled spills. The appropriate design and installation of a septic system in accordance with Council requirements and regular wastewater removal by a licensed service supplier would minimise contamination risks.

Solar panels would require regular cleaning to remove settled particulates and ensure optimal operation. Given the water quantities involved and low relief landform at the site, silt-laden runoff would be likely to be lost to evaporation, and the risk of adverse water impacts are considered minimal.

Water consumption is anticipated to be approximately 0.8 litres per panel, per cleaning exercise. A 20-KL rainwater tank would be installed on site to provide water for panel cleaning, irrigation and other non-potable uses, such as sanitary/domestic water and cleaning of equipment and plant.

If rainwater volumes are insufficient, supplemental or alternative water sources would be required. The estimated total operational water use of 200KL per year would represent 0.003% of the available aquifer water (3,493.55ML). The Project is exempt from requiring a permit to construct a bore, however a permit for aquifer interference as per section 4.41(g) of the EP&A Act would be required to penetrate the aquifer.

Alternatively, if local water utilities were used, it would represent 0.04% of the 472ML allocation. As such it is reasonable to assume the operational needs of the Project can be easily met from either a new onsite bore water or the local water utility allocation.

In the event of drought conditions, water purchases may still be available as a temporary supply on the open market. Additionally, the Project's draw on this supply would be a low percentage and may form part of the unutilised proportion of the allocation. As such, the potential impact on agricultural users especially those who rely on low cost water is likely to be minor.

Water quality

Operation phase risks to water quality include:

- Storage and use of hydrocarbons and other chemicals (pesticides, cleaning solvents, paints).
- Increased runoff from impermeable surfaces (tracks, carparks, hardstand areas).
- Spill risk from the substation (if oil-cooled).

There would be increased localised runoff from impermeable surfaces created at the site, including tracks, parking areas and hardstands surrounding facilities. Drainage from these structures would be managed to prevent long distance or concentrated flows, and to discharge onto adjacent well-developed groundcover vegetation.

No negative impacts to water quality to any downstream watercourses, GDE's and Inflow Dependent Ecosystems are expected to result from the operation of the solar farm.

The application of best practice and the mitigation measures provided in this Section 8.5 and 9.4 would be adequate to manage risks to water values at the Development site. The increased runoff from these surfaces is likely to be offset by the enhanced infiltration and landscape function resulting from the establishment of perennial groundcover over the majority of the site.

By ceasing some farming practices - soil cultivation, application of irrigation water and fertilisers - and by maintaining groundcover for grazing, the Project would be likely to improve the quality of water draining off the property and infiltrating into the shallow groundwater system. The Project is likely to have a positive effect on the local groundwater table by reducing the amount of irrigation and water influx from sources other than precipitation (McMahon Earth Science 2017).

The impact of the Project on flood risk is addressed in Section 8.5.

9.4.3 Mitigation measures

No.	Mitigation measures	Phase
W1	The Spill and Contamination Response Plan prepared as part of the Emergency Response Plan would include measures to: • Respond to the discovery of existing contaminants at the site (e.g., Pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements • Manage the storage of any potential contaminants on-site • Mitigate the effects of soil and water contamination by fuels or other chemicals (including emergency response and EPA notification procedures) • Ensure that machinery and materials arrive on site in a clean and secure condition • Prevent contaminants affecting adjacent pastures, irrigation channels, dams and native vegetation • Monitor and maintain spill equipment including spill kits in relevant machinery • Induct and train site staff. • Detail fuels, chemicals, and liquids storage locations that are at least 50m from any waterways or drainage lines, in an appropriate bunded area • Disposal process for contaminated materials.	Construction Operation Decommissioning
W2	If the substation is oil-cooled, the layout, design, size etc of the oil containment bunding and drainage would comply with the relevant standards and guidelines. The bund would be regularly inspected and cleaned, including removal of rainwater.	Pre-construction Construction Operation
W3	A Soil and Water Management Plan will be developed to incorporate the	Construction

No.	Mitigation measures	Phase
	following: • That no detergents or other chemicals would be added to the solar panel cleaning water • Specify concrete washout process and location • Specify the procedures for testing, treatment and discharge of construction wastewater • Detail staff training required	Operation
W4	If a new bore is to be constructed, the construction and maintenance of the groundwater extraction bore will be in accordance with the Minimum Construction Requirements for Water Bores in Australia (3rd edition) produced by the National Uniform Drillers Licencing Committee (NUDLC). The minimum requirements for consideration include: • Only a licensed driller shall carry out the bore installation works and shall be present at all times during bore construction activities. • The bore design should aim to ensure the protection of the groundwater resource from surface contamination. The headworks and casing are sealed so that there is no potential for flow outside the casing. • To minimise the possibility of contaminating the bore and any surrounding bores, the new bore should be located away from existing bores, surface water sources and any sources of pollution (e.g., dairies, septic tanks and absorption trenches, refuse dumps, landfill, effluent discharges from drainage ditches, cattle/stock dips). • Chemicals and other drilling fluid additives that could leave a residual toxicity should not be added to any drilling fluids or cement slurries (i.e., grouts) used to drill and complete any water bore.	Pre-Construction Construction Operation Decommissioning
W5	If ground water is to be used, a Groundwater Management Plan would be incorporated into the CEMP to manage impacts. This would be informed by onsite survey by an appropriately trained expert and include: • Pollution controls • Management of dewatering.	Pre-Construction
W6	If possible, a dedicated refuelling area near to the servicing area should be established. Refuelling areas will be communicated to all site personnel by signs and notice boards.	Construction Operations Decommissioning

9.5 Historic heritage

9.5.1 Approach

NGH have prepared a specialist Statement of Heritage Impact (SOHI) and Archaeological Assessment to identify, characterise and assess the potential impacts of the Project on non-Aboriginal historic heritage and archaeological values and sites within or near to the Development site. The SOHI and Archaeological Assessment are provided in a consolidated format in Appendix L and are summarised here.

Preparation of the SOHI and Archaeology assessment involved:

1. Desktop review of statutory and non-statutory heritage databases including the Australian Heritage Database (National and Commonwealth Heritage List as well as the archived and non-statutory Register of the National Estate), and the NSW State Heritage Inventory.
2. Desktop review of local heritage items and/sites listed under the Palerang LEP.
3. Site visits and condition assessment of listed heritage items by heritage and archaeology specialists.
4. Assessment of the heritage significance of the identified sites and items, and determination of the impacts on these sites and items, and if they are acceptable.
5. Development of recommendations that would help to avoid, minimise or mitigate against impacts to the identified cultural heritage values of the heritage items.

Terminology

NGH has been informed that the traditional name for Lake George is either ‘Ngungara’ or ‘Weereewa’ (with variations on the spelling), depending upon the traditional language of the speaker. The name Weereewa has been suggested to be a Wiradjuri word and not the name used by the local Ngun(n)awal people who use ‘Ngungara.

NGH refers to ‘Lake George’ only for consistency with reference to environmental and geographic mapping and data. Reflecting the language in the SOHI and Archaeology assessment, this chapter uses ‘Weereewa’ when quoting historical, European references, and Ngungara/Weereewa when referring to the name that local and visiting Aboriginal people are likely to have used.

9.5.2 Results

A desktop review of heritage databases was conducted to identify listed heritage sites or items known to occur near or within the Development site. Results of these searches are summarised in Table 9-11 below. Details of listed items as they pertain to the Development site and surrounding landscape are provided below.

Table 9-11 Summary of statutory listed heritage items addressed within the heritage assessment

Name of register	Number of listings
World Heritage List	0
National Heritage List	0
Commonwealth Heritage Places	0

Name of register	Number of listings
NSW State Heritage Register	0
NSW State Agency Heritage Register (section 170)	0
Palerang Local Environmental Plan (LEP) 2014	2

Australian heritage database

The AHD was searched when research commenced for this assessment (20/05/2021), and again upon completion of the report (15/02/2022). No listings identified related to the historical (non-Aboriginal) heritage significance of Lake George or the Development site.

However, three entries are listed on the Register of the National Estate (RNE) for Lake George in relation to its geological and biodiversity heritage values. While they contribute to understanding the character and heritage values of the Development site and its surrounding landscape, the RNE listings do not provide any insight into the historical (non-Aboriginal) heritage significance of Lake George and Development site. References to the RNE were removed from the EPBC Act in 2012. The RNE is no longer a statutory list

NSW state heritage register

A search of the NSW State Heritage Register was searched when research commenced for this assessment (20/05/2021) and again upon completion of the report (15/02/2022). There are no items listed on the SHR within or in proximity to the Development site.

In addition, under Section 170 of the *Heritage Act*, State agencies and authorities in NSW are required to keep a register of heritage places for which they are responsible. The s.170 registers are also held in the SHI. A concurrent search of the NSW State Heritage Inventory database indicated that there are no items listed on any s.170 within or in proximity to the Study area.

Palerang Local Environmental Plan 2014

The Palerang LEP identifies and protects local heritage conservation areas and listed buildings/items, identifies environmentally sensitive land, and prescribes land use practices. There are a number of local heritage items in the vicinity of the Development site. Two sites are within relative proximity on the surrounding properties to the Development site. These are summarised in Table 9-12 below and illustrated in Figure 9-18 below.

Table 9-12 Palerang LEP listed heritage items within close proximity to the Development site

Name and Listing ID	Details
1. Currandooley Homestead, including garden and stables *Palerang LEP ID: I175* *Inventory datasheet: LG2*	Currandooley Road, Bungendore Currandooley is an historical property listed on the Palerang LEP as an item of local significance. The property is formally described as Lot 11, DP237079. The property is immediately adjacent and located to the north of the Development site. Whilst the property boundary overlaps with the Development site it will not be impacted upon by the Development footprint. The homestead is located approximately 2.4km from the northern extent of the Development site.

Name and Listing ID	Details
	Listing includes: Homestead, barn, stables, outbuildings, cottage, shearing shed, plantings, cemetery Area/Group/Complex: Currandooley Farm Complex
2. Werriwa, including homestead, garden, cottages, & outbuildings *Palerang LEP ID: I233* *Inventory datasheet: LG5*	866 Tarago Road, Bungendore Large, single storey homestead built of limestone with brick detailing, in some cases rendered. Enclosed verandahs attached staff quarters. House set in attractive gardens with mature trees and stone walls. In 1880 when Nathaniel Osborne married Catherine Gordon, from Manar near Braidwood, Pat Hill Osborne of Currandooley offered to sell the couple a piece of his land and it was there they built the Werriwa homestead in about 1882. It was a four room house with wide main hall and a kitchen at the back, constructed of stone from the property. The property is formally described as Lot 1, DP1039100, and Lot 1, DP1173605. The property is located approximately 1km outside of the BCSF Development site and will not be impacted by the proposed Development footprint. The homestead is located approximately 1.6kms from the Development site. Listing includes: Homestead, barn, stables, outbuildings, cottage, shearing shed, plantings, cemetery Area/Group/Complex: Currandooley Farm Complex.

Unlisted heritage items

Heritage site inspections of the Development site were undertaken by three NGH archeologists over two stages from 22 July 2021 to 6 August 2021, and from 18 to 22 October 2021. Historic heritage survey areas of interest were identified pre-survey through background research and investigation of satellite imagery.

During the surveys, one unlisted item of potential historic heritage significance was confirmed within the Development site and to be potentially impacted by the proposed works:

- Trigonometrical Station, located in the north of the Development Site.

One area of interest identified pre-survey was confirmed during the site inspection to be outside the Development footprint and would not be affected by the proposed works:

- building remains of the original Currandooley Homestead, located south of Butmaroo Creek.

These items are summarised in Table 9-13 below and captured in Figure 9-18.

No historical archaeological features or materials were found during the surveys.

Table 9-13 Unlisted heritage items within proximity to the Development site identified during site survey

Name	Trig Station	Original Currandooley Homestead remains
Location	725148 E 6105577 N	Easting: 725327 Northing: 6102413 *100-150m south of the Butmaroo Creek*
Heritage	No statutory listing	No statutory listing

Name	Trig Station	Original Currandooley Homestead remains
listing		
Description	Stone pillar and marker. Height 4.3 m	Stone foundations and walls oriented as a rectangle, approximately 20 x 10m, surrounded by large, mature trees. Whilst portions of the walls remain standing, there are no other surviving elements. It is believed that the ruined building was the original Grantham Park homestead built by Joseph Thompson.
Photo		
Management issues	It has been excised from the proposed Development footprint by a 10m buffer, it's historical line of sights and visibility within the landscape may be interrupted by the solar arrays.	Outside of the proposed Development footprint.

Archaeological assessment

Historical research has informed of the location of the original Currandooley Homestead, located to the south of Butmaroo Creek (originally known as Deep Creek), which was subsequently abandoned after flooding events. The remains of this building have been confirmed to be outside the Development footprint by the current land owner, secondary historical materials, and by NGH during the site visit. The existing Currandooley Homestead was built in 1873 to the north (also outside of the Development Site) and the present ruin was probably vacated at that time. The historical research has not resulted in maps or descriptions of the paddocks, such as how they were laid out, fenced (if at all), and used, other than that both sheep and cattle were grazed.

The property was originally taken up by William Lithgow in 1825 and after his death in 1864 it was sold to Pat Hill Osborne.

Pat Osborne lived in a cottage built originally by Thompson on Butmaroo Creek, believed to be the original Grantham Park homestead (Barrow 2012:40), located approximately 100-150m south of the creek. During 1869-70, severe storms repeatedly inundated the cottage and Osborne arranged construction of a 25 room homestead in the style of a French chateau, located to the north and outside of the proposed Blind Creek Solar Farm Development Site.

The second and existing Currandooley Homestead, stables and bachelor quarters were completed in 1873, and all were built of granitic gneiss from the property and had shingled roofs. The stone cottage was completed about 1920 as was the butchers shop and dairy. There is a small private cemetery on the property, the earliest burial 1902, consecrated about 1910 by Bishop Barlow, and the last burial occurred in the 21st century. The woolshed (outside the Development site) was built in 1878 and a Wolseley shearing machine installed in 1888, the same year Wolseley installed machines at Toganmain and the first year shearing was done mechanically (Douglas Partners 2021).

Archaeological potential

The archaeological potential of the Development site relates to the historical practices, including European settlement, and the development of pastoralism and agriculture. Pastoral and agricultural activities date from the time of the first land grant in the 1830s and continue to the present-day. Archaeological materials could relate to early accommodation and personal belongings, as well as pastoral infrastructure, machinery and equipment, with technological changes overtime, and personal items and equipment of stockmen (such as saddlery; pipes).

From the time of European exploration (1820), the Development site and region was mostly cleared of vegetation to provide grazing country to cattle and sheep.

The Osborne family, descendants of those who purchased the property in 1864, have continued to live on and farm the land and are the founders of BCSF. The properties in the area contain a number of residences and associated agricultural structures such as shearing sheds and accommodation, work and storage sheds, fencing, stockyards, communications infrastructure, local sealed and unsealed roads and tracks.

The original Currandooley Homestead, located to the south of Butmaroo Creek, may have been surrounded by stables, outbuildings and various accommodations for agricultural workers and stockmen with yards on either side for mustering horses, sheep and cattle. This homestead precinct would have been contained by post and rail fences but beyond this the sheep and cattle would have been allowed to graze freely under the supervision of the stockmen. Archaeological evidence of early pastoral occupation and activities would therefore be centred around the location of the homestead, which is outside of the Development footprint.

The archaeological potential of the Development footprint could therefore include remains of:

1. fences and gates, nails and structural fittings,
2. animal stock runs, sheds, and pens/stock yards,
3. dams,
4. farming equipment, such as ploughs and tractors,
5. saddlery,
6. personal belongings of stockmen, such as clay pipes, smoking accessories; leather and potentially other fabric remains, such as buttons; and glass bottles.

Archaeological Preservation

<u>Historical Ground Disturbance</u>

Major ground disturbance has been characterised by the establishment of tracks and construction of dams, as well as sand quarrying. The removal of the native woodlands in the past would have also influenced erosion across the Development site, specifically along creek lines and valleys.

Severe rabbit plagues have also modified the landscape and contributed to erosion and modification of biodiversity habitats.

At present, the Development site is privately owned and predominantly used for grazing and cropping. Previous cropping, requiring ploughing, would have likely disturbed the top layer of soil to the depth of the ploughshare (usually between 10cm-15cm but up to 30cm) therefore potentially affecting the integrity of archaeological sites to that depth. However, localised artefact movement is common through natural process such as bioturbation and does not necessarily affect overall site context. Additionally, ploughing will not disturb deeper archaeological deposits below the plough zone.

Soils and Geotechnical testing

Geotechnical testing undertaken for the Project indicated highlighted three consistent units across all test locations:

1. **Topsoil** – a sandy deposit varying from loose to medium densities, ranging from 15-20cm in all borehole locations, while the topsoil characteristics of the two test pits excavated highlighted a more-loose-and-fine to medium grained silty sand, reaching depths between 25-30cm.
2. **Sand** – the deposit underlying the topsoil consisted of sand, with highly variable densities from loose to compact. The sand was typically fine grained with some medium grained sands occurring at depth. Within the eleven boreholes, the deposits reached a minimum depth of 90cm to a maximum depth of 3m. Within the two test pits excavated, the sand deposits reached 1-2m in depth.
3. **Silty Clay – Sandy Clay – Clayey Sand.** The underlying stratigraphy present within the geotechnical results identifies more of a ranging difference throughout the Development site. This deposit is characterised by clay of a low to high plasticity that is dense to very dense terminating at depths between 3-5m. Within the eleven boreholes, the stratigraphy varied from a silty clay to a clayey sand. This deposit had ranging plasticity and density from low to high, with the deposit terminating between 2.05-3.2m in depth.

Laboratory testing highlighted varied soil pH across the Development site, with the majority of tested soils being moderately acidic-moderately basic with a pH between 5.8 and 8.1. The varying acidity of the soils suggests that there is a possibility for organic archaeological materials, such as wood and leather, to remain within the topsoil in areas that contain a neutral pH. Furthermore, the numerous erosion hazards indicate that durable archaeological material, such as metal, located in upper soil layers will have likely been displaced from their original position, although likely to be heavily corroded.

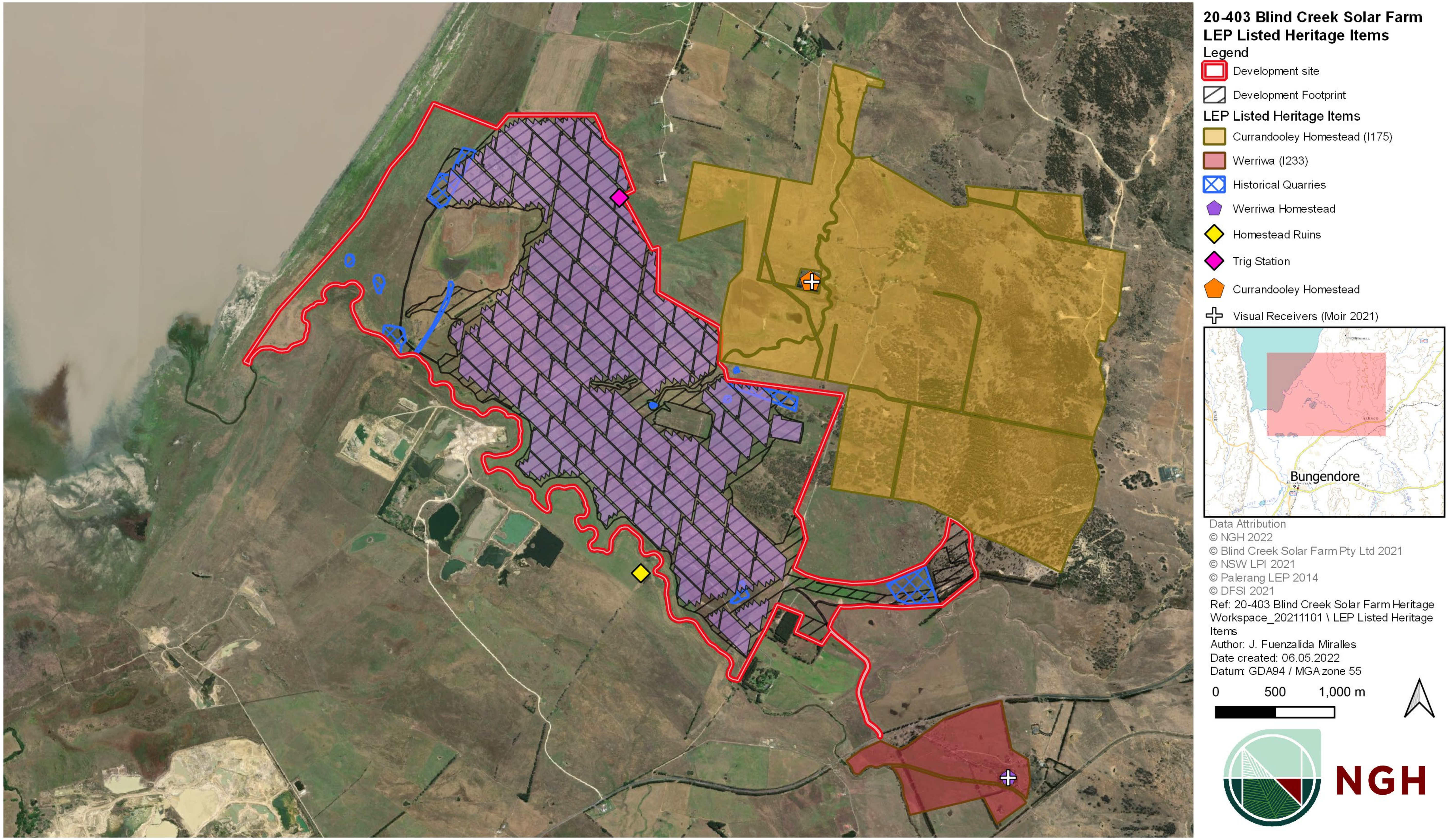


Figure 9-18 Heritage Items subject of this assessment within and adjacent to the proposed Blind Creek Development site (historical sand quarries are not heritage items but are provided to indicate areas of ground disturbance, which is a consideration to inform assessment

9.5.3 Potential impacts

Heritage assessment

Three identified heritage items located within or in proximity to the Development site and that may be impacted by the Project were assessed against NSW Heritage Significance criteria as outlined in *Assessing Heritage Significance (Heritage Office (former), 2001)*. The three heritage items assessed were:

- The Trig Station (no heritage listing).
- The Currandooley Station property (listed on the Palerang LEP, I175).
- The Werriwa Station property (listed on the Palerang LEP, I233).

Heritage assessment of the Project against these items is summarised in Table 9-14 below. Refer to Appendix L for detailed assessment for each item against each criterion.

Overall, the Project is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977*, the EP&A Act, or the EPBC Act, in terms of heritage.

Archaeological significance

Assessment of archaeological significance across the Development site was conducted against the criteria outlined in *Assessing Significance for Historical Archaeological Sites and 'Relics'* (DPE, 2009)

Impact Assessment Conclusion

The proposed Blind Creek Solar Farm has been assessed to have:

- No impact on locally listed Currandooley property (I175) on the grounds that it would have no impact on its physical and visual curtilage or historical heritage values.
- No impact on locally listed Werriwa property (I233) on the grounds that it would have no impact on its physical and visual curtilage or historical heritage values.
- A nil-negligible impact on the unlisted Trigonometrical Station. This assessment has assessed the Trig Station to potentially have historical significance at a state level. The Trig Station is a relic of the 19th century trigonometrical survey of NSW. Trig Stations are built with consideration of the landscape so that they are visible and have a line of site to other markers. Caption Major Mitchell, Dixon and Smalley undertook a baseline survey at Lake George. The Development footprint will excise the Trig Station by 10m. The Trig Station is located on elevated ground and at 4.3m will stand taller than the solar array, which will be installed on land that slopes away to the south of the Trig Station. The southern most Trig marker is located over 8km away and is not visible with the naked eye or with binoculars. While it is recognised that the Project would alter the setting and visual curtilage of the Trig Station, this impact is unlikely to affect the historical line of site to the south that forms the baseline.
- Nil-negligible potential to impact significant historical archaeological resources. The Development footprint of the proposed Blind Creek Solar Farm is located on land that has been paddocks for grazing since the early land grants of the 1820s. The historical homesteads associated with the land consist of the original Currandooley homestead located south of Butmaroo Creek, outside of the Development footprint, and the existing Currandooley homestead, located to the north of the Development site .

The findings of the SOHI and Archaeological Assessment is summarised in table 9-4 below. Refer to Appendix L for detailed archaeological assessment of the Project against each criterion.

Table 9-14 Consolidated historic heritage and archaeological assessments of significance and impact across the Development site

Heritage Item	Proximity to the proposal location	Statutory Heritage Listings	Rationale for inclusion in this report	Significance Assessment	Impact Assessment
Historical archaeological (non-Aboriginal) potential	The entire Development site	None	The Development site is part of land that was first subject to NSW colonial land grants in the 1830s. European settlers built homesteads and used the land for grazing. The remains of the Currandooley Homestead are located on the southern bank of the Butmaroo Creek, outside of the proposed Development footprint. There is the potential that the proposed ground disturbing works could impact upon archaeological evidence of the early settlement and pastoral practices of the land within the Development site.	Although there is nil-low potential for archaeological resources associated with the original land grants, any historical archaeological materials may have local significance for their ability to reveal information about the early European settlement of the Lake George region which cannot be garnered from available historical sources.	**Nil-negligible potential to impact significant historical archaeological resources.** The Development footprint of the proposed Blind Creek Solar Farm is located on land that has been paddocks for grazing since the early land grants of the 1820s. The historical homesteads associated with the land consist of the original Currandooley homestead located south of Butmaroo Creek, outside of the Development footprint, and the existing Currandooley homestead, located to the north of the Development site.
Trigonometrical Survey Station	Located within the Development site, inside the northern boundary.	None	The Trig Station was built in the early 1870s as part of trigonometrical baseline survey for NSW. Whilst the proposed works will not physically impact the structure with a 10-15 metre buffer to be excised from the proposed Development footprint, it is important to consider the potential impact of proposed works to ensure appropriate management.	The Trig Station within the BCSF Development site was constructed between 1870 and 1874 as part of the trigonometrical survey of NSW. This survey was commenced at Lake George and was undertaken by Major Thomas Mitchell and Robert Dixon, who had worked to create the 'Map of Nineteen Counties'. Governor Darling engaged Major Mitchell to undertake a trigonometrical survey of NSW to enable a more accurate mapping of NSW than previously achieved. Lake George was selected for the commencement of the trigonometrical survey with a baseline measured between the Trig Station within the BCSF Development site and another survey marker located approximately 9kms to the south. The Trig Station has historical and association heritage significance at a state level for the role that it played in the trigonometrical survey of Major Thomas Mitchell in the 18th century.	**Nil-negligible impact on the unlisted Trigonometrical Station**. This assessment has assessed the Trig Station to potentially have historical significance at a state level. The Trig Station is a relic of the 19th century trigonometrical survey of NSW. Trig Stations are built with consideration of the landscape so that they are visible and have a line of site to other markers. Caption Major Mitchell, Dixon and Smalley undertook a baseline survey at Lake George. The Development footprint will excise the Trig Station by 10m. The Trig Station is located on elevated ground and at 4.3m will stand taller than the solar array, which will be installed on land that slopes away to the south of the Trig Station. The southern most Trig marker is located over 8kms away and is not visible with the naked eye or with binoculars. While it is recognised that the proposal would alter the setting and visual curtilage of the Trig Station, this impact is unlikely to affect the historical line of site to the south that forms the baseline.
Currandooley	The property is 1,200ha located adjacent to the north of the Development site. Whilst the property boundary overlaps with the Development site it will not be impacted upon by the Development footprint. The homestead is located approximately 800m from the northern extent of the	Locally listed (Palerang LEP, listing ID: I175)	This listing includes the historical homestead and farm complex. The history of *Currandooley* is connected to the Development site a through land grants and subdivisions. This report considers any potential historical archaeology and viewsheds that may be impacted by the proposed solar farm development.	Currandooley property has belonged to the same family for more than 157 years. It represents a time of prosperity and development in NSW's rural areas and the aspirations at the time of successful landholders. Designed by renowned Sydney architect Ferdinand Reuss, the French style architecture and the extent of stonework for all major outbuildings are unusual and rare features for rural Australia. The impressive two storey homestead is set amongst old plantings of elms and pines and the whole complex presents a particularly attractive image on arrival in the forecourt. Despite the previous fire there is a high degree of intactness and integrity especially architecturally. Overall a high degree of original intactness and integrity.	Outside of the Development footprint. No physical impacts. No visual impacts.

Heritage Item	Proximity to the proposal location	Statutory Heritage Listings	Rationale for inclusion in this report	Significance Assessment	Impact Assessment
	Development site.				
Werriwa Homestead	Located outside of the Development site, approximately 1km to the east	Locally listed (Palerang LEP, listing ID: I233)	Since this property is listed on the LEP this report considers any potential viewsheds that may be impacted by the proposed solar farm development.	*An interesting example of the evolution of a homestead from the 1880s to the late 20th century. Association with some of the main 19th century pastoral families of the district. The buildings demonstrate architectural trends over a century as well as stonemasonry skills and joinery craftsmanship.*	Outside of the Development footprint. No physical impacts. No visual impacts.

9.5.4 Mitigation measures

Safeguards to avoid and mitigate non-Aboriginal heritage and archaeological impacts are summarised below.

No.	Mitigation measures	Phase
HH1	**Stock fence around the Trig Station** It is recommended that a stock fence be installed along the proposed buffer around the Trig Station. There is currently no protection from live stock.	Pre-construction
HH2	**Archival Recording of the Trig Station** A photographic archival recording of the Trig Station shall be prepared in accordance with Heritage NSW guideline, Photographic Recording of using Film or Digital Capture (2006). The photographic recording will include additional research to confirm the existence of other Trig Station or markers within or in proximity to the Development site. The photographic recording shall include photos, descriptions and a brief historical account of these identified survey markers and their relationship to each other.	Pre-construction
HH3	**Implement an Unexpected Finds Procedure** Should historical archaeological materials be uncovered while undertaking works to develop the Blind Creek Solar Farm, all activities must stop and Heritage NSW be immediately notified. An appropriately qualified archaeologist should also be consulted for the purpose of implementing best practice protection and conservation measures while the relevant approvals are obtained.	All stages

9.6 Social and economic

Large developments can produce social and economic impacts on local communities. These can be positive, such as the provision of employment and increased retail trade. They can also produce unintended or adverse impacts, such as creating strains on existing infrastructure (such as emergency services or accommodation facilities during construction), including social infrastructure (volunteer services, health services, education networks and social ties).

This section aims to identify, predict, and evaluate the likely social impacts and benefits arising from the Project, and to propose appropriate responses to mitigate and manage negative impacts and enhance positive benefits.

Considering the scale, nature and location of the Project, the social locality (the 'Study Area') has been defined as the Queanbeyan-Palerang Regional Council Local Government Area (LGA), with a particular focus on the town of Bungendore.

9.6.1 Approach

The social impact assessment (SIA) presented in this section has been informed by the Social Impact Assessment Guideline (DPIE, 2021a)and accompanying Technical Supplement (DPIE, 2021b), ensuring that the SIA is evidence-based, precautionary and responsive to the local context. Key steps are outlined below.

Impact scoping

This involved an initial identification and preliminary assessment of the likely social impacts of the Project. As noted in Section 6, the Proponent undertook extensive research of previous renewable energy Projects to understand the possible impacts, concerns and benefits to communities and applied those findings to their local community.

As part of the Proponent's CSES, a prospective SIA was undertaken prior to commencing the stakeholder consultation, which identified potential negative and positive feedback that was likely to come from stakeholder engagement. The SIA was undertaken based on the founders knowledge of their local community and their experience and knowledge of other renewable energy projects. This knowledge base also informed their community consultation approach (Appendix M.2).

Social impacts and opportunities were identified across the following eight domains: way of life, community, accessibility, culture, health and wellbeing, surroundings, livelihoods, and decision-making systems. This process accounted for direct, indirect, and cumulative impacts.

Through this process, impact scoping set the social locality, and framed the scale and depth of the SIA. Considered judgements – based on the extent of cumulative impacts and the degree of material social impact – were then made regarding the type and level of further assessment to be undertaken for each potential impact.

Characterisation of the social baseline

The baseline provides a snapshot of existing social conditions within the social locality, establishing a base case against which potential impacts can be assessed. Data was obtained from desktop research of publicly available information (e.g., from the Australian Bureau of Statistics, New South Wales Government and local government websites); a review of the stakeholder and community engagement reports; and SIA specific consultation.

Targeted SIA consultation

To inform and validate the social baseline and assessment of social impacts, the Proponent undertook comprehensive stakeholder mapping and extensive community consultation, which is summarised in Section 6. The Proponent's consultation was informed by the DPIE (2020) draft Social Impact Guideline for State Significant Projects (refer to Appendix D.2); and Beyond Public Meetings: Connecting community engagement with decision making (Twyford Consulting, 2007), in addition to the other guidelines mentioned in Section 6.

Evaluation of social impacts

This built on the impact scoping, and involved further review of relevant inputs, e.g., relevant EIS technical reports, stakeholder and community engagement findings, and comparative studies. An assessment was then carried out to determine the likely significance of each potential impact, based on its predicted magnitude and likelihood.

Identification of management, mitigation, and enhancement measures

Measures to avoid, minimise or mitigate potential negative impacts and enhance positive benefits have been developed to address impacts identified as being of medium or higher significance. A brief assessment of residual impacts post-application of mitigation measures was then undertaken.

9.6.2 Existing Environment

Social locality

The town of Bungendore is located approximately 40km north-east of Canberra, and 275km south-west of Sydney. It is locality bordered by Lake George to the north, the Australian Capital Territory to the south-west and is connected to the city of Canberra and the east coast of Australia by the Kings Highway.

Bungendore is a historic village, popular with tourists from Canberra and surrounding towns as a day tripper destination as well as a stopover point for those travelling to and from the east coast. The town is known for its specialty shops, Woodwork Gallery, and the steam train which intermittently runs between Bungendore and Canberra. Given its ideal proximity to Canberra, it has expanded rapidly in recent years as a commuter town, and many hobby farms have been established in the area. The traditional owners of the Queanbeyan-Palerang Regional Council area are the Ngunnawal/Ngunawal and Ngambri people.

Social baseline

Population and demography

Population and growth

At the 2016 census (ABS, 2016a), the town of Bungendore had a population of 4,178, while 56,027 people lived in the Queanbeyan-Palerang Regional Council area (ABS, 2016b). Over the ten-year period from 2006 to 2016, the Regional Council area experienced steady growth, and this trend is predicted to remain consistent into the future, increasing by 7,550 (9%) between 2016 and 2041 from 57,800 to 63,350 with natural change the key driver (DPIE, 2019).

Utilising the current growth rate of Bungendore (3.3%), it can be predicted that the population may increase to 7,469 by 2041 (approximately an additional 1,384 dwellings) (Queanbeyan-Palerang Regional Council, 2019). Analysis of land and potential for residential subdivision undertaken in July 2018 found potential for 462 dwellings to be created within the existing Bungendore town area, with a planning proposal to rezone rural land for approximately 300 residences to the north of Bungendore applied for (Queanbeyan-Palerang Regional Council, 2019) Rezoning requests for land available to accommodate greenfield development is provided in Figure 9-19. Zone 3 is adjacent to the Development site.

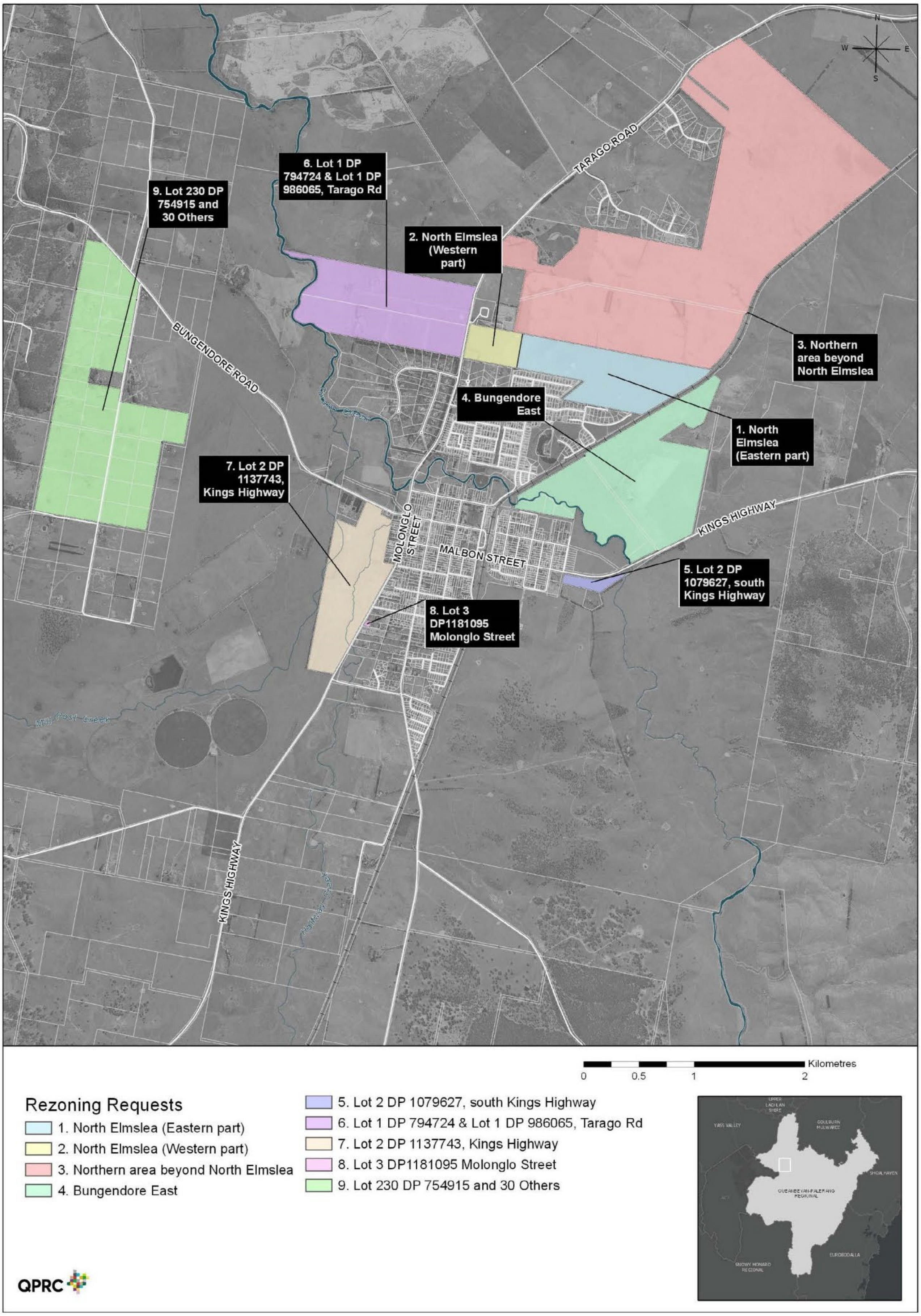


Figure 9-19 Rezoning requests (Queanbeyan-Palerang Regional Council, 2019)

Age, households, and cultural diversity

In 2016, the median ages of the populations in Bungendore and the Queanbeyan-Palerang LGA were both 38 years (ABS 2016a; ABS 2016b), just above the median age for NSW (37 years). Bungendore had a slightly higher proportion of children aged 0-14 (23.7%) compared to NSW (18.5%). The town also had a lower proportion of older people compared to the state average, with 9.5% of people aged 65 or over, compared to about 16% for NSW. The proportion of family households in Bungendore (86%) was higher than the wider Queanbeyan-Palerang region and NSW as a whole (both around 72%). Of those family households, around 63% were families with children in Bungendore, comparable to the broader region and state (both around 62%).

Relative to the wider region and NSW, there were lower proportions of Bungendore residents born overseas. Around 80% of Bungendore residents were born in Australia, with other countries of birth including England, New Zealand, the US, and Scotland. The proportion of Aboriginal and Torres Strait Islander people was also slightly lower in Bungendore (2%) than in the Queanbeyan-Palerang region and NSW (both around 3%).

Socio-economic advantage or disadvantage

In 2016, the median household weekly income in Bungendore was $2,514, notably higher than that of the Queanbeyan-Palerang LGA ($1,882) and the NSW average ($1,486) (ABS, 2016a) (ABS, 2016b). The Social-Economic Indexes for Areas (SEIFA) produced by the ABS is an aggregated score of factors reflecting relative socio-economic advantage and disadvantage within an area. On the index of relative socio-economic advantage/disadvantage based on the 2016 Census data, the Bungendore State Suburb comprises the highest possible score (decile of 10) across the indexes of economic resources, education and occupation, which shows that residents experience a high level of access to employment, income, and living conditions (ABS, 2016c). The Queanbeyan-Palerang Region LGA similarly scored highly (deciles of 9 and 10) across these indexes.

Housing and accommodation

In 2016, most Bungendore residents lived in separate houses (97.5%), and the town had higher rates of home ownership (81%) compared to the Queanbeyan-Palerang region (68%) and NSW (64%) (ABS, 2016a; ABS, 2016b). At the time of the 2016 Census, 8.6% of households in Bungendore reported monthly mortgage repayments, and 4.1% reported weekly rent payments, that were greater than or equal to 30% of household income.

More recently, the median weekly rent for a house in the Queanbeyan-Palerang region was $650 for the December 2021 quarter, which was higher than the NSW average ($495) (NSW Department of Communities & Justice, 2022). This was likely influenced by accelerating rental rates in the neighbouring ACT ($675) and record low vacancy rates (Domain, 2021). Rental vacancy rates of 3% are regarded as representing a balance between supply and demand. Within the postcode 2621, which includes Bungendore and surrounding areas, vacancy rates have been very low over both the long and short term. The rate in January 2022 was 1.5% (SQM Research, 2022a), which indicates a very tight rental market and a lack of supply of private rental accommodation. In nearby Queanbeyan, the residential vacancy rate was only 0.3% in January 2022 (SQM Research, 2022b). Compounding this are the adverse impacts of the COVID-19 pandemic on renters in regional areas generally, causing declining vacancy rates and increasing median rental rates (Pawson, H., Martin, C., Thompson, S. & Aminpour, F., 2021).

Within 25km of the Development site there is a good supply and mix of short-term accommodation options including motels, hotels, guest houses, and caravan/holiday parks (including cabins). Most accommodation options are located in Sutton and Queanbeyan (refer to Appendix M.3) which are within relatively close proximity to the Development site and provide regional-level services.

However, there are also short-term accommodation options in the smaller surrounding townships including Bungendore, Tarago and Gundaroo as well as Canberra itself.

Employment and industry

Recent labour market data for the Queanbeyan-Palerang LGA suggests an average unemployment rate of around 2.7% across the three quarters to September 2021, which is low compared to Queanbeyan (4.7%) and NSW (5.2%) (LMIP, 2021).

The skills base of the LGA is reflected in its occupational structure, influenced by proximity to Canberra. Consultation indicated that many job seekers in the Bungendore community look for work in Queanbeyan and Canberra, because of limited local opportunities.

The most common industries of employment in 2016 were central government administration (11.2%), defence (8.6%), hospitals (2.7%), and state government administration (2.4%). The four most common occupations of employment in the LGA accounted for two-thirds of all occupations. These were professionals (20%), clerical and administrative workers (18.3), managers (16.1%), and technical and trades workers (13.3%) (ABS, 2016b).

The Queanbeyan-Palerang LGA's Gross Regional Product (GRP) was $2.78B for the year ending June 2021 (.idcommunity, 2022a). The highest contributing industry was Public Administration and Safety ($442m, 21.9%), followed by Construction ($237.9m, 11.8%), and Professional, Scientific and Technical Services ($186.2m, 9.2%) (.idcommunity, 2022b).

ABS data shows there were 1,221 registered construction businesses in 2020, and a further 365 businesses associated with transport, postal and warehousing service, with these two sectors contributing 1,586 businesses or 32% of all businesses located in the Queanbeyan-Palerang Regional Council area.

Services and social infrastructure

Social infrastructure encompasses the key services and resources that sustain the liveability of communities, and strongly influences perceived and real quality of life (Australian Urban Observatory, 2021). These extend from health, education and essential services to community support and development resources, and leisure and recreational opportunities. Regional areas often experience social infrastructure gaps, compounded by distance and cost of service provision. While many services are limited in Bungendore and the Queanbeyan-Palerang region, their proximity to Canberra means that major infrastructure is accessible.

Existing key social infrastructure within the social locality is summarised below (Live Queanbeyan Palerang, 2022) ; (QPRC, 2022).

- **Education facilities**: Queanbeyan TAFE, and both public and independent primary and high schools.
- **Health facilities**: Queanbeyan Hospital and Health Service, Braidwood Multi Purpose Service, and a range of GP and specialist health and community support services.
- **Key services**: banks, Australia Post, Chamber of Commerce, Police, Rural Fire Brigade, and the SES all have services in both Bungendore and Queanbeyan.
- **Transport**: bus, rail and coach services are available in Bungendore and Queanbeyan; air services are available in Canberra.
- **Recreational and sporting facilities**: including the Bungendore Sports Hub (under development), Bungendore Bowling and Sports Club, Queanbeyan Sports and Community Club, Queanbeyan RSL Memorial Bowls Club, and public swimming pools, tennis,

basketball and netball courts, skateboard parks, and numerous ovals/parks in both Bungendore and Queanbeyan.

- **Community facilities**: Libraries, Bungendore Community Centre, Bungendore YMCA, Bungendore and Queanbeyan Scout and Girl Guide Halls, Bungendore War Memorial Hall, Lake George Men's Shed, Queanbeyan Community Services Centre, Letchworth Community Centre, Queanbeyan PCYC, Barnados Australia, and a range of churches and social association facilities.

Health and wellbeing

Key health data for the Queanbeyan-Palerang LGA is available from a health needs assessment undertaken by the South Eastern NSW Primary Health Network (NSW Department of Health, 2020). In 2019-20, the LGA had lower rates of hospitalisation for cardiovascular disease and self-harm, and slightly higher rates of alcohol attributable deaths (21.6% vs 19.7) than NSW averages (HealthStats NSW, 2022). The LGA also experiences higher than state and national prevalence figures for disability amongst persons aged 65 years and above, with an estimated figure of 19.4%.

The community consultation survey identified issues around equitable distribution of, and access to, GP and mental health services in regional areas such as Bungendore (Palerang), compared to urban centres such as Queanbeyan. In particular, key stakeholder consultation around the revision of the service model for Queanbeyan headspace service (a youth mental health) revealed that waiting times were perceived to be too long (although comparable to national waiting times), services were perceived to be uncoordinated, and that there was a perceived gap for young people with severe illness. The survey also confirmed a need for increased palliative care services.

Community culture, values, and decision-making processes

The historic town of Bungendore and surrounding areas are defined by both the traditional agricultural and tourist industries that anchor its local economy, and by their proximity to both Canberra and the coast. The Queanbeyan-Palerang region is characterised by a neighbourly, friendly, and inclusive community that appreciates the benefits of living in a place that offers the opportunity for strong social and environmental connections (QPRC, 2018).

Inclusive, safe and healthy communities, protection of the natural environment, adoption of sustainable and renewable energy, a diverse and resilient economy, and the richness of the arts and cultural heritage are characteristics that are important to the local community.

Queanbeyan-Palerang Regional Council is the principal decision-making authority at the local government level.

Community attitudes to renewable energy

Broadly, it can be said that the development of the renewable energy sector enjoys community support. NSW government research (OEH, 2016a) showed that 92% of people support renewable energy use, and 83% believed that NSW should increase its production over the 5 years from 2015. The main perceived benefits were positive environmental impacts and lower long-term costs.

However, support differs regionally, and lowers with proximity to projects. While people in regional NSW were found to be amenable to solar farms (91%), support retracted slightly when located within their local region (84%), and further when within 1-2km of people's homes (78%) (OEH, 2016a). Also, as projects accumulate in suitable regions, concern over local character loss and local agricultural impacts can emerge (Ipsos, 2015).

The Climate of the Nation 2021 Report shows a majority of Australians support a federal government plan to transition the electricity sector away from fossil fuels. Three-quarters (74%) of Australians think governments need to implement a plan to ensure the orderly closure of old coal plants and their replacement with clean energy such as solar, with 75% of Australians concerned about climate change (Australia Institute, 2017).

Consultation undertaken by the Proponent and detailed in Section 6.3.5 and Appendix C3 indicates there is general local community support for renewable energy. The broader community has shown higher than anticipated levels of interest and general support around the contribution to renewable energy transition. Aggregated feedback from feedback forms completed by 18 respondents who attended the Open Days on 19 and 20 November 2021 and 12 December 2021 showed that 100% of respondents liked that the Project was a renewable energy Project. During targeted consultation, some stakeholders highlighted that renewable energy Projects should preserve sacred, significant natural environments.

9.6.3 Potential impacts

Potential impacts have been identified through stakeholder engagement, targeted SIA consultations, and from comparative studies. Key issues and concerns that emerged from the consultation process have been presented in Section 6.3.5 and are addressed in the following section. The significance of impacts has been identified using the risk matrix outlined in Table 9-15, taking into consideration the likelihood and magnitude of impacts.

Table 9-15 Social impact significance matrix (DPIE, 2021a)

		Magnitude level				
		1	2	3	4	5
Likelihood level		Minimal	Minor	Moderate	Major	Transformational
A	Almost certain	Low	Medium	High	Very high	Very high
B	Likely	Low	Medium	High	High	Very high
C	Possible	Low	Low	Medium	High	High
D	Unlikely	Low	Low	Medium	Medium	High
E	Very unlikely	Low	Low	Low	Medium	Medium

A focus on issues

Proposed development projects can be grounds for contestation within local communities. While some stakeholders (Stakeholder Group 3) have indicated that they do not approve of the Project, there is little to suggest that there has been widespread opposition or impacts on community cohesion in the pre-development phase.

As detailed in Section 6.3 and Appendix D.2, the Proponents have committed to respectful, transparent, and meaningful consultation with their neighbours and the wider community. To date, the key focus of engagement has been to understand the concerns of the closest, directly impacted neighbours, to ensure they had a high level of Project understanding and to maximise potential benefits of the Project for them. The activities have also aimed to capture residents further from the Project and address their concerns, as well as interested members in the broader community.

Nonetheless, there is a strong need for continued communication with the community around issues of concern with the aim to build and maintain trust, rationalise decisions and create a positive dialogue. This needs to be a continued focus in the Project’s exhibition period. There is also a need to create certainty about the potential for local benefits. The Proponents have developed a formalised CBSS for this Project, created through high levels of participation with stakeholders, and discussed in detail in Section 6.3.6. It will be beneficial to continue to explain the intention and purpose of the CBSS clearly and transparently, how it is not intended as compensation, and why this approach to benefit sharing has been chosen.

Given the presence of these issues, this impact is evaluated as being of high significance.

Employment and labour impacts

Capturing work opportunities at the local level is a key potential benefit of the Project. The extent to which local people, and local and regional businesses will be able to capture the opportunities that will arise depends upon several factors; the first of which is how ‘job ready’ or ‘project ready’ they are. Local people and small businesses need to have the necessary capabilities and compliance measures in place to be able to work or sub-contract within larger construction contexts. The Queanbeyan-Palerang region has strong capability with regard to construction works, however there is presently great demand for these services, especially in the ongoing post-COVID-19 environment.

The Proponent has agreed to prioritise local jobs and services wherever possible and will work with the local Chambers of Commerce and local Indigenous job networks to develop a strategy to ensure local service providers and contractors are aware of opportunities. The Proponent will also actively look for the right skills amongst local residents and businesses to ensure the benefits stay local wherever possible. This will include a community information session to ensure that the community fully understands the opportunities available, and local residents, businesses and services are able to register their interest (see Appendix D.3 for more detail). All stages of the Project may include specific employment opportunities for residents of Bungendore and surrounding areas, Aboriginal people, young people, apprentices, and trainees.

Direct construction employment

During construction, which is expected to extend over 12-18 months, the Project will directly generate approximately 300 jobs. The workforce strategy is to use local contractors to deliver most of this work, where available.

Indirect construction employment

Significant 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 480 jobs over the construction period. It is anticipated at least 50% of the workforce would be sourced locally.

Total construction employment

A total of approximately 780 jobs (300 direct jobs and 480 indirect jobs) are therefore expected to be generated by the Project during the construction phase.

Direct operational employment

The Proponent indicates that five direct, full-time equivalent jobs will be supported locally (on-site) during the operational life. These would add to similar jobs at the local Capital and Woodlawn wind farms, which are highly prized in the local community. Capital is believed to be the second largest employer in the region.

Indirect operational employment

A number of 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 9 permanent jobs (rounded) would be generated in the wider State and national economies, with some of these jobs supported locally through operational supply chains and consumption impacts.

For the purposes of this assessment, it is assumed that 20% of indirect operational jobs are created in the LGA. This equates to approximately 1 ongoing position.

Total operational employment

In summary, approximately 6 jobs (5 direct and 1 indirect) are expected to be generated by the Project in the LGA with a further 9 indirect jobs outside of this area.

Agricultural employment Impacts

Approximately 475ha of agricultural land will be required to host solar farm infrastructure including the solar panels and the substation, with this land currently used primarily for grazing. The Project has been developed with both a view to optimising the solar array capacity and its potential to support Agri-solar, and the Proponent intends to facilitate the landowners practicing intensive regenerative agriculture beneath the panels. This strategy will involve rotational grazing, with frequent movement of groups of livestock through a series of paddocks, often organised around plant growth cycles. This process would aim to optimise pasture utilisation.

As such, the increased and more intensive agriculture use of the site will create one job in addition to the existing level of employment to service the balance of the land. No agriculture-related jobs would be lost as a result of the Project.

Given the importance that the Proponent has placed on local jobs, especially in the context of limited local opportunities (see Section 9.6.2), the potential employment benefit of the Project has been assessed as having high significance.

Increase in economic activity

An increase in economic activity within the local and regional areas is expected. The total construction cost for the Project is estimated to be approximately $503,679,005 million. Generally, with projects of this type approximately 15% of total investment is retained in the region which indicates approximately $75.4 million in wages, contracts and other service provision will flow to the economy of the regional towns.

The Project will directly and indirectly, through its supply chains, create demand for goods and services, such as accommodation, food, construction materials, freight, and local labour. It is likely that local businesses will be able to supply some of these services. This is a key potential benefit of the Project and consultation highlighted the importance that both the Proponent and local people place on seeing tangible outcomes for local business, even over the short term. This data included in Appendix M.3 indicates a strong presence in the Queanbeyan-Palerang Regional Council area of the types of industries that are likely to be well-placed to service aspects of the Project.

The increased income and spending of the construction workers and others across the supply chains will also add to the stimulation of the local economies more broadly. The Proponent indicates that 50% of the up to approximately 300 direct construction jobs may need to be sourced from outside the LGA, particularly specialist and management positions.

This level of employment would equate to $12.7 million in wages (2020 dollars) on the basis that each non-local worker is employed for 12 months and earns the average construction wage of $84,729 pa including on-costs (ABS, 2016c).

A considerable portion of these wages would likely be spent in the local area, where the workers will be based. An estimated $8.4 million in wages (2020 dollars) would likely be directed to local and regional businesses and service providers during the construction period. This estimate is based on reference to the ABS Household Expenditure Survey which indicates that approximately 75% of post-tax wages are likely to be spent by workers in the regional economy in view of the wide range of goods and services available in the local area.

In addition, the income from the Project would provide economic security for the landowners and help mitigate against the increasing incidence of drought resulting from climate change. This will have flow on effects for the long-term agricultural operation of the land enabling early destocking of the land at the beginning of droughts, thus ensuring retention of workers, encouraging investment in agricultural and environmental rehabilitation practices and providing benefits to the wider community. The Project will result in the land being less likely to be fragmented in the future.

The Project features a bespoke CBSS which shares the financial benefits with the closest neighbours and residents in three other close-by communities (<7.3 kilometres only). Through its Community Benefit Sharing Scheme (CBSS) (Section 6.3.6), the Project is sharing the financial benefits of the Project with relevant community stakeholder groups, equivalent to approximately $330/MW per year.

The funds will be distributed according to the impact of the Project on these communities. The program encourages recipients to spend the money in the local area or on improvements to property, in line with the Project's themes of sustainability and community building. The wider Bungendore community is included in the CBSS via a Voluntary Planning Agreement payment to the Queanbeyan-Palerang Regional Council, which is intended to provide $1,235,000 towards the construction of the new community swimming pool. Further details are provided in Section 6.3.6.

Given the importance that the Proponent, key stakeholders and the community place on this positive impact for the local and regional area's businesses and economies, it has been assessed as being of high significance. The development of a Local Industry Participation Plan and a Local Procurement Policy is proposed to enhance this impact.

Constrained availability of accommodation

Given the Development site is close to the more populated areas of Queanbeyan and Canberra it is expected that a large portion of the workforce would be sourced locally, and therefore not require accommodation, commuting directly from their homes. However, even with the development of a Local Industry Participation Plan, it is expected that some specialist construction workers will be unable to be sourced from the local workforce pool and will need to be brought in from other areas, and these non-resident workers will likely need accommodation closer to the Development site. Given the shortage of rental houses and the issues surrounding rental affordability in Bungendore, Queanbeyan and the broader region, these workers will likely be accommodated in short-term accommodation.

Information provided by the Proponent indicates up to 150 - 180 non-local staff may need to be accommodated in the region during the peak construction phase. There is capacity of approximately 758 rooms and cabins in commercial accommodation within 25km of the Development site (Appendix M.3). Assuming each non-local worker requires individual accommodation (180 rooms), only 23% of this accommodation stock would be required to service the Project. The Accommodation and Employment Strategy would provide further detail on accommodation providers.

This requirement is likely to be lower as some workers may choose to be accommodated in caravan/holiday parks (powered sites), B&Bs, shared private rentals (e.g., holiday homes, Airbnb) 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.

This data indicates that adequate capacity exists within 67km of the Development site to accommodate the number of non-local workers expected during the construction phase, even allowing for increased demand from other regional infrastructure Projects and seasonal demands (holiday periods, harvesting etc.). Importantly, the influx of these workers will support higher occupancy rates and revenues for local accommodation operators, particularly during off-peak periods.

However, this may constrain the availability of accommodation for tourism, particularly if construction coincides with peaks in tourism numbers, which occur at times of local festivals and events. Also, accommodation providers acknowledge that influxes of construction workers can place additional pressure on people experiencing insecure housing who are utilising short-term accommodation while looking for permanent housing in the area.

This Project has a relatively small workforce that will be active over a relatively short duration. However, given the potential for cumulative impacts, and the vulnerability of the potentially affected population group, this potential negative impact has been assessed as being of medium significance.

To mitigate competing interests regarding accommodation, it is proposed that as part of the Accommodation and Employment Strategy and ongoing engagement, the Proponent will continue to engage with Council to discuss and adaptively respond to any emerging community and business concerns. It is suggested that the Proponent will also engage with accommodation providers to avoid negatively impacting on tourism opportunities and vulnerable populations who are utilising temporary accommodation.

Increased demand for local social infrastructure and community services

Major development projects can result in significant demographic changes due to non-resident workers coming into areas, and this can place pressure on social infrastructure and community services. However, for this Project, the construction phase is of a relatively small scale and short duration, and the workforce recruitment strategy targets local resident labour.

Whilst working on the Project, workers would utilise local services in the surrounding areas including those detailed in Appendix M.3. The Project will access emergency and health services when required, however the potential for undue pressure on Queanbeyan-Palerang Regional Council area's social infrastructure is deemed unlikely to become an issue of concern.

This potential negative impact has been evaluated as being of low significance.

Amenity impacts

The Project will involve a change of land use from rural, to land being used to site electricity infrastructure for the site. The Project will be sited within a rural-residential landscape. An existing TransGrid 330kV transmission line traverses the Development site. The proposed connection to the grid would be via construction of a new onsite substation and battery storage pad located adjacent to the existing TransGrid 330 kV transmission line. The Capital Wind Farm is situated adjacent to the Project.

There are four residences that will experience the greatest degree of amenity impacts, as they are close to, and overlook, the development site. Other nearby residences will also experience amenity impacts.

Firstly, amenity impacts during construction, such as traffic and noise impacts, were considered by the Proponent and discussed with stakeholders during SIA consultation. These have been subject to specialist impact assessments.

The Traffic Impact Assessment found that during peak construction periods, traffic volumes along Tarago Road are expected to increase from the existing 53-71 vehicles per hour during peak morning and evening periods, to 110 and 128 vehicle movements per hour. The existing site access (Blind Creek Road Entrance) currently generates a low level of traffic which includes approximately two vehicle movements in each of the peak hours. As such, the intersection of the access with Tarago Road is expected to operate with a good level of service. The impacts of increased traffic on local roads and of potential traffic hazards relating to the construction phase have been assessed as being moderate and short term (see Section 9.1 and Appendix K). Any potential impacts will be managed through a Construction Traffic Management Plan.

Noise impacts during construction have been assessed (see Section 8.6 and Appendix J). Given the short duration of the construction phase, these are seen to be adequately managed as per the NMP.

As such, amenity impacts due to construction have been assessed as medium significance.

Secondly, amenity impacts, particularly visual, including glint and glare, created through the siting of the solar farm in this location are another key concern for residents. Residents are concerned that the siting of the solar farm in this location will create a change to the visual and landscape character, adding to the existing impacts from the Capital wind farm and sand mines.

A VIA has been undertaken (Section 8.1 and Appendix E). In this, it was noted that due to the relatively low height of the solar panels and ancillary facility buildings and the views towards the Development site being broad in scale, the recommended vegetation screening proposed to reduce the potential visual impacts will be effective in integrating the development into the surrounding landscape. As such, the Project could be undertaken whilst maintaining the core landscape character of the area and have a minimal visual impact on the surrounding visual landscape. Management and mitigation measures to reduce visual impact have been incorporated into the Project design.

The Glare Study conducted by SLR Consulting prior to community consultation meetings with the stakeholder groups indicated there was no potential for glare for surrounding residences during normal operations, although it is likely that some receivers may experience visible reflections for Fixed Tilt modes with modest East or West tilts or Horizontal (Flat), especially for elevated receivers (Section 8.2 and Appendix F).

Despite these measures, residents have expressed strong concerns about the visual impacts of the solar farm. This was a common concern for all stakeholder groups, and particularly those in Stakeholder Group 4 who are in an elevated position with expansive views of the Project.

Given the high degree of concern expressed by residents, amenity impacts resulting from having a solar farm sited within the rural-residential landscape have been assessed as high significance.

Concern about loss of agricultural land

Some of the stakeholders in Stakeholder Group 3 raised concerns about the loss of productive agricultural farmland. The Office of Environment and Heritage soil classification Land and Soil Capability (LSC) has assessed that 6.6% of the land to be a classification of 5 (Moderate-low Capability Land) and 93.4% of the land to be classification 6 (Low Capability Land). These soil studies show this is light sandy country with very little organic content that has been heavily farmed for over 150 years. The solar farm is sited on low grade sandy soils next to an operating sand mine; part of it is an old sand mine. The solar array area is approximately 650 hectares and the panels themselves will cover approximately half of the land (325 hectares) with generous spacing in between to allow for Agri-solar. Sheep will continue to graze on the whole of the 650 hectares.

By carrying out their farming activities using the principles of regenerative agriculture the Proponent can restore grazing land and rebuild biodiversity and soil health at the same time as increasing productivity and sustainability. Sheep and solar are an ideal combination because the sheep get protection from the wind, rain and sun from the panels, and the grass or pasture under the panels help keep the panels at the optimum temperature to maximise electricity production.

As such, this Project would have a minimal negative impact upon agricultural production on the property and the region over the life of the Project and may even improve the soil and production. Given these factors, the overall potential negative social impact has been evaluated as of low significance.

Concern about potential negative impacts on land values

The potential impact on surrounding land values of renewable energy developments is a common source of conflict between proponents and residents. For this Project, some residents have expressed a high level of concern about potential negative impacts to land values.

The Proponent has advised stakeholders that since the neighbouring Capital Wind Farm was built the Valuer General has assessed the BCSF site land value to have increased 60%. Changes in land and property values are complex as they are subject to a range of interplaying influences, making it near impossible to pinpoint individual causal factors. Adding to this, is that there is very limited research regarding the impacts of solar farms on nearby property values that could reliably inform an assessment of impact. There is also no definitive research that clarifies whether the presence of large-scale renewable energy projects negatively impacts upon nearby property values.

A key Australian study examining the impacts of wind farms on property prices found there to be insufficient sales data to make definitive conclusions (Urbis, 2016) and no Australian research examining the impacts of solar farms is available. However, a Dutch study examining the impacts of wind and solar farms on houses prices using Dutch data concluded that within that context, there may be small decreases in house prices for houses located within 1 km of solar farms (Dröes, 2021).

Given that there is no definitive and directly relatable research regarding the impacts of solar farms on nearby property values, it is not possible to make an evidence-based assessment about the impact of this Project on the property values of the surrounding properties.

However, since there is strong resident sentiment about potential negative impacts to property values, this impact is assessed as a high significance. The Proponent will address these concerns through the ongoing stakeholder and community engagement activity, where adequate space and time can be given to directly address and respond to these issues.

Energy network and environmental impacts

With a nominal installed capacity of 350 MW AC, the Project has the potential to provide sufficient renewable energy to support the annual electricity needs of the equivalent of 124,155 homes through the generation up to 735,000 MWh per year.

In a regional context, the townships of Bungendore, Tarago, Gundaroo, Sutton, Wamboin, Carwoola and Queanbeyan have approximately 7,058 dwellings (ABS, 2016b). Nearby Canberra has approximately 71,018 occupied dwellings; therefore, the Project has the potential to provide over 1000% of the annual electricity requirements of the local area and the power will instead flow to NSW's major load centre of Greater Sydney, highlighting the importance of the Project from a clean electrical generation perspective.

The operation of the Project would help reduce greenhouse gas emissions intensity and move towards cleaner electricity generation. Based on 735,000 MWh, the Project would offset the equivalent of 239 kilotonnes per annum of CO^2 emissions for Brown Coal, 513 kilotonnes per annum of CO^2 emissions for Black Coal (emission calculation based on 2013 NTNDP emission intensity values averaged across the power stations (AEMO, 2018).

Given these factors, this positive impact is evaluated as being of low significance.

Cultural heritage and tourism opportunities

Stakeholders expressed concerns that the Project would make Lake George look industrial, and that the sacred, significant natural environment of Weereewa/Lake Ngungara/Lake George should be preserved as such. This area has been identified by the Project archaeologists and the Aboriginal community as having Indigenous heritage. The Proponent has been informed during Aboriginal community consultation that on the western side of the lake at the foot of the hills, there are many burial sites and sacred sites, while there are several cultural sites to the north of Lake George (see Section 6.2.2).

In response to these concerns the Development footprint sets back from the Lake and avoids the 'standlines' (historic sand dunes marking ancient shorelines).

In terms of Project benefits, discussions are underway regarding the potential for making a 2 km^2 area available as an Indigenous Cultural and Heritage and Learning Zone (ICHLZ) if the Project proceeds. The area is between the proposed edge of the solar farm and Weereewa/Lake Ngungara/Lake George in the avoided area. This will provide access to the lake from the eastern shore for the first time in over 150 years for Indigenous peoples and for the wider community and provide a significant barrier between the Project and the lake (refer Appendix D.3).

The Proponent has assigned $267,000 from the CBSS over the lifetime of the Project to promote and hold Indigenous learning days at the Lake George foreshore where Indigenous Elders would be able to educate communities about Indigenous culture and heritage on this land. It is anticipated this will be an important event for Indigenous people, the local community, school children, scientists, and archaeologists. Benefits of attracting new visitors to the area include increased expenditures on accommodation, food and beverage, fuel, retail, entertainment etc, all of which will support businesses and employment, especially in nearby townships such as Bungendore.

Given these factors, this positive impact is evaluated as being of high significance.

Summary of potential impacts

Table 9-16 Impact scoping summary

Project phase	Potential impact	Positive / negative	Significance	Potentially affected stakeholder group
Pre-construction	A focus on issues	Negative	High	Residents
Construction	Employment and labour impacts	Positive	High	Local regional people and businesses
Construction	Increase in economic activity	Positive	High	Local regional people and businesses
Construction	Amenity impacts during construction	Negative	Medium	Directly impacted residents
Construction	Constrained availability of accommodation	Negative	Medium	Vulnerable populations utilising temporary accommodation
Construction	Increased demand for local social infrastructure and community services	Negative	Low	Bungendore and Queanbeyan community
Construction and Operations	Concern about loss of agricultural land	Negative	Low	Primary producers
Operations	Amenity impacts of having a solar sited within the rural-residential landscape	Negative	High	Directly impacted residents
Operations	Energy network and environmental impacts	Positive	Low	Energy network users across the east coast
All	Concern about potential impacts on nearby property values	Negative	High	Directly impacted residents
Operations	Cultural heritage and tourism opportunities	Positive	High	Indigenous people, local regional people and businesses

9.6.4 Mitigation and enhancement measures, and residual impacts

The Proponents have demonstrated their iterative approach to the development throughout the stakeholder engagement and consultation to date and have made several adjustments, such as removing a section of more elevated panels, and agreeing to additional plantings for screening, both to reduce the visual impact. These and other mitigation measures and responses to key issues raised during consultation are detailed in Appendix M.3.

The enhancement and mitigation measures outlined below directly respond to the potential positive and negative social impacts associated with the Project and that have been identified as being of medium or higher significance. They have been identified through consideration of Project impacts, along with stakeholder consultation.

- It is recommended to continue to implement the targeted, benefits and issues focused CSES for the exhibition period as outlined in Section 6.3.7 that is aware of the potential for opposition and conflict, and that delivers:
    - specific engagement materials and activities to address issues and confirm benefits
    - the proposed Community Benefits Sharing Scheme through a participatory approach with residents (Section 6.3.6)
    - continued engagement with Queanbeyan-Palerang Regional Council, to create a formal mechanism to discuss and adaptively respond to any emerging community and business concerns. During the pre-construction and construction phases this may be best facilitated through scheduled monthly meetings. This will include consideration of impacts on accommodation supply.
- The Local Industry Participation Plan will focus on maximising the involvement of local people and businesses in the Project. It will include specific focus on people and businesses within the Queanbeyan-Palerang LGA, but also the ACT, and the wider regional area. It will consider specific opportunities for Aboriginal people and businesses, women, and young people. It will include culturally sensitive Aboriginal employment goals for workers and university graduates, and protocols and systems to ensure Aboriginal employment does not conflict with cultural obligations (Appendix D.2).

  The plan should be developed in partnership with the key local economic development stakeholders in the region (e.g., the Industry Capability Network, NSW Training Services, Regional Development Australia, Queanbeyan-Palerang Regional Council, Bungendore Chamber of Commerce and Industry, and Queanbeyan Business Chamber). It will assess the feasibility to support local schools in science and engineering studies through a partnership.

  The plan would outline mechanisms that will be used to ensure that local people and businesses are given full, fair, and reasonable opportunity to participate in the Project. It will also detail how the proponent will link in at the local level with government and agency support programs that assist people and businesses improve their capacity and capability.
- The **Local Procurement Policy** will outline the proponent's commitment to providing local and regional businesses the opportunity to supply goods and services to meet Project needs during all phases of the Project. This will be developed through consultation with key local economic development stakeholders (e.g., the Industry Capability Network, Regional Development Australia, Queanbeyan-Palerang Regional Council). It will give Aboriginal businesses full and fair opportunities to supply goods and services.

- The **Employment and Accommodation Strategy** will provide further detail on accommodation providers. The strategy will include engagement with accommodation providers to avoid negatively impacting on tourism opportunities and any vulnerable populations who are utilising temporary accommodation.
- Develop the proposed CBSS in partnership with residents. The intention is to create a fund that can support very localised and meaningful community development or other neighbourhood-level initiatives that have strong resident support, throughout the life of the Project. The proponent will consider the need for a greater level of clarity on the rationale for benefit sharing and the way the CBSS has been structured.

Table 9-17 outlines a summary of enhancement and mitigation measures, along with the predicted significance of residual impacts, after the effective application of mitigation or enhancement measures. Only those impacts that have been assessed as being of medium or higher significance are addressed in the assessment of residual impacts. The table below details the conforming mitigation measures that will form the overall Statement of Commitments of this EIS.

Table 9-17 Summary of enhancement and mitigation measures, and residual impacts

Potential impact	Significance	Mitigation / Enhancement Measures	Significance of residual impact
A focus on issues	High	Continued implementation of the CSES, addressing issues, and developing ongoing trust. Regular community updates about the progress of the Project and findings of the assessments. Assess the feasibility to implement a program to open the solar farm for visits and education events. An accessible complaints process with a timely response protocol. Community Benefits Scheme.	Medium
Employment and labour impacts	High	Local Industry Participation Plan Employment and Accommodation Strategy	High
Increase in economic activity	High	Local Industry Participation Plan Local Procurement Policy	High
Amenity impacts during construction	Medium	Construction Traffic Management Plan (see Section 9.1) Noise Management Plan (see Section 9.2)	Low
Constrained availability of accommodation	Medium	Employment and Accommodation Strategy Targeted, specific engagement	Low
Amenity impacts from having a solar farm sited within the rural-residential	High	Targeted engagement focused on addressing issues, sharing benefits and developing ongoing trust Measures as per Visual Impact Assessment	Medium

Potential impact	Significance	Mitigation / Enhancement Measures	Significance of residual impact
landscape		(see Section 8.2)	
Concern about potential impacts on nearby land values	High	Targeted engagement focused on addressing issues and concerns	Medium
Cultural heritage and tourism opportunities	High	Targeted and culturally sensitive engagement	Medium

No.	Mitigation Measure	Phase
S1	The Local Industry Participation Plan will focus on maximising the involvement of local people and businesses in the Project. It will: Include specific focus on people and businesses within the Queanbeyan-Palerang LGA, but also the ACT, and the wider regional area. Consider specific opportunities for Aboriginal people and businesses, women, and young people. Include culturally sensitive Aboriginal employment goals for workers and university graduates, and protocols and systems to ensure Aboriginal employment does not conflict with cultural obligations (Appendix D.2). The plan should be developed in partnership with the key local economic development stakeholders in the region (e.g., the Industry Capability Network, NSW Training Services, Regional Development Australia, Queanbeyan-Palerang Regional Council, Bungendore Chamber of Commerce and Industry, and Queanbeyan Business Chamber). It will assess the feasibility to support local schools in science and engineering studies through a partnership. The plan would outline mechanisms that will be used to ensure that local people and businesses are given full, fair, and reasonable opportunity to participate in the Project. It will also detail how the proponent will link in at the local level with government and agency support programs that assist people and businesses improve their capacity and capability.	Design, Construction, Operation
S2	The Local Procurement Policy will outline the proponent’s commitment to providing local and regional businesses the opportunity to supply goods and services to meet Project needs during all phases of the Project. This will be developed through consultation with key local economic development stakeholders (e.g., the Industry Capability Network, Regional Development Australia, Queanbeyan-Palerang Regional Council). It will give Aboriginal businesses full and fair opportunities to supply goods and services.	Design, Construction, Operation
S3	The Employment and Accommodation Strategy will provide further detail on accommodation providers. The strategy will include engagement with	Design, Construction,

No.	Mitigation Measure	Phase
	accommodation providers to avoid negatively impacting on tourism opportunities and any vulnerable populations who are utilising temporary accommodation.	Operation
S4	Develop the CBSS in partnership with residents. The intention is to create a fund that can support very localised and meaningful community development or other neighbourhood-level initiatives that have strong resident support, throughout the life of the Project. The proponent will consider the need for a greater level of clarity on the rationale for benefit sharing and the way the CBSS has been structured.	Design, Construction, Operation

9.7 Bushfire

Bushfire presents a threat to human life and assets and can adversely impact ecological values. Bushfire risk can be evaluated and managed by considering environmental factors that increase the risk and severity of fire (fuel load and type, topography and weather patterns), as well as specific activities (such as hot works) or infrastructure components that exacerbate combustion or ignition risks (such as transmission lines, energy storage systems and other electrical components).

This Project is an SSD and therefore exempt from requiring a bushfire safety authority (BFSA) under section 4.41(f) EP&A Act. Section 5.16(3) of the Act requires that "the Planning Secretary is to consult relevant public authorities and have regard to the need for the requirements to assess any key issues raised by those public authorities", which includes consulting with the NSW Rural Fire Service (RFS) on bushfire considerations. The outcomes of consultation with NSW RFS are outlined in Section 6.1.

9.7.1 Existing environment

The Development site is within the Lake George Bushfire Management Committee (LGBFMC) area as identified in the Lake George Bushfire Risk Management Plan (LGBFMC, 2018). The typical climate of the region is warm and dry, cooled by southeast cool changes. Section 1.3.2 of the Management Plan states that the local bushfire season typically extends from October to March, though research has demonstrated that bushfire seasons are lengthening substantially as a result of climate change (Jolly, et al., 2015), including in Australia (Nerili, et al., 2021).

Prevailing winds during the bushfire season are typically north-westerly which precede a cool easterly change. Dry thunderstorms are common throughout summer with the highest risk occurring between December and February. There are on average 30 bushfires per year in excess of 30ha, three of which would be considered major in the last five years. Based on historical bushfire frequency data, the Queanbeyan-Palerang LGA has a 20-month cycle of major bushfires. Primary causes and ignition have been identified to be:

- Lightning.
- Human activity (accidental or deliberate).
- Legal burning off.
- Illegal burning off.
- Campfires.

The effect of anthropogenic climate change on extreme weather, increasing the number of hot days and heatwaves, is driving up the likelihood of very high fire danger weather (Climate Council, 2016). This was evident during the 2019/2020 bushfire season that led to over 17 million ha of fire damage: the single largest recorded bushfire season for Australia (Parliament of Australia, 2021).

Bushfire prone land

The entirety of the Development site is mapped as Bushfire Prone Land by the Queanbeyan-Palerang Regional Council. Approximately 95% of the Development site is mapped as Vegetation Category 3 Bushfire Prone Land (BPL), and the remaining amount is mapped as Vegetation Category 1. According to the NSW Rural Fire Service's Guide for Bushfire Prone Land Mapping, Vegetation Category 1 is considered to be the highest risk for bushfire and has the highest combustibility and likelihood of forming fully developed fires (NSW Rural Fire Service, 2015).

Vegetation Category 3 has a lower combustibility and potential fire size than Category 1. Vegetation Category 2 is considered to be the lowest bushfire risk.

An isolated section of excluded land (which is excluded from the bushfire vegetation categories), an operational quarry, is located directly to the south of the Development site (refer Figure 9-20). The quarry is considered a low fuel area and is subject to ongoing disturbance; it is identified as presenting a low hazard.

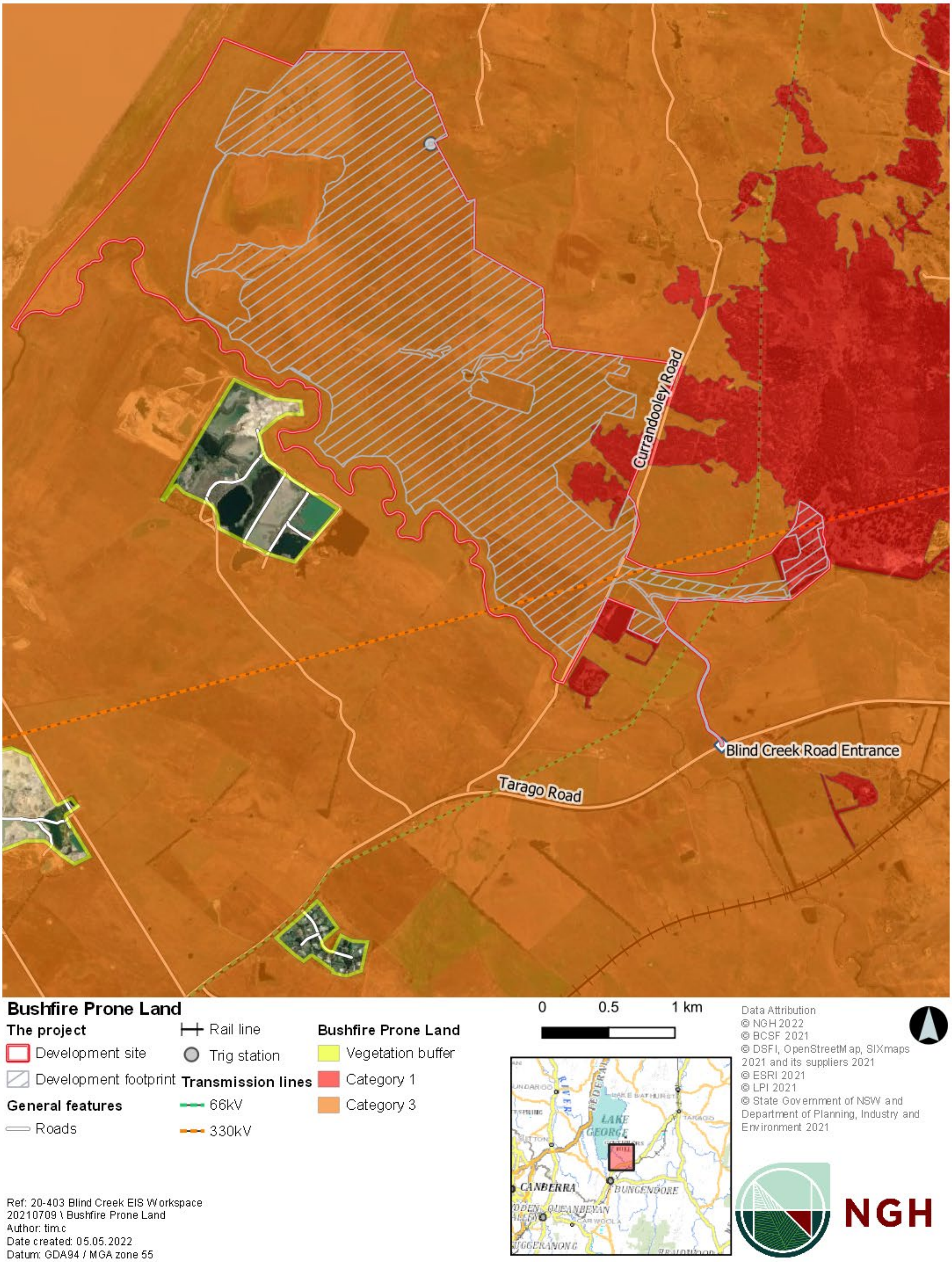


Figure 9-20 Bushfire prone land

Site characteristics summary

The size of the Development site is approximately 1,026 ha. The Development site is currently agricultural land and has been highly modified through historical and ongoing farming practices and sand quarrying. There are some remnant stands of woody vegetation to the east of the Development site which includes softwood plantations. Wrights Creek runs through the Development site, and Butmaroo Creek runs along the south boundary of the Development site. Butmaroo Creek is an ephemeral waterway that feeds into Lake George. The natural flow of Wrights Creek has been modified and terminates at a stock dam at the approximate centre of the Development site. There are several small dams located across the Development site and a 42ha wetland is located in the north of the site.

The overall topography of the Development site is flat with minor undulating rises and creek flats, with slopes of predominantly <10%. The elevation is approximately 670-720m AHD. Lake George is located on the western boundary of the Development site. The immediate landscape surrounding the Development site consists of cleared agricultural land, native vegetation and two operational quarry sites.

There are intermittent linear woodland remnants located along roads and homesteads in the Development site. High voltage 330kV transmission lines cross the southern section of the site. A 66kV transmission line is present along the eastern borders of the site and briefly crosses the most eastern part of the site. Numerous 11kV lines service local buildings in and around the Development site.

Fire weather

A Forest Fire Danger Index (FFDI) of 100 applies to the Queanbeyan-Pelarang Region, as set out in the NSW RFS' NSW Local Government Areas FDI (RFS, 2017).

9.7.2 Planning for Bushfire Protection (PBP) 2019

Planning for Bushfire Protection (PBP) 2019 provides development standards and specifications for development on BPL in New South Wales. PBP includes the following overarching objectives:

- Afford buildings and their occupants protection from exposure to a bushfire,
- Provide for a defendable space to be located around buildings,
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings,
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available,
- Provide for ongoing management and maintenance of bushfire protection measures (BPMs), and
- Ensure that utility services are adequate to meet the needs of firefighters.

This assessment considers the bushfire threat that may impact the Project area and the surrounding locality, considering the above objectives. In addition, consideration has been given to the application of BPMs prescribed by PBP 2019, which would be implemented throughout the construction and operation phases of the Project.

Section 8.3.5 of PBP requires the following measures to be incorporated into the design and operation of solar farms:

- A minimum 10-metre Asset Protection Zone (APZ) for the structures and associated buildings/infrastructure, and
- The APZ must be maintained to the standard of an inner protection area (IPA) for the life of the development (to the specifications identified in Appendix 4 of PBP).

PBP also requires a bushfire emergency management and operations plan to be prepared prior to construction.

Vegetation assessment

According to PBP, the 'predominant vegetation' surrounding the asset (in this case, the Project) in all directions for a distance of 140m must be classified as a 'vegetation formation', according to the categories of Keith (2004). Vegetation mapping conducted as part of the Biodiversity Development Assessment Report (see Appendix GAppendix E) was used to determine predominant vegetation within and adjoining the site. The identified BioNet Vegetation Classification Plant Community Types (PCTs) surrounding the solar farm have been translated to Keith vegetation formations.

The Biodiversity Development Assessment Report (Appendix GAppendix E) indicates that the majority of the site and surrounding land has been highly modified by historical agricultural activities. As such, vegetation comprises open grassland of exotic and native grasses that is subject to historic and ongoing grazing. The Development site and the surrounding area is predominantly made up of exotic-dominated grasslands.

There are areas with tree cover on the eastern edge of the Development site boundary which include both remnant native woodland and exotic pine plantation. Lake George is located on the western boundary of the Development site. Two PCTs occur within the site. The vegetation classification types are given in Table 9-18.

Table 9-18 Vegetation classifications

PCT classification	Keith Class	PBP classification
1110 – River Tussock – Tall Sedge – Kangaroo Grass moist grasslands (including exotic dominated wetland subcategories)	Temperate Montane Grasslands	Grassland - perennial grasses and the presence of broad-leaved herbs on flat topography, lacking woody plants.
1100 – Ribbon Gum – Snow Gum grassy forest on damp flats - woodland	Tablelands Clay Grassy Woodlands	Woodland – General, which covers all vegetation types that contain an open or sparse layer of eucalypts with a sparse shrub layer and diverse ground cover of grasses. This vegetation

PCT classification	Keith Class	PBP classification
		type is usually found on flat or gently undulating ground
Pine Plantation (Non-PCT)	NA	Dry sclerophyll Forest – generally comprising trees 10 – 30m in height, with crowns that touch or overlap.

Slope assessment (effective slope)

PBP defines 'effective slope' as 'slope within the hazard that most significantly affects the fire behaviour of a site'. Appendix 1 of PBP requires effective slope to be calculated within the hazard that most significantly affects fire behaviour having regard to the vegetation present, measured over a distance of 100m extending out from the existing site boundary. Effective slope for the areas of bushfire hazard applicable to the site were calculated using GIS software and available topographical data.

Effective slopes calculated in each direction from the edge of the proposed solar panel arrays are shown in Figure 9-21. The results of the slope analysis demonstrate that the land within the area of the potential bushfire hazard, extending out from the proposed asset (being the solar panels, substations, BESS and control centre/office buildings), is generally flat, with very slight upslope grades in north, east and south directions. Land located adjacent to Lake George on the western boundary of the Development site slopes downwards.

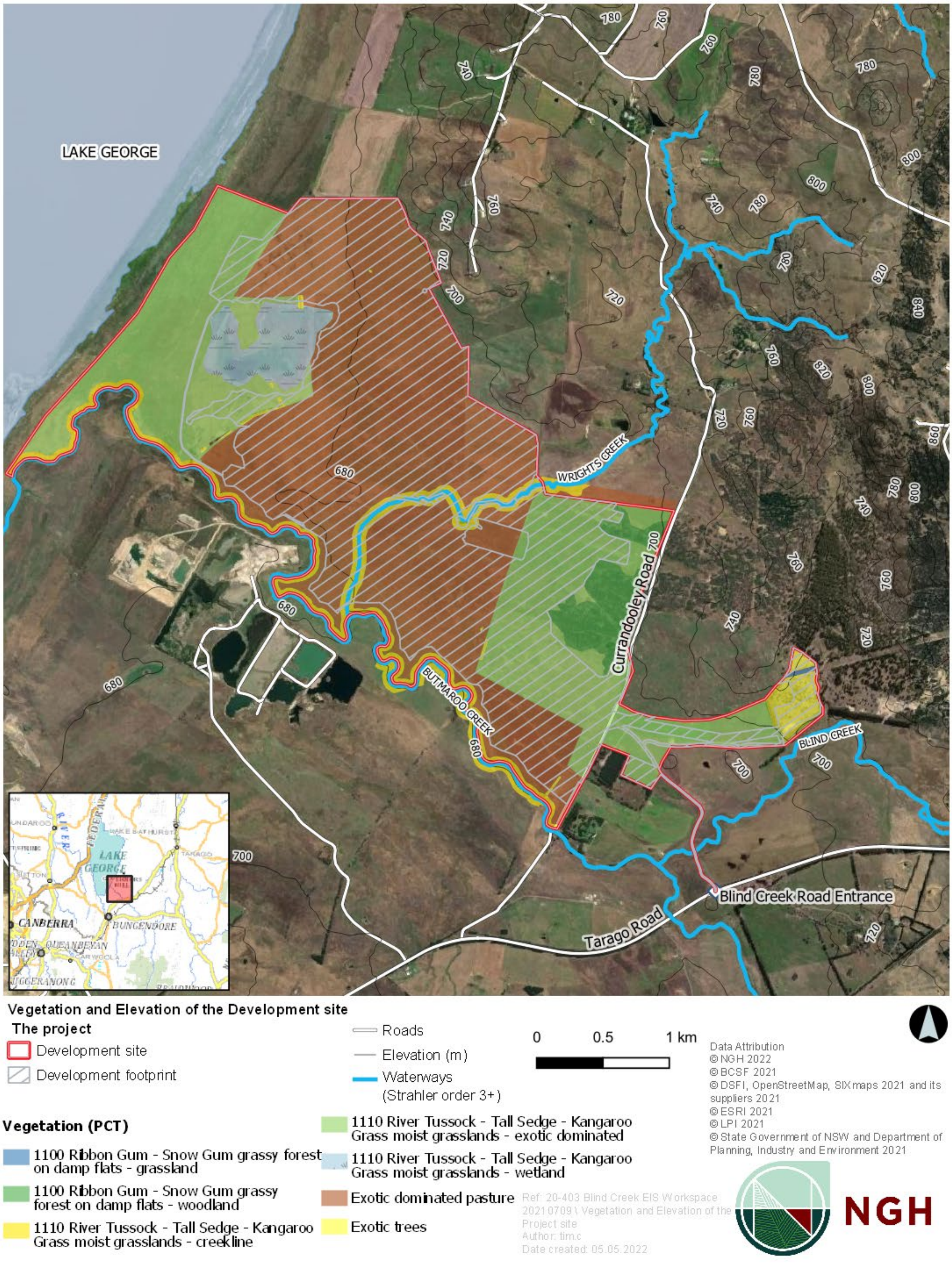


Figure 9-21 Vegetation and elevation of the Development site

- The main potential bushfire hazards for the Development site include:
- Unmanaged grassland.
- Existing transmission lines.
- Electrical malfunction of the proposed substation and/or BESS.
- Lightning.
- Human error.
- Vehicle accidents.
- Machinery operating at nearby sand mining operations.

Resources available for firefighting are detailed below under 'Services'. There is good all-weather access to the property from the public road network. Several NSW RFS brigades are located close to the Development site; Bungendore Rural Fire Brigade is located approximately 8km (<10-minute drive along Tarago Road) from the Development site. Taylors Creek Rural Fire Brigade is approximately 12km north of the site, along Taylors Creek Road and Bungendore Road, and Boro/Mount Fairy Rural Fire Brigade is approximately 18km east of the site, along Goulburn Road and Tarago Road.

Specialist fire and rescue services would be provided by the Fire and Rescue NSW Queanbeyan Fire Station, which is located approximately 32km from the Development site, a 30 minutes drive via the Kings Highway and Tarago Road.

Two receivers are located within 500m of the Development site (refer Figure 1-3). The closest residence to the Development site is within the Development footprint on the eastern boundary. From review of aerial imagery, many of those on rural properties within the locality appear to have associated farm sheds, watering points, silos and other equipment.

9.7.3 Mitigation Strategies

Planning for Bushfire Protection guidelines

According to NSW RFS Planning for Bushfire Protection (PBP) 2019 (RFS, 2019), an acceptable level of protection from bushfires is achieved for developments through a combination of strategies which:

- Control the types of development permissible in bushfire prone areas.
- Minimise the impact of radiant heat and direct flame contact by separating development from bushfire hazards.
- Minimise the vulnerability of buildings to ignition and fire spread from flames, radiation and embers.
- Enable appropriate access and egress for the public and firefighters.
- Provide adequate water supplies for bushfire suppression operations.
- Focus on property preparedness, including emergency planning and property maintenance requirements.
- Facilitate the maintenance of Asset Protection Zones (APZs), fire trails, access for firefighting and on site equipment for fire suppression.

- Management of bushfire buffer zones around substations and the Development site as appropriate.
- The PBP guidelines provide six key Bushfire Protection Measures (BPMs) for developments, which include:
- APZs.
- Access.
- Construction, siting and design.
- Landscaping.
- Services.
- Emergency and evacuation planning.

APZ

Intent of measure: To provide suitable building design, construction, and sufficient space to ensure that radiant heat levels do not exceed critical limits for firefighters and other emergency services personnel undertaking operations, including supporting or evacuating occupants. A summary of relevant PBP APZ specifications is outlined below.

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bushfire hazard. An APZ provides:

- A buffer zone between a bushfire hazard and an asset,
- An area of reduced bushfire fuel that allows for suppression of fire,
- An area from which back-burning or hazard reduction can be conducted, and
- An area which allows emergency services access and provides a relatively safe area for firefighters and homeowners to defend their property.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- Direct flame contact on the building,
- Damage to the building asset from intense radiant heat, and
- Ember attack.

In accordance with Appendix 4 of PBP 2019, an Asset Protection Zone (APZ) comprises of two key elements, an inner protection area (IPA) and outer protection area (OPA). An APZ surrounds a development to provide a managed or reduced fuel area, to reduce the bushfire hazard to an acceptable level to mitigate risk posed to persons and the built environment. As Section 8.3.5 of PBP requires an APZ in the form of an IPA to be provided, IPA specifications are identified below.

An IPA is located in immediate proximity to the asset and provides a defendable space consisting of minimal fuel loads. An IPA shall display characteristics that include, but are not limited to:

- A tree canopy cover of less than 15% at maturity,
- A maximum 30% of the IPA may contain shrubs,
- Trees should have lower limbs (up to 2m in height) removed,
- Shrubs are not to have a connection with tree canopy layer,

- Shrubs should not form more than 10% ground cover,
- Maintain 2 – 5m canopy separation of trees and branches are not to overhang buildings, and
- Wooden sheds, combustible material storage areas, stacked flammable building materials for example, are not permitted in the IPA.

Access

Intent of measures: To provide safe operational access for emergency services personnel in suppressing a bushfire, while residents are accessing or egressing an area. A summary of relevant PBP Access specifications is outlined below.

- Minimum carriageway width of 4m.
- The capacity for fire fighting vehicles to pass oncoming vehicles.
- Avoiding grades greater than 15 degrees (sealed) and 10 degrees (if unsealed).
- Minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.
- Will not have a cross fall of more than 10 degrees.
- The capacity to carry a fully loaded fire fighting vehicle (which may be up to 23 tonne).
- Appropriate drainage and erosion controls, and
- All weather access is provided.

In some cases, access roads would provide separation between the Development footprint layout and hazard vegetation interface (i.e., between the solar array area and the snow gum woodland area, located on adjoining land). Subject to future detailed design, future access roads would meet the specifications above. Access tracks, where practicable should be provided in a perimeter road formation, around the Development footprint. Future roads would need to be constructed to ensure adequate capacity for a 23-tonne firefighting appliance.

Construction, siting, and design

Intent of measures: To provide appropriate design and construction of buildings enhance their survivability from bushfires.

Australian Standard AS 3959-2018 ‘Construction of buildings in bush-fire prone areas’ (AS3959) and PBP include ‘grassland’ as a vegetation classification. Grassland vegetation has the ability to carry fire and pose a hazard to proposed infrastructure and emergency services.

In accordance with AS3959 and the additional construction requirements prescribed by PBP, BAL-12.5 construction and design standards shall be provided for any buildings constructed or transported to site for the duration of the Project. This basic construction requirement would afford buildings protection from ember attack.

Landscaping

Landscaping should be considered throughout the design process and further enforced throughout the operational phase of the development. Suitably positioned and considered landscape design can reduce the risk of flame contact and radiant heat to assets, thus improving the defence of an asset or structure. A well-considered landscape design includes, but is not limited to:

- Increasing chances of filtering wind-driven embers or burning debris.
- Reduces wind forces.
- Create spaces between vegetation to slow and reduce the intensity of a fire run towards a building.
- Fire retardant species could be selected, and
- Plant selection that does not drop large amounts of leaf litter that can act as ground fuel in the event of a bushfire.
- Any revegetation or landscape screening that may occur on site, particularly in close proximity to infrastructure, shall comply with the specifications of Appendix 4 of PBP.

Services

Adequate water supply is essential for firefighting when property protection is involved. Two new non-combustible water storage tanks would be constructed at the beginning of the Construction period: One dedicated 20-KL litre tank near the entrance of the substation area; another 100-KL tank near the entrance to the solar array area, 20-KL of which will be dedicated for firefighting purposes. An existing concrete 100-KL tank at Latitude -35.181222628 Longitude 149.4826401 would have 20KL dedicated for firefighting purposes. The provision of static water supply is dedicated for firefighting purposes. The water storage tanks shall be fitted with appropriate fire-fighting couplings (i.e., 65mm Storz outlet) and must be accessible at all times. Hardened ground surface for truck access is supplied within 4m of the tank. In addition to water storage tanks, a 2-inch pressurised underground water main will be installed within the solar array area alongside a central road for a length of 4km. The water main will be shared for firefighting purposes and as a water source for livestock grazing within the solar array area. A rising main will be installed every 1km along the water main to facilitate filling of firefighting vehicles' water tanks. The source of water for the water main will be the new 100-KL water tank at the entrance to the solar array area. The water main will be pressurised by a suitable pressure pump to deliver 5 litres per second at each rising water main.

Emergency and evacuation planning

Several firefighting response resources are situated within a reasonable distance of the Project. Fire agencies that could attend in the event of an emergency, includes both the NSW RFS and Fire & Rescue NSW. These are given in Table 9-19.

Table 9-19 Nearest firefighting resources

Agency	Location
NSW Rural Fire Service	Bungendore Fire Station, 28 King St, Bungendore NSW 2621 Boro/Mt Fairy Fire Station, 419 Mt Fairy Road Mt Fairy 2580 Taylors Creek Fire Station, Taylors Creek Road, Tarago 2580
Fire and Rescue NSW	41 Campbell St, Queanbeyan NSW 2620

Develop a Bushfire Emergency Management and Operations Plan

PBP requires the preparation of a Bushfire Emergency Management and Operations Plan (BFEMOP), prior to construction. The preparation of a BFEMOP is identified as a mitigation measure, as it covers, but is not limited to, the following:

- Work that should not be carried out during total fire bans.
- Plant and equipment operation during high bushfire danger periods.
- Detailed measures to prevent or mitigate fires igniting.
- Notification of emergency access points to emergency authorities.
- Notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate.
- Appropriate bushfire emergency management planning and availability of fire-suppression equipment, access and water, and
- Storage and maintenance of fuels and other flammable materials, covering:
  - The suspension of work involving risk of ignition during total fire bans.
  - The availability of fire-suppression equipment, storage and maintenance of flammable materials.
  - Notification of the local NSW RFS District Fire Control Centre for any works during the fire danger period that have the potential to ignite surrounding vegetation, and
  - Bushfire emergency management planning.

The BFEMOP would be prepared in consultation with the NSW RFS and Fire & Rescue NSW.

9.7.4 Potential impacts

Construction and decommissioning

The potential for increased bushfire risk (including grass fire) may coincide with the construction and decommissioning stages of the Project. Ignition sources during these stages include:

- Earthworks and slashing machinery causing sparks.
- Hot works activities such as welding, soldering, grinding and use of a blow torch.
- Sparks and contact ignition from vehicles in long combustible vegetation.
- Smoking and careless disposal of cigarettes.
- Use of petrol-powered tools.
- Operating plant fitted with power hydraulics on land containing combustible material.
- Electrical faults during testing and commissioning.
- Storage of chemicals and hazardous materials.

Most of the construction works would take place on flat land in a low fuel environment, in grassland formerly used for cropping and grazing. Site access would be formalised at the beginning of the construction stage during civil works, which would increase the ability to access and suppress any fire on-site or on adjoining sites. Access roads would be designed to comply with PBP requirements.

The bushfire hazard associated with the activities listed above is considered highly manageable. Risks would be minimised through the implementation of fire and bushfire mitigation measures outlined below.

Potential impacts from decommissioning activities would be similar to those for construction; and any bushfire risk associated with decommissioning of the project would be highly manageable.

Operation

The operational stage of the Project has the following associated bushfire risks:

- Transmission line failure or contact with vegetation within clearances.
- Overheating in the substation.
- Overheating in the battery banks.
- Grass fire ignition from vehicles and maintenance machinery.
- Poor groundcover management and associated increase in fuel loads.

The Project would implement specific measures to address the strategies and risks outlined above. The measures are discussed below and summarised in Section 9.7.5.

Buildings (i.e., substation and O&M infrastructure) would be constructed of low combustibility or non-combustible materials suitable for buildings of class 5 to 8 and 10 of the Building Code of Australia (BCA), now the National Construction Code (NCC).

All electrical components would be designed and managed to minimise potential for ignition. The solar array, which would occupy the majority of the site, would likely be largely constructed of glass, silicon, steel and aluminium and would have very low flammability.

Ground Groundcover beneath panels would be maintained and not permitted to accumulate to high fuel loads; this is consistent with access and solar input requirements. Strategic grazing is one potential method for controlling fuel loads around the solar farm infrastructure. The site could be intensively grazed by sheep using rotational grazing. The agricultural methods that would be proposed for the site if it is grazed by the landowner ensure grasses are kept in a growing phase and mostly prevented from maturing and ‘haying off’, in accordance with the guideline Standards for Asset Protection Zones (NSW RFS, 2005). The plan would be for intensive rotational grazing involving sheep going into a paddock when the grass is at approximately 10cm height and then being moved to the next paddock when the grass is approximately 5cm height.

Where grazing may be difficult or ineffective, manual slashing or other clearance methods would be utilised to control fuel loads.

An APZ would be maintained around individual buildings and critical infrastructure, including inverters, BESS' and the substation. In accordance with Section 8.3.5 of PBP, APZs would be maintained as an Inner Protection Area (IPA), in accordance with Appendix 4 of PBP.

A 20m wide APZ is proposed for the substation. The objective is to provide greater separation between the interface of hazard vegetation and the substation footprint, to reduce the intensity and likelihood of flame contact impacting the proposed substation. Internal access tracks would be a minimum 3.5m wide, allowing adequate access for emergency vehicles, including fire trucks. Dead end access roads should be avoided. Access design would conform to relevant specifications in Appendix 3 of PBP.

Bushfire and structural fire risks during operation of the solar farm are considered manageable subject to the control of grass fuels at the site, the appropriate maintenance of equipment, adoption of applicable best practice and technical standards and the implementation of safeguards provided below. Potential ignition sources not associated with the solar farm site would continue to present bushfire risks in the locality, including lightning, machinery, discarded cigarette butts from public road traffic, transmission lines and local stubble burn or hazard reduction burn escapes.

In view of the likely fire hazards and risks, the Project is not considered likely to present a substantial bushfire ignition and structural fire threat, or to represent an unacceptable hazard in the event of a bushfire affecting the site.

Lithium-ion batteries

The Project would include up to approximately 300MW of BESS capacity. All energy storage systems carry risks associated with the uncontrolled release of energy. While lithium-ion batteries (LiBs) offer significant advantages over competing commercialised storage technologies in terms of energy density, efficiency and charging times, these advantages also elevate the risk of fire. Both options of the Lithium-ion based BESS (as discussed in Section 4.3.4) would be designed with the required disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate the fire risk to the required level of safety.

Operating strategies spanning proper planning, risk assessment, storage methods, maintenance protocols, and response protocols are the other important factors in mitigating LiB fire risks (Butler, 2013).

Fire risk

Li-ion cells contain highly flammable electrolytes within a metal prismatic can or metalized pouch that have seals designed for a 10 to 20-year service life. The ambient operating temperature range for Lithium-ion systems can span -10 to 50 degrees Celsius but the cells inside the containers are kept within a smaller range, 10 to 30 degrees Celsius, through the enclosure's thermal management system that is sized to keep the cells within the recommended operating temperature range under normal conditions. Faults can lead to 'thermal runaway' triggering new chemical reactions through breakdown of the electrolyte, additional heat generation and ultimately the venting of gases including carbon monoxide, carbon dioxide and hydrogen.

Gas combustion occurs when the electrolyte vapours or combustible decomposition products come into contact with air and there is an ignition source, or the temperature reaches the autoignition point of 350-400°C (Recharge, 2013).

As these risks are well known, battery manufacturers incorporate protection systems. The battery management systems include monitoring of module temperature and voltage combined with well-designed controls designed to take system offline before critical conditions are reached. Since thermal runaway in one battery cell can initiate thermal runaway in adjacent cells battery manufacturers include features that prevent propagation of fire among modules and between adjacent battery units.

Fire causes

Battery overheating may be caused by a range of factors including electrical shorting, rapid discharge, overcharging, manufacturers defect, poor design and mechanical damage (Butler, 2013).Li-ion batteries do not produce any exhaust gases during normal operation, but they can produce flammable and toxic gases if there is a fault (WA Department of Commerce, 2017). The main failure modes for these battery systems are either latent (manufacturing defects, operational heating, etc.) or abusive (mechanical, electrical, or thermal) (Blum & Long, 2016).

A large majority of incidents involving Li-ion batteries have been due to failure to adhere to packing and transport requirements, use by non-professionals for innovative applications or use in non-controlled storage conditions (Recharge, 2013).

Risk and incident management

A large proportion of actions to mitigate battery fire impacts are part of the manufacturer's product design. These include:

- Enclosures which protect the system from weather and extreme heat, solar degradation, dust, and animals. These must be fit for the local conditions.
- Cooling systems able to handle the local conditions.
- Battery management systems to monitor for faults, automatically respond and alert staff.
- Fire suppression systems, if effective.

In addition to the manufacturer's mitigations the Proponent can take actions to reduce fire risk. These include BESS selection, location and spatial design. Specifically, the Proponent should:

- Select a BESS design which addresses those matters above.
- Strictly adhere to the manufacturer's requirements on installation and testing.
- Carefully handle the BESS during transport and installation to avoid mechanical damage.

- Provide adequate clearance between battery containers and/or install fire rated walls to avoid or delay fire spread.
- Provide adequate access/egress for installation, maintenance and fire response.
- Provide an Asset Protection Zone to reduce the risk of fire spreading to or from the BESS. In the case of a centralised (AC coupled) this should be a 10m radius around the installation of a vegetation free surface such as crushed gravel.
- Preparation of a specific Battery Fire Response Plan, under the general Fire Response Plan, in consultation with fire authorities, fire suppression experts, and in reference to relevant standards and guidelines.
- Facilitation (including funding) of first responder training in the management of LiB fires at the site for local brigades.
- Comply with relevant standards and guidelines.

Standards and guidelines

The installation of utility-scale Li-ion batteries has been identified as in need of relevant standards. In lieu of these, following manufacturer's recommendations and good design practice are vital. The following have been identified and possibly of assistance but mainly focused on small installations. Standards Australia has developed a new standard (AS/NZS 5139) for smaller scale battery installations. The Clean Energy Council provides requirements for accredited installers, the Australian Energy Storage Council has produced a Guide for Energy Storage Systems, and the WA Department of Commerce has released a guide for electrical contractors in relation to BESS systems (WA Department of Commerce, 2017).

9.7.5 Mitigation measures

It is unlikely that the Project would present a substantial bushfire and structural fire threat or represent an unacceptable hazard in the event of a bushfire affecting the Development site.

Bushfire risks during construction and decommissioning are considered to be low and would be managed through standard mitigation strategies. During operation of the Project, specific fire risks strategies would be adopted including:

- Adequate setbacks, access and firefighting facilities maintained onsite.
- Control of grass fuels including maintenance of groundcover beneath panels in addition to an area around the BSU and other ancillary infrastructure.
- Proper design and maintenance of equipment.
- Application of best practice and technical standards.

These underpin the commitments of the Project, a set out below.

No.	Mitigation measures	Phase
BF1	Copper conductors would be used where necessary to electrically bond the metal structures to earth to protect personnel and	Design

No.	Mitigation measures	Phase
	equipment in the event of lightning strikes and electrical faults.	
BF2	Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*.	Construction Operation Decommissio n
BF3	Develop a Bushfire Emergency Management and Operations Plan to include but not be limited to: • Specific management of activities with a risk of fire ignition (hot works, vehicle use, smoking, use of flammable materials, blasting). • Incorporation of fire safety and response in staff and contractor induction, training, OHS procedures and Work Method Statements. • Designation of a staff safety officer tasked with ensuring implementation of the plan and regular liaison with firefighting agencies including emergency access to site. • Document all firefighting resources maintained at the site with an inspection and maintenance schedule. • Monitoring and management of vegetation fuel loads. • A communications strategy incorporating use of mobile phones, radio use (type, channels and call-signs), Fire Danger Warning signs located at the entrance to the site compounds, emergency services agency contacts. In developing the Bushfire Emergency Management and Operations Plan, NSW RFS and Fire and Rescue NSW would be consulted on the volume of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, emergency access points, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures.	Construction Operation Decommissio n
BF4	An APZ buffer of minimum 10m would be maintained from the outside edge of the Project infrastructure. Additionally, where remnant or planted woody vegetation is present within the Development footprint, an APZ buffer of minimum 20m would be maintained between this vegetation and solar farm infrastructure. An APZ comprising of crushed gravel (20m in width) would be maintained between the substation and hazard vegetation Average grass height within the APZ buffer (adjacent solar array perimeter) would be maintained at or below 10 centimetres on average in the lead-up to and throughout the October - April fire season. APZs would meet the specifications of Appendix 4 of PBP.	Construction Operation Decommissio n

No.	Mitigation measures	Phase
	Land outside designated APZs, including beneath the solar array, would be maintained by intensive rotational grazing.	
BF5	The project would include a defendable space around the permitter of the solar array area that permits unobstructed vehicle access: • 20m around woody vegetation. • 10m around grassland.	Design Operation
BF6	The overhead powerlines to the TransGrid transmissions lines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the *ISSC 3 Guideline for Managing Vegetation Near Power Lines.*	Operation
BF7	Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart (fitted with suitable hosing, fittings and diesel fire-fighting pump) retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements. A 20,000-litre non-combustible water storage tank, with a 65mm Storz outlet with a ball valve fitted to the outlet, would be provided close to the entrance of the substation. A 100,000-litre tank close to the entrance of the solar array area and a second 100,000-litre tank within the solar array area would be provided, each with 20,000-litres reserved for firefighting purposes with a 65mm Storz outlet and ball valve fitted to the outlet	Construction Operation Decommissio n
BF8	The NSW RFS and Fire and Rescue NSW would be provided with a contact point for the solar farm, during construction and operation.	Construction Operation
BF9	Following commissioning of the solar farm, the local RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site.	Operation
BF10	All internal access tracks would comply with the requirements of property access roads in accordance with Table 5.3b of the PBP. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bushfire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead end tracks would be signposted and	Construction Operation Decommissio n

No.	Mitigation measures	Phase
	include provision for turning firefighting vehicles.	
BF11	A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas).	Construction Operation Decommission
BF12	Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days.	Construction Operation Decommission
BF13	Prior to operation of the solar farm, an Emergency Response Plan (ERP) would be prepared in consultation with NSW RFS and Fire and Rescue NSW. This plan must include but not be limited to: • Specifically addresses foreseeable on site and off site fire events and other emergency incidents. • Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment). • Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site. • Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s. • Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC).	Operation

BF14	Fire risk mitigation associated with the lithium-ion BESS would include:
	• Selecting a BESS unit with:
	  o Enclosures which protect the system from weather and extreme heat, solar degradation, dust, and animals. Of course these must be fit for the local conditions;
	  o Cooling systems able to handle the local conditions;
	  o Battery management systems to monitor for faults, automatically respond and alert staff;
	  o Fire suppression systems, if effective.
	• Appropriate fire risk reduction including
		Operation

No.	Mitigation measures	Phase
	○ Strictly adhere to the manufacturer's requirements on installation and testing; ○ Carefully handle the BESS during transport and installation to avoid mechanical damage; ○ Locating the BESS as far as practicable from any sensitive receptors or large stands of vegetation. ○ Provide adequate clearance between battery containers and/or install fire rated walls to avoid or delay fire spread;; ○ Provide adequate access/egress for installation, maintenance and fire response; ○ Provide an Asset Protection Zone to reduce the risk of fire spreading to or from the BESS. In the case of a centralised (AC coupled) this should be a 10m radius around the installation of a vegetation free surface such as crushed gravel. • Facilitation (including funding) of first responder training in the management of LiB fires at the site for local brigades. • Preparation of a BESS specific section within the Battery Fire Response Plan, under the Bushfire Emergency Management and Operations Plan, in consultation with fire authorities, fire suppression experts and in reference to relevant standards and guidelines.	
BF15	A Fire Safety Study (FSS) will be undertaken and developed in accordance with the requirements of Hazardous Industry Planning Advisory Paper No. 2 (HIPAP No.2) and consultation with FRNSW prior to commencement of construction. The FSS will consider the limited operational capacity of local fire agencies and the need for the facility to achieve an adequate level of on-site fire and life safety dependence.	Pre - Construction
BF16	Ensure the battery cooling systems are fully-tested when installed	Construction

9.8 Hazardous materials and development

The SEARs for the Project require that a Preliminary Hazard Assessment (PHA) be prepared for the BESS component in accordance with Hazard Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DPIE, 2011a).

The SEARs also required that an assessment of potential hazards and risks be undertaken, including but not limited to bushfires, 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.

The Resilience and Hazards SEPP also requires a PHA to be prepared for potentially hazardous or offensive development. Appendix 3 of the Applying SEPP 33 guidelines (DoP, 2011b) lists industries that may fall within the Resilience and Hazards SEPP; the guidelines do not include solar farms and energy storage facilities. Appendix 2 of the guidelines provides a risk screening procedure and a checklist to identify Hazardous and Offensive Development in instances where the applicability of the Resilience and Hazards SEPP is not immediately apparent. Information relevant to the risk screening and the checklist is provided below.

9.8.1 Potential impacts

Risk screening

The Resilience and Hazards SEPP screening procedure is based on the quantity of dangerous goods stored or transported, the frequency of transportation movements and, in some cases, the distance of the materials from the site boundary. The guidelines require goods to be classified according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The ADG Code lists 9 classes of dangerous goods:

- Class 1 Explosives.
- Class 2 Gases.
- Class 3 Flammable liquids.
- Class 4 Flammable solids.
- Class 5 Oxidising substances and organic peroxides.
- Class 6 Toxic and infectious substances.
- Class 7 Radioactive material.
- Class 8 Corrosive substances.
- Class 9 Miscellaneous dangerous substances and articles, including environmentally hazardous substances.

A development which exceeds screening thresholds in the guidelines would be considered potentially hazardous, and a PHA would need to be submitted with the development application. For quantities below the given thresholds, the Resilience and Hazards SEPP indicates that there is unlikely to be a significant off-site risk, in the absence of other risk factors.

The dangerous goods that would require transportation and storage during construction or operation of the proposed solar farm are identified in Table 9-20, with ADG Code classification, relevant quantity and transportation thresholds, and storage arrangements. In terms of the class, transportation and storage of dangerous goods, the Project would not exceed Resilience and Hazards SEPP thresholds and would not be considered potentially hazardous.

Table 9-20 Dangerous goods and Resilience and Hazards SEPP thresholds relevant to the Project

Hazardous material	Storage threshold	Transport threshold		Storage arrangements	Exceeds thresholds?
		Movements	Quantities		
Class 2.1 Flammable gases					
LPG	10 tonnes or 16m^3 (above ground)	>500 cumulative >30/week	2-5 tonnes	Up to 45kg cylinders beside control building, at least 20m from boundary.	No
Class 2.2 Non-flammable, non-toxic gases					
Inert fire suppression gas	NA	NA	NA	Compressed in steel bottles in BS	No
Class 3 – Flammable liquids (PGII)					
Fuel (petrol)	5 tonnes	>750 cumulative >45/week	3-5 tonnes	Secure operations storage building	No (1 tonne)
Class 9 Miscellaneous dangerous substances and articles					
Li-on batteries	NA	>1000 cumulative >60/week	No limit	Housed across the site in up to 85 customised containers, or clustered together adjacent to the substation	No (18 x 21.99m^3 containers (total 396m^3)

Class 2.2 Non-flammable, non-toxic gases

There is potential for inert gas to be stored in compressed form in the proposed Battery Storage for fire suppression. This would belong to Class 2.2 Non-flammable, non-toxic gases. Gases within this class/division are excluded from the Resilience and Hazards SEPP risk screening process and are not considered to be potentially hazardous with respect to off-site risk. These materials have a Workcover notification threshold of 10,000 litres.

The use of inert gases for fire suppression in enclosed spaces carries asphyxiation risks for staff, site visitors and emergency personnel. Gases commonly used are blends of argon, nitrogen and carbon dioxide. Inert gases are used to reduce oxygen content to below 15% to extinguish fires. Levels below 18% are hazardous for humans, and levels below 10% are extremely dangerous. The risk of accidental asphyxiation can be minimised by:

- Proper installation and operation.
- Regular equipment inspection maintenance.
- Provision of warning signs and information to staff.
- Staff and emergency responder training (including during maintenance and rescue/first aid).
- Fixed or personal oxygen monitoring equipment.
- Activation of an audible and visible internal and external alarm prior to gas release.
- Incorporation of an odour in the gas.
- Effective ventilation and air exchange.
- Safe and effective purging system.

Class 9 Miscellaneous dangerous substances and articles

Class 9 represents miscellaneous dangerous goods, which pose little threat to people or property, although they may pose an environmental hazard (DoP, 2011b). Lithium-ion batteries are Class 9 Hazardous Goods (both new and waste batteries). Class 9 goods are also excluded from the Resilience and Hazards SEPP risk screening process. The major hazard offered by lithium-ion battery technologies is fire, as a result of the flammability of the substances used in the battery (Recharge, 2013). Fire risks associated with lithium-ion batteries are discussed in Section 9.7. Class 9 materials have a Workcover notification threshold of 10,000 litres or kilograms.

Lithium-ion batteries are classified as hazardous waste under the *Commonwealth Hazardous Waste Act 1989* and are classified as Dangerous Goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The ADG Code requires dangerous goods to be carried in a secure, safe and environmentally controlled manner. The code specifies ‘special provisions’ and ‘packing instructions’ applying to the transportation of Li-ion batteries. The code listing also applies to waste Li-ion batteries. The National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998 (the NEPM), which sets the regulatory framework for transporting ‘controlled wastes’ between Australian states and territories, does not currently cover Li-ion batteries. Waste Li-ion batteries are not currently regulated as a hazardous waste by state governments and hence transport within the state is not required to be tracked in hazardous waste tracking systems (Randell Environmental Consulting, 2016).

Other risk factors

The Project would not involve the storage or transport of incompatible materials, generation of hazardous wastes, generation of dusts within confined areas, activities involving hazardous materials, incompatible, reactive or unstable materials and process conditions, storage or processing operations involving high (or extremely low) temperatures.

Battery Energy Storage System – lithium-ion batteries

A Preliminary Hazard Analysis (PHA) has been prepared for the Project and provided in Appendix N. The PHA has been prepared to address the SEARs and to be in accordance with the *Hazard Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis* (DoP, 2011) (HIPAP 6) and Multi-Level Risk Assessment (DPIE, 2011a). (MLRA).

The objective of the PHA is to develop a comprehensive understanding of the hazards and risks associated with the operation of the BESS for the Blind Creek SF and the adequacy of safeguards. The PHA assessed both options for the BESS, DC-coupled distributed batteries and AC-coupled Energy Storage Facility with the use of lithium-ion batteries.

Methodology

The methodology undertaken to prepare the PHA included:

- Identification of the nature and scale of all hazards at the Project, and the selection of representative incident scenarios.
- Analysis of the consequences of these incidents on people, property, and the biophysical environment.
- Evaluation of the likelihood of such events occurring and the adequacy of safeguards.
- Calculation of the resulting risk levels of the facility.
- Comparison of these risk levels with established risk criteria and identification of opportunities for risk reduction.

A schematic of the hazard analysis process is included below in Figure 9-22.

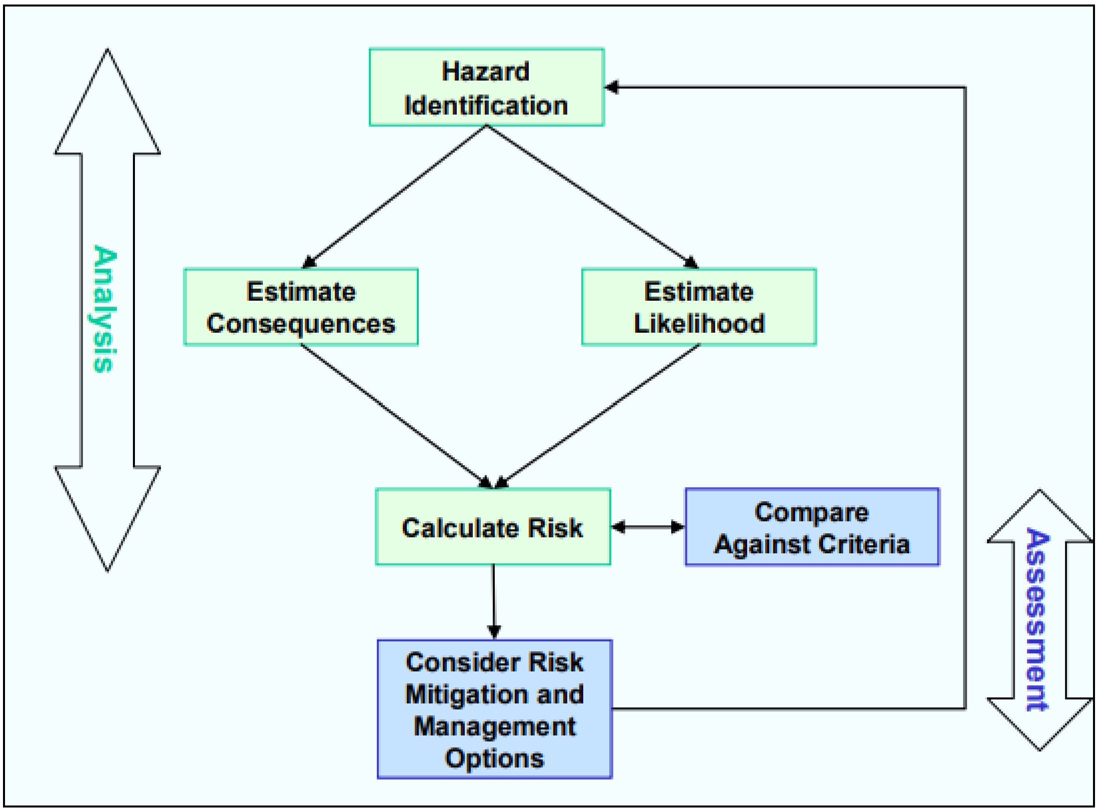


Figure 9-22 Basic methodology for hazard analysis (Source: HIPAP 6, (DoP, 2011b))

Risk assessment

For each identified hazard and associated event, the resulting consequences and likelihood pair was determined from a hazard register. The consequence and likelihood of the identified events are presented in Table 9-21.

Table 9-21 Risk assessment

Hazard	Event	Consequence (Impact to People)	Likelihood	Risk
Electrical	Exposure to voltage	Major	Very Unlikely	Medium
Arc flash	Arc flash	Major	Very Unlikely	Medium
EMF	Exposure to EMF	Insignificant	Extremely Unlikely	Low
Fire	Bushfire	Major	Very Unlikely	Medium
Reaction	Thermal runaway in battery	Major	Unlikely	High

Hazard	Event	Consequence (Impact to People)	Likelihood	Risk
Chemical	Release of electrolyte from the battery cell (liquid/vented gas) resulting in fire and/or explosion	Major	Very Unlikely	Medium
	Battery coolant leak	Minor	Very Unlikely	Low
	Refrigerant leak	Minor	Very Unlikely	Low
External factors	Water ingress resulting in fire	Major	Extremely Unlikely	Medium
	Vandalism due to unauthorised personnel access	Moderate	Unlikely	Medium

A total of 10 risk events were identified. The breakdown of these events according to their risk ratings are as follows:

- 1 high risk event
- 6 medium risk events
- 3 low risk events.

Based on the risk acceptance criteria used for the study, the risk profile for the project is considered to be tolerable if adequate precautions are implemented to meet the So Far As Is Reasonably Practicable (SFARP) test.

A recent example of the high risk event identified in the risk assessment – battery thermal runaway – occurred in a battery facility being constructed in Victoria. It is understood that the fire was contained to the site. The details of this incident were not available at the time of writing and have not been considered in the assessment. When more information becomes available, any findings and recommendations arising from investigations into the fire will be considered for relevance and implementation in the Blind Creek project. This assessment has identified proposed controls to reduce the likelihood of thermal runaway, and control and mitigate the effects of any fires caused by thermal runaway.

The majority of the medium risk events relate to fire events resulting from a variety of causes (e.g. release of flammable materials, battery thermal runaway, infrastructure fire, bushfire, etc). The study identified proposed prevention controls to reduce the likelihood of these fire events and mitigation controls to contain the fires to minimise potential for escalated events (e.g. fire management plan, APZs, vegetation management etc.). Based on the identified controls, the highest likelihood for these events were rated as very unlikely (i.e. heard If in the industry, but not expected to occur).

Based on the size of the Development footprint, proposed location for project infrastructure within the Development site, proposed controls and distance to neighbouring land uses (including neighbouring properties and agricultural operations), the exposure to fire events will primarily be to the Project's construction and operations workforce. Offsite impacts would be expected to be minimal.

The risk assessment concluded that there is very low potential for offsite fatality or injury. Therefore, the project meets the land use planning criteria. Risk events identified are onsite impacts and assessed against *Work Health and Safety* (WHS) *Act* requirements to reduce risk to SFARP. Risks were assessed by the Project as tolerable if SFARP.

In regard to risks between the two proposed options for BESS including DC coupled distributed batteries and AC-coupled facility, both options use similar equipment therefore resulting in similar risk. The key difference is their location within the Development site, DC includes smaller batteries distributed across the site, while the AC includes all the batteries at one location.

In the event of a battery fire, it is likely that the DC option may have a higher likelihood and a lower consequence. Whereas the AC option may have a lower likelihood and a higher consequence. The overall risk of battery fire is expected to be similar for both options.

Potentially offensive industry

The Project would result in vehicle and machinery exhaust emissions during the construction phase, as in any construction project. The emissions occur outside, in a rural locality, and would be readily dispersed. The emissions would not be considered hazardous within the context of the Resilience and Hazards SEPP. Noise impacts would also largely be confined to standard working hours during the construction phase and would not be hazardous to employees or neighbouring residents. Noise impacts have been assessed in Section 8.6. Water pollution risks are assessed as low, subject to identified mitigation measures, with longer term benefits following cessation of cultivation and maintenance of groundcover across the site.

9.8.2 Mitigation measures

No.	Mitigation measures	Phase
PHA1	Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids* and the ADG code where relevant.	Construction Operation Decommissionin g
PHA2	Protocols would be developed for lithium-ion battery storage, maintenance, and incident response to mitigate Li-ion fire risks.	Construction Operation Decommissionin g
PHA3	The transportation of new and waste lithium-ion batteries would comply with the requirements of the Dangerous Goods Code,	Construction Operation

No.	Mitigation measures	Phase
	including specific ‘special provisions’ and ‘packing instructions’ applying to the transportation of Li-ion batteries.	Decommissioning
PHA4	Preparation of a specific Battery Fire Response Plan, under the general Fire Response Plan, in consultation with fire authorities, fire suppression experts, and in reference to relevant standards and guidelines	Construction Operation Decommissioning
PHA5	The results of this PHA should be used as inputs into other safety studies required including: • Fire Response Plan • Evacuation Plan • Spill and Contamination Response Plan	Construction Operation Decommissioning

9.9 Electric and magnetic fields

9.9.1 Existing environment

Electromagnetic fields (EMFs) consist of electric and magnetic fields and are produced whenever electricity is used. EMFs also occur naturally in the environment, such as the Earth's magnetic field and discharges during thunderstorms (World Health Organisation, 2016).

Electric fields are produced by voltage and magnetic fields are produced by current. When electricity flows, EMFs exist close to the wires that carry electricity and close to operating electrical devices and appliances (World Health Organisation, 2007). Electric and magnetic field strength reduces rapidly with distance from the source, and while electric fields are insulated by air and insulation material, magnetic fields can be reduced through shielding, specific transmission line construction and other techniques.

Fields of different frequencies interact with the body in different ways. EMF field sources to which people may be exposed are predominantly in three frequency ranges. The Extremely Low Frequency (ELF) range of 0-300 Hz incorporates the 50 and 60 Hz frequencies of the electric power supply and of electric and magnetic fields generated by Transmission Lines and other electrical devices and infrastructure (Repacholi, 2003).

Over decades of EMF research, no major public health risks have emerged, but uncertainties remain (WHO, 2021). While it is accepted that short-term exposure to very high levels of electromagnetic fields can be harmful to health, the International EMF Project, established by the World Health Organisation, has thus far concluded that there are no substantive health consequences from exposure to ELF *electric* fields at the low levels generally encountered by the public (World Health Organisation, 2007), such as those that would be produced by electricity generation at the proposed solar farm and along the Transmission Line.

While exposure to ELF magnetic fields is not demonstrated to be harmful, a policy of prudent avoidance has been taken to account for any uncertainty. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) advises that '*the scientific evidence does not establish that exposure to ELF EMF found near Transmission Lines is a hazard to human health', and that 'current science would suggest that if any risk exists, it is small'*.

Australia does not currently have a standard regulating exposure to ELF electric or magnetic fields. The International Commission on Non-Ionizing Radiation Protection (ICNPR) published *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz)* in 1998. The guidelines were updated in 2010. The objective of the paper was to establish guidelines for limiting EMF exposure that would provide protection against known adverse health effects.

To prevent health-relevant interactions with Low Frequency fields, ICNIRP recommends limiting exposure to these fields so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects inside the body is never reached. The exposure limits, called basic restrictions, are related to the threshold showing adverse effects, with an additional reduction factor to consider scientific uncertainties pertaining to the determination of the threshold. They are expressed in terms of the induced internal electric field strength in V/m. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions would also be met (in the body) (ICNIRP, 2010). Reference levels for occupational and general public exposure are shown in Table 9-22.

Table 9-22 ICNIRP reference levels at 50Hz (ICNIRP, 2010).

Exposure characteristics	Electric field strength (kVolts–per metre - kV/m)	Magnetic flux density (microteslas - µT)
Occupational	10	1000
General public	5	200

EMF Sources and Levels

Potential for EMF impacts occurs only during the operational phase of the solar farm when electrical infrastructure is capable of generating EMFs. In relation to potential occupational exposure for solar farm personnel, the electromagnetic fields would vary in different locations at the site. The Project includes the following components that could generate EMFs:

- Underground cables, expected to be approximately 33kV.
- 330kV overhead transmission lines (existing).
- 330kV onsite substation (3).
- Energy storage facility with a nominal capacity of 300MW/600MWh.

Typical and maximum EMF levels for these types of infrastructure are discussed below. Strength attenuates with distance from the infrastructure and electric field levels for underground infrastructure are lessened by the shielding that the fill provides (approximate depth of 600–900mm).

Research into electric and magnetic fields undertaken at utility scale solar farm installations indicates that magnetic fields are significantly lower for PV panels than for household appliances. The PV system components which exhibit significant AC magnetic fields are transformers and power conditioning units. However, the AC magnetic fields associated with these components are localized and are not detected at PV system perimeters (Safigianni & Tsimtsios, 2014).

9.9.2 Potential impacts

Construction and decommissioning

There is low potential for EMF impacts during the construction and decommissioning phases of the project. The maximum magnetic field of the proposed transmission line is well under the 200µT and 1000µT limits respectively recommended for public and occupational exposure.

Staff would be exposed to EMFs over intermittent periods during works at and around the existing 330kV overhead transmission line (TL). Exposure to EMFs during the construction of the substation and its connection to the existing TL would be short term, therefore the effects are likely to be negligible.

The construction site would be fenced to protect the public from construction health and safety risks.

Operation

The assessment focuses on the potential for health impacts. The EMFs emitted by the solar farm would not be likely to interfere with local mobile phone, radio or television reception. These devices operate at a much higher frequency than the AC electrical equipment that would be used at the solar farm, and any EMFs produced would dissipate rapidly with distance from the source.

During operation, EMF sources would include overhead transmission lines, underground cabling, and battery storage and the substations. Electric fields can be reduced with distance from operating electrical equipment and by shielding, while magnetic fields are reduced more effectively with distance. Through prudent design and siting of this infrastructure, the exposure to EMFs can be minimised and potential for adverse health impacts minimised.

Overhead Transmission Lines

Figure 9-23 Figure 9-23graphs the typical electric fields emitted from different voltage overhead TLs. The Subject land has existing 66kv and 330kV transmission lines. The Project would make use of the existing 330kV transmission line that traverses the site. The onsite substation would connect the solar array via a mainly underground cable of approximately 33kVe. Within the array the medium voltage underground cables would mostly be installed next to and parallel with the internal access tracks. The existing and proposed overhead TLs are less than the recommended 5kV/m and 10kV/m limits.

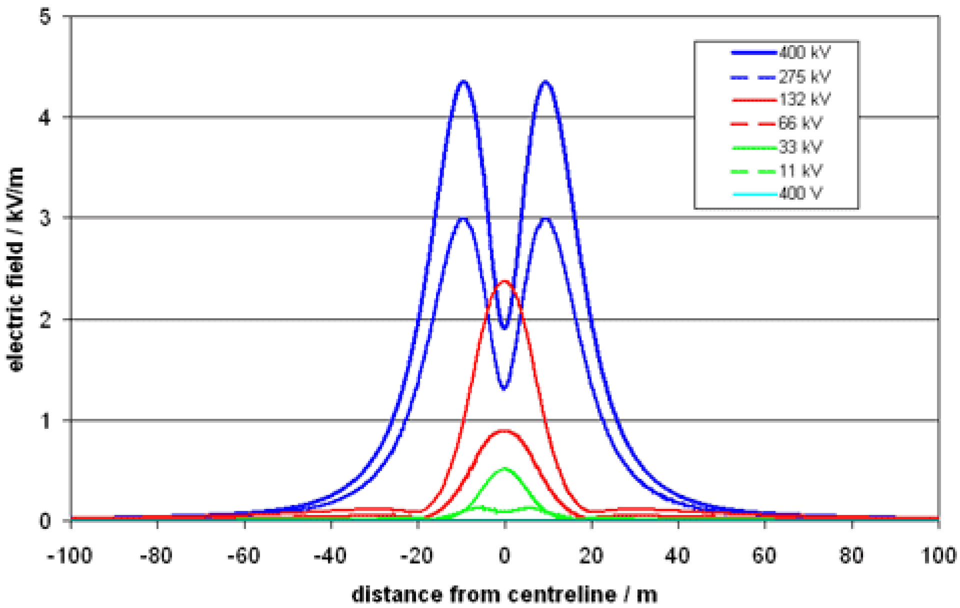


Figure 9-23 Typical electric fields from overhead transmission lines (EMFs.info 2017)

Figure 9-24 and Table 9-23 show a range of magnetic field levels measured by the ARPANSA around Transmission Line and substations. The existing TL are less than the recommended 200 μT and 1000 μT limits, even if directly underneath the TL.

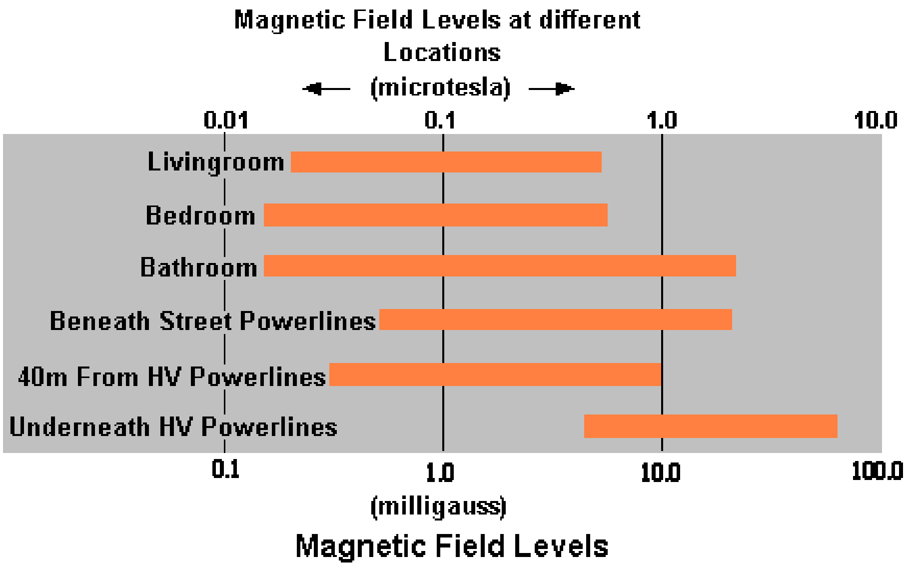


Figure 9-24 Magnetic field levels at different locations (ARPANSA 2015)

Table 9-23 Typical magnetic fields near overhead powerlines and substations

Source	Location of measurement	Range of measurement	
		(mG)	(μT)[7]
Transmission Line	Directly underneath	10 - 200	1 - 20
Transmission Line	At edge of easement	2 - 50	0.2 - 5
Substation	At substation fence	1 - 8	0.1 - 0.8
Distribution Line	Directly underneath	2 - 30	0.2 - 3
Distribution Line	10m away	0.5 - 10	0.05 - 1

Underground Cabling

External electric fields from underground cables are shielded by the soil. EMFs.info (2016) provides typical magnetic field data for a single 33kV underground cable at a 0.5m depth. Magnetic fields for this cabling would be under the recommended limits of 200μT and 1000μT.

[7] Converted from mG where 1 mG = 0.1 μT.

Table 9-24 Magnetic field levels from underground 33kV cabling

Distance from 33kV centreline (metres)	Magnetic Field (μT)
0	1.00
5	0.29
10	0.15
20	0.07

The Project would require the installation of internal reticulated cabling at approximately 33kV. Cables used in the on-site reticulation cabling would typically contain 3 core conductors in trefoil (3 lobed) arrangements to reduce the effects of magnetic fields from adjacent conductors. The underground cabling would not produce external electric fields due to shielding from soil, and its magnetic fields are expected to be well within the public and occupational exposure levels recommended by ARPANSA and ICNIRP. During detailed design and construction, the electric and magnetic fields produced by the cable would be maintained at much lower levels than the ICNIRP reference levels for the general public.

Power Conversion Units

Based on current design, up to 85 PCUs, would be installed across the site. The inverters would typically have an AC power frequency range between 47 and 63 Hz and fall into the Extremely Low Frequency (ELF) range of 0-300 Hz. Within this range, EMFs are not considered to be hazardous to human health. In addition, the PCUs would be located within the fenced solar farm site with no public access and would be producing power only during the daytime reducing the total time that EMFs are generated by the infrastructure. Although farming operations will continue within the solar field the range of EMF is low and the distance between the internal access track and the PCUs would be approximately 3-5m, as such the magnetic field beyond this distance would be negligible.

Substation

For substations and transformers, the magnetic fields at distances of 5 – 10m are generally indistinguishable from typical background levels in a home. Public access would be restricted by fencing around substations. As such, the fenced exclusion area around the substation components is sufficient to reduce EMF to negligible levels.

Solar arrays

The solar farm would require installation of DC wiring between panels and the PCUs. This cabling may be above ground or underground and would typically conduct less than 320A and 1500V. The potential for electromagnetic interference as a result of the aboveground and underground cable is considered negligible.

Battery Storage

Lithium-ion batteries are not associated with high levels of EMF and the EMF produced by the proposed BESS would be well below ICNIRP reference levels. Public access would be restricted by fencing around the BESS. As such, the fenced exclusion area around the BESS is sufficient to reduce EMF to negligible levels.

9.9.3 Mitigation measures

No.	Mitigation measures	Phase
E1	All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.	Preconstruction Construction
E2	All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required and would aim to minimise EMFs.	Preconstruction Construction

9.10 Air quality and climate

The impacts of poor air quality can adversely affect plant growth, degrade ecosystems, represent human health risks, and contribute to GHG emissions and anthropogenic climate change.

Air quality impacts would arise during the ground-preparation activities, construction activities and to a lesser degree, throughout the lifetime operation of the proposed solar farm. The duration, frequency and severity of these impacts and their significance would vary in accordance with the phases of the Project. In Australia's rural agricultural landscape, dust and dirt are a major influence on air quality.

This section describes the existing air quality conditions in the locality and the potential impacts that may occur as a result of the construction and operation of the proposed solar farm. Measures that would be implemented to mitigate these impacts are also identified.

9.10.1 Existing environment

Air quality

Air quality for the locality is generally expected to be good and typical of that found in rural settings in NSW. Existing sources of air pollution include vehicle emissions (particularly along major roads such as the Kings Highway during high-use periods), dust from agricultural activities during dry periods. During colder months, there may be a localised increase in air contaminants due to temperature inversions in valleys trapping smoke from the solid fuel heating.

A search of DPE's air quality data services for the last year was undertaken to determine the likely air quality at the site. The monitoring station at Goulburn was selected as it was closest to the Development site. The rating of the readings is presented in Table 9-25, with the measurements presented in Table 9-26.

Table 9-25 Air pollutant classification ratings (DPIE, 2020)

Pollutant	Averaging Period	Good	Fair	Poor	Very Poor	Extremely Poor
Nitrogen Dioxide NO_2	1 hour	<8	8-12	12-18	18-24	>24
Ozone 1hr average	1 hour	<6.7	6.7-10.0	10.0-15.0	15.0-20.0	>20.0
Ozone 4hr average	4 hour	<5.4	5.4-8.0	8.0-12.0	12.0-16.0	>16.0
Particles PM_{10}	1 hour	<50	50-100	100-200	200-600	>600
Particles $PM_{2.5}$	1 hour	<25	25-50	50-100	100-300	>300
Visibility NEPH	1 hour	<1.5	1.5-3.0	3.0-6.0	6.0-18.0	>18.0

Table 9-26 Pollutant measurements at Goulburn station for July 2020 to June 2021

Pollutants	Nitrogen Dioxide NO_2	Ozone 1hr average	Ozone 4hr average	Particles PM_{10}	Particles $PM_{2.5}$	Visibility NEPH
Measurement	pphm	pphm	pphm	µg/m³	µg/m³	bsp
July 2020	0.6	1.8	1.9	10.8	8.1	0.37
August 2020	0.4	2.3	2.3	8.9	6.6	0.26
September 2020	0.3	2.3	2.3	10.5	5.9	0.21
October 2020	0.2	2.6	2.6	8.2	4.2	0.13
November 2020	0.3	2.5	2.5	12.3	5.2	0.14
December 2020	0.2	2.2	2.2	8.7	3.5	0.10
January 2021	0.2	2.2	2.2	8.5	4.0	0.12

Pollutants	Nitrogen Dioxide NO2	Ozone 1hr average	Ozone 4hr average	Particles PM10	Particles PM2.5	Visibility NEPH
February 2021	0.2	1.9	1.9	8.6	3.9	0.15
March 2021	0.3	1.9	1.9	7.8	3.5	0.14
April 2021	0.4	1.6	1.6	13.8	9.3	0.37
May 2021	0.5	1.5	1.5	10.5	8.0	-
June 2021	0.5	1.7	1.7	9.3	7.4	0.31

All readings fell into the 'good category' and given the rural setting of the Development site it is likely that pollutant levels at the site would be less than those recorded at the Goulburn station.

Adjacent to the Development site are Paragalli Sands quarry, Bungendore Sands Quarry and the Holcim quarry; refer Figure 8-12. Quarrying and transporting sands generates dust in the local airshed and along the transport route of unsealed roads.

Climate

A search of the Bureau of Meteorology's climate data (Bureau of Meteorology, 2021) for rainfall at station 070011 (Bungendore Post Office) for 2019 revealed the area had an annual rainfall of 332.1mm for 2019. In 2019 rainfall was not consistently heavy during certain seasons, however over the years 2010–2019 the highest risk periods of heavy rain and localised flooding is November to March. The average rainfall for the period 2010 to 2019 was 637mm (with 2011 excluded due to lack of data).

The nearest station reading temperature was 070351 (Canberra Airport) recording a mean maximum temperature in the area which varied from 12.8^{0}C to 31.7^{0}C in 2020 and a recorded mean minimum temperature which varied from 1.2^{0}C to 15.2^{0}C in 2020.

Winds speeds are greatest during spring and summer. The strongest winds (>25km/hr) are generally north-westerly.

Sensitive receivers

In accordance with international best practice, the assessment of sensitive receivers should extend to 500m from the Development site for both human and ecological receivers (Holman et al, 2014), due to the typical distance of dust dispersion. The assessment of other pollutants (e.g. gaseous exhaust fumes) would require a smaller area of assessment (~200 m) before emissions are indistinguishable from background concentrations (Bignal, Ashmore, & Power, 2004). Refer to Figure 1-3 for the locations of sensitive receivers.

Settlement within proximity of the Development site is considered sparse, particularly on the north-western side of Tarago Road. A small cluster of residential properties are present 2.6km on the south-eastern side of Tarago Road as shown on aerial imagery. The closest non-associated receiver (R40) is approximately 1.4km south-west of the Development site, with a total of six sensitive receivers within 2km of the Development footprint. Topography of the Development site is consistent with an undulating plain. The two adjacent quarries affect the airshed of the Development site. The closest non-point sources include herbicides and fertilizers from adjacent agricultural land, and vehicles along Tarago Road.

The Holcim owned Bungendore quarry is the closest listed facility on the National Pollutant Inventory (NPI). A monitoring report from 2019/2020 indicated fugitive air emissions was 130,000kg for PM_{10} and 2,100kg for $PM_{2.5}$ (NPI, 2021).

Criteria

The POEO Act requires that no vehicle shall have continuous smoky emissions for more than ten seconds. Limits on dust emission of less than $4mg/m/m^2$ are also specified.

The National Environment Protection Measure for Ambient Air Quality (Air NEPM) sets standards for the 7 key air pollutants to which most Australians are exposed: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (PM_{10} and $PM_{2.5}$) and sulfur dioxide.

The standard for 1-year average PM_{10} is $25\mu g/m^3$ and $PM_{2.5}$ is $8\mu g/m^3$ (Australia State of the Environment, 2021).

Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of GHG in the atmosphere. Climate change projections for Australia includes more frequent and hotter hot days and fewer frost days, rainfall declines in southern Australia and more extreme weather events including intense rainfall, severe drought and harsher fires (CSIRO, 2015). 2019 was both the warmest and driest year on record for Australia since consistent national temperature records began in 1910, the previous record being in 2013 (Bureau of Meteorology, 2020). Additionally, heading into the 2019–20 bushfire season, much of Australia had experienced the worst drought on record (Bureau of Meteorology, 2020).

At the global level, temperature averages over the five years from 2015, to 2019 has been confirmed as the highest ever on record for any five-year period. The annual mean air temperature in Australia is projected to increase by 2.6-4.8°C by 2090 (above the 1986-2005 period) (CSIRO, 2015).

July 2021 was the fourth-warmest July on record for Australia, with the national mean temperature 1.77 °C warmer than the 1961–1990 average for Australia as a whole (Bureau of Meteorology, 2020). The minimum mean temperature for towns within the Southern Tablelands was generally higher than average (Bureau of Meteorology, 2021).

Rainfall for Australia in July 2021 was 3% below average, however south-east Australia was above average (Bureau of Meteorology, 2020). NSW in July 2021 saw rainfall 9% above the 1961–1990 average at 41.1mm, comparable to 2016 and 2020 (Bureau of Meteorology, 2021). Rainfall patterns were consistent with the developing negative Indian Ocean dipole event, which in winter typically enhances the flow of moist air from the tropics to inland areas of eastern Australia (Bureau of Meteorology, 2021).

The NSW Rural Fire Service (RFS) Annual Report for 2019 to 2020 (NSW Rural Fire Service, 2020) reported that from July 2019 to June 2020, there were 13,105 bush and grass fires across the state. Over 5.5 million ha were burnt in NSW, this equates to nearly 7% of the state. At the time of reporting, 2019 was reported as the hottest and driest year on record for Australia, with approximately 98% of NSW affected by drought. Extreme heat and drought conditions, combined with low humidity and high winds increase the fire danger index.

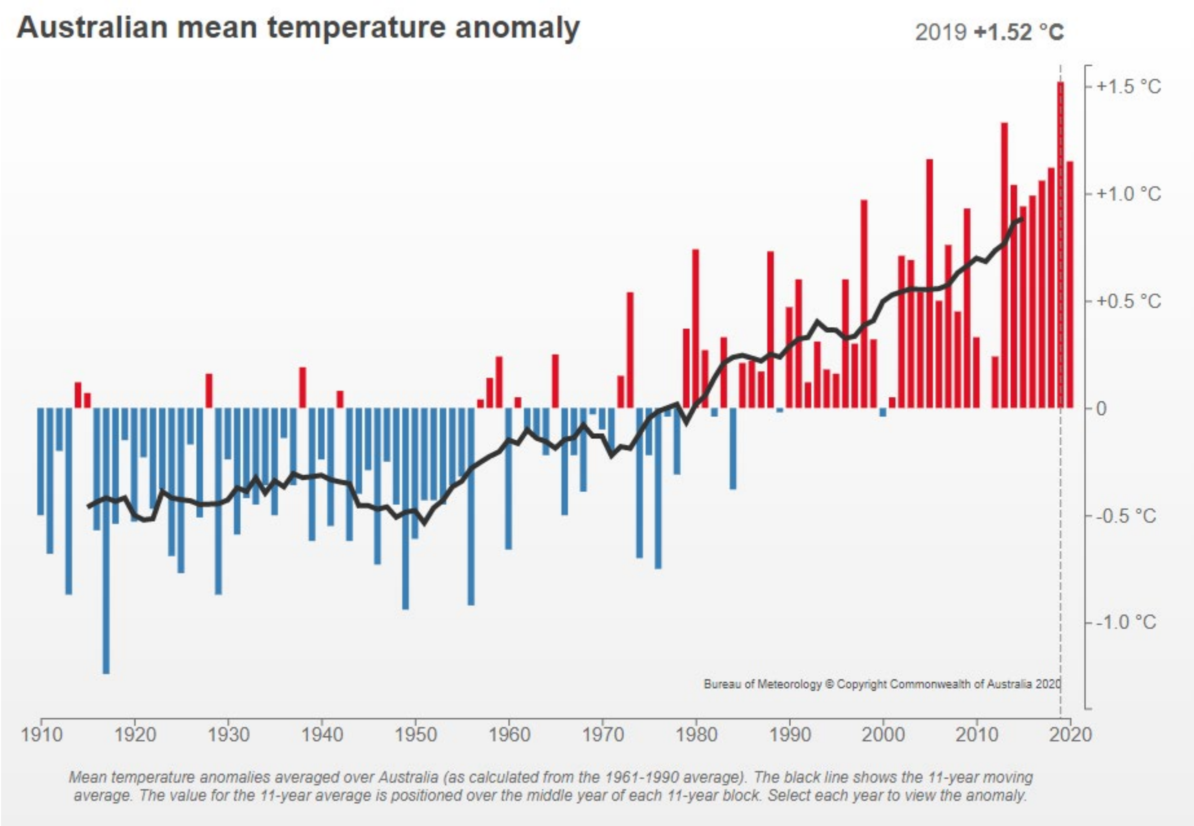


Figure 9-25 Australian mean temperature anomaly, (Bureau of Meteorology, 2021)

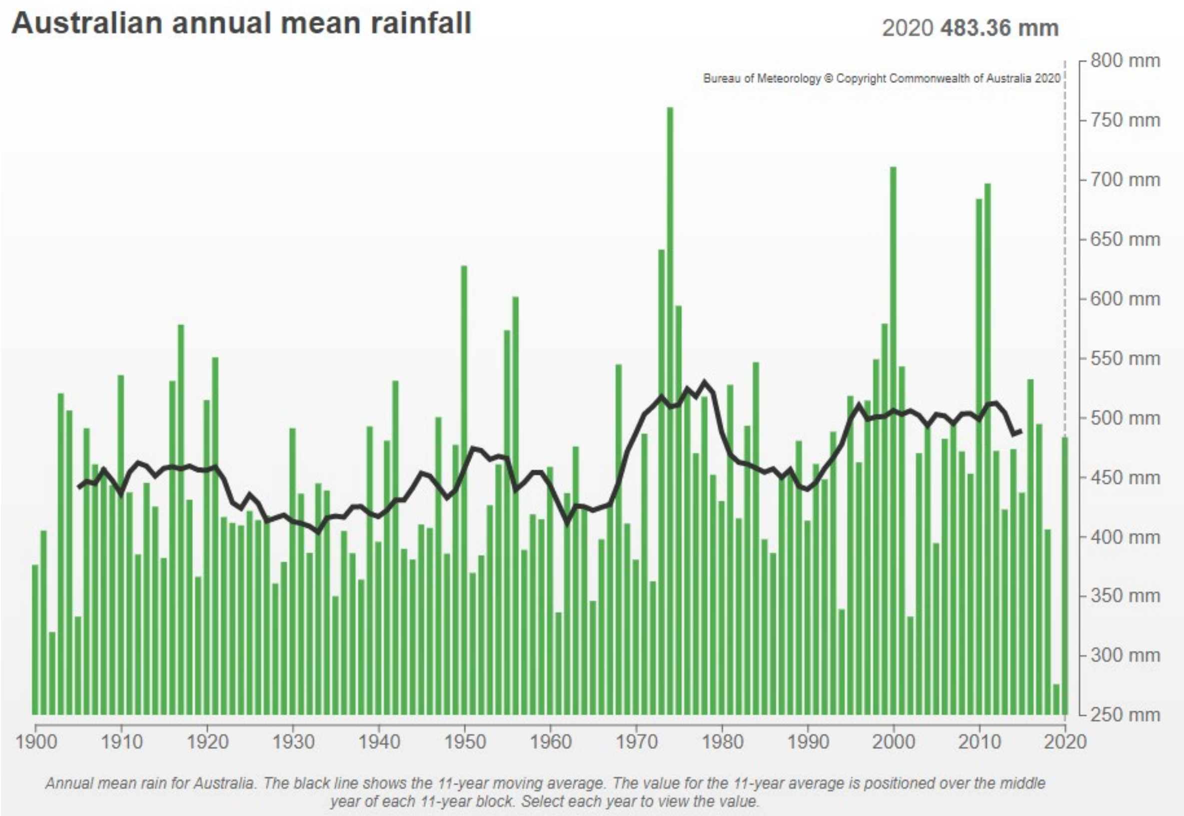


Figure 9-26 Australian annual mean rainfall (Bureau of Meteorology, 2021)

Rural and regional communities are disproportionately affected by the impacts of climate change, through worsening extreme weather events and impacts to capacity, productivity and resilience in some rural industries (Climate Council, 2016). The NSW government provided a $1Billion Emergency Drought Relief Package to drought-stricken farmers in the year 2018. A significant proportion of Australian exports are agricultural products that are sensitive to global warming impacts (Australian Greenhouse Office, 2002). Some incremental adaptations in agricultural enterprises would be straightforward, but the more transformational adaptive changes may be risky and expensive, especially for individual farmers (Climate Council, 2016).

It is now generally accepted that the release of certain gases including, most notably carbon dioxide, contribute to global climate change. These gases are collectively referred to as 'greenhouse gasses'. Construction and maintenance activities where plant and equipment use diesel, gasoline and other hydrocarbons, result in greenhouse gas emissions and are likely to contribute to climate change. The construction, operation and decommission of the proposed solar farm assessed in this EIS would produce minimal CO_2 emissions. This is compared to conventional coal and gas fired powered stations outlined in Table 9-27.

Table 9-27 Comparison of CO2 equivalent emissions produced per kilowatt hour

Generation method	Emissions produced (grams CO2 equivalent per kWh)	Source
Solar farm	19-59	(Wright and Hearps, 2010)
Coal-fired power station	800-1000	(Wright and Hearps, 2010)
Combined cycle gas turbine	400	(Alsema et al., 2006)

Assuming an average household consumption of 5,920kWh pa, the Blind Creek SF Project would provide electricity to approximately 124,155 homes through the generation up to 735,000MWh per year. If this displaces NEM-average emissions intensity of 820kg, then the project will abate approximately 600,000 tonnes of C02-e emissions annually.

9.10.2 Potential impacts

Construction and decommissioning

The assessment of the construction impacts on air quality has been undertaken qualitatively considering the likely construction equipment, processes and materials expected for the Project.

The principal sources of dust and emissions of the Project during construction would be:

- Excavation and earthwork, such as ground-breaking, levelling (cutting and filling), preparation of pipe and cable trenches, etc.
- Vehicle movement over unpaved surfaces.
- Movement of vehicles to and from the site (e.g. for deliveries).
- Dust from uncovered stockpiled powdery materials or truckloads.
- Emissions (e.g., NO2, CO) and particulates from vehicles, diesel generators, heavy plant and other mechanical equipment; and
- Stored VOCs and other volatile hazardous materials.

During construction, the ambient air quality at the Project may potentially be affected by increased dust, particularly during the earthworks phase and by gaseous exhaust fumes from construction activities, equipment, and additional vehicle movements to and from the site. These impacts are anticipated to be minor and able to be managed with appropriate mitigation measures.

In compliance with the NSW *Protection of the Environment Operations Act 1997* (POEO Act) and the Protection of the Environment Operations (Clean Air) Regulation 2002, the Project is not anticipated to result in the release of offensive odours.

Vehicle Emissions

The Development site is located within a rural zone with sparsely distributed residences usually located some distance from roads. The construction phase is expected to last 12 –

18 months with a peak period lasting approximately 6-9 months. During this time, emissions would be generated from earth-moving equipment, diesel generators, trucks, cranes, pile driving equipment and hand-held equipment.

Vehicles accessing the site would include the labour force (approximately 300 construction personnel during the peak period), shuttle buses transporting workers and haulage traffic delivering construction components (detailed further in Section 9.1). The major haulage route to the Development site is the Kings Highway. The access to the site would be from Tarago Road a Council managed roadway onto a private road via the Blind Creek entrance (refer to Section 9.1).

Construction vehicle emissions would impact local air quality, local residents, crops, pastures, surface water bodies and road users along these roads. Site workers would also be impacted by localised vehicle emissions at the Development site.

Air quality impacts relating to the use of the above are generally small. Equally, the equipment used on site should be well maintained, as such the significance of impacts is assessed to be minor.

Where there are multiple vehicles or equipment in use, the potential for cumulative impacts from the combination of these emissions would however increase to moderate negative impacts.

Dust Due to Site Preparation and Road Upgrades

During construction, dust is likely to be generated from the following:

- Excavation activities.
- Intersection upgrades, road widening, and other earthworks.
- Movement of trucks and vehicles along the Blind Creek Road (unsealed) and the internal access tracks which would be unsealed in the construction phase.
- Earthworks associated with construction would be relatively minor and mostly involve levelling the ground to upgrade/widen existing roads, construct the access road and laydown areas, and trenching work for cable installation. Posts for the module frames would either be pile driven or screwed which would generate little dust. The impact area for the piles would be less than 1% of the Development footprint' s area.
- Traffic using the unsealed road and internal tracks during the decommissioning phase would also have the potential to generate dust impacts.

Factors such as the meteorology and particle mass would influence the dispersion of dust, and the significance of dust impacts from construction works would be largely based on the direction of the wind and proximity to sensitive receivers.

Dust resulting from construction activities typically comprises large diameter particles, which settle rapidly and close to the generation source, e.g., within 500m under low/calm conditions. Studies by the US EPA (United States Environmental Protection Agency, 1995) show that particles larger than 100μm would likely settle out within 6 to 9m from the point of emission at wind speeds of 16km/h. The closest associated receiver is 250m away, whilst the remaining receivers are between 586m and 1971m from the Development footprint. Consequently, far field dust impacts from construction works are not considered significant.

The prevailing wind direction in the Project's area may vary between seasons and could therefore disperse dust in almost any direction. Existing vegetation screening at several of the sensitive receivers' act as a barrier between the work areas and receivers, trapping dust and reducing potential for dust to affect the receivers. As such, substantive air quality impacts are not anticipated.

Dust risks would be mitigated by wetting roads, tracks and worked surfaces as required. Work carried out during long periods of dry weather and high winds have a greater potential to generate dust which can impact air quality. Construction work during the summer months may require greater dust suppression measures to manage any increased impacts.

Dust due to Movement of Trucks and Material Transportation

Except for vehicle movements on unpaved surfaces, dust due to the movement of trucks and material transportation should only occur where mitigation measures are not effectively implemented at the site or in the access road being used by the construction vehicles.

Uncontained and/or un-sheeted trucks may lose material where the containment is not effective (i.e. spills), or where wind or other air turbulence may disturb the contents and result in dispersion of material. Such impacts have the potential to degrade local air quality in the immediate area of such movements if particles become suspended.

GHG emissions would be generated during construction. These emissions would contribute to climate change at a global level but are offset many times over by the benefits of carbon reduction delivered from the electricity produced by the Project over its operational life. Construction related emissions would not impact directly or materially on the local climate.

Mitigation strategies also include a formal community consultation and engagement system, and complaints mechanisms, whereby the sources of complaints are promptly identified and addressed, and appropriate application of a suite of dust and emission reduction measures. Subject to mitigation measures, any dust or other air quality impacts are likely to be minor, temporary and highly localised.

Dust generating activities from the adjacent quarries can cause health problems particularly for those with respiratory problems and can have physical impacts on vegetation such as blocking and damaging their internal structure (Sustainable Build, 2008). These impacts would need to be considered when assessing the cumulative effects of dust generation from the Project.

No air quality impacts in addition to those mentioned for construction are anticipated during the decommissioning phase. Impacts during decommissioning would be less in extent and traffic requirements would be similar in type but of shorter duration than that required for the construction phase.

Due to the existing surrounding agricultural activities and the minimal impacts on air quality including the operation of the adjacent quarries during construction and decommissioning, the cumulative impact is expected to be low with the implementation of mitigation measures.

Operation

Unlike fossil fuel power generation, solar farms are by nature zero emission facilities since they use renewable and clean sources to generate power.

Emissions of pollutants including sulfur dioxide, nitrogen oxides, carbon monoxide and carbon dioxide are indirectly related to the operational and maintenance process of the solar farm and would result in some localised, intermittent negative impacts to air quality. Some generation of dust from vehicles travelling on the unsealed access roads and tracks would also be expected. Up to 10 vehicle movements per day are expected to be required at the site during normal operation. During major maintenance operations, this number could increase to 15 vehicles at any one time for a limited period. Limited amounts of fuel would also be required for temporary power generation in the event of an unplanned outage. As such impacts on local and regional air quality are expected to be negligible during the lifetime operation of the solar farm.

A groundcover management plan would be implemented to reduce dust production from disturbed areas and planting of the site would provide screening to sensitive receivers located along the northern boundary of the Development site (Section 8.3).

Negative impacts to air quality during operation are likely to be negligible. Additionally, the Project would have a positive impact on global climate change by assisting to reduce Australia's reliance on fossil fuels for electricity generation and reducing the amount of GHG emissions (discussed in Section 2.2).

The Project would also reduce local exhaust emissions from farm machinery, as a result of the change in land use.

Based on the sparse local settlement pattern and the low level of emissions during operation, the cumulative impact is not expected to be significant. Cumulative impacts are discussed further in Section 9.12.

Climate and Climate Change

The Project would not affect local weather or climate patterns. The Project would provide a new less polluting form of electricity generation, as it represents a transition to renewable energy sources. The Project would be a part of the positive contribution to reducing GHG emissions and help mitigate the negative effects of climate change. On an annual basis, the Project would provide enough clean, renewable energy for about 124,155 average NSW homes. At the same time, it would displace approximately 245,284 metric tonnes of carbon dioxide – the equivalent of taking about 4,157 cars off the road, based on the average light vehicle producing 59°Mt CO_2-e per year (Green Vehicle Guide, 2021).

9.10.3 Mitigation measures

No.	Mitigation measures	Phase
AQ1	The CSES will be implemented to promote information sharing for air quality and include: • Notification of relevant stakeholders. • An accessible complaints process with a timely response protocol.	Preconstruction/ Construction/ Decommissioning
AQ2	Dust control measures, including on site access roads, will be specified in the CEMP and DEMP and may include water applications or other means as required.	Construction/ Decommissioning
AQ3	Idling for more than 5 minutes is prohibited. Lorries and trucks engines would be turned off.	Construction/ Decommissioning
AQ4	Vehicle loads of material which may create dust or litter would be covered while using the public road system.	Construction/ Decommissioning
AQ5	All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use.	Construction/ Decommissioning
AQ6	Fires and material burning would be prohibited in the Development site.	Construction/ Decommissioning

9.11 Resource use and waste generation

This section provides an assessment of the resources and materials required for the Project, including potential sources and quantity estimates during construction and operation phases. Mitigation measures are recommended to address any potential impacts identified.

Waste would be expected to be generated by the Project during construction and operation. This section also provides an assessment of the environmental impacts of waste generation. Activity-specific mitigation measures are provided to address the identified potential impacts.

9.11.1 Legislative framework

In NSW waste management and recycling is regulated through the *Protection of the Environment Operations Act 1997* (POEO Act), the Protection of the Environment Operations (Waste) Regulation 2014 (including the requirement to track certain types of waste) and the *Waste Avoidance and Resource Recovery Act 2001.*

The *Waste Avoidance and Resource Recovery Act 2001* aims to promote efficient use of resources, and avoidance and minimisation of waste through the following resource management hierarchy:

- Avoidance of unnecessary resource consumption.
- Resource recovery, including reuse, reprocessing, recycling and energy recovery.
- Disposal.

Through reducing consumption and promoting resource efficiency, the *Waste Avoidance and Resource Recovery Act 2001* aims to reduce the generation and impacts of waste.

The following guidelines and policies inform and/or respond to the regulatory framework and have been applied to the assessment of the Project:

- The National Waste Policy: Less Waste, More Resources (Department of Agriculture, Water and the Environment, 2018) sets out the objectives, principles, outcomes and strategies for waste management. The policy aims to:
    - Avoid the generation of waste, reduce the amount of waste (including hazardous waste) for disposal, manage waste as a resource and ensure that waste treatment, disposal, recovery and re-use is undertaken in a safe, scientific and environmentally sound manner, and
    - Contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency and the productivity of the land.
- The NSW Waste Avoidance and Resource Recovery Strategy (EPA 2014), the 'WARR Strategy', provides a framework for achieving these statutory objectives, focusing on the following key result areas:
    - Avoid and reduce waste generation.
    - Increase recycling.
    - Divert more waste from landfill.
    - Manage problem wastes better.
    - Reduce litter.

- Reduce illegal dumping.

9.11.2 Existing environment

The Queanbeyan-Palerang Regional Council has adopted the former Queanbeyan City Council's 'Waste and Resource Recovery Strategy 2013–2023' (Queanbeyan City Council, 2013), containing context, targets and actions. Priorities identified in the Strategy relevant to the Project include:

- Reduce the current high levels of contamination in the recycling stream
- Promote existing recycling and organics services offered to the construction and industrial sector
- Conduct waste audits to determine weight and composition of waste.

The regional Canberra Region Joint Organisation (CRJO) Regional Waste Strategy (Canberra Region Joint Organisation, revised 2014) is based on the WARR approach and contains an action plan to achieve the objectives of the strategy. The purpose of the strategy is to provide a road map to guide long-term improvement of regional performance through activity and investigation, followed by consolidation of services. Queanbeyan-Palerang Regional Council is a member of the CRJO.

The Queanbeyan-Palerang Regional Council operates several waste facilities relevant to the Project as identified in Table 9-28. The Council website notes that asbestos containing materials are not accepted at any of their waste facilities.

Table 9-28 Waste facilities within the Queanbeyan-Palerang LGA

Waste facility	Types of waste accepted (pertinent to the Project)
Braidwood Waste Transfer Station	General waste, commercial waste (waste 4.5 tonnes GVM and over will need to call in advance to make a time for delivery), green waste.
Bungendore Waste Transfer Station	Commercial waste, construction and demolition waste, green waste, large items.
Queanbeyan Waste Minimisation Centre (for Queanbeyan-Palerang Regional Council residents only)	N/A

Veolia operates the Woodlawn Eco Precinct waste processing facility, which is located approximately 15km north east of the Project. This precinct covers 6,000ha and includes a Bioreactor landfill which treats municipal solid waste and captures the waste gases to produce energy. The precinct also includes a new Mechanical and Biological Treatment (MBT) facility, which sorts and recovers organic content from household waste to produce compost which is used to rehabilitate the former mine site.

Resource use

Key resources and estimated quantities projected based on the current Project design required to construct the proposed solar farm are presented in Section 4.5.1

The majority of the required resources would be used during the construction of the proposed solar farm. During operation and decommissioning, resource requirements would relate to maintenance activities including the use of machinery, vehicles and water resources. Water resources would be required throughout construction, operation and decommissioning. Water use is considered in Section 9.4 of this EIS.

Life cycle analysis

Life cycle analysis (LCA) assesses and quantifies the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. LCA estimates of energy and emissions based on the total life cycle of materials used for a project, i.e., the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

A life cycle inventory of polycrystalline PV panels has been undertaken by the International Energy Agency Photovoltaic Power System Program. In their report, Life Cycle Inventories and Life Cycle Assessments of Photovoltaic Systems (IEA-PVPS-T12-04:2015) the ‘energy payback time’ for thin film modules has been estimated at less than 1 year for a solar installation in Southern Europe. This is consistent with the estimation that the Project would have an energy payback period of approximately 1.5 years. Over the panels’ lifetime, they are expected to produce less than 18 grams of GHG per kWh generated, almost 50% lower than for Csi (Frischknecht, Stolz, Krebs, de Wil-Scholten, & Sinha, 2020).

The production of the frames and other system components including cabling would also produce emissions and waste but less than the production of modules. The carbon footprint of PV systems - assuming a location in southern Europe - ranges from 16 to 32 grams CO_2 eq. per kWh compared to between 300 and 1,000 g CO_2 eq. per kWh when produced from fossil fuels ((SolarPower Europe, 2017). In terms of the water footprint, PV consumes 0.1 l/kWh(VI), mainly during manufacturing and recycling, compared to 0.75 to 75 l/kWh for typical fossil fuel electricity production in a southern Europe location (SolarPower Europe, 2017).

As such, solar farms are favourable in a number of aspects when compared to the major electricity generating methods employed in Australia:

- CO2 emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the lifespan of the Project.
- Potential to reuse and recycle component parts such as metals and glass from frames and panels.

9.11.3 Potential impacts

Construction

Waste

The management of waste during the construction phase would observe the objectives of the *Waste Avoidance and Resource Recovery Act 2001* and the relevant key result areas of the WARR Strategy and the Canberra Region Joint Organisation Regional Waste Strategy.

Solid waste is one of the major pollutants caused by construction. A number of different construction activities associated with the Project would produce solid wastes, including:

- Packaging materials.
- Excess building materials.
- Scrap metal and cabling materials.
- Plastic and masonry products, including concrete wash.
- Excavation of topsoils and vegetation clearing.
- Bio wastes, from on-site septic and greywater systems.

In accordance with the definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction and decommissioning phases would be classified as building and demolition waste within the class *general solid waste* (non-putrescibles). Ancillary facilities in the site compound would also produce sanitary wastes classified as *general solid waste* (putrescibles) in accordance with the POEO Act. Waste produced during construction would be disposed of at an appropriately licensed waste facility. Green waste from tree clearing would be mulched for use in rehabilitation at the site or removed from the site.

The impact from waste generation on regional waste facilities is assessed to be moderate without the implementation of any recycling or re-use measures. However, with the implementation of a Waste Management Plan, identification of recycling waste facilities in the LGA, the impacts from construction waste disposal on regional landfills, the biological environment and social environment is assessed to be minor.

Operation

During operation, the solid waste streams would be associated with maintenance activities and presence of employees. Some materials, such as fuels and lubricants, panels and metals may require replacement over the operational life of the solar farm. These materials would be reused or recycled wherever possible. Given the minimal number of moving parts and limited wear tear of equipment, the operational waste streams generated by the solar farm would be very low and impacts to regional waste disposal facilities would be minor.

Li-ion batteries

The average life of the Li-ion PV solar batteries is assumed to be 10 years (Randell Environmental Consulting, 2016) although this may vary depending on manufacturer and how they are operated, and the batteries may require replacement 2-3 times during the life of the solar farm.

Li-ion batteries are classified as hazardous waste under the Commonwealth *Hazardous Waste Act 1989*, and Dangerous Goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The code has a special provision and packaging instructions for Li-ion batteries transported for disposal or recycling.

In Australia, we have limited recycling capacity with only one recycler approved to recycle Lithium-ion batteries. Until recently, most of the processing to recover precious metals including lithium occurs offshore. Our main LIB recycler physically breaks down (direct process) and separates all of the components in the LIB, but sends the cathode dust containing Li, Co, Mn and Ni to Korea for hydrometallurgical recovery. Recent technological advances has allowed for this step and the recovery of the materials to now occur in Australia.

Any spent batteries that would be exported would require an export permit under section 40 of the *Hazardous Waste Act 1989*. The Proponent would coordinate this activity and the associated commercial arrangements with the selected battery supplier.

Given the rapid rise of Li-ion battery use in Australia, including in renewable energy projects and electric cars, cost-effective local recycling may be available at the time of battery replacement or decommissioning. AEMO (2015) predict strong growth in the consumption of Li-ion batteries for both electric vehicles and PV solar over the next 20 years. This growth would begin to significantly affect the waste stream from 2025 (Randell Environmental Consulting, 2016).

Decommissioning

As during the construction phase, waste during decommissioning would be handled in line with the objectives of the relevant legislation, policies and strategies. Decommissioning of the solar farm would involve the recycling or reuse of materials including:

- Solar panels and mounting system.
- Metals from posts, cabling, fencing.
- Buildings and equipment such as the inverters, transformers and similar components.

Buildings and major electrical equipment would be removed for resale or reuse, or for recycling as scrap. The Li-ion PV solar batteries would be disposed in accordance with the hazardous waste policies active at the time of decommissioning.

Items that cannot be recycled or reused, would be disposed of at appropriate facilities in accordance with applicable regulations. All above ground infrastructure would be removed from the site during decommissioning. Any cabling (and buried infrastructure) more than 500mm underground would be installed with consideration of DPI Agriculture's 'Primefact: Infrastructure proposals on rural land' and in consultation with the landowner should full rehabilitation not be possible.

The majority of the Project components are recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

9.11.4 Mitigation measures

No.	Mitigation measures	Phase
R1	A Waste Management Plan (WMP) would be developed to minimise waste, including: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management on-site. • Provision of toilet facilities for on-site workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	Construction/ Operation/ Decommissioning
R2	A septic system would be installed and operated according to the Queanbeyan Palerang Regional Council regulations.	Construction/ Operation

9.12 Cumulative impacts

9.12.1 Approach

The assessments elsewhere in Sections 8 and 9 deal with the potential impacts of the proposal on the existing, condition of the environment. Existing condition includes past environmental changes and the effects of other developments which are currently operating in the study area.

Cumulative impacts are the additional impacts arising from further planned or foreseeable future developments, combined with the impacts of the proposal on the existing environment.

This section follows the NSW Government's *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021). The assessment is largely based on impacts to relevant key issues identified in the Scoping Report (NGH 2021) and SEARs, and subject to more detailed investigation in Sections 8 of this report.

9.12.2 Existing environment

Only new large-scale projects which have potential to produce material cumulative impacts within the Queanbeyan-Palerang LGA within 44km of the Project have been considered, including State Significant Development (SSD) and State Significant Infrastructure (SSI) projects, designated development projects requiring an EIS, projects which are likely to significantly affect the environment and require an EIS, major urban developments and 'controlled actions' requiring Commonwealth approval.

A scoping exercise was used to identify the potential cumulative impacts of these projects. The results of the scoping exercise are summarised in Table 9-29. The locations of these projects are shown in Figure 9-27.

The existing condition of the natural, socio-economic and cultural environment in the study area is described against relevant issues in Sections 8 and 9. Operating large-scale developments in the local area which form part of the existing environment include:

- Woodlawn Bioreactor Eco Precinct (15km north of the Development site).
- Woodlawn Wind Farm – 23 turbines (12km north of the Development site).
- Capital Wind Farm 1-67 turbines (from 280m north and east of the Development site).

The potential for cumulative impact incorporates the combined impacts of these existing developments, the proposed development and future planned or foreseeable developments

Table 9-29 Major projects in or near the Queanbeyan-Palerang LGA as of December 2021

Project	Proposed activity	Status	Timing	Distance from project	Relevant issues	Potential for cumulative impact
Cooma Road Quarry	Increased production limit from 1 million tonnes per annum (Mtpa) to 1.5 Mtpa.	Approved	Complete – operational.	31km	Impacts to issues unlikely given distance and location.	Low
Dargues Gold Project	Underground mine and associated infrastructure, extracting and processing up to 355,000 tonnes of gold ore per year.	Approved	On hold since Nov 2013 due to delays in technical studies and funding.	43.5km	Impacts to issues unlikely given distance and location.	Low
New High School in Bungendore	Relocation of Bungendore Community Centre and Bungendore Swimming Pool; construction of new school buildings.	Response to submissions	Construction to commence in early 2022 and complete by early 2023.	5.8km	Impacts unlikely; no overlap in construction periods.	Low
Googong Primary School	Construction of new primary school accommodating up to 700 students.	Assessment	Construction is anticipated to commence in December 2021 and be completed in May 2022.	32.3km	complete	Low
DCI Poplars Data Centre Project	Construction and operation of a data centre with office space, infrastructure, car parking and landscaping.	SEARS issued, EIS in preparation	Construction period not known.	37km	complete	Low
Springdale Solar Farm	Construction and operation of a 120MWDc solar farm.	Approved	Construction delayed, start unknown. Construction duration would be 10 months.	40km	Impacts unlikely; no overlap in construction periods	Low

Project	Proposed activity	Status	Timing	Distance from project	Relevant issues	Potential for cumulative impact
			Commissioning would commence in the eighth or ninth month of construction.			
Capital 2 Wind Farm Mod 1	131MW, 41 turbines. 9 turbines within the Development site would be revoked if the Blind Creek SF Project is approved.	Approved	Not started. Would be reduced in size if the Blind Creek Project is approved.	Less than 5km	Biodiversity Land use Visual amenity	Moderate
Capital Solar Farm	50MW solar farm on land neighbouring the Project.	Approved	Would not be constructed if the Blind Creek project is approved.	2km	NA	None

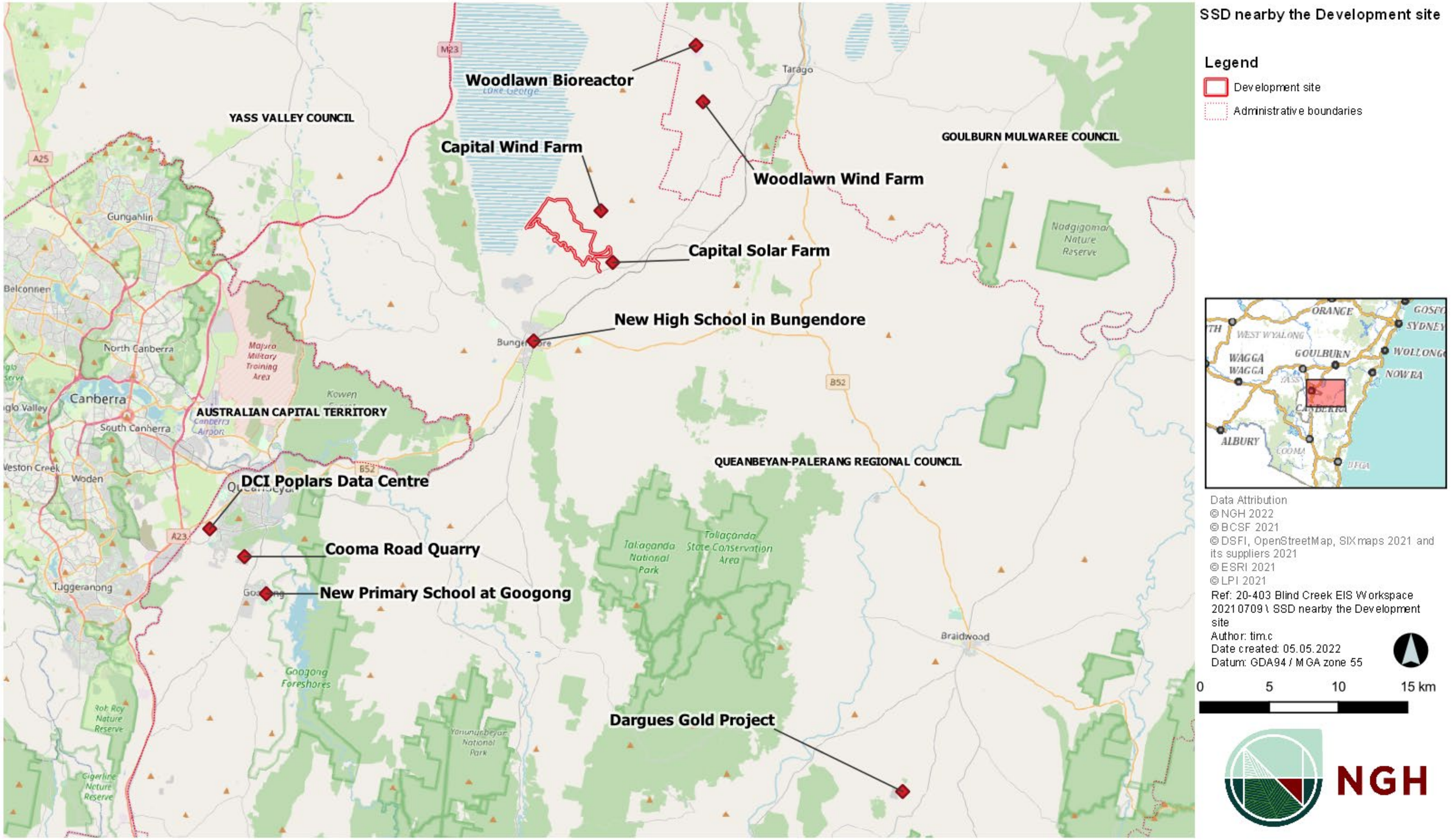


Figure 9-27 Existing and approved SSD nearby the Development site

9.12.3 Potential cumulative impacts

The scoping exercise indicates that the Capital 2 Wind Farm Modification 1, a portion of which is located in the Development site has the potential to produce cumulative impacts in relation to the Blind Creek Solar Farm project.

It is noted that the Proponent would revoke the approval for 9 of the 41 approved Capital 2 Wind Farm turbines closest to the Blind Creek Solar Farm, if the solar farm is approved.

The Blind Creek and Capital 2 Wind Farm Modification 1 projects have potential to impact biodiversity, land use and visual amenity values.

There are likely to be negligible cumulative impacts affecting social and economic, access and traffic, water, air quality, Aboriginal heritage, noise and vibration, bushfire and hazards and other issues assessed in Sections 8 and 9 of this report.

Biodiversity

Cumulative biodiversity impacts are unlikely to be significant primarily because the Blind Creek and Capital 2 projects would be constructed on cleared farmland, with minor clearing requirements. The affected land has a long history of grazing, cultivation, fertiliser application and sowing with exotic pasture species. Many of the impacts to biodiversity arising from the solar farm are qualitatively different to the impacts of the Capital 2 Wind Farm and would not be likely to produce cumulative impacts to species, communities and habitats present at each of the sites. The impacts to biodiversity values have been assessed in detail in the BDAR (Appendix G), summarised in Section 8.3, which concludes that the proposal would not significantly affect biodiversity values at the local or regional scales.

Land use

Potential land use impacts operating for the life of the solar farm include:

- Temporary loss of agricultural land and production.
- Increased biosecurity risks.
- Increased bushfire risks.

These potential impacts have been assessed in detail in Section 8.3 and Section 9.2 and found to be highly manageable.

The Development footprint of the Project would not be significant in comparison to the total availability of land in the region. The Queanbeyan-Palerang LGA covers an area of approximately 531,900ha and contributes 4.1% of the South East Tablelands Region Agriculture GVP. The Development footprint represents 0.2% of the agricultural holdings within the South East Tablelands region of NSW.

The closest major project is the approved Capital Wind Farm 2 Modification 1, with 32 turbines located outside the Blind Creek Solar Farm site and occupying 52ha. It is understood that stock grazing would continue over the Capital 2 Wind farm site. The Development footprint for the proposed solar farm would be up to 700ha. Approximately 567ha would retain vegetation groundcover and approximately 7ha would be under compacted gravel surfaces.

Rotational sheep grazing would be maintained throughout the Development site for the operational life of the solar farm, for commercial production as well as to help control grass and weed growth. The solar array panels have been spaced to ensure that the land remains productive for grazing stock. The affected land would however not be available for cropping for the operational period of the solar farm.

In terms of area, the Project would not be likely to result in significant cumulative impacts to the availability of agricultural land at the local or regional scales.

The potential cumulative impact of the reduction in agricultural employment would be balanced by the additional employment during construction and on-going employment of staff during operation. Currently, there is only part time staff employed in agriculture at the Development site (less than one FTE). The Proposed project would drastically increase employment on this land; during construction there would be approximately 300 full time equivalent staff during peak construction and 5 full time equivalent staff during operation.

The pre-works agricultural potential and productivity can be readily restored following decommissioning of the solar farm (refer Section 9.2).

The proposal is not likely to result in significant cumulative impacts to the area of available agricultural land, local and regional agricultural production and agricultural employment opportunities.

Visual amenity

The potential for cumulative visual impact relates to the combined effect of the proposed solar farm and the 32 turbines to be constructed on neighbouring land as part of the Capital 2 Wind Farm project. The cumulative impacts would operate for the life of the solar farm and wind farm. The proposed Blind Creek Solar Farm would be located low in the landscape with limited long range visibility, and very limited opportunities to view the Project. Analysis in the form of wireframes and photomontages was undertaken to illustrate these impacts from the perspective of R79, located 7km east of the Project. Figure 9-28 illustrates the Blind Creek solar farm and modified approved Capital 2 Wind Farm with the nine (9) less turbines. Note the existing Capital Wind Farm turbines are viewed as part of the existing visual character. Due to a relatively low vertical scale of the Project, the Blind Creek Solar Farm will have negligible visual impact from R79.

As such the Project would result in minimal impact on the surrounding visual landscape. In locations where the Project is visible, screening or roadside vegetation would be used to obscure views. The proposed solar farm would be unlikely to contribute significantly to the cumulative visual impacts of the Capital 2 Wind Farm, or the impacts of the existing Woodlawn Wind Farm and Capital 1 Wind Farm located on ridge crests to the north of the Development site.

Other issues

Cumulative traffic impacts are unlikely because of the relative timing and location of projects, conditions attached to road use for construction traffic and the high-capacity nature of the affected roads, which have been designed for heavy vehicle traffic. The construction traffic associated with the Capital 2 Wind Farm would not use the same local access roads as the Blind Creek Solar Farm Project. The number of vehicle movements on Tarago Road where the majority of the site traffic will be concentrated is expected to be low. The traffic assessment provided in Appendix K demonstrated that the local road network is expected to continue to operate with a good level of service with ample spare capacity. As such, the combined increase in traffic generated by the site and nearby projects is expected to have a minimal cumulative impact on the road network. Further, it is noted that the peak traffic generated by this Project during construction occurs before 7am which is outside of the peak times of the road network. A TMP would be prepared to take into account other road users including freight from other projects that may generate additional traffic impacts.

The specialist cumulative noise assessment identified other noise generating developments in the area include the Capital Wind Farm, Bungendore Sand Mine, Paragalli Sand Quarry and Holcim Sand quarry. It is noted that wind farms are not considered as industrial noise sources in accordance with the NPfI and have specific noise criteria applicable to wind farms only, which are different to the noise criteria stipulated in the NPfI. The predicted operational noise levels of the proposed Project at all unassociated receiver locations were at or below the minimum background noise levels, for all time periods and under all weather conditions. Therefore, operational noise from the proposed Project is unlikely to contribute to cumulative noise impacts at the identified receiver locations.

The cumulative socio-economic impacts are expected to be positive, including benefits from sales of local goods and services impacts and increased employment and skills. The relative timing and location of projects should ensure that no bottlenecks in the supply of goods, services or labour occur.

9.12.4 Mitigation measures

No additional mitigation measures are required.

Figure 9-28 Wire frame diagram existing Capital Wind Farm turbines and Approved Capital 2 Wind Farm and proposed Blind Creek Solar Farm

10. Environmental management

10.1 Environmental management framework

Environmental protection and management measures would be implemented via a Construction Environmental Management Plan (CEMP), Operation Environmental Management Plan (OEMP) and a Decommissioning Environmental Management Plan (DEMP). These plans would be prepared sequentially, prior to each stage of works.

The EMPs would include performance indicators, timeframes, implementation and reporting responsibilities, communications protocols, a monitoring program, auditing and review arrangements, emergency responses, induction and training and complaint/dispute resolution procedures. The monitoring and auditing program would clearly identify any residual impacts after mitigation. Adaptive management would be used to ensure that improvements are consolidated in updated EMPs.

The EMP process for the CEMP and OEMP, is illustrated in Figure 10-1. The EMPs would incorporate all of the specific mitigation measures contained in this EIS and any additional applicable requirements from the DPE's Conditions of Consent.

10.1.1 Framework EMP structure

For the construction phase of the project, the key components of environmental management can be included in a Framework Construction Environmental Management Plan (FCEMP). It is recommended that Blind Creek SF (or its appointed consultant or Engineering, Procurement and Construction contractor (EPC contractor)) prepare the FCEMP. Depending on the volume of the construction works required, it may further be useful to have each major sub-construction contractor prepare its own CEMP for their specific construction activities and sites in accordance with Blind Creek SF's FCEMP and this report.

The FCEMP should incorporate all the environmental mitigation measures proposed in this EIS Report and any additional applicable requirements from the DPE's Conditions of Consent. Monitoring procedures associated with the management strategies are key elements to measure the performance of the project against set criteria. A monitoring program should be an integral part of the FCEMP.

As a guide and indication of the required information, the FCEMP should include:

- A description of the expected standards to be achieved by individual construction contractors.
- The mechanisms, processes and organizational arrangements that will be used to promote and achieve these standards.
- Arrangements for auditing of construction contractors.
- Communication channels to enable good control of environmental related issues.
- Procedures for notification by the construction contractors of issues, problems and mitigation measures.
- Contact details for environmental specialists.
- A complaints procedure for dealing with complaints from the public.

The following plans would be developed prior to construction and implemented at all stages of the Project via the CEMP and the OEMP:

- Emergency Response Plan, incorporating an Evacuation Plan (Section 9.7), Fire Response Plan (Section 9.7), Flood Response Plan (Section 8.5) and Spill and Contamination Response Plan (Section 9.3).
- Waste Management Plan (Section 9.11).

10.1.2 CEMP Structure

As a guide and indication of the required information, each CEMP should include:

- A commitment by a director of the Engineering Procurement and Construction (EPC)r company (or member of the management board for a joint venture) to achieve good environmental performance (this could be the company Environmental Policy with a commitment to apply it on this project).
- A Construction Programme showing the planned duration and a detailed breakdown of the main construction activities.
- A description of the approach to be taken to ensure conformance with environmental requirements.
- Contact details (including office and mobile telephone) for the person(s) responsible for environmental management.
- An environmental complaint contact number (to be clearly posted at the construction site entrance).
- An environmental complaint procedure.
- Procedures for keeping environmental related records and documentation.
- Arrangements for a regular environmental management meeting including keeping minutes with attendance list and actions.
- An environmental monitoring programme (with monitoring type, frequency, event / action plan and reporting procedures.
- A commitment to the use of best available technology (BAT).
- The CEMPs would incorporate the following sub-plans:
    - Soil and Water Management Plan, incorporating an Erosion and Sediment Control Plan and Site Drainage Plan (Section 9.3).
    - Construction Noise Management Plan (Section 8.6).
    - Traffic Management Plan (Section 9.1).
    - Noise Management Plan (Section 8.6).
    - Cultural Heritage Management Plan (Section 8.4).
    - Biodiversity Management Plan (Section 8.3) including a Weed Management Plan (Section 8.3) and Groundcover Management Plan (Section 8.3).
    - Landscape Management Plan (Section 8.1).
    - Groundwater Management Plan (Section 9.4).
    - Bush fire Management Plan (Section 9.8).
    - Emergency Response Plan, incorporating an Evacuation Plan (Section 9.8), Fire Response Plan (Section 9.8), Flood Response Plan (Section 8.5) and Spill and Contamination Response Plan (Section 9.3)..
    - Waste Management Plan (Section 9.11).

The Decommissioning Environmental Management Plan (DEMP) would include the same sub plans as the CEMP and would also incorporate a Site Rehabilitation Plan (Section 8.3).

10.1.3 OEMP structure

It is recommended that Blind Creek SF prepares an Operational Environmental Management Plan (OEMP) for managing the operational stages of the Blind Creek SF, as a minimum this OEMP should include:

- A description of the expected standards to be achieved by the solar farm
- The mechanisms, processes and organizational arrangements that will be used to promote and achieve these standards
- Guidance documents for good environmental operational practices
- Arrangements for checking and auditing of facility operations
- Communication channels to enable good control of environmental related issues, including contact details for environmental specialists
- Procedures for notification between stakeholders and the operators for handling complaints, incidents or scheduled maintenance activities
- A spill prevention and response plan including provision of adequate supplies of spill clean-up materials and appropriate training of staff in emergency response
- An incident response plan including provision of adequate supplies of fire and flood response and appropriate training of staff in emergency response
- A complaints procedure for dealing with complaints from the public.

10.1.4 EMS

It is recommended that an Environmental Management System (EMS), is developed. The EMS could be an internally designed system or could conform to an international standard such as, the International Standards Organisation's ISO 14001 certification standard for an EMS. The EMS comprises four elements:

- Environmental Policy.
- Planning.
- Implementation and Operation.
- Checking.

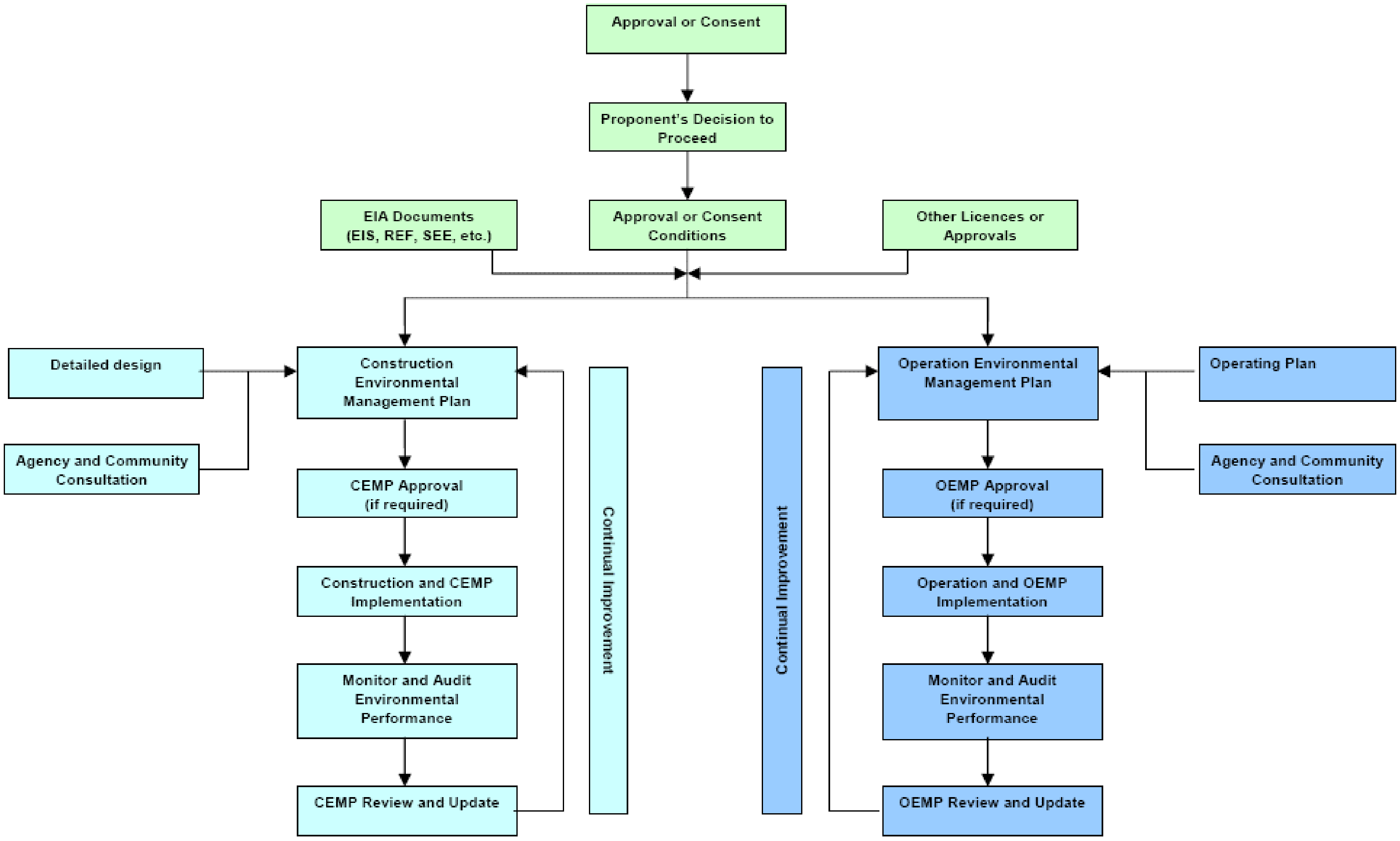


Figure 10-1 Post-approval Environmental Management Plan (EMP) process

10.2 Consolidated mitigation measures

The 121 mitigation measures contained in this EIS report comprise Project-specific safeguards, recommendations from specialist assessment reports and reference to a range of best practice guidelines and regulatory requirements. The mitigation measures form Statements of Commitment (SoC) for this EIS. The measures are to be incorporated in Project plans and designs, contract specifications and the CEMP, OEMP and DEMP as appropriate. Each assessment of issue in this EIS includes a table of mitigation measures, and are consolidated into one table in Appendix P. Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

11. Conclusion

11.1 Need and benefits

The Project's location is highly suitable for renewable energy generation; it is a flat, largely modified grassland site in close proximity to regional centres and connection to the grid. After removing land of higher environmental value, and to mitigate flood risks and address amenity impacts for neighbours, the resulting project is able to make a meaningful contribution to the state's transition away from fossil fuel generated electricity and its adverse climate effects.

The 350MW Project would generate up to 735,000 MWh per year, saving approximately 245,284 tonnes of carbon dioxide per year, contribute to a reduction in global GHG emissions and provide the equivalent of 124,155 homes with clean renewable energy. The Project would assist in reducing Australia's GHG emissions intensity in relation to the gross domestic product (GDP) and contribute to State and Federal efforts to meet climate change mitigation targets.

Developed by a farmer-led consortium made up of local landholders and renewable energy experts with strong historical and ongoing personal connections to the site and local area, the project has taken a strong stance in particularly to:

- Identify and respond to the issues raised by the community. This includes adjacent land holdings but also community members at some distance from the site. Initiatives developed by the community are now part of the Project.
- Remain compatible with current and proposed agricultural land use practices at the site. The 'agro-voltaic' considerations include the height and spacing of solar panels, such that grazing can be continued with the solar array area and benefit from micro climate effects, such as shading and soil moisture retention in summer.

The Project has recently partnered with a joint venture between Octopus Investments Australia and the Clean Energy Finance Corporation, both entities having strong environmental, social, and governance (ESG) credentials. Octopus Group is one of the largest owners of renewable energy projects in Australia and Europe. In Australia, it is responsible for managing over $1 billion of development, construction and operational assets. Recently, Octopus connected Australia's largest operating solar farm at Darlington Point (333MW), one of the 10 largest operating solar farms in the world.

Local social and economic benefits that would be associated with the construction and operation of the proposal include:

- Direct and indirect employment opportunities during construction and operation of the solar farm This includes up to approximately 300 full-time jobs generated during the peak construction phase (12 to 18 months) which would be a significant boost for a rural community following the bushfires and Covid-lockdowns.
- Approximately 5 full-time equivalent jobs would be required over the operational life of the Project, with many additional service providers required to support operations. Direct business volume benefits for local services, materials, and contracting of $12.6 million. Over the life of the project, this could provide around $43.7 million of additional economic activity in the local community.
- The Indigenous Cultural and Heritage Learning Zone will provide an important connection for Indigenous People and the wider community to reconnect with the lake and facilitate the education of cultural heritage.

- A formalised Community Benefit Sharing Scheme which will contribute $3.5million, based on a 350MW Project, over the lifetime of the Project to key Stakeholder Groups and the local community. The theme of the CBSS is environmental sustainability, agricultural resilience and community building.

11.2 Environmental assessment and mitigation of impacts

In detailing areas that would be impacted by the Blind Creek Solar Farm (Development footprint) and setting out the required the infrastructure components, a conservative or upper limit has been presented in this EIS. This concept follows through into the impact assessment approach adopted for the project. While sometimes over estimating impacts, it provides certainty regarding areas to be protected from impacts (Exclusion zones) and mitigation strategies that are robust to minor project changes. This will accommodate innovation and efficiencies to be achieved as the project progresses, subject to approval.

- NGH, with input from specialists, has prepared this EIS. The Project is considered compatible with existing and adjacent land uses and highly reversible upon decommissioning. The key environmental risks have been investigated through detailed specialist investigations and the central response of the Project has been to 'design out' environmental risks and impacts. The Project has been designed to prevent environmental impacts by:
- Incorporating screening and landscaping elements to reduce visual impact.
- Selecting technologies that minimise glare.
- Avoiding the higher biodiversity and heritage value areas of the site and committing to mitigation strategies to protect values.
- Locating infrastructure to avoid hydrological hazards; this will ensure no change to local hydrology and no exacerbation of run off and erosion due to the project.
- Designing infrastructure to retain compatible land capability and land use; The layout will maximise the use of existing grazing and cropping land and allow for continued regenerative agriculture practices.

Due to the low-lying site and low profile infrastructure, in combination with the low number of near neighbours, the Project has been able to demonstrate:

- No greater than low visual impact for any non-associated receiver.
- No greater than low glare impact for any non-associated receiver.
- No greater than low noise impact for any non-associated receiver.
- The impacts have been found acceptable and manageable for all areas assessed by the EIS.

11.3 Ability to be approved

On balance, the Project is considered appropriate:

- To the site's environmental constraints, avoiding high value areas and including long reaching mitigation strategies that will benefit the broader area in the longer term.
- To the site's resources, maximising renewable energy generation alongside existing agricultural and quarry operations.
- To the site's location where it will supply nearby population centres.

- To meeting global state and local policy targets to reduce in global greenhouse gas emissions.
- To the community's expectations, as verified through the consultation process to date.
- It meets all relevant planning provisions and guidelines and is considered justifiable and acceptable.

12. References

.idcommunity. (2022a). *Queanbeyan-Palerang Gross Regional Product*. Retrieved from https://economy.id.com.au/queanbeyan-palerang/gross-regional-product

.idcommunity. (2022b). *Queanbeyan-Palerang Value Add by Industry*. Retrieved from https://economy.id.com.au/queanbeyan-palerang/value-add-by-industry

100% Renewables Pty Ltd. (2020). *Queanbeyan – Palerang Regional Council Climate Change Action Plan: Community Plan Period: 2020 to 2030 .* Queanbeyan – Palerang Regional Council.

A Bell, R. (1985). Geology of the Lake George Basin. *Geology and Geophysics Record*, 1-57.

ABS. (2016). *2016 Census QuickStats - Canberra*. Retrieved from https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/CED801?opendocument#:~:text=In%20the%202016%20Census%2C%20there,up%201.8%25%20of%20the%20population.&text=The%20median%20age%20of%20people,Electoral%20Divisions)%20w

ABS. (2016a). *Census Quickstats: Bungendore*. Retrieved from https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC10684?opendocument

ABS. (2016b). *Census Quickstats: Queanbeyan-Palerang Regional*. Retrieved from https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA16490?opendocument

ABS. (2016c). *2033.0.55.001 - Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA)*. Retrieved from https://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001

AEMC. (2020, November). *New draft rules open a door to renewable energy zones*. Retrieved from https://www.aemc.gov.au/news-centre/media-releases/new-draft-rules-open-door-renewable-energy-zones

AEMO. (2018). *AEMO Integrated System Plan*. Retrieved from National Transmission Network Development Plan : https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/national-transmission-network-development-plan-ntndp

AEMO. (2020, July). Retrieved from 2020 Integrated System Plan for the National Electricity Market: https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp

AEMO. (2020a). *2020 Integrated System Plan*. Retrieved from https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp

AILA. (2018). *Guidance Note for Landscape and Visual Impact Assessment.* Australian Institute of Landscape Architects.

Alsema et al. (2006). *Environmental impacts of PV electricity generation—A critical comparison of energy supply options. 3rd PV Industry Forum. .* Alsema, E.A. & de Wild-Scholten, Mariska & Fthenakis, V.M.

Amber. (2021). *Blind Creek Solar Farm Traffic Impact Assessment.*

Australia Institute. (2015, August). *Take the pressure down. Sorting scare and substance in the renewable energy target debate. .* Retrieved from

<http://www.tai.org.au/sites/defualt/files/Take%20the%20pressure%20down%20-%20FINAL.pdf>

Australia Institute. (2017). *Meeting our Paris Commitment. Discussion Paper. Rod Campbell, September 2017*. Retrieved from http://www.tai.org.au/content/meeting-our-paris-commitment

Australia State of the Environment. (2021). *National air quality standards*. Retrieved from https://soe.environment.gov.au/theme/ambient-air-quality/topic/2016/national-air-quality-standards

Australian Greenhouse Office. (2002). *Living with climate change: an overview of potential climate change impacts on Australia.* Canberra: Australian Government.

Australian Urban Observatory. (2021). *Australian Urban Observatory*. Retrieved from https://auo.org.au/

Bignal, K., Ashmore, M., & Power, S. (2004). *The ecological effects of diffuse air pollution from road transport (Report Number 580).* English Nature Research . Retrieved from http://publications.naturalengland.org.uk/publication/133002

Blum, A., & Long, T. (2016). *Lithium Ion Battery Energy Storage System Fires.*

BNEF. (2017). *Bloomberg New Energy Finance (BNEF), New Energy Outlook 2017.* Retrieved from <https://about.bnef.com/new-energy-outlook/>

BOM. (2020). *Hydrologic reference stations*. Retrieved from Butmaroo Creek (411003): http://www.bom.gov.au/water/hrs/#id=411003

BOM. (2021). *Australian Groundwater Explorer*. Retrieved from http://www.bom.gov.au/water/groundwater/explorer/map.shtml

Bureau of Meteorology. (2020). *Annual Report 2019-2020.*

Bureau of Meteorology. (2021, February). *Annual climate statement 2020*. Retrieved from http://www.bom.gov.au/climate/current/annual/aus/2020/#tabs=Temperature

Bureau of Meteorology. (2022). *Three-monthly solar exposure for New South Wales/ACT.* Retrieved from http://www.bom.gov.au/jsp/awap/solar/index.jsp?colour=colour&time=latest&map=solarave&period=3month&step=0&area=ns

Butler, R. (2013, July 23). *Managing the lithium (ion) battery fire risk.* Retrieved from Hemmingfire: http://www.hemmingfire.com/news/fullstory.php/aid/1790/Managing_the_lithium__ion__battery_fire_risk.html

Canberra Region Joint Organisation. (revised 2014). *Regional Waste Strategy 2018 - 2023.*

CEC. (2021). *Australian Guide to Agrisolar for Large-scale Solar: For proponents and farmers .*

CER. (2017). *Tracking towards 2020: encouraging renewable energy in Australia.* Retrieved from Clean Energy Regulator: www.cleanenergyregulator.gov.au/About/Accountability-and-reporting/administrative-reports/tracking-towards-2020-encouraging-renewable-energy-in-australia

Chang, G., & Jennings, C. (2021). *Magnetic Field Survey at PG&E Photovoltaic Sites*. Retrieved from http://www.osti.gov/bridge/servlets/purl/82309-WOEtJb/webviewable/82309.pdf

Clean Energy Council . (2020). *Clean Energy Council*. Retrieved from Clean Energy Australia Report 2020: ttps://assets.cleanenergycouncil.org.au/documents/resources/reports/clean-energy-australia/clean-energy-australia-report-2020.pdf

Climate Council. (2016). *On The Frontline: Climate Change and Rural Communities.* Retrieved from https://www.climatecouncil.org.au/uploads/564abfd96ebac5cbc6cf45de2f17e12d.pdf

Climate Council of Australia. (2017). *State of Solar 2016. Globally and in Australia.* Retrieved from <https://www.climatecouncil.org.au/uploads/4127a8c364c1f9fa8ab096b04cd93f78.pdf>

CSIRO. (2008). *Guidelines for Surveying Soil and Land Resources .* CSIRO Publishing.

CSIRO. (2009). *Australian Soil and Land Survey Handbook .* CSIRO publishing.

CSIRO. (2015). *Climate Change in Australia*. Retrieved from http://www.climatechangeinaustralia.gov.au/en/

CSIRO. (2018). *Australias changing climate*. Retrieved from State of the Climate: https://www.csiro.au/en/Research/OandA/Areas/Assessing-our-climate/State-of-the-Climate-2018/Previous-State-of-the-Climate-reports/State-of-the-Climate-2016/Australias-changing-climate#:~:text=Temperature-,Australia's%20weather%20and%20climate%20are%20cha

DECC. (2006). *Assessing Vibration: a technical guideline.*

DECC. (2008, January 1). *Volume 2A Installation of Services .* Retrieved from Department of Planning Industry and Environment: https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-2a-installation-of-services

DECC. (2008, January 1). *Volume 2C Unsealed Roads .* Retrieved from Department of Planning, Industry and Environment: https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-2c-unsealed-roads

DECC. (2009). *Interim Construction Noise Guidelines.*

DECCW. (2011). *NSW Road Noise Policy.*

Department of Agriculture, Water and the Environment. (2018). *National Waste Policy: Less Waste, More Resources.*

Department of Industry, Science, Energy and Resources. (2019). *National Greenhouse Accounts 2019*. Retrieved from https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019/state-and-territory-greenhouse-gas-inventories-2019-emissions

Department of Industry, Science, Energy and Resources. (2021). *National Greenhouse Gas Inventory Quarterly Update: December 2020*. Retrieved from https://www.industry.gov.au/data-and-publications/national-greenhouse-gas-inventory-quarterly-update-december-2020

DoEE. (2019). *National Inventory Report*. Retrieved from The Australian Government Submission to the United Nations Framework Convention on Climate Change: http://www.environment.gov.au/climate-change/greenhouse-gas-measurement/publications/national-inventory-report-2014-revised

DoISER. (2020, March). *National Greenhouse Gas Inventory: Quartely updates.* Retrieved from Department of Industry, Science, Energy and Resources:

https://www.industry.gov.au/sites/default/files/2020-08/nggi-quarterly-update-march-2020.pdf

Domain. (2021). *December 2021 Rental Report*. Retrieved from Domain. (2021https://www.domain.com.au/research/rental-report/december-2021/#canberra

DoP. (2011). *HIPAP 6: Hazard Analysis.*

DoP. (2011b). *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33. .*

DPE. (2009). *Assessing Significance for Historical Archaeological Sites and 'Relics'.* Heritage Branch of the Department of Planning.

DPE. (2017). *South East and Tableland Regional Plan 2036.*

DPI. (2020a). *South East and Tablelands Region, Agriculture Industry Snapshot for Planning*. Retrieved from https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/1260496/South-East-Tabllands-Snapshot.pdf

DPIE. (2011a). *Multi-level risk Assessment.*

DPIE. (2018). *Large Scale Solar Energy Guideline for State Significant Development.* Retrieved from https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/large-scale-solar-energy-guideline-2018-12-11.pdf?la=en

DPIE. (2018). *Water in NSW*. Retrieved from Lake George Cachment snapshot: https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/lake-george

DPIE. (2018a). *Large-Scale Solar Energy Guideline for State Significant Development.*

DPIE. (2019). Retrieved from NSW Electricity Strategy: https://energy.nsw.gov.au/sites/default/files/2019-11/NSW%20Electricity%20Strategy%20-%20Final%20detailed%20strategy_0.pdf

DPIE. (2019). *Queanbeyan-Palerang Regional Council: 2019 NSW Population Projections.* Parramatta.

DPIE. (2020, March). *Net Zero Plan Stage 1: 2020 - 2030.* Retrieved from Department of Planning, Industry and Environment: https://www.environment.nsw.gov.au/topics/climate-change/net-zero-plan

DPIE. (2020, November). *Understanding air quality data*. Retrieved from https://www.environment.nsw.gov.au/topics/air/understanding-air-quality-data/air-quality-categories

DPIE. (2021). *ArcGIS*. Retrieved from Naturally Occurring Asbestos in NSW: https://trade.maps.arcgis.com/apps/PublicInformation/index.html?appid=87434b6ec7dd4aba8cb664d8e646fb06

DPIE. (2021, September). *Proposed Infrastructure SEPP Amendments: Renewable Energy and Regional Cities Explaination of Intended Effect.*

DPIE. (2021). *Social Impact Assessment Guideline for State Significant Projects.* Retrieved from https://shared-drupal-s3fs.s3.ap-southeast-2.amazonaws.com/master-test/fapub_pdf/SIA+Guideline+20210622v6_FINAL.pdf

DPIE. (2021, August). *Water in NSW*. Retrieved from Lake George: https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/lake-george

DPIE. (2021, August). *Water in NSW*. Retrieved from Lake George: https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/lake-george

DPIE. (2021a). *Draft Large-Scale Solar Energy Guideline (December).*

DPIE. (2021a). *Social Impact Assessment Guideline for State Significant Projects.*

DPIE. (2021b). *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects.*

DPIE NSW. (2020a). *NSW Electricity Infrastructure Roadmap. Building an Energy Superpower Overview.*

Dröes. (2021). *Dröes, M. & Koster, H.R.A. Wind turbines, solar farms, and house prices*. Retrieved from Energy Policy, 155 (2021): 112327: https://doi.org/10.1016/j.enpol.2021.112327

EDAW. (2000). *Section 12 – Visual Assessment', The Mount Arthur North Coal Project: Environmental Impact Asssessment, URS Australia Pty Ltd, Prepared for Coal Operations Limited.* EDAW(Australia) Pty Ltd.

Emissions, D. N. (2021). *NSW AdaptNSW*. Retrieved from NSW DPIE Understanding and adapting to climate change in NSW: https://climatechange.environment.nsw.gov.au/about-climate-change-in-nsw/nsw-emissions

Evans, S. (2017). *Solar, wind and nuclear have 'amazingly low' carbon footprints, study finds*. Retrieved from CarbonBrief: https://www.carbonbrief.org/solar-wind-nuclear-amazingly-low-carbon-footprints

Finkel, A., Moses, K., Munro, C., Effeney, T., & O'Kane, M. (2017, June 1). Retrieved from Independent Review into the Future Security of the National Electricity Market - Blueprint for the Future: https://www.energy.gov.au/sites/default/files/independent-review-future-nem-blueprint-for-the-future-2017.pdf

Footprint Pty Ltd. (2022). *Proposed Blind Creek Solar Farm, Lake George, NSW. Hydrological and Hydraulic Analysis.* Footprint Sustainability Engineering.

Frischknecht, R., Stolz, P., Krebs, L., de Wil-Scholten, M., & Sinha, P. (2020). *Life Cycle Inverntories and Life Cycle Assessments of Photovoltaic Systems.*

Geoscience Australia. (2010). *Solar Energy*. Retrieved from https://www.ga.gov.au/scientific-topics/energy/resources/other-renewable-energy-resources/solar-energy

Geoscience Australia. (2019). *Australian Rainfall and Runoff: A guide to flood estimation.*

Green Vehicle Guide. (2021). *Vehicle Emissions*. Retrieved from Green Vehicle Guide: https://www.greenvehicleguide.gov.au/pages/Information/VehicleEmissions

HealthStats NSW. (2022). *HealthStats NSW. (2022). Queanbeyan-Palerang Regional Council LGA*. Retrieved from https://www.healthstats.nsw.gov.au/#/location-overview/queanbeyanlga/LGA

Holman et al, C. (2014). *Institute of Air Quality Management*. Retrieved from Guidance on the assessment of dust from demolition and construction V1.1: www.iaqm/wp-content /uploads/guidance/dust_assessment.pdf

ICNIRP. (2010). ICNIRP Guidelines for limiting exposure to time-varying electric and magnetic fields (1Hz - 100 kHz). *Health Physics 99(6)*, 818:836. Retrieved from https://www.icnirp.org/cms/upload/publications/ICNIRPLFgdl.pdf

Ipsos. (2015). *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry*. Retrieved from Australian Renewable Energy Agency: https://arena.gov.au/projects/utility-scale-solar-installa

Jolly, W., Cochrane, M., Freeborn, P., Holden, Z., Brown, T., Williamson, G., & Bowman, D. (2015). Climate-induced variations in global wildfire dnager from 1979 to 2013. *Nature Communications, 6*(7537).

Landcom. (2004, March). *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition .* Retrieved from Landcom: https://www.landcom.com.au/assets/Publications/Statement-of-Corporate-Intent/5245260a89/managing-urban-stormwater-soils-construction-volume-1-fourth-edition.pdf

Lazard. (2021). *lazards-levelized-cost-of-energy*. Retrieved from https://www.lazard.com/media/451881/lazards-levelized-cost-of-energy-version-150-vf.pdf

Lewis, H. (2016). *Product Stewardship in Action. The Business Case for Life-cycle Thinking.*

LGBFMC. (2018). *Lake George Bush Fire Risk Management Plan.*

Live Queanbeyan Palerang. (2022). *Education*. Retrieved from https://www.livequeanbeyanpalerang.com.au/education/

LMIP. (2021). *Labour Market Information Portal. SALM LGA Data Tables (ASGS 2021)*. Retrieved from https://lmip.gov.au/default.aspx?LMIP/Downloads/SmallAreaLabourMarketsSALM/Estimates

MDBA. (2021, August). *Water Management*. Retrieved from Murrumbidgee Catchment: https://www.mdba.gov.au/water-management/catchments

Nerili, J., Henley, B., Gupta, A., Lippmann, T., Clarke, H., Dowdy, A., . . . Boer, M. (2021). Connections of climate change change and variability to lrage and extreme forest fires in southeast Australia. *Nature Communications Earth & Environment, 2*(8).

NGH. (2021). *Blind Creek Solar Farm Scoping Report.*

NPI. (2021). *Department of Environment and Energy*. Retrieved from Link to http://www.npi.gov.au/substances/particulate-matter/index.html

NSW Department of Communities & Justice. (2022). *Rent and Sales Report – interactive dashboard*. Retrieved from https://public.tableau.com/app/profile/facs.statistics/viz/Rentandsales_15565127794310/Rent

NSW Department of Health. (2020). *Primary Health Networks Needs Assessment (November 2018 Version 2)*. Retrieved from https://www.coordinare.org.au/assets/Needs-Assessment.pdf

NSW EPA. (2017). *Noise Policy for Industry.*

NSW Government. (2016). *NSW Climate Change Policy Framework.* OEH.

NSW Government. (2021). *NSW water quality and river flow objectives*. Retrieved from Murrumbidgee River and Lake George catchment: https://www.environment.nsw.gov.au/ieo/Murrumbidgee/index.htm

NSW Government. (2022). *Hunter-Central Coast REZ Registration of Interest*. Retrieved from https://www.energy.nsw.gov.au/hunter-central-coast-rez-registration-interest#-where-is-the-huntercentral-coast-rez-

NSW Legislation. (2021, August). *Water Sharing Plan for the NSW Murray Darlin Basin Fractured Rock Groundwater Sources Order 2020*. Retrieved from https://legislation.nsw.gov.au/view/html/inforce/current/sl-2020-0348

NSW RFS. (2005). *Standards for Asset Protection Zones*. Retrieved from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf

NSW Rural Fire Service. (2015). *Guide for Bush Fire Prone Land Mapping .*

NSW Rural Fire Service. (2020). *NSW Rural Fire Service Annual Report 2019/2020.* Retrieved from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0008/186236/NSW-RFS-Annual-Report-2019-20.pdf

OEH. (2012). *The land and soil capability assessment scheme (Second approximation).* Office of Environment and Heritage.

OEH. (2012, October 1). *The land and soil capability assessment scheme: second approximation .* Retrieved from NSW Office of Environment and Heritage: https://www.environment.nsw.gov.au/research-and-publications/publications-search/land-and-soil-capability-assessment-scheme

OEH. (2016, November 1). *Climate change in NSW.* Retrieved from NSW Climate Change policy framework: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/climate-change-fact-sheet-160595.pdf

OEH. (2016a). *State of NSW and Office of Environment and Heritage (2016) NSW Climate Change Policy Framework* . Retrieved from <http://www.environment.nsw.gov.au/topics/climate-change/policy-framework>

Parliament of Australia. (2021). *2019-20 Australian bushfires - frequentrly asked questions: A quick guide.* Parliament of Australia. Retrieved March 12, 2021, from https://parlinfo.aph.gov.au/parlInfo/download/library/prspub/7234762/upload_binary/7234762.pdf

Pawson, H., Martin, C., Thompson, S. & Aminpour, F. (2021). *Covid-19: Rental housing and homelessness impacts in Australia. Sydney: City Futures Research Centre, University of NSW*. Retrieved from https://apo.org.au/node/315289

QPRC. (2018). *Queanbeyan-Palerang Community Strategic Plan 2018-2028*. Retrieved from https://www.qprc.nsw.gov.au/Resources-Documents/Strategies-and-Plans

QPRC. (2022). *Queanbeyan-Palerang Regional Council. Community Profile*. Retrieved from https://www.qprc.nsw.gov.au/Community/Community-Profile

Queanbeyan City Council. (2013). *Waste and resource recovery strategy 2013 - 2023.*

Randell Environmental Consulting. (2016). *Waste lithium-ion battery projections.*

Recharge. (2013). *Battery Safety.* Retrieved from Recharge: https://rechargebatteries.org/battery-safety/

Repacholi, M. (2003). An Overview of WHO's EMF Project and the Health Effects of EMF Exposure. *International Conference on Non-Ionizing Radiation at UNITEN - Electromagnetic Fields and Our Health.* Geneva, Switzerland. Retrieved from https://www.who.int/peh-emf/meetings/archive/en/keynote4repacholi.pdf

RFS. (2019). *NSW RFS Planning for Bushfire Protection (PBP) 2019.*

RFS, N. (2017). *NSW Local Government Areas FDI.*

Ritchie, H. (2020, September 18). *Our World in Data*. Retrieved from Sector by sector: where do global greenhouse gas emissions come from? : https://ourworldindata.org/ghg-emissions-by-sector

Roam, C. (2014). *RET Policy Analysis. Report to the Clean Energy Council.* Retrieved from <https://www.cleanenergycouncil.org.au/policy-advocacy/renewable-energy-target/ret-policy-analysis.html>

Safigianni, A. S., & Tsimtsios, A. M. (2014). Electric and Magnetic Fields due to Rooftop Photovoltaic Units. *Journal of Basic and Applied Physics* , 76-80.

Sinclair Knight Merz . (2013, June 20). *Estimating the Impact of the RET on Retail Prices*. Retrieved from <http://images.smh.com.au/file/2013/06/25/4518185/SKM.pdf?rand=1372130430845>

SLR. (2022). *Blind Creek Solar Farm, Reflective Glare Assessment.*

SolarPower Europe. (2017). *Sustainability of photovoltaic systems. Water Footprint*. Retrieved from http://www.solarpowereurope.org/policy/solar-fact-sheets

SQM Research. (2022a). *Residential vacancy rates: Postcode 2620*. Retrieved from https://sqmresearch.com.au/graph_vacancy.php?postcode=2621&t=1

SQM Research. (2022b). *Residential vacancy rates: Postcode 2620*. Retrieved from https://sqmresearch.com.au/graph_vacancy.php?postcode=Queanbeyan&t=1

Sustainable Build. (2008, January). *The Impact of Quarrying*. Retrieved from https://sustainablebuild.co.uk/the-impact-of-quarrying/

Twyford Consulting. (2007). *Beyond Public Meetings; Connecting Community Engagement with Decision-Making.*

UNCC. (2022). *The Paris Agreement*. Retrieved from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

United States Environmental Protection Agency. (1995). AP-42 Compilation of Air Pollution Emission Factors. In *Volume 1 - Stationary Point and Area Sources.* Office of Transportation and Air Quality.

URBIS. (2009). *Berrybank Visual Impact Assessment - Final Report, Australia.*

Urbis. (2016). *Review of the Impact of Wind Farms on Property Values*. Retrieved from https://www.environment.nsw.gov.au/resources/communities/wind-farm-value-impacts-report.pdf

US EPA. (2020). *AVERT, U.S. national weighted average CO2 marginal emission rate, year 2019 data. .* Washington DC: U.S. EPA.

WA Department of Commerce. (2017). *Battery Energy Storage Systems: A guide for Electrical Contractors.* Perth. Retrieved from https://www.commerce.wa.gov.au/sites/default/files/atoms/files/bess_guideline.pdf

WaterNSW. (2021, August). *NSW Water Register*. Retrieved from https://waterregister.waternsw.com.au/water-register-frame

WaterNSW. (2021, August). *Rivers and Streams*. Retrieved from Real Time Data: https://realtimedata.waternsw.com.au/water.stm?ppbm=411_LAKE_GEORGE&rs&2&rsvm_org

WHO. (2021). *World Health Organization*. Retrieved from Electromagnetic fields: https://www.who.int/health-topics/electromagnetic-fields#tab=tab_1

World Health Organisation. (2007, June). *Electromagnetic fields and public health*. Retrieved from Exposure to extremely low frequency fields: https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/electromagnetic-fields-and-public-health---exposure-to-extremely-low-frequency-fields

World Health Organisation. (2016, August 4). Retrieved from Radiation: Electromagnetic fields: https://www.who.int/news-room/q-a-detail/radiation-electromagnetic-fields

Wright and Hearps. (2010). *Australian Sustainable Energy Zero Carbon Australia Stationary Energy Plan, University of Melbourne Energy Research Institute- Beyond Zero Emissions.* Wright, M. and Hearps, P. .

Appendix A Secretary's Environmental Assessment Requirements

Appendix B Project plans

Appendix C Planning context

C.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and instruments set the framework for development assessment in NSW. The Project would be assessed under Part 4 of the EP&A Act. The objects of the EP&A Act are outlined in Section 1.3 of the EP&A Act. This EIS has addressed the objects of the EP&A Act in Section 5.1.

Developments requiring consent under a planning instrument (such as State Environmental Planning Policies (SEPP) and Local Environmental Plans (LEP)) are assessed under Part 4 of the EP&A Act. The matters to be considered in determining a Development Application (DA) in accordance with Section 4.15 of the EP&A Act have been addressed in Section 5.4.2 of this EIS.

Section 4.36 of the EP&A Act provides that a development would be State Significant Development (SSD) if it is declared to be SSD by a SEPP. Section 4.12 (8) of the EP&A Act requires an SSD DA to be accompanied by an EIS prepared in accordance with the EP&A Regulation. This EIS is intended to meet the objectives and assessment requirements of the EP&A Act, and the EP&A Regulation and *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP).

The Scoping Report for the Project was submitted to DPE on 8 January 2021. SEARs for the assessment were issued by DPE on 11 February 2021 (refer to Appendix A). A summary of the SEARs and corresponding sections in the EIS are provided in Appendix A.

C.2 Environmental Planning and Assessment Regulation 2021

Part 8 Division 5 of the EP&A Regulation specifies the form and content of EISs, which provide the basis for the Secretary's Environmental Assessment Requirements (SEARs) issued for Projects. The relevant sections in the EIS are referenced against each of the SEARs in Section 6.1.1 of this EIS.

Part 3, Division 1 identifies who can make a DA. 23(1b) states that any person with the consent of the owner of the land may make a DA. 23(2) states 'The consent of the owner of the land is not requires for a development application …. for public notification development if the applicant complies with subsections (3) and (4)'. The Proponent requires consent from private landowners, and other agencies with tenured land in the Development footprint e.g., Crown Lands.

Section 59 of the EP&A Regulation addresses public participation for SSD. The DA, including environmental assessment (EIS) must be placed on public exhibition on the NSW planning portal for a minimum of 30 days as per section 5.8 of the EP&A Act.

Section 251 requires an 'estimated cost' of the CIV of a DA in order for the Planning Secretary to make their determination. This is provided in Section 4.6.

C.3 State Environmental Planning Policy (Planning Systems) 2021

Schedule 1 and Schedule 2 of the *State Environmental Planning Policy (Planning Systems) SEPP 2021* (Planning Systems SEPP) identifies development which is SSD due to the size, economic value or potential impacts of the development. An SSD approval is obtained from the Independent Planning Commission (the IPC) for an SSD application that:

- Is not supported by relevant council(s), or

- Where DPE has received more than 50 unique public objections, or
- Has been made by a person who has disclosed a reportable political donation in connection with the DA.

For all other SSD applications, the Minister for Planning and Public Spaces or delegate is the consent authority. Under section 4.41 of the EP&A Act, SSD developments do not require the following authorisations:

a) (Repealed).

b) a permit under section 201, 205 or 219 of the Fisheries Management Act 1994.

c) an approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977.

d) an Aboriginal heritage impact permit under section 90 of the National Parks and Wildlife Act 1974.

e) (Repealed).

f) a bushfire safety authority under section 100B of the Rural Fires Act 1997.

g) 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.

Section 4.42 of the EP&A Act outlines authorisations that cannot be refused if they are necessary for and consistent with an approved SSD. These are outlined below

- An aquaculture permit under Section 144 of the *Fisheries Management Act 1994.*
- An approval under Section 15 of the Mine Subsidence Compensation Act 1961.
- A mining lease under the *Mining Act 1992.*
- A production lease under the Petroleum (Onshore) Act 1991.
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in Section 43 of that Act).
- A consent under Section 138 of the *Roads Act 1993.*
- Subdivision according to the *Conveyancing Act 1919*
- A licence under the Pipelines Act 1967.

Only the underlined acts are relevant to the proposal, these are discussed in Section 5.2.

State Significant Development status

Clause 20 of Schedule 1 of the Planning Systems SEPP defines SSD as including:

Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:

a) has a capital investment value of more than $30 million, or

b) has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance.

The Project would have an estimated capital investment cost greater than $30 million and is therefore considered SSD under Part 4 of the EP&A Act.

C.4 NSW legislation

C.4.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) was introduced to facilitate the effective delivery of infrastructure across the State by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.

a) Part 2.3 Division 4 of Transport and Infrastructure SEPP relates to electricity generating works. The Project falls under a development for the purpose of 'electricity generating work–' – as defined in the Standard Instrument, for making or generating electricity, or electricity storage in any land in a prescribed rural, industrial or special use zone.

The Land use zone of the Development site is RU1 Primary Production and C3 Environmental Management. RU1 is a prescribed zone. However, C3 is not a prescribed zone. The declaration of the Project as SSD extends to all parts of the Project, even those that are to be carried out on land that is not within a prescribed zone as a result of Chapter 4 of the Planning Systems SEPP.

Traffic generating development

Section 2.121 of the Transport and Infrastructure SEPP requires certain developments (identified in Column 1 of the Table in Schedule 3 and known as 'traffic generating development') to be referred to TfNSW. The consent authority would then be required to take into account any submission made by TfNSW in relation to the development.

Electricity generation or solar energy systems are not included within Column 1 of the table in Schedule 3 of the Transport and Infrastructure SEPP. However, development for any other purpose not listed within Column 1 is considered traffic generating development if:

- A site with access to a road (generally) would receive 200 or more motor vehicles per hour, or
- A site with access to a classified road or to a road that connects to classified road (if access is within 90m of connection, measured along the alignment of the connecting road) would receive 50 or more motor vehicles per hour.

The Project would result in the generation of fewer than 50 vehicles per hour during peak construction and operation, thus the requirements under Section 2.121 of the Transport and Infrastructure SEPP do not apply. Section 9.1of the EIS assesses the impact of the Project on traffic and transport.

C.4.2 State Environmental Planning Policy (Primary Production) 2021

State Environmental Planning Policy (Primary Production) 2021 (Primary Production SEPP) provides for agricultural land use matters of State or regional significance. Part 2.2 Section 2.8 of the Primary Production SEPP identifies State significant agricultural land as land listed in Schedule 1. Schedule 1 of the Primary Production SEPP is currently incomplete/blank, with mapping yet to be completed or publicly available.

The Project is compatible with the aims of the Primary Production SEPP, as it would not entirely remove the Development site from agricultural land use, with synergistic sheep or other small animal grazing to occur under the solar panels during operation. The Project also does not permanently divert the land from future grazing, as the Development site would eventually be returned to the landowner following decommissioning.

C.4.3 State Environmental Planning Policy (Resilience and Hazards) 2021

Hazards

State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) (formally the State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (or SEPP 33)) defines and regulates the assessment and approval of potentially hazardous or offensive development for the purpose of industry or storage. For developments classified as 'potentially hazardous industry', Part 3 of the Resilience and Hazards SEPP requires a preliminary hazard analysis (PHA) to determine risks to people, property and the environment.

A checklist and a risk screening procedure developed by DPE is used to help determine whether a development is considered a potentially hazardous industry (DOP 2011). Appendix 3 of the Applying SEPP 33 guidelines list industries that may fall within the Resilience and Hazards SEPP; the lists do not include solar farms. The applicability of the Resilience and Hazards SEPP is not immediately apparent for solar farms and as a result, a risk assessment against Appendix 2 of the SEPP 33 guidelines was undertaken. The hazardous development status of the Project is assessed in Section 9.8 of this EIS.

Remediation of land

The Resilience and Hazards SEPP also aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. Chapter 4 Section 4.6 of the Resilience and Hazards SEPP requires the remediation of land to be considered by a consent authority, when determining a DA.

A search of the NSW OEH Contaminated Sites Register on 6 November 2020 identified two sites within the Queanbeyan-Palerang LGA. One is not in the vicinity of the Project (a waste oil storage facility>45km from the site), while the other is approximately 10km from the site (a former timber treatment plant in Bungendore) but poses no risk due to the large offset distance. No land within the Project appears on the List of NSW Contaminated Sites notified to the EPA (EPA, 2020) as of 6 November 2020.

Contamination associated with agricultural activities (e.g., pesticides, petrochemicals) may be present on the site, but it is unlikely as the landowners have mainly used the area for grazing and cropping. In terms of the proposed solar farm, the risk from contamination and the need for remediation prior to the works is low. Refer to Section 9.3 for details.

C.4.4 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 3 of the Biodiversity and Conservation SEPP encourages the conservation and management of natural vegetation that provides habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline. The SEPP applies to each LGA listed in Schedule 2 of this SEPP, where Queanbeyan-Palerang LGA is listed. Although this SEPP applies to this LGA, with Council as the determining authority, the BDAR for this Project has considered the potential impacts of the Project to the Koala.

No evidence of Koalas was identified as part of the BDAR survey effort. Refer to Section 8.3 and Appendix G of this EIS for details.

C.4.5 Roads Act 1993

The *Roads Act 1993* (Roads Act) establishes a system of 'classified roads', comprising the following categories: main road, highway, freeway, controlled access road, secondary road, tourist road, tollway, transitway and a State work. TfNSW groups these road classes into a three-tier administrative system of State, Regional and Local Roads.

The Roads Act provides for the declaration of TfNSW and other public authorities as roads authorities for both classified and unclassified roads. Freeways, state highways and main roads ('State Roads') are generally the responsibility of TfNSW. For State Roads other than Freeways, the local council generally has responsibility for footpaths and road reserves. Councils are roads authorities for less important classified roads and for roads not classified under the Roads Act. Regional roads may be classified, or unclassified, and local roads are unclassified under the Roads Act. The Minister administering the Crown Land Management Act 2016 (CLM Act) is the authority for Crown roads, including 'paper roads' (refer below).

The Roads Act regulates the carrying out of various activities in, on and over public roads. Under section 138, the consent of the appropriate road's authority is required to:

a) Erect a structure or carry out a work in, on or over a public road
b) Dig up or disturb the surface of a public road
c) Remove or interfere with a structure, work or tree on a public road
d) Pump water into a public road from any land adjoining the road
e) Connect a road (whether public or private) to a classified road.

Consent in relation to a classified road requires the concurrence of TfNSW. Section 138 also applies to works undertaken by roads authorities.

Construction traffic would access the Project via Tarago Road. The need for upgrade works on the access roads has been considered as part of the traffic assessment conducted for the Project (refer to Section 9.1). If works are required, approval from the relevant roads authority would be sought under section 138 of the Roads Act. Under section 4.42 of the EP&A Act; a consent under section 138 of the Roads Act cannot be refused if it is necessary for and consistent with an approved SSD.

C.4.6 Water Management Act 2000

The *Water Management Act 2000* (WMA) is currently administered by DPE – Water division and the Natural Resource Access Regulator (NRAR). The aim of the WMA is to ensure that water resources are conserved and properly managed for sustainable use, benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses, as well as to provide for the protection of catchments.

Freshwater sources throughout NSW are managed via Water Sharing Plans (WSPs) under the WMA. Key rules within the WSPs specify when licence holders can access water and how water can be traded. The Development site is located in an area subject to the Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020 and NSW Murray-Darling Basin Fractured Rock Groundwater Source 2020.

Under section 89J of the EP&A Act, SSD developments do not require a water use approval under section 89, a water management work approval under section 90 nor an activity approval (other than an aquifer interference approval) under section 91 of the WMA.

Water management work includes 'water supply work' which is defined as "a work (such as a water pump or water bore) for the purpose of taking water from a water source". Thus, the Project does not require approval to construct and use a bore within the development site. However, a permit for aquifer interference as per section 4.41(g) of the EP&A Act would be required, post approval, to penetrate the aquifer, where the establishment of a new groundwater bore was proposed to supply water for the Project. Construction water requirements are discussed in Section 9.4.

C.4.7 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. The FM Act aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities. Threatened species, populations and ecological communities and key threatening processes are listed in the Schedules of the FM Act.

Waterways with a Strahler Order 3 and above are classified as Key Fish Habitat (KFH). Within the Development site, the following waterways are therefore considered to be KFH: Blind Creek, Butmaroo Creek and the larger ephemeral wetland area near Lake George. Lake George, adjacent to the site is also KFH. Wrights Creek, is not a KFH. Historically, this creek was incorrectly mapped as a tributary to Butmaroo Creek, however, no such direct discharge to Butmaroo Creek occurs and the creek instead discharges onto a flat plain. Downstream of a dam, a bed or banks are not discernible or distinguishable from the surrounding landscape. Impacts to the KFH have been assessed in Section 8.3.

No threatened species, populations or communities would be impacted by the Project; as such no Test of Significance under Part 7 of the FM Act is required, nor is an Assessment of Significance required under the EPBC Act. As the Project does not include any dredging activities and no passage of fish would be blocked, a permit under sections 201 or 219 of the FM Act is not required under the provisions of Section 89J of the EP&A Act.

C.4.8 Crown Land Management Act 2016

Crown land includes leased Crown lands, Crown roads, Crown reserves managed by local councils and community trusts. It also includes Crown land retained for environmental purposes, many non-tidal waterways and most tidal waterways, and unallocated Crown land (NSW Trade and Investment 2014). Approval from the Lands Minister is required to:

- Reside, erect a structure or graze or drive stock on Crown land.
- Clear, dig up or cultivate or enclose Crown land.
- Under Part 3 of the Act, land must be assessed prior to any allocation action (reservation, dedication, sale, lease, licence or permit), considering capabilities and suitable uses.

Consultation with Crown Lands has revealed that two segments of Crown land are located within the Development footprint; an isolated segment of Crown road in Lot 2 DP 1154765 and a Crown road which forms the southern boundary of Lot 1 DP 456698 (refer to Figure 9-7).

The Proponent has received acknowledgement from Crown Lands regarding a submitted land owner's consent for closing the isolated Crown Road (Enclosure Permit 49717) and undertaking works over other Crown lands (Enclosure Permit 486387). This EIS will be provided to Crown Lands to inform their decision.

C.4.9 Aboriginal Land Rights 1983

The *Aboriginal Land Rights Act 1983* (ALR Act) provides a mechanism for compensating Aboriginal people of NSW for loss of their land. The role of the Department of Aboriginal Affairs is to administer the ALR Act on behalf of the Minister for Aboriginal Affairs.

The Project includes an easement through Crown land. A search of the Register of Native Title Claims identified no active claims across the site (results in Appendix O).

C.4.10 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides a regulatory framework for assessing and offsetting the biodiversity impacts of proposed developments and activities. The BC Act contains provisions relating to flora and fauna protection, threatened species and ecological communities listing and assessment of a Biodiversity Offsets Scheme (BOS), a single Biodiversity Assessment Method (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals.

The BOS applies to the following development and clearing proposals:

- Local development that would have impacts above the 'BOS Threshold' or is likely to significantly affect threatened species or ecological communities based on the assessment of significance in Section 7.3 of the BC Act. ("Local development" is development approved under Part 4 of the EP&A Act other than SSD and Complying Development).
- SSD and State Significant Infrastructure (SSI), unless it is not likely to have any significant impact on biodiversity values (as determined by the Secretary of DPE and the environment agency head).
- Biodiversity certification proposals.
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold and does not require consent.
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the Local Land Services Act 2013.
- Activities assessed under Part 5 of the EP&A Act, if the Proponent chooses to opt-in to the BOS.

Given this Project is assessed as SSD, and may have impacts on biodiversity values, a Biodiversity Development Assessment Report (BDAR) has been prepared (refer to Section 8.3 and Appendix G). There are no significant impacts on BC Act listed threatened species, ecological communities or their habitats. Where some unavoidable impacts are predicted to threatened species and ecological communities, an offset obligation has been calculated in accordance with BAM. Offsets would be required for one species:

- Southern Myotis (*Myotis Macropus*) (97 credits).

C.4.11 Local Land Services Amendment Act 2016

The *Local Land Services Amendment Act 2016* (LLSA Act) provides a three-tier system for native vegetation clearing approval based on a Native Vegetation Regulatory Map, and a Land Management (Native Vegetation) Code 2017. Under the LLSA Act, clearing is permitted if it is authorised under other legislation, including development consent under Part 4 of the EP&A Act. Although the Project is not being assessed under the LLSA Act, it is still consistent with its objectives, and its vegetation clearing would be assessed under Part 4 of the EP&A Act.

C.4.12 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides a framework for the conservation of nature, including but not limited to habitat, ecosystem processes, landforms of significance, and landscape and natural features of significance. In addition, the NPWS Act is also responsible for the conservation of objects, places or features of cultural value within the landscape, such as but not limited to places, object and features of significance to Aboriginal people, places of social value and places of historic, architectural or scientific value.

The Project is not located on land reserved or acquired under the NPW Act.

An Aboriginal Cultural Heritage Assessment (ACHA) was carried out for the Project which included site survey and test excavation within the Study area. The ACHA concluded that impacts of the proposal vary across the Study area based on the type of activities to be undertaken. Eleven recommendations have been made in the ACHA, including that the proposed solar farm development be granted approval with conditions for management of Aboriginal heritage including the ACHA recommendations.

Under section 4.41 of the EP&A Act, an Aboriginal Heritage Impact Permit under section 90 of the NPW Act would not be required for an SSD. The potential impacts to Aboriginal heritage are discussed in Section 8.4 of this report.

C.4.13 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) provides a framework for the prevention, elimination and minimisation of biosecurity risks. The Biosecurity Act and supporting Biosecurity Regulation 2017 provide for the establishment and functions of Local Control Authorities for weeds (LGA or County Councils) and weed control obligations on public and private land.

The EIS provides for the control of priority weeds occurring at the Development site as part of the Project (refer to Section 8.3).

C.4.14 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) defines ‘environmental heritage’ as those places, buildings, works, relics, moveable objects, and precincts, of State or local heritage significance, and aims to conserve these values. A property is a heritage item if it is listed in the heritage schedule of the local council’s LEP or listed on the State Heritage Register: a register of places and items of particular importance to the people of NSW.

Under Section 4.41 of the EP&A Act, an approval under Part 4 of the Heritage Act or an excavation permit under Section 139 of the Heritage Act would not be required for an SSD. The Project is unlikely to directly or indirectly affect any items of heritage significance (refer to Section 9.5 of this EIS).

C.4.15 Conveyancing Act 1919 (and Real Property Act 1900)

The purpose of the *Conveyancing Act 1919* (Conveyancing Act) is to amend and consolidate the law of property and to simplify and improve the practice of conveyancing, and for such purposes to amend certain Acts relating thereto.

When land is leased from a landowner and the lease affects part of a lot or lots in a current plan, a subdivision under section 7A of the Conveyancing Act is required when the total term of the lease, together with any options of renewal, is more than five years. However, a lease of a solar farm is treated as a lease of premises, irrespective of the lease term. A deposited plan will be prepared by a surveyor showing the part of the land as the solar farm premises, together with any associated easements. The plan will refer to ‘Solar Farm Lease Area [number]’ over the relevant part of the existing lot and will constitute a ‘current plan’ for the purposes of section 7A of the Conveyancing Act, and therefore will not require subdivision consent under section 23G of the Conveyancing Act.

The Project will however require subdivision as described in Section 4.2 of:

- Lot 17 DP535180, to separate the solar facility from the adjacent Capital Wind Farm.

- Lot 1 DP456698, to separate connection assets that will become the property of TransGrid or similarly empowered entity.

The subdivision proposed would be subject to changes in the layout during the detailed design phase and any required changes as needed to gain approval by Queanbeyan-Palerang City Council.

C.4.16 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides an integrated system of licensing for certain polluting activities within the objective of protecting the environment:

- Section 148 of POEO Act requires notification of pollution incidents.
- Section 120 of POEO Act provides that it an offence to pollute waters.
- Schedule 1 of the POEO Act describes activities for which an Environment Protection Licence (EPL) is required.

Under Section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an EPL. Clause 17 of Schedule 1 of the POEO Act concerns electricity generation works, however does not include solar power. The Project would not be a scheduled activity under the Act and an EPL is not required.

The Project would be managed to ensure pollution risks are minimised during the construction and operation phases. Measures have been incorporated into the EIS to ensure risks to soils, waterways and air quality are avoided or minimised.

Legal requirements for the management of waste are also established under the POEO Act and the Protection of the Environment Operations (Waste) Regulation 2005. Unlawful transportation and deposition of waste is an offence under section 143 of the POEO Act. Waste minimisation and management is addressed in Section 9.11 of this EIS.

C.4.17 Waste Avoidance and Resource Recovery Act 2001

The Waste Avoidance and Resource Recovery Act 2001 (WARR Act) includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The Project's resource management options would be considered against a hierarchy of the following order:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling and energy recovery).
- Disposal.

Adopting the above principles would encourage the most efficient use of resources and reduce costs and environmental harm in accordance with the principles of ecologically sustainable development (refer to Section 9.11).

C.5 Commonwealth legislation

C.5.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) provides an assessment and approval process for actions likely to have a significant impact on Matters of National Environmental Significance (MNES). The nine MNES are:

- World Heritage properties.
- National Heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Nuclear actions (including uranium mines).
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- A water resource, in relation to coal seam gas development and large coal mining development.

Also, consideration is required of whether there is any impact on Commonwealth Land. Actions that adversely affect these matters may be deemed to be a 'controlled action' under the EPBC Act.

The only matters relevant to the Blind Creek Solar Farm are in relation to listed threatened species and ecological communities. These are assessed in the BDAR (refer Appendix G) and summarised in Section 8.3. The assessment concluded no adverse impacts to these entities and therefore, the Project has not been referred to DAWE under this Act.

C.5.2 Native Title Act 1993

The *Native Title Act 1993* provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title.

People who hold native title have a right to continue to practice their law and customs over traditional lands and waters while respecting other Australian laws. This could include visiting to protect important places, making decisions about the future use of the land or waters, and hunting, gathering and collecting bush medicines. Further, when a native title claimant application is registered by the National Native Title Tribunal, the people seeking native title recognition gain a right to consult or negotiate with anyone who wants to undertake a proposal on the area claimed.

Native title may exist in areas such as:

- Vacant Crown Land.
- Some national parks, forests and public reserves.
- Some types of pastoral leases.
- Some land held for Aboriginal communities.
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

A search of the National Native Title Tribunal Registers on 05 March 2021 found no Native Title Claims for the Study area.

C.5.3 Renewable Energy (Electricity) Act 2000

The *Renewable Energy (Electricity) Act 2000* (RE Act) aims to:

- Encourage the additional generation of electricity from renewable sources

- Reduce emissions of greenhouse gases in the electricity sector
- Ensure that renewable energy sources are ecologically sustainable.

Section 17 of the RE Act defines renewable energy sources eligible under the Commonwealth Government’s RET; this includes solar.

Certificates for the generation of electricity are issued using eligible renewable energy sources. This requires purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire. In January 2011, renewable energy certificates were reclassified as either large-scale generation certificates or small-scale technology certificates following changes to the RET scheme.

The Project would need to be accredited as a Renewable Energy Generator to create Renewable Energy Certificates.

Appendix D Consultation

D.1 Agency consultation

D.2 Community and Stakeholder Engagement Strategy

D.3 Summary of activities and results

D.4 Evidence of media releases, articles and open days undertaken

D.5 Team credentials Landholder consultation

Appendix E Visual Impact Assessment

Appendix F Reflective Glare Assessment

Appendix G Biodiversity Development Assessment Report

Appendix H Aboriginal Heritage Assessment Report plans

Appendix I Hydrology and flooding

Appendix J Noise and vibration

Appendix K Access and traffic

Appendix L Historic heritage

Appendix M Social Impact Assessment

M.1 Direct Response to residents

M.2 Social Impact Assessment

M.3 Regional Industry and social infrastructure services

Appendix N Preliminary hazard analysis

Appendix O Background search results

Appendix P Consolidated mitigation measures

No.	Mitigation measures	Phase
	Visual Amenity	
V1	A Landscape Management Plan (LMP) is recommended to address the ‘as built’ visual impacts of the proposed solar farm. The plan should include: • On-site vegetation screening generally in accordance with Figure 8-8. This would include details of selected species aimed at ‘breaking up’ not blocking views of onsite infrastructure. • Vegetation screening along Butmaroo would avoid Archaeological and ecological sensitive areas. Consultation with the RAPS will be undertaken to inform the location of this vegetation screening. • Location of planting locations, generally expected to be between the security fencing and the property boundary. • Band width, generally expected to be approximately 6m with three (3) rows of vegetation in high visual impact areas and two (2) rows in low / moderate visual impact areas. • Maintenance schedule for a period of 24 months. Maintenance should generally include the removal of weeds and replacement of dead or non-performing plants. The plan would be implemented nearing completion of construction and would be subject to agreement with the relevant landowner.	Design Construction
V2	To ensure that the screen planting integrates into the existing landscape character, the bands will be planted with fast growing small trees and bushes, and low-lying vegetation to ensure a naturalistic effect whilst providing habitat and movement corridors for the native fauna.	Design
V3	Consult with landowners where landscaping has been proposed, in order to receive their feedback and adjust the mitigation measures accordingly.	Design
V4	Plantings from the following species will be selected, as they match the Plant community type generally present at the site: • *Eucalyptus pauciflora* 12m. • *Eucalyptus mannifera* 10-20m. • *Eucalyptus viminalis* 50m. • *Eucalyptus stellulata* 15m. • *Casuarina cunninghamiana* 10-15m. • *Cassinia aculeata* 1.0-2.6m.	Design

No.	Mitigation measures	Phase
	• *Hakea laurina* 5m. • *Dodonea viscosa subsiata* 2m.	
V5	Consideration will be given to the colours, type and height of the PCUs, the battery facility, O&M facility buildings and storage shed to ensure minimal contrast and to help blend into the surrounding landscape to the extent practicable.	Design
V6	Existing vegetation generally present around the site, and specifically to the eastern and southern boundary will be mostly retained and protected to maintain the existing level of screening.	Design Construction
V7	External lighting would be installed to comply with Australian/New Zealand Standard AS/NZS 4282:2019 – Control of Obtrusive Effects of Outdoor Lighting, or its latest version. All external operational lighting would be low intensity lighting (except where required for safety or emergency purposes) and would not shine above the horizontal.	Design Operation
	Reflective Glare	
R1	General methods to reduce visual impact of buildings will centre on the colour and materials of infrastructure, to reduce the overall visual contrast and reflectivity of the Project.	Design Construction
R2	Back-Tracking software can address all of the identified potential reflection glare and/or visibility during operational, specifically, by avoiding the horizontal position of panels at the very start and end of each day. The precise limiting angle should be established during commissioning.	Operation
R3	Avoid very low tilt angles either East or West.	Construction Operation
R4	Potential glare conditions at ID7 and 8 will be addressed via vegetation screening or avoid low angle fixed tilt east (avoid tilt position less than 25 degrees east).	Design Construction
R5	Lighting design AS 4282-1997 *Control of the Obtrusive Effect of Outdoor Lighting* will be implemented for lighting at the Project. • Lights will be directed downward as much as possible and luminaires that are designed to minimise light spill will be used, e.g., full cut-off luminaires where no light is emitted above the horizontal plane, ideally keeping the main beam angle less than 70°. Less spill-light means that more of the light output can be used to illuminate the area and a lower power output	Design Operation

No.	Mitigation measures	Phase
	can be used, with corresponding energy consumption benefits, but without reducing the illuminance of the area. • Wherever possible use floodlights with asymmetric beams that permit the front glazing will be kept at or near parallel to the surface being lit.	
	Biodiversity	**Phase**
B1	Preparation and implementation of a Biodiversity Management Plan (BMP) for the site to include: • How to remove and dispose of vegetation and topsoil containing weeds declared under the *Biosecurity Act 2015* during and after construction. • Identification and protection of biodiversity exclusion zones during construction and operation.	Pre-construction Construction Operations
B2	Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecologist or licensed trained spotter catcher during clearing events, construction and maintenance activities for human-made structures and non-native vegetation.	Pre-construction Construction
B3	Relocating habitat features (fallen timber, hollow logs and embedded rock) from within the Development footprint.	Pre-construction Construction
B4	Induct all staff prior to construction to identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance: ○ Staff training and site briefing to communicate environmental features to be protected and measures to be implemented. ○ Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing. ○ No stockpiling or storage within dripline of any mature trees. No stockpiling or storage within riparian buffers.	Pre-construction Construction
B5	Adopt clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed: • Documented clearance protocols to mark and protect vegetation to be retained. • Use handheld machinery where possible and have elevated work platform check hollows prior to tree felling.	Pre-construction Construction
B6	Use noise barriers, or daily/seasonal timing of construction and operational activities to reduce impacts of noise.	Construction

No.	Mitigation measures	Phase
B7	Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill.	Construction
B8	Using adaptive dust management and monitoring programs to control air quality.	Construction Operations
B9	Install temporary fencing to protect significant environmental features such as riparian zones, karst, caves, rock outcrops and water bodies: • Prior to construction commencing, exclusion fences and signage would be installed around identified exclusion zones.	Pre-construction Construction
B10	Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.	Construction Operations
B11	Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed Project.	Construction
B12	Scheduling the timing of construction activities to avoid critical life cycle events (e.g. timing construction activities to avoid migratory species on site, or using the site).	Construction
B13	Using sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment.	Construction
B14	Ecological restoration, rehabilitation actions and/or maintenance of retained native vegetation on, or adjacent to, the Development footprint.	Construction
	Aboriginal Heritage	
AH1	The proponent must prepare a Cultural Heritage Management Plan (CHMP) to outline management steps and requirements for ongoing management of cultural heritage values within the construction, operation and decommissioning stages of the project. The CHMP may include some of the following elements, with agreement of relevant stakeholders. • Management of known sites, • Management of high sensitivity areas excluded from the project footprint, • Management of unexpected finds, and	Pre-construction Construction Operation Decommissioning

No.	Mitigation measures	Phase
	• Ongoing consultation and engagement with the local Aboriginal community.	
AH2	All cultural material recovered from the subsurface testing programme which is currently in temporary care at the NGH Canberra office be reburied in accordance with Requirement 26 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* in an appropriate location within the Development site as agreed with the registered Aboriginal parties. The reburial location must be submitted to the AHIMS database and will not be impacted in the future.	Pre and post construction
AH3	Any recorded surface artefacts that cannot be avoided by the Development footprint must be salvaged by community collection prior to the commencement of ground disturbing works. The collection and relocation of the artefacts should be undertaken by an archaeologist with representatives of the registered Aboriginal parties in accordance with Requirement 26 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. The map shown in Figure 8-27 must be used as a guide for undertaking community collections. The artefacts should be collected and moved to a safe area within the property that will not be subject to any ground disturbance.	Pre-construction
AH4	All objects salvaged must have their reburial location submitted to the AHIMS database. An Aboriginal Site Impact Recording Form must be completed and submitted to AHIMS following harm for each site collected or destroyed from salvage and/or construction works.	Post construction
AH5	A Cultural Smoking Ceremony should be considered if requested by the Aboriginal community to take place to cleanse any artefacts salvaged during the reburial.	Pre-construction
AH6	Representative subsurface salvage excavations should be undertaken within the following landforms where significant ground disturbance works such as cabling or infrastructure is proposed. • Elevated Sand Body. • Undulating Plains. • Creek Terrace. The excavations would be undertaken within relatively undisturbed deposits (or deposits assumed to be undisturbed) and be aimed at retrieving important scientific information about the nature and age of the sites. The detailed research aims should be guided by those identified in this assessment and other researchers. This includes detailed analysis of the stone artefact technology and landuse.	Pre-construction
AH7	A selection of salvaged artefacts could be stored securely on-site (within the Cultural Learning Zone, for example) for easy access by the local Aboriginal community for education and cultural purposes such as Open Days, (contingent upon the consensus of comments received from RAPs on this ACHA report).	Pre-construction

No.	Mitigation measures	Phase
AH8	The Proponent continue to consult with the Aboriginal community should the proposal receive approval regarding any conditions of consent concerning Aboriginal cultural heritage.	Pre-construction Construction Operation Decommissioning
AH9	In the event that human remains are discovered during the works, all work must cease in the immediate vicinity. Heritage NSW and the local police should be notified. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal. Should the remains be identified as Aboriginal in origin, Heritage NSW will identify the appropriate course of action.	Pre-construction Construction Operation Decommissioning
AH10	Any changes to the proposed Development footprint that has not been assessed by this report should be subject to further assessment.	Pre-construction Construction Operation Decommissioning
	Hydrology	
H1	Ensure appropriate erosion and sediment controls are incorporated into the design and should be implemented before works commence and maintained for the duration of the construction and until soil is stabilised after construction.	Design Construction Operations Decommissioning
H2	The Flood Response Plan prepared as part of the Emergency Response Plan would include: • Detail who will be responsible for monitoring the flood threat and how this is to be done. • Detail specific response measures to ensure site safety and environmental protection. • Outline a process for removing any necessary equipment and materials offsite and out of flood risk areas (i.e. rotate array modules to provide maximum clearance of the predicted flood level). • Consider site access in the event that some tracks become flooded. • Establish an evacuation point. • Define communication protocols with emergency services agencies.	Construction Operations Decommissioning

No.	Mitigation measures	Phase
H3	All buildings and structures (including solar arrays) associated with the proposal should be located outside high hazard areas (H5 and above) where they may be vulnerable to structural damage and have significant impact on flood behaviour.	Design Construction
H4	The finished floor level of all buildings should be a minimum of 500mm above the 1% AEP flood level, whilst critical infrastructure such as the electrical substation, control room and battery storage areas (i.e. BESS infrastructure) should be a minimum of 500mm above the PMF flood level in the adjacent Blind Creek.	Design Construction
H5	For proposed crossing structures over any watercourses that will likely be rendered impassable during significant flood events it is recommended that: • Flood warning signs and flood level indicators should be placed on each approach to the proposed crossings. • A Business Floodsafe Plan be prepared for the development to ensure the safety of employees during flood events in general accordance with the NSW SES "Business Floodsafe Toolkit and Plan"	Design Construction
H6	For solar tracking modules, the tracking axis should be located above the 1% AEP flood level plus 500mm freeboard, and the modules rotated to the horizontal during significant flood events to provide maximum clearance to the predicted flood level.	Design Construction
H7	Where located in the floodplain the solar array mounting piers should be designed to withstand the forces of floodwater (including any potential debris loading) up to the 1% AEP flood event, giving regard to the depth and velocity of floodwaters. Post development 1% AEP flood levels and velocities are shown in Figure 8-38 and Figure 8-39.	Design Construction
H8	All electrical infrastructure, including power conversion stations (PCUs) and the proposed substation, should be located above the 1% AEP flood level plus appropriate freeboard (minimum 500mm).	Design Construction
H9	Where electrical cabling is required to be constructed below the 1% AEP flood level it should be capable of continuous submergence in water.	Design Construction
H10	Wherever possible security fencing within the floodplain should be avoided or minimised. Where required security fencing should be constructed in a manner which does not adversely affect the flow of floodwater and should be designed to withstand the forces of floodwater or collapse in a controlled manner to prevent impediment to floodwater.	Design Construction
H11	Any fencing across Butmaroo, Blind and Wrights Creeks should be avoided in preference to creating separate fenced compounds on either side of the creeks.	Design Construction

<table>
<tr><th>No.</th><th>Mitigation measures</th><th>Phase</th></tr>
<tr><td>H12</td><td>All proposed infrastructure associated with the proposed development should be setback from existing watercourses at the recommended riparian corridor widths specified in Table 1 of the Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012) as provided below. In accordance with the guidelines the width of the vegetated riparian zone (VRZ) should be measured from the top of the highest bank on both sides of the watercourse.

Table 1. Recommended riparian corridor (RC) widths
<table>
<tr><th>Watercourse type</th><th>VRZ width (each side of watercourse)</th><th>Total RC width</th></tr>
<tr><td>1st order</td><td>10 metres</td><td>20 m + channel width</td></tr>
<tr><td>2nd order</td><td>20 metres</td><td>40 m + channel width</td></tr>
<tr><td>3rd order</td><td>30 metres</td><td>60 m + channel width</td></tr>
<tr><td>4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)</td><td>40 metres</td><td>80 m + channel width</td></tr>
</table>
</td><td>Design
Construction</td></tr>
<tr><td>H13</td><td>Non-riparian corridor works may be authorised in the outer riparian corridor, so long as where appropriate 50 percent of the outer vegetated riparian zone width may be used for non-riparian uses including asset protection zones, recreational areas, roads, development lots and infrastructure. However, an equivalent area connected to the riparian corridor must be offset on the site and the inner 50 percent of the vegetated riparian zone must be fully protected and vegetated with native endemic riparian plant species.</td><td>Design
Construction</td></tr>
<tr><td>H14</td><td>Any road crossing of existing watercourses associated with the proposed development should be of the type defined in Table 2 of the Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012) and Guidelines for Laying Pipes and Cable in Watercourses on Waterfront Land (NSW DPI, 2012).
Based on a preliminary assessment under the Strahler System defined in the Guidelines for Riparian Corridors on Waterfront Land (DPI Water, 2012) all three watercourses of the Development site would be classified as having a stream order of four or</td><td>Design
Construction</td></tr>
</table>

No.	Mitigation measures	Phase
	greater.	
H15	Within the floodplain access roads should be constructed as close to natural ground levels as possible so as not to form an obstruction to floodwaters, unless otherwise supported by modelling to demonstrate no adverse flooding impacts during the detailed design phase. The surface treatment of roads should be designed giving regard to the velocity of floodwaters to minimise potential for scouring during flood events, which could include the use of stabilised gravels or grassed surfaces for roads within the floodplain.	Design Construction
H16	Any areas of existing erosion within the proposed Development footprint should be appropriately treated prior to the erection of solar array modules to ensure their ongoing stability. For further information refer to Saving Soil: A Landowners Guide to Preventing and Repairing Soil Erosion, NSW DPI (2009) available at https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/270881/saving-soil-complete.pdf	Construction
	Noise and vibration	
N1	A Noise Management Plan (NMP) would be developed as part of the CEMP. The plan would include, but not be limited to: • Use less noisy plant and equipment where feasible and reasonable. • Plant and equipment will be properly maintained. • Use and maintain 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended. • Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel. • Avoid any unnecessary noise when carrying out manual operations and when operating plant. • Any equipment not in use for extended periods during construction work will be switched off • Implement a complaints procedure to manage noise complaints that may arise from construction activities. Each complaint will need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits. • Establish good relations with people living in the vicinity of the site at the beginning of Project. Keep people informed, deal with complaints seriously and expeditiously. The community liaison member of staff should be adequately experienced.	Construction Decommissioning
N2	Potential noise impacts to associated receivers R2 and R48, will be managed in consultation with the homeowner and may include the following: • Time restrictions and/or providing periods of respite for residents, where feasible and reasonable e.g., between 10am and	Construction

No.	Mitigation measures	Phase
	3pm (with one-hour break for lunch between 12pm and 1pm). • Allowing the construction activities to proceed, despite the noise exceedance, may be the preferred method in order to complete the works expeditiously, with noise exceedances occurring over only two to three days. • These residents will be consulted to determine appropriate respite periods and will be notified of the potential noise impact during this time period so that they can organise their day around the noisy period.	
N3	Works will be undertaken during standard working hours only (except for works that can be performed without noise nuisance): No work on Sundays or public holidays. Construction • Monday – Friday 7am to 6pm. • Saturday 8am to 1pm. • No work on Sundays or public holidays. Operation • Monday – Friday 7am to 6pm. • Saturday 8am to 1pm.	Construction Operation Decommissioning
N4	All staff on-site should be informed of procedures to operate plant and equipment in a quiet and efficient manner where possible.	Construction Operation Decommissioning
	Access and Traffic	
AT1	A Traffic Management Plan (TMP) will be developed as part of the CEMP, OEMP and DEMP, in continued consultation with Council and TfNSW. The plan would include: • Neighbours of the solar farm will be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access. • Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time. • All vehicles will enter and exit the site in a forward direction. • Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site: ○ Utilisation of only the designated transport routes.	Preconstruction Construction Decommissioning

No.	Mitigation measures	Phase
	○ Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities. • Implementation of a proactive erosion and sediment control plan for on-site roads, hardstands and laydown areas. • All permits for working within the road reserve will be received from the relevant authority prior to works commencing. • A map of the primary haulage routes highlighting critical locations. • An induction process for vehicle operators and regular toolbox meetings. • A complaint resolution and disciplinary procedure. • Local climatic conditions that may impact road safety of employees throughout all project phases (e.g., fog, wet and significant dry, dusty weather).	
AT2	TfNSW education staff will be invited to provide information, guidance and discussion on fatigue management and road safety to site staff.	Preconstruction Construction Decommissioning
AT3	Stakeholders including TfNSW, Queanbeyan-Palerang Regional Council, local landholders and emergency services will continue to be consulted during construction and decommissioning to advise of any changes to road use and conditions.	Construction Decommissioning
AT4	The intersection of Blind Creek Road Entrance + and Tarago Road will be upgraded to accommodate a BAL treatment to allow B-Doubles to exit the track to the north.	Pre-construction
	Land Use	
L1	Consultation would be ongoing with TransGrid regarding connection to the substation and design of electricity transmission infrastructure.	Preconstruction
L2	Consultation with adjacent landowners, to minimise impact of the Project on adjacent agricultural activities and access.	Preconstruction Construction
L3	Construction, operation and decommissioning to operate in accordance with the Traffic Management Plan (TMP), to minimise dust generation and disturbance to livestock.	Construction Operation Decommissioning
L4	Relevant landholders and residents would be consulted and notified to minimise, where possible, the noise, dust, traffic and other disturbance impacts.	Preconstruction Construction

No.	Mitigation measures	Phase
L5	Underground cabling and other works to remain in situ following decommissioning of the solar farm would be installed deeper than 500mm to allow cultivated cropping to resume following decommissioning.	Decommissioning
L6	Prior to construction, a license will be applied for to allow construction to commence within Crown roads on the Development site.	Preconstruction
L7	Consultation with representatives from nearby Major Projects, including Capital Wind Farm, Woodlawn Wind Farm, and Woodlawn Bioreactor would be undertaken to ensure cumulative traffic and pressure on local services are managed adequately.	Preconstruction Construction
L8	A Decommissioning Environmental Management Plan (DEMP) would be prepared and submitted to DPE for approval prior to decommissioning. The DEMP would include a Site Rehabilitation Plan covering: • Criteria and indicators for the restoration of land capability and agricultural potential based on pre-works soil survey results. • Details of rehabilitation actions such as removal of infrastructure, remediation of soils, reinstatement of dams and irrigation/drainage channels as required, reinstatement of property boundaries and establishment of suitable groundcover vegetation on bare areas. • A monitoring and assessment process to demonstrate that the target state has been achieved. • An expected timeline for the rehabilitation program.	Pre-decommissioning
	Soils and Landforms	
S1	The solar array would be designed and installed to optimise the capacity of the solar array and maintain perennial groundcover (subject to climatic conditions). Groundcover management details (including any stocking levels etc) and rehabilitation of civil work completed during construction are to be included in the Construction Environmental Management Plan and Operational Environmental Management Plan.	Preconstruction Construction Operation
S2	A Construction Environmental Management Plan (CEMP) would be implemented to manage runoff, soil erosion and sedimentation and pollution risks at the site. The CEMP would be prepared in accordance with the 'Blue Book' Volume 1 Managing Urban Stormwater: Soils and Construction (Landcom 2004), Volume 2A Installation of Services (DECC 2008a) and Volume 2C Unsealed Roads (DECC 2008b).	Pre-construction Construction
S3	As part of the CEMP, a Soil and Water Management Plan (incorporating a Site Drainage Plan and Erosion and Sediment Control Plan) would be prepared, implemented and monitored during the Project to minimise soil and water impacts. These plans would include provisions to: • Install, monitor and maintain erosion controls.	Pre-construction Construction

No.	Mitigation measures	Phase
	• Identify and protect sensitive features such as native vegetation, dams and water courses. • Ensure that machinery leaves the site in a clean condition to avoid tracking of sediment onto public roads. • Manage topsoil: in all excavation activities, separate subsoils and topsoils to restore natural soil profiles and assist revegetation, guided by the findings of the pre-works soil survey. Topsoils stockpiled for extended periods would be managed to avoid contact with overland runoff, minimise weed risks, and maintain soil organic matter, soil structure and microbial activity. • Minimise the area of disturbance from excavation and compaction and rationalise vehicle movements to minimise soil impacts. • Ensure any discharge of water from the site is managed to ensure ANZECC (2000) water quality criteria are met as far as practicable, ensure excavations are not scheduled when heavy rainfall events are predicted, or soils are saturated.	
S4	Prior to commencement of construction, representative soil samples would be gathered as part of a specialist soil survey to establish baseline data on the existing agronomic characteristics of the soil. The survey would include sampling and analysis for soil texture and structure, nutrients, acidity, salinity, sodicity, dispersion and organic matter.	Pre-construction
S5	The Spill and Contamination Response Plan prepared as part of the Emergency Response Plan would include measures to: • Respond to the discovery of existing contaminants at the site (e.g., Pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements. • Manage the storage of any potential contaminants on-site. • Mitigate the effects of soil and water contamination by fuels or other chemicals (including emergency response and EPA notification procedures). • Ensure that machinery and materials arrive on site in a clean and secure condition. • Prevent contaminants affecting adjacent pastures, water courses, dams and native vegetation. • Monitor and maintain spill equipment including spill kits in relevant machinery. • Induct and train site staff. • Detail fuels, chemicals, and liquids storage locations that are at least 50m from any waterways or drainage lines, in an appropriate bunded area. • Disposal process for contaminated materials.	Construction Operation Decommissioning
S6	If earthworks during construction have a likelihood of impacting potential NOA, an Asbestos Management Plan (AMP) is to be prepared prior to construction for identified or suspected areas of naturally occurring asbestos mapped by NSW Department of Planning, Industry & Environment. The AMP is to include the items outlined in the NSW SafeWork Naturally occurring asbestos factsheet, www.safework.nsw.gov.au.	Pre-construction Construction

No.	Mitigation measures	Phase
S7	Any development that intersects mapped moderate to high salinity, a salinity soil survey is required.	Pre-construction
S8	Sodic soil amendment should be applied where sodic soils are present. Treatment with Gypsum should be applied. The application rate should be determined following soil testing (Clay content, ECEC and EC), and should be at a minimum rate of 10t/ha.	Pre-construction
S9	An unexpected finds protocol is to be prepared prior to construction including actions to be undertaken if contaminated soils and/or water are encountered during construction.	Pre-construction Construction
	Water use and water quality	
W1	The Spill and Contamination Response Plan prepared as part of the Emergency Response Plan would include measures to: • Respond to the discovery of existing contaminants at the site (e.g., Pesticide containers or asbestos), including stop work protocols and remediation and disposal requirements. • Manage the storage of any potential contaminants on-site. • Mitigate the effects of soil and water contamination by fuels or other chemicals (including emergency response and EPA notification procedures). • Ensure that machinery and materials arrive on site in a clean and secure condition. • Prevent contaminants affecting adjacent pastures, irrigation channels, dams and native vegetation. • Monitor and maintain spill equipment including spill kits in relevant machinery. • Induct and train site staff. • Detail fuels, chemicals, and liquids storage locations that are at least 50m from any waterways or drainage lines, in an appropriate bunded area. • Disposal process for contaminated materials.	Construction Operation Decommissioning
W2	If the substation is oil-cooled, the layout, design, size etc of the oil containment bunding and drainage would comply with the relevant standards and guidelines. The bund would be regularly inspected and cleaned, including removal of rainwater.	Pre-construction Construction Operation
W3	A Soil and Water Management Plan will be developed to incorporate the following: • That no detergents or other chemicals would be added to the solar panel cleaning water. • Specify concrete washout process and location.	Construction Operation

No.	Mitigation measures	Phase
	• Specify the procedures for testing, treatment and discharge of construction wastewater. • Detail staff training required.	
W4	If a new bore is to be constructed, the construction and maintenance of the groundwater extraction bore will be in accordance with the Minimum Construction Requirements for Water Bores in Australia (3rd edition) produced by the National Uniform Drillers Licencing Committee (NUDLC). The minimum requirements for consideration include: • Only a licensed driller shall carry out the bore installation works and shall be present at all times during bore construction activities. • The bore design should aim to ensure the protection of the groundwater resource from surface contamination. The headworks and casing are sealed so that there is no potential for flow outside the casing. • To minimise the possibility of contaminating the bore and any surrounding bores, the new bore should be located away from existing bores, surface water sources and any sources of pollution (e.g., dairies, septic tanks and absorption trenches, refuse dumps, landfill, effluent discharges from drainage ditches, cattle/stock dips). • Chemicals and other drilling fluid additives that could leave a residual toxicity should not be added to any drilling fluids or cement slurries (i.e., grouts) used to drill and complete any water bore.	Pre-Construction Construction Operation Decommissioning
W5	If ground water is to be used, a Groundwater Management Plan would be incorporated into the CEMP to manage impacts. This would be informed by onsite survey by an appropriately trained expert and include: • Pollution controls. • Management of dewatering.	Pre-Construction
W6	If possible, a dedicated refuelling area near to the servicing area should be established. Refuelling areas will be communicated to all site personnel by signs and notice boards.	Construction Operations Decommissioning
	Historic heritage	
HH1	**Stock fence around the Trig Station** It is recommended that a stock fence be installed along the proposed buffer around the Trig Station. There is currently no protection from live stock.	**Pre-construction**
HH2	**Archival Recording of the Trig Station** A photographic archival recording of the Trig Station shall be prepared in accordance with Heritage NSW guideline, Photographic	**Pre-construction**

No.	Mitigation measures	Phase
	Recording of using Film or Digital Capture (2006). The photographic recording will include additional research to confirm the existence of other Trig Station or markers within or in proximity to the Development site. The photographic recording shall include photos, descriptions and a brief historical account of these identified survey markers and their relationship to each other.	
HH3	**Implement an Unexpected Finds Procedure** Should historical archaeological materials be uncovered while undertaking works to develop the Blind Creek Solar Farm, all activities must stop and Heritage NSW be immediately notified. An appropriately qualified archaeologist should also be consulted for the purpose of implementing best practice protection and conservation measures while the relevant approvals are obtained.	**All stages**
	Social and economic	
S1	The Local Industry Participation Plan will focus on maximising the involvement of local people and businesses in the Project. It will: • Include specific focus on people and businesses within the Queanbeyan-Palerang LGA, but also the ACT, and the wider regional area. • Consider specific opportunities for Aboriginal people and businesses, women, and young people. • Include culturally sensitive Aboriginal employment goals for workers and university graduates, and protocols and systems to ensure Aboriginal employment does not conflict with cultural obligations (Appendix D.2). The plan should be developed in partnership with the key local economic development stakeholders in the region (e.g., the Industry Capability Network, NSW Training Services, Regional Development Australia, Queanbeyan-Palerang Regional Council, Bungendore Chamber of Commerce and Industry, and Queanbeyan Business Chamber). It will assess the feasibility to support local schools in science and engineering studies through a partnership. The plan would outline mechanisms that will be used to ensure that local people and businesses are given full, fair, and reasonable opportunity to participate in the Project. It will also detail how the proponent will link in at the local level with government and agency support programs that assist people and businesses improve their capacity and capability.	Design, Construction, Operation
S2	The Local Procurement Policy will outline the proponent’s commitment to providing local and regional businesses the opportunity to supply goods and services to meet Project needs during all phases of the Project. This will be developed through consultation with key local economic development stakeholders (e.g., the Industry Capability Network, Regional Development Australia, Queanbeyan-Palerang Regional Council). It will give Aboriginal businesses full and fair opportunities to supply goods and services.	Design, Construction, Operation

No.	Mitigation measures	Phase
S3	The Employment and Accommodation Strategy will provide further detail on accommodation providers. The strategy will include engagement with accommodation providers to avoid negatively impacting on tourism opportunities and any vulnerable populations who are utilising temporary accommodation.	Design, Construction, Operation
S4	Develop the CBSS in partnership with residents. The intention is to create a fund that can support very localised and meaningful community development or other neighbourhood-level initiatives that have strong resident support, throughout the life of the Project. The proponent will consider the need for a greater level of clarity on the rationale for benefit sharing and the way the CBSS has been structured.	Design, Construction, Operation
	Bushfire	
BF1	Copper conductors would be used where necessary to electrically bond the metal structures to earth to protect personnel and equipment in the event of lightning strikes and electrical faults.	Design
BF2	Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids*.	Construction Operation Decommission
BF3	Develop a Bushfire Emergency Management and Operations Plan to include but not be limited to: • Specific management of activities with a risk of fire ignition (hot works, vehicle use, smoking, use of flammable materials, blasting). • Incorporation of fire safety and response in staff and contractor induction, training, OHS procedures and Work Method Statements. • Designation of a staff safety officer tasked with ensuring implementation of the plan and regular liaison with firefighting agencies including emergency access to site. • Document all firefighting resources maintained at the site with an inspection and maintenance schedule. • Monitoring and management of vegetation fuel loads. • A communications strategy incorporating use of mobile phones, radio use (type, channels and call-signs), Fire Danger Warning signs located at the entrance to the site compounds, emergency services agency contacts. In developing the Bushfire Emergency Management and Operations Plan, NSW RFS and Fire and Rescue NSW would be consulted on the volume of water supplies, fire-fighting equipment maintained on-site, fire truck connectivity requirements, emergency access points, proposed APZ and access arrangements, communications, vegetation fuel levels and hazard reduction measures.	Construction Operation Decommission

No.	Mitigation measures	Phase
BF4	An APZ buffer of minimum 10m would be maintained from the outside edge of the Project infrastructure. Additionally, where remnant or planted woody vegetation is present within the Development footprint, an APZ buffer of minimum 20m would be maintained between this vegetation and solar farm infrastructure. An APZ comprising of crushed gravel (20m in width) would be maintained between the substation and hazard vegetation Average grass height within the APZ buffer (adjacent solar array perimeter) would be maintained at or below 10 centimetres on average in the lead-up to and throughout the October - April fire season. APZs would meet the specifications of Appendix 4 of PBP. Land outside designated APZs, including beneath the solar array, would be maintained by intensive rotational grazing.	Construction Operation Decommission
BF5	The project would include a defendable space around the permitter of the solar array area that permits unobstructed vehicle access: • 20m around woody vegetation. • 10m around grassland.	Design Operation
BF6	The overhead powerlines to the TransGrid transmissions lines at the site would be managed by maintaining appropriate vegetation clearance limits to minimise potential ignition risks, in accordance with the *ISSC 3 Guideline for Managing Vegetation Near Power Lines.*	Operation
BF7	Appropriate fire-fighting equipment would be held on site to respond to any fires that may occur at the site during construction. This equipment would include fire extinguishers, a 1000 litre water cart (fitted with suitable hosing, fittings and diesel fire-fighting pump) retained on site on a precautionary basis, particularly during any blasting and welding operations. Equipment lists would be detailed in Work Method Statements. A 20,000-litre non-combustible water storage tank, with a 65mm Storz outlet with a ball valve fitted to the outlet, would be provided close to the entrance of the substation. A 100,000-litre tank close to the entrance of the solar array area and a second 100,000-litre tank within the solar array area would be provided, each with 20,000-litres reserved for firefighting purposes with a 65mm Storz outlet and ball valve fitted to the outlet	Construction Operation Decommission
BF8	The NSW RFS and Fire and Rescue NSW would be provided with a contact point for the solar farm, during construction and operation.	Construction Operation
BF9	Following commissioning of the solar farm, the local RFS and Fire and Rescue brigades would be invited to an information and orientation day covering access, infrastructure, firefighting resources on-site, fire control strategies and risks/hazards at the site.	Operation

No.	Mitigation measures	Phase
BF10	All internal access tracks would comply with the requirements of property access roads in accordance with Table 5.3b of the PBP. All access and egress tracks on the site would be maintained and kept free of parked vehicles to enable rapid response for firefighting crews and to avoid entrapment of staff in the case of bushfire emergencies. Access tracks would be constructed as through roads as far as practicable. Dead end tracks would be signposted and include provision for turning firefighting vehicles.	Construction Operation Decommission
BF11	A Hot Works Permit system would be applied to ensure that adequate safety measures are in place. Fire extinguishers would be present during all hot works. Where practicable hot works would be carried out in specific safe areas (such as the Construction Compound temporary workshop areas).	Construction Operation Decommission
BF12	Machinery capable of causing an ignition would not be used during bushfire danger weather, including Total Fire Ban days.	Construction Operation Decommission
BF13	Prior to operation of the solar farm, an Emergency Response Plan (ERP) would be prepared in consultation with NSW RFS and Fire and Rescue NSW. This plan must include but not be limited to: • Specifically addresses foreseeable on site and off site fire events and other emergency incidents. • Risk control measures would include the level of personal protective clothing required to be worn, the minimum level of respiratory protection required, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment). • Outline other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site. • Two copies of the ERP are stored in a prominent 'Emergency Information Cabinet' which is located in a position directly adjacent to the site's main entry point/s. • Once constructed and prior to operation, the operator of the facility would contact the relevant local emergency management committee (LEMC).	Operation

BF14	Fire risk mitigation associated with the lithium-ion BESS would include:
	• Selecting a BESS unit with:
	  o Enclosures which protect the system from weather and extreme heat, solar degradation, dust, and animals. Of course these must be fit for the local conditions.
	  o Cooling systems able to handle the local conditions.
	  o Battery management systems to monitor for faults, automatically respond and alert staff.
		Operation

No.	Mitigation measures	Phase
	○ Fire suppression systems, if effective. • Appropriate fire risk reduction including ○ Strictly adhere to the manufacturer's requirements on installation and testing. ○ Carefully handle the BESS during transport and installation to avoid mechanical damage. ○ Locating the BESS as far as practicable from any sensitive receptors or large stands of vegetation. ○ Provide adequate clearance between battery containers and/or install fire rated walls to avoid or delay fire spread. ○ Provide adequate access/egress for installation, maintenance and fire response. ○ Provide an Asset Protection Zone to reduce the risk of fire spreading to or from the BESS. In the case of a centralised (AC coupled) this should be a 10m radius around the installation of a vegetation free surface such as crushed gravel. • Facilitation (including funding) of first responder training in the management of LiB fires at the site for local brigades. • Preparation of a BESS specific section within the Battery Fire Response Plan, under the Bushfire Emergency Management and Operations Plan, in consultation with fire authorities, fire suppression experts and in reference to relevant standards and guidelines.	
BF15	A Fire Safety Study (FSS) will be undertaken and developed in accordance with the requirements of Hazardous Industry Planning Advisory Paper No. 2 (HIPAP No.2) and consultation with FRNSW prior to commencement of construction. The FSS will consider the limited operational capacity of local fire agencies and the need for the facility to achieve an adequate level of on-site fire and life safety dependence.	Pre - Construction
BF16	Ensure the battery cooling systems are fully -tested when installed.	Construction
	Hazardous materials and development	
PHA1	Dangerous or hazardous materials would be stored and handled in accordance with AS1940-2004: *The storage and handling of flammable and combustible liquids* and the ADG code where relevant.	Construction Operation Decommissioning
PHA2	Protocols would be developed for lithium-ion battery storage, maintenance, and incident response to mitigate Li-ion fire risks.	Construction Operation Decommissioning
PHA3	The transportation of new and waste lithium-ion batteries would comply with the requirements of the Dangerous Goods Code, including specific 'special provisions' and 'packing instructions' applying to the transportation of Li-ion batteries.	Construction

No.	Mitigation measures	Phase
		Operation Decommissioning
PHA4	Preparation of a specific Battery Fire Response Plan, under the general Fire Response Plan, in consultation with fire authorities, fire suppression experts, and in reference to relevant standards and guidelines.	Construction Operation Decommissioning
PHA5	The results of this PHA should be used as inputs into other safety studies required including: • Fire Response Plan. • Evacuation Plan. • Spill and Contamination Response Plan.	Construction Operation Decommissioning
	EMF	
E1	All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.	Preconstruction Construction
E2	All design and engineering would be undertaken by qualified and competent person/s with the support of specialists as required and would aim to minimise EMFs.	Preconstruction Construction
	Air quality	
AQ1	The CSES will be implemented to promote information sharing for air quality and include: • Notification of relevant stakeholders. • An accessible complaints process with a timely response protocol.	Preconstruction/ Construction/ Decommissioning
AQ2	Dust control measures, including on site access roads, will be specified in the CEMP and DEMP and may include water applications or other means as required.	Construction/ Decommissioning
AQ3	Idling for more than 5 minutes is prohibited. Lorries and trucks engines would be turned off.	Construction/ Decommissioning

No.	Mitigation measures	Phase
AQ4	Vehicle loads of material which may create dust or litter would be covered while using the public road system.	Construction/ Decommissioning
AQ5	All vehicles and machinery used at the site would be in good condition, fitted with appropriate emission controls and comply with the requirements of the POEO Act, relevant Australian standards and manufacturer's operating recommendations. Plant would be operated efficiently and turned off when not in use.	Construction/ Decommissioning
AQ6	Fires and material burning would be prohibited in the Development site.	Construction/ Decommissioning
	Resource use and waste generation	
R1	A Waste Management Plan (WMP) would be developed to minimise waste, including: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy. • Quantification and classification of all waste streams. • Provision for recycling management on-site. • Provision of toilet facilities for on-site workers and identify that sullage would be disposed of (i.e., pump out to local sewage treatment plant). • Tracking of all waste leaving the site. • Disposal of waste at facilities permitted to accept the waste. • Requirements for hauling waste (such as covered loads).	Construction/ Operation/ Decommissioning
R2	A septic system would be installed and operated according to the Queanbeyan Palerang Regional Council regulations.	Construction/ Operation